BIOMONITORING SERVICES

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BIOASSAY REPORT
CHRONIC BIOASSAYS
Conducted August 5 through 12, 2003

CH2MHILL

870712

SCOEPA00027174

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BIOASSAY REPORT
CHRONIC BIOASSAYS
Conducted August 5 through 12, 2003

Prepared for

WACKER SILTRONICS
PORTLAND, OREGON

Prepared by

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August 18, 2003
Lab I.D. No. B1080

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INTRODUCTION

CH2M HILL conducted chronic bioassays from August 5 through 12, 2003. The samples were provided by the Wacker Siltronics, Portland, Oregon. The organisms tested were the fathead minnow (*Pimephales promelas*) and the water flea (*Ceriodaphnia dubia*). Forty eight hour acute data was obtained from the chronic tests (dual-endpoint testing).

METHODS AND MATERIALS

TEST METHODS

The chronic test methods were performed according to: Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Weber, C. et al. (1994); EPA/600/4-91/002 and *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.

TEST ORGANISMS

The *Ceriodaphnia dubia* used in the test were obtained from CH2M HILL's in-house cultures and were less than 24 hours old and within an eight hour age range, respectively, at test initiation. The fathead minnows were obtained from Aquatox, Inc., Hot Springs, Arkansas, and were less than 24 hours old at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (1994). The test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used in the tests was moderately hard reconstituted water (EPA, 1994) with a total hardness of 82 and 90 mg/l as $CaCO_3$, alkalinity of 62 and 68 mg/l as $CaCO_3$, and a pH of 7.9 and 7.9.

TEST CONCENTRATIONS

The concentrations tested in the chronic tests were 1.90, 3.75, 7.50, 15.0, and 30.0 percent effluent and dilution water for the control. For the fathead minnow chronic test, 10 organisms per chamber with four chambers per concentration, for a total of 40 organisms per concentration were used. For the *Ceriodaphnia* chronic test, 1 organism per chamber with ten chambers per concentration for a total of 10 organisms per concentration were used.

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SAMPLE COLLECTION

Samples were collected by Wacker Siltronics personnel on August 4, 6, and 8, 2003. All samples were delivered to CH2M HILL's Aquatic Toxicology Laboratory by Greyhound bus and stored in the dark at 4°C until test solutions were prepared and tested. Chain of custody for sample collection is provided in Appendix C.

SAMPLE PREPARATION

The samples were filtered through a 60 µm net upon arrival and temperature was adjusted prior to each daily renewal on samples used during the tests.

MONITORING OF BIOASSAYS

Samples were monitored on arrival for hardness, total residual chlorine, ammonia, and temperature.

For the chronic test, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in the control and all concentrations tested. Conductivity was measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was measured daily in the chronic tests. According to EPA (1994), *Ceriodaphnia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia* in the controls have produced their third brood and at least 15 neonates per adult are produced. Fathead minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the fathead minnow chronic test. Temperature was monitored continuously throughout the testing period.

DATA ANALYSIS

The effect measured during the dual-endpoint acute tests was survival during the 48 hour exposure period. The effects measured during the *Ceriodaphnia* chronic test included survival and reproduction over the 7-day exposure period. The effects measured during the fathead minnow chronic test included survival and growth over the 7-day exposure period. The statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, using Toxcalc version 5.0. Dunnett's Procedure, Bonferroni's T-Test or Fisher's Exact Test was used to compare the survival data and Dunnett's Procedure or Bonferroni's T-Test was used to compare the reproduction or growth data between the control and each effluent treatment. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test with Bonferroni Adjustment could not be met, Steel's Many-One Rank Test or Wilcoxon Rank Sum with Bonferroni Adjustment was used to analyze the data.

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RESULTS AND DISCUSSION

ACUTE DUAL ENDPOINT

Table 1 summarizes the acute dual-endpoint survival data taken from the chronic tests.

Table 1
Acute Dual-Endpoint Survival Data

Sample Concentration (%)	*Ceriodaphnia dubia* 48 hour percent survival	Fathead minnow 48 hour percent survival
Control	100	100
1.90	100	100
3.75	100	97.5
7.50	100	100
15.0	100	100
30.0	100	100

The acute dual-endpoint test results showed no statistically significant reduction in survival when compared to the control at any of the effluent concentrations tested for both species. The dual-endpoint LC_{50} was greater than 30 percent for both species.

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CHRONIC BIOASSAY

Table 2 summarizes the survival and growth data for the samples tested on the fathead minnow.

Table 2
Chronic Fathead Minnow
Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight (mg)
Control	100	0.863
1.90	100	0.843
3.75	97.5	0.904
7.50	100	0.873
15.0	100	0.946
30.0	100	0.910

The fathead minnow test results showed no statistically significant reduction in survival or growth at any effluent concentration tested when compared to the control. Control survival was 30 percent. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 30 and greater than 30 percent effluent, respectively.

The IC_{25} value (the concentration of effluent causing a 25 percent reduction in biological measurement, e.g. growth) calculated on the fathead minnow growth was greater than 30 percent.

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Table 3 summarizes the survival and reproduction data for the effluent tested on the *Ceriodaphnia dubia.*

Table 3
***Ceriodaphnia Dubia* Chronic Results**

Concentration (%)	Percent Survival	No. Young Per Adult
Control	90	24.6
1.9	100	20.2
3.75	100	13.3
7.50	90	13.2
15.0	90	8.2[b]
30.0	30[a]	6.0

[a] Indicates a statistically significant reduction when compared to the control at p equal to 0.05 using Fisher's Exact Test.
[b] Indicates a statistically significant reduction when compared to the control at p equal to 0.05 using Dunnett's Test.

The test results show a statistically significant reduction in survival at the 30 percent and in reproduction at the 15 percent sample concentrations when compared to the control. Control survival was 90 percent. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 7.5 and 15 percent sample, respectively.

The IC_{25} value (the concentration of sample causing a 25 percent reduction in biological measurement, e.g. growth) was calculated on the *Ceriodaphnia dubia* reproduction. The IC_{25} value for reproduction was 2.1 percent sample.

The dissolved oxygen levels in the chronic tests remained above 40 percent saturation throughout the test period. Test temperatures remained at 25±1°C. The tests proceeded without interruption or incidents that could have affected test results.

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REFERENCE TOXICANT TESTS

The results of the reference toxicant tests conducted in August with sodium chloride (*Ceriodaphnia* and fathead minnow) indicate that the test organisms were within their respective sensitivity range based on EPA guidelines (EPA 1989).

The IC_{25}, LC_{50}, and 95 percent confidence intervals of the reference toxicant test conducted are listed in the tables below.

Table 4
Chronic Reference Toxicant Tests (g/L)

Species (test)	IC_{25}	Control Chart
Ceriodaphnia dubia (survival)	1.58	0.58 to 2.40
Ceriodaphnia dubia (reproduction)	0.47	0.12 to 1.03
Pimephales promelas (survival)	3.1	1.5 to 5.1
Pimephales promelas (growth)	3.0	1.2 to 4.0

Table 5
Acute Reference Toxicant Test (g/L)

Species	LC_{50}	Control Chart
Pimephales promelas (FHM 1084)	7.5	6.7 to 8.2

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APPENDIX A
RAW DATA SHEETS

CH2M HILL *TOXICITY TEST ORGANISM AND WATER QUALITY DATA*

Client Wacker Siltronics — Test Initiation: Date 8-5-03 Time 1100 — Test Termination: Date 8-12-03 Time 1630

Contact Tom Rothschild — Technician Holm, Mulky, Ensor, Dalton-AHA, Winn

Test Species/ID *Pimephales promelas* / FHM 1084 /

Ceriodaphnia dubia / Cd 1562 /

Sample Information								Test Species Information	ID# FHM 1084	ID# Cd 1562	ID#	ID#
Sample ID Number	Field ID	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Dechlor.	Ammonia NH_3-N mg/l	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$	Age or Size	< 24 hours	< 24 hours within an 8 hour span		
B1080 -01	03-85	8-4-03	0740	0.021 / -	0.71	156	34	Test Container Size	800 ml	30 ml		
-02	03-86	8-6-03	0740	0.00 / -	0.89	322	32	Test Volume	~~500~~ 500 mS ml	15 ml		
-03	03-86	8-8-03	0740	001 / -	0.69	164	34	Feeding: Type	0.15 ml *Artemia*	0.1 ml Algae &		
				/				Amount	2 x daily	YCT daily		
				/				Aeration: Began	None	None		
				/				Amount	—	—		
				/				Dilution Water ID#	2299 + 2303	2299 + 2303		
				/				Acclimation Period	< 24 hours	< 24 hours		
				/				Test Location	# 4	# 5		
				/				Condition of Survivors				
				/				Size (mm)	—	—		
				/				Loading Rate	—	—		
				/				Comments H_2O_2 levels measured (via Hach Kit) -01 = 34 mg/L				

Dilution Water Source	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	2299	82	62
↓	2303	90	68

-02 = 31 mg/L

-03 = 33 mg/L

Water Quality Meters Used/ID#

Dissolved Oxygen 2 pH 3 Temperature _____

Conductivity 2 Refractometer _____ Other _____

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FATHEAD MINNOW 7-DAY GROWTH DATA

Client: Wacker | Species ID# FHM 1084

Lab ID: B 1080 | Start Date: 08/05/2003

Sample Description:

Technician:	kj	tf
Date:	08/11/2003	08/13/2003

Concentration or Percent	Replicate	Tare Weight (mg)	Total Weight (mg)	No. of Fish
Control	A	1147.02	1154.57	10
	B	1162.35	1171.76	10
	C	1136.72	1145.76	10
	D	1137.76	1146.27	10
1.9%	A	1140.16	1148.69	10
	B	1137.92	1146.45	10
	C	1134.25	1143.20	10
	D	1156.77	1164.47	10
3.75%	A	1155.75	1164.70	10
	B	1141.53	1152.02	10
	C	1133.91	1142.95	9
	D	1143.77	1151.43	10
7.50%	A	1149.05	1157.72	10
	B	1131.31	1140.89	10
	C	1156.77	1164.73	10
	D	1144.85	1153.57	10
15.0%	A	1139.17	1148.53	10
	B	1151.50	1160.73	10
	C	1142.49	1151.71	10
	D	1156.31	1165.35	9
30.0%	A	1160.74	1169.67	10
	B	1123.60	1133.70	10
	C	1150.24	1158.22	10
	D	1151.77	1161.16	10
	A			
	B			
	C			
	D			

weigh to 0.01 mg

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client: Wacker Siltronics — Date Initiated: 8-5-03 — Time: 1410

Sample Description: EOB1080 — Date Terminated: 8-12-03 — Time: 1630

Technician: Day 0 CEH Day 1 [illegible] Day 2 [illegible] Day 3 CEH Day 4 CEH Day 5 CEH Day 6 CEH Day 7 [illegible]

Time: Day 0 1410 Day 1 1500 Day 2 1035 Day 3 1530 Day 4 1355 Day 5 1430 Day 6 1135 Day 7 1630

Concentration or Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
CONTROL	0	10	10	10	10		8.3		8.1	25.4	281
	1	10	10	10	10	6.9	8.1	7.6	7.9	24.3	
	2	10	10	10	10	7.0	8.0	7.5	7.8	24.2	275
	3	10	10	10	10	7.3	7.9	7.7	7.9	24.1	
	4	10	10	10	10	7.5	8.3	7.5	7.8	23.9	289
	5	10	10	10	10	6.0	8.0	7.2	7.8	24.0	
	6	10	10	10	10	6.6	8.0	7.4	7.9	24.0	
	7	10	10	10	10	7.1		7.5		23.6	
1.90 %	0	10	10	10	10		8.3		8.1	25.4	316
	1	10	10	10	10	6.8	8.1	7.6	7.9	24.3	
	2	10	10	10	10	7.1	8.1	7.5	7.7	24.2	293
	3	10	10	10	10	7.0	7.9	7.7	7.9	24.0	
	4	10	10	10	10	7.3	8.3	7.5	7.8	25.9	290
	5	10	10	10	10	6.1	8.1	7.3	7.8	23.8	
	6	10	10	10	10	6.5	8.1	7.4	7.9	24.1	
	7	10	10	10	10	6.7		7.5		24.2	
3.75 %	0	10	10	10	10		8.3		8.0	25.2	312
	1	10	10	9	10	6.8	8.0	7.6	7.9	24.6	
	2	10	10	9	10	7.1	8.1	7.5	7.7	24.2	303
	3	10	10	9	10	7.1	7.8	7.7	7.9	24.7	
	4	10	10	9	10	7.5	8.3	7.5	7.8	24.1	297
	5	10	10	9	10	6.4	8.1	7.3	7.8	23.8	
	6	10	10	9	10	6.5	8.1	7.4	7.9	24.0	
	7	10	10	9	10	6.7		7.5		24.1	
7.50 %	0	10	10	10	10		8.3		7.9	25.2	306
	1	10	10	10	10	6.8	8.1	7.6	7.9	24.3	
	2	10	10	10	10	7.1	8.2	7.5	7.7	24.2	326
	3	10	10	10	10	7.0	7.9	7.7	7.9	24.7	
	4	10	10	10	10	7.4	8.3	7.5	7.8	23.9	319
	5	10	10	10	10	6.5	8.1	7.3	7.8	23.8	
	6	10	10	10	10	6.5	8.1	7.4	7.8	23.9	
	7	10	10	10	10	6.3		7.4		23.8	
15.0 %	0	10	10	10	9 10		8.3		7.9	25.0	328
	1	10	10	10	9	6.9	8.1	7.6	7.8	24.3	
	2	10	10	10	9	7.1	8.2	7.4	7.7	24.1	388
	3	10	10	10	9	7.0	7.9	7.6	7.8	24.0	
	4	10	10	10	9	7.4	8.1	7.5	7.8	23.9	360
	5	10	10	10	9	6.5	8.2	7.3	7.8	23.9	
	6	10	10	10	9	6.7	8.1	7.4	7.8	24.0	
	7	10	10	10	9	6.4		7.4		23.9	
30.0 %	0	10	10	10	10		8.3		7.8	25.0	360
	1	10	10	10	10	6.9	8.0	7.5	7.8	24.5	
	2	10	10	10	10	7.1	8.2	7.4	7.6	24.0	503
	3	10	10	10	10	7.0	7.9	7.6	7.7	24.0	
	4	10	10	10	10	7.5	8.3	7.5	7.7	23.9	439
	5	10	10	10	10	6.6	8.3	7.3	7.7	24.0	
	6	10	10	10	10	6.5	8.3	7.3	7.7	23.9	
	7	10	10	10	10	6.4		7.3		23.8	

Larval Fish Growth and Survival Test-48 Hr Survival

Start Date:	08/05/2003 14:10	Test ID:	108001ppc	Sample ID:	WACKER-SILTRONICS
End Date:	08/12/2003 16:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/04/2003 07:40	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP

Comments:

Conc-%	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	0.9000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000

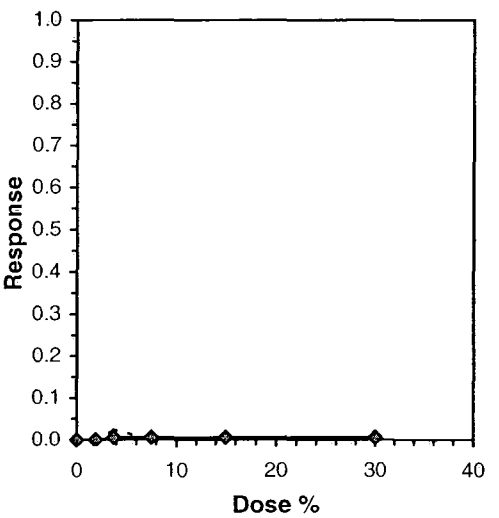
			Transform: Arcsin Square Root					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			1.0000	1.0000
1.9	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
3.75	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	0.9938	0.9938
7.5	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0.9938	0.9938
15	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4	16.00	10.00	0.9938	0.9938
30	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0.9938	0.9938

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.4951	0.884	-3.0083	13.8912
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	30	>30		3.33333

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>30			
IC10	>30			
IC15	>30			
IC20	>30			
IC25	>30			
IC40	>30			
IC50	>30			



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Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	08/05/2003 14:10	Test ID:	108001ppc	Sample ID:	WACKER-SILTRONICS
End Date:	08/12/2003 16:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/04/2003 07:40	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP

Comments:

Conc-%	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	0.9000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
1.9	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
3.75	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
7.5	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
15	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4	16.00	10.00
30	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.4951	0.884	-3.0083	13.8912
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	30	>30		3.33333

SCOEPA00027188

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	08/05/2003 14:10	Test ID:	108001ppc	Sample ID:	WACKER-SILTRONICS
End Date:	08/12/2003 16:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/04/2003 07:40	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

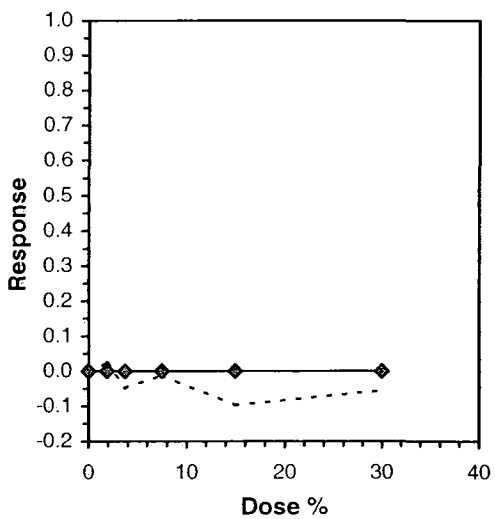
Conc-%	1	2	3	4
LAB-Control	0.7550	0.9410	0.9040	0.8510
1.9	0.8530	0.8530	0.8950	0.7700
3.75	0.8950	1.0490	0.9040	0.7660
7.5	0.8670	0.9580	0.7960	0.8720
15	0.9360	0.9230	0.9220	1.0044
30	0.8930	1.0100	0.7980	0.9390

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	0.8628	1.0000	0.8628	0.7550	0.9410	9.362	4				0.8898	1.0000
1.9	0.8428	0.9768	0.8428	0.7700	0.8950	6.216	4	0.363	2.410	0.1329	0.8898	1.0000
3.75	0.9035	1.0472	0.9035	0.7660	1.0490	12.804	4	-0.739	2.410	0.1329	0.8898	1.0000
7.5	0.8733	1.0122	0.8733	0.7960	0.9580	7.593	4	-0.190	2.410	0.1329	0.8898	1.0000
15	0.9464	1.0969	0.9464	0.9220	1.0044	4.147	4	-1.516	2.410	0.1329	0.8898	1.0000
30	0.9100	1.0548	0.9100	0.7980	1.0100	9.762	4	-0.857	2.410	0.1329	0.8898	1.0000

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97311		0.884		-0.0771	-0.0091
Bartlett's Test indicates equal variances (p = 0.60)					3.64495		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	30	>30		3.33333	0.13288	0.15402	0.00561	0.00608	0.48881	5, 18

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>30			
IC10	>30			
IC15	>30			
IC20	>30			
IC25	>30			
IC40	>30			
IC50	>30			



SCOEPA00027189

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client: Wacker Siltronics
Test Start Date: 8-5-03
Sample Description:
Sample ID#: ~~EO~~ B1080
Ceriodaphnia Lot#: Cd 1562
Statistician: DW

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	32	33	47	33	0/AD	35	4	27	6	29	9	246
1.9	5	19	5	36	18	38	7	35	5	34	10	202
3.75	7	5	5	5	35	34	4	4	4	30	10	133
7.5	4	33	28	6	33	7	4/AD	4	6	7	9	132
15	2	4	10	5	3	3	6	17	6/AD	26	9	82
30	5/AD	0/AD	4/AD	5/AD	9	4/AD	5	5/AD	4/AD	19	3	60

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Wacker Siltronics Test Beginning: Date 8-5-03 Time 1100

Sample Description COB1030-01 Test Ending: Date 8-12-03 Time 1400

Ceriodaphnia Lot# Cd Dilution Water Recon MH (FHM) ID# 2299 + 2303

Technician Day 1 Jm Day 2 MM Day 3 Jm Day 4 Jm Day 5 Jm Day 6 Jm Day 7 DW

Time Day 1 1305 Day 2 1510 Day 3 1220 Day 4 1150 Day 5 0830 Day 6 0935 Day 7 1400

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	6	0	0 AD	0	4	0	6	0	9	~~44~~ 16
	4	6	6	8	6		7	0	7	0	5	9	44
	5	10	12	0	13		12	0	0	0	11	9	58
	6	17	15	16	14		16	0	6	0	0	9	84
	7	0	0	17	0		0	0	14	0	13	9	44
1.90 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	5	0	5	0	0	0	7	0	5	0	10	22
	4	0	3	0	6	4	4	0	7	0	5	10	29
	5	0	9	0	13	8	7	0	11	0	10	10	53
	6	0	7	0	0	6	11	0	0	0	0	10	24
	7	0	0	0	17	0	16	0	17	0	19	10	69
3.75 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	7	5	5	5	0	0	4	4	4	0	10	34
	4	0	0	0	0	3	5	0	0	0	6	10	14
	5	0	0	0	0	14	12	0	0	0	14	10	40
	6	0	0	0	0	0	0	0	0	0	0	10	0
	7	0	0	0	0	18	17	0	0	0	10	10	45
7.50 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	0	0	6	0	7	4	4	6	0	10	31
	4	0	6	7	0	4	0	0	0	0	7	10	24
	5	0	11	10	0	12	0	0 AD	0	0	0	10	33
	6	0	0	0	0	0	0	0	0	0	0	10	0
	7	0	16	11	0	17	0	0 AD	0	0	0	9	44
15.0 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	2	4	5	5	0	3	6	0	6 AD	0	~~9~~ 9	31
	4	0	0	0	0	3	0	0	5		3	9	11
	5	0	0	0	0	0	0	0	12		10	9	22
	6	0	0	5	0	0	0	0	0		0	9	5
	7	0	0	0	0	0	0	0	0		13	9	13
30.0 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	5	0 AD	4 AD	5 AD	0	0	5	0	4 AD	0	6	23
	4	0				2	4	0	5 AD		4	5	~~10~~ 15
	5	0				5	0	0			9	5	14
	6	0 AD				0	0 AD	0			0	3	0
	7					2	5	0			6	3	8

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client: Wacker Siltronics | Initiated Date: 8-5-03 Time: 1100 | Adults Isolated Date: 8-4-03 Time: 2210

Sample Description: QC B1090 | Terminated Date: 8-12-03 Time: 1400 | Neo's Collected Date: 8-5-03 Time: 0845

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	BW	BW	BW	BW	BW	BW	BW	DW
Time	1415	1330	1645	1422	1355	1105	1000	1400

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	8.2	7.6 / 7.1	8.0 / 7.6	7.6 / 7.5	7.7 / 7.7	8.0 / 7.8	8.0 / 7.6	7.9
1.9	8.2	7.7 / 7.2	8.0 / 7.6	7.6 / 7.5	7.9 / 7.7	8.0 / 7.8	7.9 / 7.8	7.9
3.75	8.2	7.7 / 7.1	7.9 / 7.6	7.6 / 7.5	8.0 / 7.7	8.1 / 7.7	8.0 / 7.7	7.9
7.5	8.1	7.7 / 7.2	7.9 / 7.4	7.6 / 7.4	8.0 / 7.6	8.1 / 7.7	8.0 / 7.7	7.9
15	8.1	7.7 / 7.2	7.9 / 7.3	7.6 / 7.3	8.0 / 7.6	8.2 / 7.7	8.0 / 7.6	7.9
30	8.2	7.7 / 7.3	7.9 / 7.4	7.7 / 7.8	8.1 / 7.6	8.2 / 7.8	7.9 / 7.6	7.9

Percent or Concentration	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.6	8.0 / 7.5	8.1 / 7.7	7.9 / 7.7	7.9 / 7.7	7.9 / 7.6	7.9 / 7.6	8.0
1.9	7.6	8.0 / 7.4	8.1 / 7.6	7.9 / 7.6	7.9 / 7.6	7.9 / 7.5	7.9 / 7.5	8.0
3.75	7.6	8.0 / 7.4	8.0 / 7.5	7.9 / 7.6	7.9 / 7.6	7.9 / 7.5	7.8 / 7.5	7.9
7.5	7.5	7.9 / 7.4	8.1 / 7.5	7.9 / 7.6	7.9 / 7.5	7.9 / 7.5	7.9 / 7.5	7.9
15	7.5	7.9 / 7.4	8.1 / 7.4	7.9 / 7.5	7.9 / 7.5	7.8 / 7.4	7.8 / 7.5	7.9
30	7.5	7.9 / 7.3	8.1 / 7.3	7.8 / 7.4	7.9 / 7.4	7.8 / 7.3	7.8 / 7.3	7.8

Percent or Concentration	Temperature (C) / Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	24.9 / 271	25.4	24.6 / 276	24.9	25.8 / 276	26.0	25.8	24.8
1.9	24.8	25.7		24.3	25.1	25.5	25.2	25.2
3.75	25.1	24.3		25.1	24.7	24.3	25.0	25.0
7.5	25.1	25.0		21.1	25.0	24.5	24.8	25.3
15	25.2	24.9		24.9	25.2	24.9	24.9	25.1
30	25.0 / 410	25.7	24.2 / 403	24.3	25.6 / 449	25.1	25.5	25.4

COMMENTS:

SCOEPA00027192

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	08/05/2003 11:00	Test ID:	10800cdpc	Sample ID:	WACKER-SILTRONICS
End Date:	08/12/2003 14:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/04/2003 07:40	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

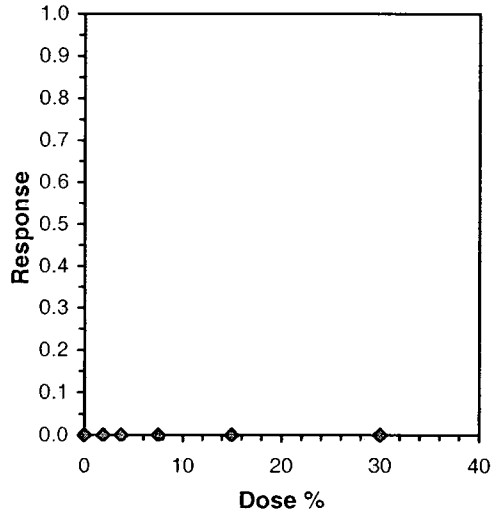
Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
LAB-Control	1.0000	1.0000	0	10	10	10			1.0000	1.0000
1.9	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
3.75	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
7.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
15	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
30	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	30	>30		3.33333

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL	Skew
IC05	>30			
IC10	>30			
IC15	>30			
IC20	>30			
IC25	>30			
IC40	>30			
IC50	>30			



SCOEPA00027193

Ceriodaphnia Survival and Reproduction Test-7 Day survival

Start Date:	08/05/2003 11:00	Test ID:	10800cdpc	Sample ID:	WACKER-SILTRONICS
End Date:	08/12/2003 14:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/04/2003 07:40	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
30	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
LAB-Control	0.9000	1.0000	1	9	10	10		
1.9	1.0000	1.1111	0	10	10	10	0.5000	0.0500
3.75	1.0000	1.1111	0	10	10	10	0.5000	0.0500
7.5	0.9000	1.0000	1	9	10	10	0.7632	0.0500
15	0.9000	1.0000	1	9	10	10	0.7632	0.0500
*30	0.3000	0.3333	7	3	10	10	0.0099	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	15	30	21.2132	6.66667

SCOEPA00027194

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	08/05/2003 11:00	Test ID:	108001cdc	Sample ID:	WACKER-SILTRONICS
End Date:	08/12/2003 14:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/04/2003 07:40	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	32.000	33.000	47.000	33.000	0.000	35.000	4.000	27.000	6.000	29.000
1.9	5.000	19.000	5.000	36.000	18.000	38.000	7.000	35.000	5.000	34.000
3.75	7.000	5.000	5.000	5.000	35.000	34.000	4.000	4.000	4.000	30.000
7.5	4.000	33.000	28.000	6.000	33.000	7.000	4.000	4.000	6.000	7.000
15	2.000	4.000	10.000	5.000	3.000	3.000	6.000	17.000	6.000	26.000
30	5.000	0.000	4.000	5.000	9.000	4.000	5.000	5.000	4.000	19.000

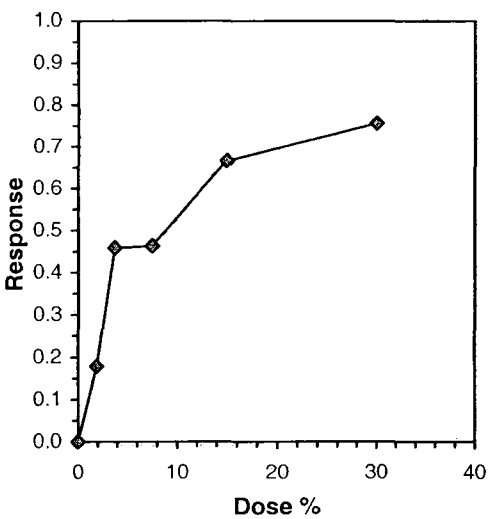
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
LAB-Control	24.600	1.0000	24.6000	0.0000	47.0000	63.648	10			24.600	1.0000
1.9	20.200	0.8211	20.2000	5.0000	38.0000	70.969	10	104.50	76.00	20.200	0.8211
3.75	13.300	0.5407	13.3000	4.0000	35.0000	102.852	10	90.00	76.00	13.300	0.5407
7.5	13.200	0.5366	13.2000	4.0000	33.0000	95.747	10	88.50	76.00	13.200	0.5366
*15	8.200	0.3333	8.2000	2.0000	26.0000	93.372	10	75.50	76.00	8.200	0.3333
30	6.000	0.2439	6.0000	0.0000	19.0000	84.254	10			6.000	0.2439

Auxiliary Tests					Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)					0.92849	0.93	0.28946	-0.9571
Bartlett's Test indicates equal variances (p = 0.35)					4.40529	13.2767		
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**				
Steel's Many-One Rank Test	7.5	15	10.6066	13.3333				

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL		Skew
IC05*	0.5311	1.6051	0.1890	5.1517	3.3849
IC10*	1.0623	1.9783	0.3780	7.8032	3.0982
IC15*	1.5934	2.3531	0.5670	8.4054	2.8721
IC20	2.0394	2.6576	0.7559	9.0609	2.9127
IC25	2.3692	3.2192	0.9449	10.2072	2.3150
IC40	3.3586	4.8102	1.5119	18.0530	1.6584
IC50	8.8500				

* indicates IC estimate less than the lowest concentration



SCOEPA00027195

APPENDIX B
REFERENCE TOXICANT DATA SHEETS

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Reference Toxicant Test Data Summary

Client: QA/QC – August
Test Start Date: 7-29-03
Sample Description: NaCl
Sample ID#: ——
Ceriodaphnia Lot#: 1561
Statistician: BM

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	36	35	24	35	34	32	36	31	40	36	10	339
0.25 g/L	36	33	32	27	35	15	34	33	31	28	10	304
0.5 g/L	26	32	25	14	24	26	27	23	29	21	10	247
1.0 g/L	20	23	17	19	14	17	20	19	2	21	10	172
1.5 g/L	0	11	12	1	1 (AD)	4	4	6	2	5	9	46
2.0 g/L	0	0	0	0	0	0	0	0	0	0	0	0
4.0 g/L	0	0	0	0	0	0	0	0	0	0	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Endpoint	IC25	Cusum Chart Limits
Survival	1.58	0.58 to ~~2.35~~ 2.40 DD
Reproduction	0.47	BM ~~0.13~~ ~~0.23~~ 0.12 to 1.03

Task Manager: [signature]
Project Manager: Doug Winn
QA Officer: [signature]

CH2MHILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client QA/QC - August Test Beginning : Date 7-29-03 Time 1030

Sample Description NaCl (18013-08) 50 g/L STOCK Test Ending : Date 8-4-03 Time 1350

Ceriodaphnia Lot# Cd 1561 Dilution Water Recon MH (FHM) ID# 2297 f

Technician Day 1 DW Day 2 DW Day 3 JM Day 4 MM Day 5 MM Day 6 JM Day 7 ____

Time Day 1 0845 Day 2 0915 Day 3 1030 Day 4 1650 Day 5 1445 Day 6 1350 Day 7 ____

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	6	6	6	5	5	4	5	6	7	6	10	56
	4	9	10	8	10	11	10	11	8	12	10	10	99
	5	0	0	10	0	0	0	0	0	0	3	10	13
	6	21	19	0	20	18	18	20	17	21	17	10	171
	7												
0.25 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	7	6	6	6	6	4	7	7	7	7	10	63
	4	11	11	10	7	10	9	10	10	10	8	10	96
	5	0	0	0	0	0	0	0	0	0	0	10	0
	6	18	16	16	14	19	2	17	16	14	13	10	145
	7												
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	4	5	6	2	5	6	5	6	4	10	47
	4	10	11	8	6	8	7	7	5	7	7	10	76
	5	0	0	0	0	0	0	0	0	0	0	10	0
	6	12	17	12	2	14	14	14	13	16	10	10	124
	7												
1.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	2	4	2	3	3	2	5	5	2	3	10	31
	4	7	11	6	8	11	8	7	4	0	10	10	~~62~~ 72
	5	6	8	0	0	0	0	0	0	0	0	10	8
	6	11	0	9	8	0	7	8	10	0	8	10	61
	7												
1.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	3	2	1	1	0	1	3	2	3	10	15
	4	0	2	4	0	0	4	3	4	0	2	10	19
	5	0	DND 80	0	0	0	0	0	0	0	0	10	0
	6	0	6	6	0	OAD	0	0	0	0	0	~~10~~ 9	12
	7					1							
2.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0/AD	0	0	0	9	0
	3	0	0	0	0	0	0	1	0	0 AD	0	8	0
	4	0/M	0/M	0/M	0/M	0M	0M		0M		0M	0	0
	5												
	6												
	7												
4.0 g/L	1	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0
	2												
	3												

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client: QA / QC – August

Initiated Date: 7-29-03 Time: 1030

Adults Isolated Date: 7-28-03 Time: 0830

Sample Description: NaCl Reagent Log # 18013-08 (50 g/L STOCK)

Terminated Date: 8-4-03 Time: 1355

Neo's Collected Date: 7-28-03 Time: 1400

Technician: Day 0 DW | Day 1 DW | Day 2 DW | Day 3 [illegible] | Day 4 [illegible] | Day 5 [illegible] | Day 6 [illegible] | Day 7

Time: Day 0 1030 | Day 1 0845 | Day 2 0915 | Day 3 1100 | Day 4 1515 / 1715 | Day 5 1425 | Day 6 1355 | Day 7

Dissolved Oxygen (mg/l)

Percent or Concentration	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.9	7.9 / 8.1	7.9 / 8.1	7.9 / 8.1	7.9 / 8.0	7.9 / 8.1	7.9	
0.25 g/L	7.9	7.9 / 8.1	7.9 / 8.1	7.9 / 8.1	7.9 / 8.0	7.8 / 8.1	7.3	
0.50 g/L	7.9	7.9 / 8.1	7.9 / 8.1	8.0 / 8.1	7.8 / 8.0	7.8 / 8.1	7.3	
1.0 g/L	7.9	7.9 / 8.1	7.9 / 8.1	8.0 / 8.1	7.8 / 8.0	7.9 / 8.1	7.2	
1.5 g/L	7.9	7.9 / 8.1	7.9 / 8.1	7.9 / 7.9	8.0 / 8.0	7.9 / 8.1	7.2	
2.0 g/L	7.8	7.9 / 8.1	7.9 / 8.1	7.9 / 8.0	8.0 / 8.0			
4.0 g/L	7.8	8.1 / –						

pH

Percent or Concentration	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.9	7.8 / 7.9	8.0 / 7.8	8.1 / 7.9	8.0 / 7.8	7.8 / 7.8	8.0	
0.25 g/L	7.8	7.8 / 7.9	8.0 / 7.7	8.0 / 7.7	8.0 / 7.8	7.9 / 7.7	7.9	
0.50 g/L	7.8	7.8 / 7.9	8.0 / 7.7	8.0 / 7.7	8.0 / 7.8	7.9 / 7.7	7.9	
1.0 g/L	7.8	7.9 / 7.8	8.0 / 7.6	8.0 / 7.6	7.9 / 7.6	7.8 / 7.6	7.9	
1.5 g/L	7.8	7.9 / 7.8	8.0 / 7.6	7.9 / 7.5	7.9 / 7.6	7.8 / 7.6	7.9	
2.0 g/L	7.8	7.9 / 7.7	8.0 / 7.6	7.9 / 7.5	7.9 / 7.6	7.5 / [illegible]		
4.0 g/L	7.8	7.9 / –						

Temperature (C) / Conductivity (µmhos/cm)

Percent or Concentration	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	25.0 / 287	25.2 / 289	24.3 / 295	24.1 / 284	24.2 / 288	24.6 / 292	24.4	
0.25 g/L	25.3 / 753	24.9 / 708	24.8 / 721	25.1 / 736	24.8 / 742	24.5 / 715	24.8	
0.50 g/L	25.1 / 1186	25.1 / 1162	24.6 / 1170	24.7 / 1166	24.3 / 1172	24.4 / 1174	25.9	
1.0 g/L	25.0 / 2010	25.3 / 2840	24.7 / 1993	24.5 / 1990	24.7 / 1970	24.5 / 1950	25.3	
1.5 g/L	25.0 / 2840	25.1 / 2860	24.9 / 2850	24.4 / 3600	24.3 / 2840	24.4 / 2790	25.2	
2.0 g/L	24.9 / 3680	25.2 / 3670	24.3 / 3680	24.8 / [illegible]	24.3 / 3580			
4.0 g/L	25.1 / 6770	25.0 / –						

COMMENTS:

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	07/29/2003 10:30	Test ID:	rcdc1561	Sample ID:	REFTOX-Reference Toxicant test
End Date:	08/04/2003 13:50	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

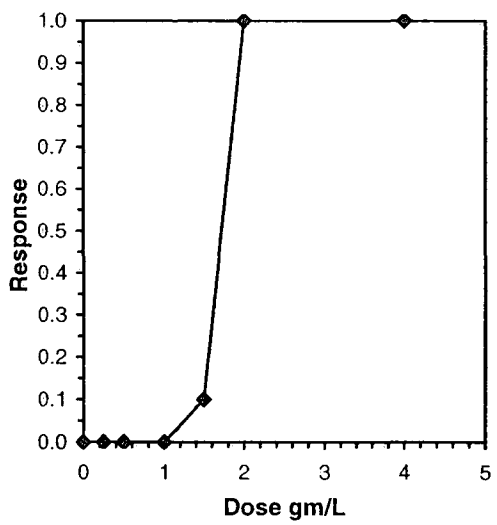
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
0.25	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
0.5	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
1	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
1.5	0.9000	0.9000	0.9948	0.5236	1.0472	16.644	10	0.9000	0.9000
2	0.0000	0.0000	0.5236	0.5236	0.5236	0.000	10	0.0000	0.0000
4	0.0000	0.0000	0.5236	0.5236	0.5236	0.000	10	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.30293	0.93	-6.1489	41.7311
Equality of variance cannot be confirmed				

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	1.2500	0.1560	1.0833	1.5250	0.5928
IC10	1.5000	0.1356	1.1667	1.5500	-1.0582
IC15	1.5278	0.1018	1.2500	1.5750	-1.3745
IC20	1.5556	0.0745	1.3333	1.6000	-2.4096
IC25	1.5833	0.0630	1.4167	1.6250	-2.4582
IC40	1.6667	0.0452	1.5714	1.7000	-2.7185
IC50	1.7222	0.0377	1.6429	1.7500	-2.7185



SCOEPA00027200

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	07/29/2003 10:30	Test ID:	rcdc1561	Sample ID:	REFTOX-Reference Toxicant test
End Date:	08/04/2003 13:50	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	36.000	35.000	24.000	35.000	34.000	32.000	36.000	31.000	40.000	36.000
0.25	36.000	33.000	32.000	27.000	35.000	15.000	34.000	33.000	31.000	28.000
0.5	26.000	32.000	25.000	14.000	24.000	26.000	27.000	23.000	29.000	21.000
1	20.000	23.000	17.000	19.000	14.000	17.000	20.000	19.000	2.000	21.000
1.5	0.000	11.000	12.000	1.000	1.000	4.000	4.000	6.000	2.000	5.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

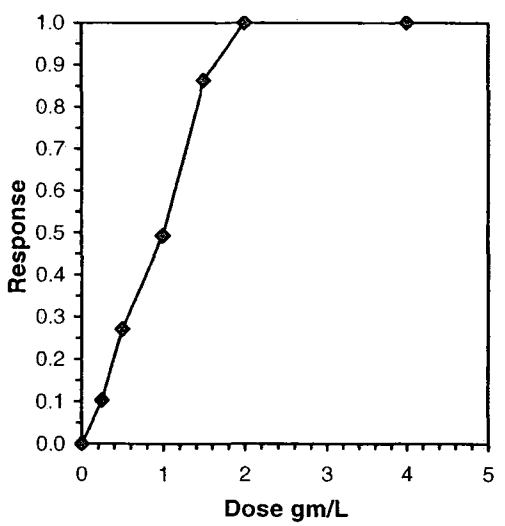
			Transform: Untransformed					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	33.900	1.0000	33.900	24.000	40.000	12.550	10	33.900	1.0000
0.25	30.400	0.8968	30.400	15.000	36.000	20.111	10	30.400	0.8968
0.5	24.700	0.7286	24.700	14.000	32.000	19.654	10	24.700	0.7286
1	17.200	0.5074	17.200	2.000	23.000	34.210	10	17.200	0.5074
1.5	4.600	0.1357	4.600	0.000	12.000	89.457	10	4.600	0.1357
2	0.000	0.0000	0.000	0.000	0.000	0.000	10	0.000	0.0000
4	0.000	0.0000	0.000	0.000	0.000	0.000	10	0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.8839	0.93	-1.3867	2.66989
Bartlett's Test indicates equal variances (p = 0.69)	2.26546	13.2767		

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05*	0.1211	0.0811	0.0508	0.3048	0.6815
IC10*	0.2421	0.0749	0.1017	0.3676	-0.0913
IC15	0.3195	0.0720	0.1525	0.4430	-0.3987
IC20	0.3939	0.0745	0.2033	0.5241	-0.4079
IC25	0.4682	0.0781	0.2607	0.6070	-0.1643
IC40	0.7907	0.0934	0.6128	0.9577	0.0955
IC50	1.0099	0.0801	0.8184	1.0995	-0.4828

* indicates IC estimate less than the lowest concentration



SCOEPA00027201

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

FHM 1083

Client: Ref Tox → August
Sample Description: NaCl (1B013-08) 50 g/L STOCK
Date Initiated: 7-29-03 Time: 1315
Date Terminated: 8-5-03 Time: 1550

Technician: Day 0 DW Day 1 DW Day 2 DW Day 3 CEA Day 4 MM Day 5 PSB Day 6 CEA Day 7 CEA
Time: Day 0 1315 Day 1 0955 Day 2 1045 Day 3 1145 Day 4 1720 Day 5 1450 Day 6 1235 Day 7 1550

Concentration or Percent g/L	Day	Number of Live Organisms A	B	C	D	Dissolved O_2 (mg/l) Pre	Post	pH Pre	Post	Temperature (°C)	Specific Conductivity (µmhos/cm)
Control	0	10	10	10	10		7.9		8.0	25.2	287
	1	10	10	10	10	7.8	8.0	7.7	8.0	25.1	304
	2	10	10	10	10	7.9	8.0	7.8	8.0	25.0	296
	3	10	10	10	10	7.9	8.1	7.8	8.0	24.1	294
	4	10	10	10	10	7.8	8.0	7.7	8.0	24.3	284
	5	10	10	10	10	7.7	8.1	7.8	8.0	24.4	293
	6	10	10	10	10	7.7	7.8	8.1	7.9	24.1	287
	7	10	10	10	9	7.2		7.7		24.2	297
0.3	0	10	10	10	10		7.9		8.0	25.4	813
	1	10	10	10	10	7.8	8.0	7.8	8.0	25.2	792
	2	10	10	10	10	7.9	8.0	7.8	8.0	24.5	869
	3	10	10	10	10	7.9	8.2	7.8	8.0	24.4	908
	4	10	10	10	10	7.8	8.0	7.7	8.0	24.4	820
	5	10	10	10	10	7.7	8.1	7.8	7.8	24.2	797
	6	10	10	10	10	7.2	7.9	8.1	7.9	24.4	821
	7	10	10	10	10	7.0		7.6		24.5	833
1.0	0	10	10	10	10		7.9		7.9	25.0	1910
	1	10	10	10	10	7.8	8.1	7.8	7.9	25.3	1870
	2	10	10	10	10	7.9	8.0	7.8	7.9	24.8	1908
	3	10	10	10	10	7.9	8.2	7.8	8.0	24.4	1857
	4	10	10	10	10	7.7	8.0	7.7	8.0	24.7	1900
	5	10	10	10	10	7.7	8.0	7.8	7.8	24.7	1880
	6	10	10	10	10	7.2	7.8	7.8	7.9	24.5	1850
	7	10	10	10	10	7.0		7.6		24.8	2030
2.0	0	10	10	10	10		7.9		7.9	25.3	3500
	1	10	10	10	10	7.8	8.1	7.7	7.9	25.1	3470
	2	10	10	10	10	7.9	8.0	7.8	7.9	24.5	3490
	3	10	10	10	10	7.7	8.3	7.8	7.9	24.7	3480
	4	10	10	10	10	7.7	8.0	7.7	8.0	24.6	2570 3510
	5	10	10	10	10	7.7	8.0	7.7	7.8	24.2	3430
	6	10	10	10	10	7.1	7.9	7.8	7.9	24.5	3500
	7	9	10	9	10	7.0		7.6		24.3	3510
4.0	0	10	10	10	10		7.9		7.9	25.1	6650
	1	10	10	10	10	7.8	8.1	7.7	7.9	25.4	6810
	2	10	10	10	10	7.9	8.0	7.7	7.9	24.6	6590
	3	10	10	10	10	7.8	8.3	7.8	7.9	24.7	6380
	4	9	10	10	10	7.7	8.0	7.7	8.0	24.2	6450
	5	8	10	10	7	7.6	8.0	7.7	7.8	24.3	6570
	6	8	9	9	6	7.1	7.9	7.8	7.9	24.3	6490
	7	6	7	7	3	7.2		7.6		24.7	6580
8.0	0	10	10	10	10		7.9		7.8	25.4	12350
	1	10	10	10	10	7.8	8.1	7.8	7.8	25.0	12320
	2	7	7	9	8	7.8	8.0	7.7	7.8	24.9	12520
	3	4	5	8	3	7.8	8.3	7.7	7.9	24.6	12310
	4	3	3	4	3	7.7	8.0	7.7	7.8	24.1	12100
	5	3	2	0	3	7.6	8.0	7.7	7.8	24.8	12600
	6	2	2	0	1	7.1	8.3	7.8	7.8	24.2	11100
	7	2	2	0	1	7.5		7.7		24.3	12500 CEA

Endpoint	IC25	Cusum Chart Limits	
Survival	3.1	1.5 to	6.1
Growth	3.0	1.2 to	4.0

Task Manager: Dawn Winn
Project Manager:
QA Officer:

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: QA/QC Species ID# FHM 1083

Lab ID: na Start Date 7/29/2003

Sample Description: NaCl

Technician: dw kj

Date: 07/30/2003 08/07/2003

Concentration or Percent	Replicate	Tare Weight (mg)	Total Weight (mg)	No. of Fish
Control	A	1131.58	1136.60	10
	B	1138.60	1143.18	10
	C	1154.98	1160.05	10
	D	1124.08	1127.98	9
0.3 g/L	A	1121.01	1126.01	10
	B	1152.54	1157.47	10
	C	1125.60	1130.92	10
	D	1143.45	1147.83	10
1.0 g/L	A	1151.39	1158.57	10
	B	1137.76	1143.24	10
	C	1149.21	1154.58	10
	D	1157.56	1163.35	10
2.0 g/L	A	1139.78	1145.35	9
	B	1146.81	1153.52	10
	C	1156.07	1162.21	9
	D	1149.03	1154.47	10
4.0 g/L	A	1152.57	1155.13	6
	B	1134.88	1137.97	7
	C	1112.51	1115.02	7
	D	1155.83	1157.97	3
8.0 g/L	A	1138.73	1139.89	2
	B	1141.81	1142.59	2
	C	1140.23		0
	D	1131.28	1131.76	1

weigh to 0.01 mg

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	07/29/2003 13:15	Test ID:	rppc1083	Sample ID:	REFTOX-Reference Toxicant test
End Date:	08/05/2003 15:50	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

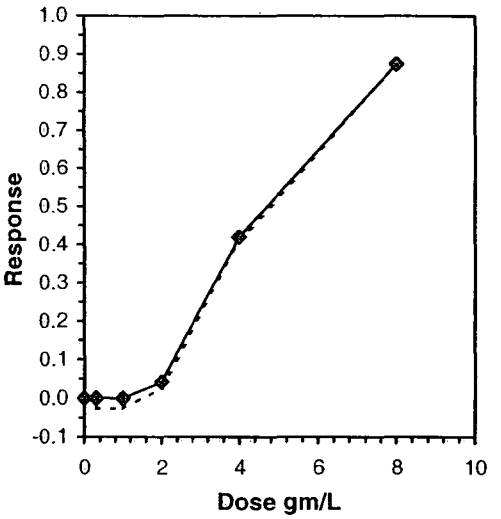
Conc-gm/L	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	0.9000
0.3	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
2	0.9000	1.0000	0.9000	1.0000
4	0.6000	0.7000	0.7000	0.3000
8	0.2000	0.2000	0.0000	0.1000

			Transform: Arcsin Square Root					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	0.9917	1.0000
0.3	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	0.9917	1.0000
1	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	0.9917	1.0000
2	0.9500	0.9744	1.3305	1.2490	1.4120	7.072	4	0.9500	0.9580
4	0.5750	0.5897	0.8620	0.5796	0.9912	22.581	4	0.5750	0.5798
8	0.1250	0.1282	0.3520	0.1588	0.4636	41.232	4	0.1250	0.1261

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.88994	0.884	-1.2028	1.97075
Equality of variance cannot be confirmed				

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	2.0422	0.2173	1.2385	2.4806	-0.7828
IC10	2.3067	0.1455	1.9200	2.8279	-0.0348
IC15	2.5711	0.1620	2.1888	3.2095	0.3766
IC20	2.8356	0.1979	2.4123	3.5787	0.4745
IC25	3.1000	0.2448	2.5833	3.9587	0.4608
IC40	3.8933	0.4106	3.1310	5.2098	0.3529
IC50	4.7037	0.5113	3.2784	5.8755	-0.2939



SCOEPA00027204

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	07/29/2003 13:15	Test ID:	rppc1083	Sample ID:	REFTOX-Reference Toxicant test
End Date:	08/05/2003 15:50	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

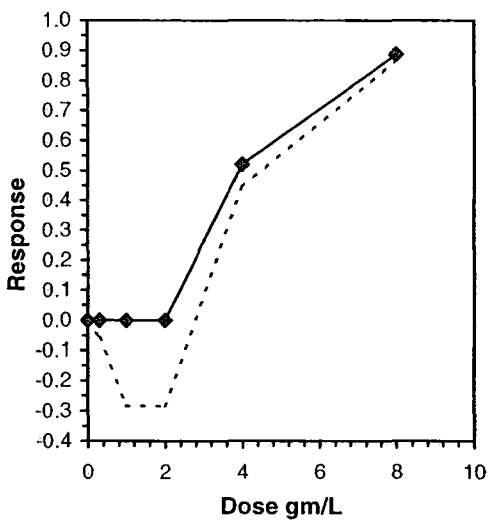
Conc-gm/L	1	2	3	4
LAB-Control	0.5020	0.4580	0.5070	0.3900
0.3	0.5000	0.4930	0.5320	0.4380
1	0.7180	0.5480	0.5370	0.5790
2	0.5570	0.6710	0.6140	0.5440
4	0.2560	0.3090	0.2510	0.2140
8	0.1160	0.0780	0.0000	0.0480

			Transform: Untransformed					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	0.4643	1.0000	0.4643	0.3900	0.5070	11.669	4	0.5368	1.0000
0.3	0.4908	1.0571	0.4908	0.4380	0.5320	7.957	4	0.5368	1.0000
1	0.5955	1.2827	0.5955	0.5370	0.7180	14.035	4	0.5368	1.0000
2	0.5965	1.2849	0.5965	0.5440	0.6710	9.762	4	0.5368	1.0000
4	0.2575	0.5547	0.2575	0.2140	0.3090	15.189	4	0.2575	0.4797
8	0.0605	0.1303	0.0605	0.0000	0.1160	80.992	4	0.0605	0.1127

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9579	0.884	0.54529	-0.0142
Bartlett's Test indicates equal variances (p = 0.80)	2.33056	15.0863		

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	2.1922	0.0129	2.1694	2.2396	1.2331
IC10	2.3844	0.0258	2.3387	2.4791	1.2331
IC15	2.5766	0.0387	2.5081	2.7187	1.2331
IC20	2.7688	0.0516	2.6774	2.9583	1.2331
IC25	2.9611	0.0645	2.8468	3.1978	1.2331
IC40	3.5377	0.1032	3.3549	3.9165	1.2331
IC50	3.9221	0.1960	3.6936	4.7632	1.9966



SCOEPA00027205

REFERENCE TOXICANT DATA SHEET

Client: QA/QC | Reference Toxicant: Sodium chloride | Test Begin: Date 8-5-03 Time 1410

Test Organism: *Pimephales promelas* | Solvent: distilled water | Stock Solution: 20 g/L | Test End: Date 8-7-03 Time 1630

Source: Aquatox Inc. | Reagent Log ID #:

ID#: FHM 1024 | *Dilution Water: Recon MH (FHM) ID# 2299

Age: <24 hrs. | Total Hardness as CaCO3: 82 | Total Alkalinity as CaCO3: 62

Size: na | (Conductivity (µmhos/cm)) Salinity (ppt): 289 | Temperature: 20 ± 1 °C

Loading: na | Technician: 0 hr CEH, 24 hr Bm, 48 hr Bm, 72 hr, 96 hr

Time: 0 hr 1410, 24 hr 1555, 48 hr 1630, 72 hr, 96 hr

Toxicant Concen. (g/L)	Test Chamber Number	Number Surviving					Dissolved Oxygen (mg/l)					pH					Temperature °C					Cond.
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0
Control		10	10	10			8.2	8.1	8.0			7.7	8.1	8.2			19.6	19.7	19.9			262
4		10	10	10			8.2	8.1	8.1			7.8	7.7	7.8			19.7	19.7	19.8			5730
6		10	10	10			8.3	8.1	8.1			7.7	7.7	7.7			19.8	19.7	19.8			9700
8		10	9	3			8.3	8.2	8.0			7.7	7.5	7.6			19.8	19.7	19.8			12600
10		10	3	0			8.3	8.3	8.1			7.6	7.5	7.5			19.8	19.7	19.7			13770
12		10	0				8.3	8.3	-			7.6	7.4	-			19.8	19.7	-			15330
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ± 1 °C					

*Dilution Water Code

Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 hr LC50: 7.5

Cusum Chart Limits: 6.7 to 8.2

Statistical Method: Spearman-Karber

We verify this data is true and correct.

Task Manager: Doug Winn

Project Manager:

QA Officer:

Acute Test-48 Hr Survival

Start Date:	08/05/2003 14:10	Test ID:	rppa1084	Sample ID:	REFTOX-Reference Toxicant test
End Date:	08/07/2003 16:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	PP
Comments:					

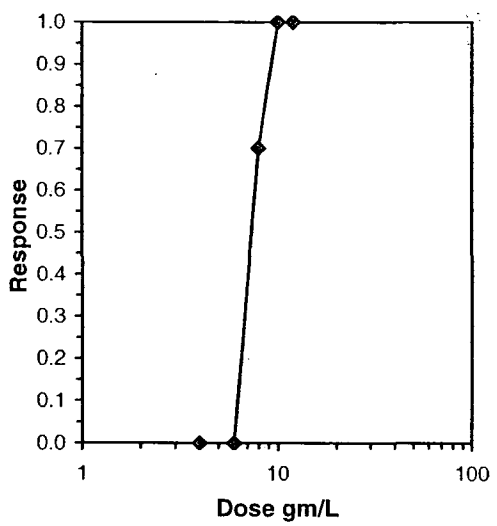
Conc-gm/L	1
LAB-Control	1.0000
4	1.0000
6	1.0000
8	0.3000
10	0.0000
12	0.0000

			Transform: Arcsin Square Root					Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Resp	Number
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	1	0	10
4	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	1	0	10
6	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	1	0	10
8	0.3000	0.3000	0.5796	0.5796	0.5796	0.000	1	7	10
10	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	1	10	10
12	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	1	10	10

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

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	7.4799	6.9462	8.0547
5.0%	7.4544	6.8710	8.0873
10.0%	7.4303	6.7969	8.1228
20.0%	7.3892	6.6521	8.2081
Auto-0.0%	7.4799	6.9462	8.0547



SCOEPA00027207

APPENDIX C
CHAIN OF CUSTODY

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic
Address 7200 NW Front Ave
Portland, Or
Contact Person: Tom Rothschild
Phone: 503-219-7274
CH2M HILL Project #

NPDES# 101128
Composite Sample Information
Samples/Hour 1 Volume/Sample 6L
Total Hours 24 Total Volume 144L
Initiated: Date 8-3-03 Time 0800
Ended: Date 8-4-03 Time 0740
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160
P.O.# 5461 b1
4500225439

Check Chlorine (Y/N)
Temp. Upon Arrival (°C) 8.0
Check Ammonia (Y/N) Dechlorinate (Y/N)

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste	Concentrations and/or Comments
03-85	8-4-03	0740	X		1	B1080-0	X	X	X	X											Dilutions: 1.9%, 3.75%, 7.5%, 15%, 30% Test for: Ammonia - Nitrogen Alkalinity Nitrate - Nitrogen Hydrogen Peroxide

Sampled By & Title (Please sign and print name) Thomas J Rothschild Thomas J. Rothschild	Date/Time 4 Aug 2003 / 0820	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Paul Conroy P. CONROY	Date/Time 4 Aug 2003 / 9:05	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time 8/4/03 / Noon 12:08	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Chris Helm	Date/Time 8/4/03 / 14:20	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

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SCOEPA00027209

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic
Address 7200 N.W. Front Ave
Portland, OR

Contact Person: Tom Rothschild
Phone: 503-219-7274

CH2M HILL Project #

NPDES# 101128
Composite Sample Information
Samples/Hour 1 Volume/Sample 6 L
Total Hours 24 Total Volume 144 L
Initiated: Date 8/5/03 Time 0800
Ended: Date 8/6/03 Time 0740
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

P. O.# 4500225439

Check Chlorine (Y/N)
Temp. Upon Arrival (°C) 3
Check Ammonia (Y/N) Dechlorinate (Y/N)

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
03-86	8/6/03	0740	X		1	31080-02	X	X	X	X														Dilutions:
																								1.9%, 3.75%,
																								7.5%, 15%,
																								30%
																								Test for: Nitrogen
																								Ammonia ~~Nitrate~~
																								Alkalinity
																								Nitrate - Nitrogen
																								Hydrogen Peroxide

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Thomas J. Rothschild Thomas J. Rothschild	6 Aug 2003 / 0740	Thomas J. Rothschild Thomas J. Rothschild	6 Aug 2003 / 0900
Received By (Please sign and print name) P. Conroy P. CONROY	Date/Time 7-6-8:30	Relinquished By (Please sign and print name) P. Conroy P. CONROY	Date/Time 7-6-03 11:10 A
Received By (Please sign and print name) Jim Watenpaugh	Date/Time 8-6-03 11:10	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Jim WATENPAUGH / Bert Atkins	Date/Time 8-6-03 1130	Shipped Via UPS ___ Bus ___ Fed-Ex X Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

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CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic NPDES# 101128

Address 7200 N.W. Front Ave Composite Sample Information _____
Portland, OR

Samples/Hour 1 Volume/Sample 6L

Total Hours 24 Total Volume 144L

Contact Person: Tom Rothschild Initiated: Date 8/7/03 Time 0800

Phone: 503-219-7374 Ended: Date 8/8/03 Time _____

Chilled During Collection Yes ☐ No ☒

CH2M HILL Project # _____

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

P.O.# 4500225439

Check Chlorine (Y/N) 0.01

Temp. Upon Arrival (°C) 6.5°C

Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
03-86	8/8/03	0745	X	0745	1	B0020-03	X	X	X	X														Dilutions: 1.9%, 3.75%, 7.5%, 15%, 30%. Test for: Ammonia-Nitrogen, Alkalinity, Nitrate-Nitrogen, Hydrogen-Peroxide

Sampled By & Title (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 8 Aug 2003 / 0745	Relinquished By (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 8 Aug 2003 / 0900 3JR 0745
Received By (Please sign and print name) P. Conroy P. CONROY	Date/Time 8-9-03 / 8:30 A.	Relinquished By (Please sign and print name) P. Conroy P. CONROY	Date/Time 8-9-03 / 11:15 A.
Received By (Please sign and print name) Jim Watenpaugh	Date/Time 8-8-03	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) JIM WATENPAUGH	Date/Time 8-8-03	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

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SCOEPA00027211

WACKER

Wacker Siltronic Corpora

April 11, 2001

Dr. Elliot Zais
Water Quality Source Control
Dept. of Environmental Quality
State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

ER:014TM

RE: Annual Bioassay Results

Dear Dr. Zais:

Previously reported evaluations of bioassay test results submitted in our October 2000 DMR were over-reported and did not take into account the correct dilution data to describe the effluent concentration within the zone of immediate dilution and the dilution at the edge of the mixing zone. This effected the test results and the percent of effluent used to determine the no observable effect concentration (NOEC). Using actual dilution data from three mixing zone studies, Wacker Siltronic Corporation is currently in compliance with all NPDES permit conditions in Schedule D, Section 6, Bioassay requirements.

The error occurred when we failed to take into account the effluent dilution data produced by the mixing zone studies when conducting the bioassay testing. Data used for effluent dilution determination up to this point were early estimated dilution values suggested in 1994 before the ZID was established in the permit.

A total of three mixing zone studies have been performed at the outfall in the years 1994, 1995, and 1999. These studies have been submitted to DEQ in the past. Each of these studies model the dilution conditions within the mixing zone and at the edge of the mixing zone. This data is used to define the pass/fail criteria for bioassay tests.

All mixing zone data that is valid for the existing permit has been used to calculate the average dilution a 5 foot radius for the ZID and at a 50 foot radius for the edge of the mixing zone. All dilution data points are based on 7Q10 worst case low flow conditions at 0.1 feet per second current velocity during both average and maximum permitted discharge volumes. Under these conditions the NOEC test criteria is:

Acute: NOEC $\geq$13.4% effluent (10-17.5% based on ZID dilutions of 5.7-10)

Chronic: NOEC $\geq$1.8% effluent (1.5-3.0% based on mixing zone dilutions of 33-72)

Test results have been re-evaluated based on the above average effluent dilutions:

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

WACKER

Wacker Siltronic Corpora

Test Date (2000)	Test	Ceriodaphnia dubia Survival (% Effluent)	Pimephales promelas Survival (% Effluent)
Aug 8-15	Acute NOEC	17%	100%
	Chronic NOEC	<3%	<3%
Oct 10-17	Acute NOEC	50%	100%
	Chronic NOEC	3%	100%
Dec 5-12	Acute NOEC	50%	100%
	Chronic NOEC	<6.25	100%

The bioassay tests conducted in October and December pass under all mixing zone conditions. The August bioassay test appears to pass but a lack of data at the lower concentration make the results questionable. Future bioassay tests will be conducted at lower effluent concentrations to bracket the test criteria.

A Toxicity Identification Evaluation study has been conducted on the total effluent and upstream from the discharge point to determine the cause for periodic test failures. Testing is ongoing and it is hoped that it will assist in the design of long term solutions.

If you have any questions, please contact me at 503-219-7532

Very truly yours,

Wacker Siltronic Corporation;

Thomas C McCue

Thomas C. McCue
Environmental Manager

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

WACKER
Wacker Siltronic Corporation

September 7, 2001

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER054:JC

Dear Dr. Zais,

Below are the results of the annual bioassay test performed August 14 through August 21, 2001 as required in our NPDES permit number 101128. The results of the bioassay are in compliance with the conditions of our permit. The bioassay was conducted by Coffey Laboratories, Inc.

Acute (48-hour) Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
LC_{50}	15%	>20%
ZID Pass Criteria[1]	≥13.4%	≥13.4%
Chronic Results:	**Survival (% Effluent)**	
	Ceriodaphnia dubia	Pimephales promelas
LC_{50}	14.2%	>20%
Mixing Zone Pass Criteria[1]	≥ 1.8%	≥ 1.8%

If you have any questions please contact me at 503-219-7532.

Regards,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
NPDES DMR File

[1] CH2MHILL. Mixing Zone Effluent Dilution Evaluations prepared for Wacker Siltronic Corporation in 1994, 1995 and 1996. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution studies identified worst-case (0.1 feet/ second as current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 7.5:1 and 55.5:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 13.4% effluent at the edge of the ZID and 1.8% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test LC_{50} is less than 13.4% effluent, and is considered to be chronically toxic if a chronic test LC_{50} is less than 1.8% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test $LC_{50} \geq$ 13.4% effluent and the chronic test $LC_{50} \geq$ 1.8% effluent.

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

SCOEPA00027214

RECEIVED SEP 6 2001

AQUATIC TOXICOLOGY REPORT:

CHRONIC DEFINITIVE
BIOASSAYS CONDUCTED
August 14 through August 21, 2001
MXA10813AL

Ceriodaphnia dubia
Pimephales promelas

Prepared for:

WACKER SILTRONIC
7200 NW Front Avenue
Portland, OR 97210

Prepared by:

COFFEY LABORATORIES, INC.
12423 NE Whitaker Way
Portland, OR 97230

August 28, 2001

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- Data Analysis

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- Summary of Bioassays
- Chronic Bioassays
- Acute Results
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Appendix B. Reference Toxicant Data Sheets
Appendix C. Chain-of-Custody
Appendix D. Organism History

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way ● Portland, OR ● 97230 ● (503) 254-1794 ● FAX (503) 254-1452

SCOEPA00027216

ANALYTICAL NARRATIVE

Mr. Thomas J. Rothschild
Wacker Siltronic
7200 NW Front Avenue
Portland, OR 97210

August 27, 2001
Job #: MXA10813AL

Re: Statistical Analysis - Toxicity Tests

Coffey Laboratories, Inc. has completed the statistical analysis of the data collected from dual endpoint toxicity tests which were conducted from 8/14/01 through 8/21/01 on effluent provided by Wacker Siltronic. The enclosed report includes a summary of the *Ceriodaphnia dubia* and Fathead Minnow tests and results, along with the raw data and statistical summaries for the effluent and reference toxicant.

In summary of the statistical analyses, the *Ceriodaphnia dubia* chronic test showed a significant reduction in survival at the 20 percent effluent concentration, and a significant reduction in reproduction at the 5 percent effluent concentration. Therefore, the chronic No-Observable-Effect-Concentration (NOEC) values for *Ceriodaphnia dubia* survival and reproduction were 10 and 3 percent effluent respectively. The chronic LC_{50} value for *Ceriodaphnia dubia* survival was 14.2 percent effluent. The chronic IC_{25} value (an estimate of the effluent concentration causing a 25 percent reduction in biological growth) for *Ceriodaphnia dubia* reproduction was 3.24 percent effluent. The Fathead Minnow chronic test showed no significant difference in survival at any effluent concentration when compared to survival in the controls. The chronic NOEC values for Fathead Minnow survival and growth were >20 percent effluent. The chronic LC_{50} value for Fathead Minnow survival was >20 percent effluent, and the chronic IC_{25} value for Fathead Minnow growth was >20 percent effluent.

Acute data was derived from the chronic test data in the *Ceriodaphnia dubia* and Fathead Minnow tests. Data from the *Ceriodaphnia dubia* 48-hour acute tests showed toxicity at the 20 percent effluent concentrations. Thus, the acute NOEC values for *Ceriodaphnia dubia* survival were 10 percent effluent. Data from the Fathead Minnow 96-hour acute tests showed no toxicity at the 20 percent effluent concentrations. Thus, the acute NOEC values for Fathead Minnow survival were 20 percent effluent.

Coffey Laboratories' Aquatic Toxicology Department is accredited by the Washington State Department of Ecology which demonstrates the high priority we place on Quality Assurance. It is our goal to meet all of your needs by offering the highest quality services in the most efficient manner possible. If you would like further assistance, or should you have other questions regarding Aquatic testing, please feel free to contact me at (503) 254-1794, ext. 215. We look forward to working with you in the future to ensure the health of our Northwest waterways.

Sincerely,
COFFEY LABORATORIES, INC.

Brian Boling
Aquatic Biologist

Approved by,

Susan Coffey
President

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

INTRODUCTION

Coffey Laboratories, Inc. conducted two chronic definitive bioassay tests using the water flea (*Ceriodaphnia dubia*) and the Fathead Minnow (*Pimephales promelas*) on samples provided by Wacker Siltronic. The tests were conducted from August 14 through August 21, 2001.

METHODS AND MATERIALS

Test Methods: The chronic test methods were performed according to *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* Lewis, P.A. *et al.*; EPA/600/4-91/002 (1994). The acute test results were derived from the chronic data and were analyzed according to *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* Weber, C.I. *et al.*; EPA/600/4-90/027F (1993).

Test Organisms: The *Ceriodaphnia dubia* used in the chronic test were obtained from Coffey Laboratories, Inc. in-house cultures and were less than 24 hours old and within an 8-hour age range at test initiation. The Fathead Minnows used in the chronic test were obtained from Environmental Consulting and Testing, Superior WI (See Appendix D) and were 24 - 36 hours old at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA/600/4-91/002 (1994). The test organisms appeared vigorous and in good condition prior to testing.

Dilution Water: The dilution water used for the Fathead Minnow and *Ceriodaphnia dubia* tests was reconstituted moderately hard water (EPA/600/4-91/002) with a total hardness and alkalinity of 100 and 60 mg/L as $CaCO_3$, respectively.

Test Concentrations: The concentrations tested in the chronic tests were 1, 3, 5, 10, and 20 percent effluent and dilution water alone for the control. Ten fish were placed in each of four replicates per concentration for the Fathead Minnow chronic test. For the chronic *Ceriodaphnia* test, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel.

Sample Collection: Samples were collected by Wacker Siltronic personnel on August 13, 15 and 17. (See Chains-of-Custody). The samples were picked up by Coffey Laboratories personnel and transported to the laboratory. Samples were stored in the dark at 4°C until test solutions were prepared.

Sample Preparation: The samples used during these tests were diluted and temperature adjusted prior to each daily renewal.

Monitoring of Bioassays: Pre- and post-renewal solutions were monitored for conductivity and dissolved oxygen daily in each concentration, as well as for pH in the control and 100 percent effluent concentration. Additionally, the pH was measured in all the post-renewal solutions of every concentration. Alkalinity and hardness were measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was monitored daily in the chronic test. According to EPA/600/4-91/002 (1994), *Ceriodaphnia dubia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia* in the controls have produced their third brood and at least 15 neonates per adult. In addition, control organism survival must be equal to or greater than 80 percent. Fathead Minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the Fathead Minnow chronic test. Temperature was monitored continuously throughout the 7-day period.

Data Analysis: All statistical analyses were performed using Tidepool Scientific, Inc. computer package, Toxcalc, Version 5.0. This program utilizes, among others, Dunnett's, Steel's Many One Rank Sum, and Wilcoxon's Rank Sum Analyses for the hypothesis endpoint estimates, and Probit, Spearman-Karber, and Linear Interpolation methods for point estimates. The effect measured for acute tests is survival over the exposure period. The effects measured for *Ceriodaphnia dubia* chronic

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METHODS AND MATERIALS (CONT.)

tests are survival and reproduction over the 7-day exposure period. The effects measured for Fathead Minnow chronic tests are survival and growth over the 7-day exposure period. The statistical analyses performed are those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* EPA/600/4-91/002, and *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms,* EPA/600/4-90/027F. Dunnett's, T-test with Bonferroni Adjustment, Steel's Many-One Rank Sum, or Wilcoxon Rank Sum Tests are used to determine the No-Observed-Effect-Concentration (NOEC) and the Lowest-Observed-Effect-Concentration (LOEC) when analyzing the survival and growth data of the Fathead Minnow, as well as the reproduction data of the *Ceriodaphnia dubia*. Fisher's Exact Test is used to analyze the survival data of the *Ceriodaphnia dubia* tests. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test with Bonferroni Adjustment cannot be met, Steel's Many-One Rank Sum Test or Wilcoxon Rank Sum with Bonferroni Adjustment is used to analyze the data. In addition, the Linear Interpolation method is used to determine the chronic IC_{25} values (the concentration of effluent causing a 25 percent reduction in biological growth) for the Fathead Minnow growth data and the *Ceriodaphnia dubia* reproduction data.

SCOEPA00027219

RESULTS AND DISCUSSION

Table 1 summarizes the chronic bioassay results.

Table 1
Chronic Bioassay Results

	Ceriodaphnia dubia		Fathead Minnow	
Evaluation	Survival (% effluent)	Reproduction (% effluent)	Survival (% effluent)	Growth (% effluent)
NOEC	10	3	20	20
LOEC	20	5	--	--
Point Estimate	14.2 (LC_{50})	3.24 (IC_{25})	>20 (LC_{50})	>20 (IC_{25})

Table 2 summarizes the acute bioassay results.

Table 2
Acute Bioassay Results

Evaluation	Survival (% effluent)	
	Ceriodaphnia dubia 48-Hour Acute Bioassay Results	Fathead Minnow 96-Hour Acute Bioassay Results
NOEC	10	20
LOEC	20	>20
LC_{50}	15	>20

RESULTS AND DISCUSSION

Table 1 summarizes the chronic bioassay results.

Table 1
Chronic Bioassay Results

	Ceriodaphnia dubia		Fathead Minnow	
Evaluation	Survival (% effluent)	Reproduction (% effluent)	Survival (% effluent)	Growth (% effluent)
NOEC	10	3	20	20
LOEC	20	5	–	–
Point Estimate	14.2 (LC_{50})	3.24 (IC_{25})	>20 (LC_{50})	>20 (IC_{25})

Table 2 summarizes the acute bioassay results.

Table 2
48-Hour Acute Bioassay Results

	Survival (% effluent)	
Evaluation	*Ceriodaphnia dubia*	Fathead Minnow
NOEC	10 All Alive	20
LOEC	20 All Dead	>20
~~IC_{25}~~ LC50	15	>20

If would have run 15%,
Corrective Act 1, 5, 10, 15, 20

SCOEPA00027221

RESULTS AND DISCUSSION (Cont.)

Chronic Bioassays:

Table 3 summarizes the survival and growth data for the Fathead Minnow test conducted.

Table 3
Fathead Minnow Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight per Fish (mg)
Control	100	0.594
1	100	0.591
3	97.5	0.576
5	97.5	0.551
10	97.5	0.621
20	97.5	0.615

* Indicates a statistically significant reduction from control at $p \leq$ to 0.05 using Steel's Many-One Rank Test or Dunnett's Test.

Results using Steel's Many-One Rank Test showed no significant reduction in survival when compared to the control at any effluent concentration. Dunnett's Test showed no reduction in growth when compared to the control at any effluent concentration. Therefore, the NOEC values for survival and growth were both 20 percent effluent. Control survival was 100 percent.

The chronic LC_{50} value (an estimate of the effluent concentration which is lethal to 50 percent of the test organisms) for Fathead Minnow survival was >20 percent effluent. The chronic IC_{25} value for Fathead Minnow growth was >20 percent effluent. The EPA has indicated that the IC_{25} is the approximate analogue of the NOEC (Technical Support Document for Water Quality Based Toxics Control EPA/505/2-90-001, March 1991), making it a valuable indicator of chronic aquatic toxicity.

The dissolved oxygen levels remained above 40 percent saturation throughout the tests. Test temperatures were steady at $25 \pm 1°C$. The tests proceeded without interruption or incident that could have affected test results.

RESULTS AND DISCUSSION (Cont.)

Chronic Bioassays (Cont.):

Table 4 summarizes the survival and reproduction data for the *Ceriodaphnia dubia* test.

Table 4
***Ceriodaphnia dubia* Results**

Concentration (%)	Percent Survival	Number of Young per Adult
Control	100	15
1	100	11.8
3	100	11.6
5	100	8.7*
10	80	4.1*
20	20*	0*

* Indicates a statistically significant reduction from control at $p \leq$ to 0.05 using Fisher's Exact Test or Steel's Many-One Rank Test.

Results using Fisher's Exact Test showed a statistically significant reduction in survival when compared to the control at the 20 percent effluent concentration. In addition, Steel's Many-One Rank Test showed a reduction in reproduction when compared to the control at the 5, 10 and 20 percent effluent concentrations. Therefore, the NOEC value for survival and reproduction were 10 and 3 percent effluent respectively. Control survival was 100 percent.

The chronic LC_{50} value for *Ceriodaphnia dubia* survival was 14.2 percent effluent. The chronic IC_{25} value for *Ceriodaphnia dubia* reproduction was 3.24 percent effluent.

The dissolved oxygen levels in the tests remained above 40 percent saturation throughout the test. Test temperatures were steady at 25 ± 1°C. The tests proceeded without interruption or incident that could have affected test results.

RESULTS AND DISCUSSION (Cont.)

Acute Results:

Table 5 summarizes the survival data for the acute screening tests using the Fathead Minnow and the *Ceriodaphnia dubia*.

Table 5
Summary of 48/96-Hour Acute Results

Species	Concentration (%)	Percent Survival		
		0 Hour	24 Hours	48/96 Hours
Fathead Minnow	Control	100	100	100
	20	100	100	100
Ceriodaphnia dubia	Control	100	100	100
	20	100	0*	0*

* Indicates a statistically significant reduction from the control at $p \leq 0.05$ using the Steel's Many-One Rank Test.

Dual-endpoint testing allows the acute test results to be derived from the chronic test data. In the Fathead Minnow 96-hour acute test, the Steel's Many-One Rank Test. showed no statistically significant reduction in survival between the control organisms and those in the 20 percent effluent concentration. In addition, Steel's Many-One Rank Test showed a significant difference in survival between the control organisms and those in the 20 percent effluent concentration in the *Ceriodaphnia dubia* 48-hour acute test. Therefore, the acute NOEC values for Fathead Minnow and *Ceriodaphnia dubia* survival were 20 and 10 percent effluent, respectively.

RESULTS AND DISCUSSION (Cont.)

Reference Toxicant Tests:

Tables 6 & 7 summarize the results from the *Ceriodaphnia dubia* and the Fathead Minnow chronic and acute reference toxicant tests conducted in August.

Table 6
Chronic Reference Toxicant Tests with Sodium Chloride

Species (test)	Point Estimates	95% C.I.
Pimephales promelas (survival - LC_{50})	6.34 g/L	5.79 - 7.04 g/L
Pimephales promelas (growth - IC_{25})	4.41 g/L	3.47 - 4.83 g/L
Ceriodaphnia dubia (survival - LC_{50})	1.55 g/L	--- - --- g/L
Ceriodaphnia dubia (reproduction - IC_{25})	0.32 g/L	0.21 - 0.54 g/L

Table 7
Acute Reference Toxicant Tests

Species	LC_{50}	95% C.I.
Pimephales promelas	9.07 g/L	7.68 - 12.99 g/L
Ceriodaphnia dubia	1.88 g/L	--- - --- g/L

The reference toxicant tests with sodium chloride conducted in August showed that test organisms were within their respective sensitivity range based on EPA guidelines (EPA/600/4-91/002, 1994).

The chronic IC_{25} values, as well as the LC_{50} values and the respective 95 percent confidence intervals are listed in the Tables above. The data sheets for the reference toxicant tests are provided in Appendix B.

Analytical Data

Wacker Siltronic

Job Number: A10813AL

Lab Sample ID: A10813AL-1
Field ID: 01-90
Date/Time: 08/13/01 0815
Matrix: Waste Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Ammonia Nitrogen	SM4500NH3BC	0.2	0.7	mg/L
Conductivity	EPA 120.1	0.5	990.	μmhos/cm
Alkalinity	EPA 310.1	0.5	15.	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L

ND means none detected at or above the detection limit listed.

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Analytical Data

Wacker Siltronic

Job Number: A10813AL

Lab Sample ID: A10813AL-1
Field ID: 01-90
Date/Time: 08/13/01 0815
Matrix: Waste Water

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Total Hardness	SM 2340-B	0.5	240.	mg/L
Calcium	EPA 200.7	0.5	94.	mg/L
Chromium	EPA 218.2	0.001	0.001	mg/L
Magnesium	EPA 200.7	0.05	1.4	mg/L

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Analytical Data

Wacker Siltronic

Job Number: A10813AL

Lab Sample ID: A10813AL-2
Field ID: 01-91
Date/Time: 08/15/01 0750
Matrix: Waste Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Ammonia Nitrogen	SM4500NH3BC	0.2	2.6	mg/L
Conductivity	EPA 120.1	0.5	1200.	μmhos/cm
Alkalinity	EPA 310.1	0.5	14.	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L

ND means none detected at or above the detection limit listed.

SCOEPA00027228

Analytical Data

Wacker Siltronic

Job Number: A10813AL

Lab Sample ID: A10813AL-2
Field ID: 01-91
Date/Time: 08/15/01 0750
Matrix: Waste Water

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Total Hardness	SM 2340-B	0.5	230.	mg/L
Calcium	EPA 200.7	0.5	90.	mg/L
Magnesium	EPA 200.7	0.05	1.6	mg/L

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Analytical Data

Wacker Siltronic

Job Number: A10813AL

Lab Sample ID: A10813AL-3
Field ID: 01-93
Date/Time: 08/17/01 0815
Matrix: Waste Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Ammonia Nitrogen	SM4500NH3BC	0.2	0.7	mg/L
Conductivity	EPA 120.1	0.5	890.	μmhos/cm
Alkalinity	EPA 310.1	0.5	14.	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L

ND means none detected at or above the detection limit listed.

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Analytical Data

Wacker Siltronic

Job Number: A10813AL
Page Number: 16 of 16

Lab Sample ID: A10813AL-3
Field ID: 01-93
Date/Time: 08/17/01 0815
Matrix: Waste Water

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Total Hardness	SM 2340-B	0.5	140.	mg/L
Calcium	EPA 200.7	0.05	55.	mg/L
Magnesium	EPA 200.7	0.05	1.3	mg/L

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APPENDIX A

RAW DATA SHEETS

COFFEY LABORATORIES, INC.
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CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Job Number: _____
Custabbr: Workers
Sample/Source Name: Influent

Test Organism: C. dubia
Dates Delivered: 8-14-01
Dates Collected: 8-21-01

Test Initiation: 8-14-01
Test Conclusion: 8-21-01
Dechlorination: _____

Analyst(s): AR/HT
Reviewed by: _____

Conc. %	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS									
					pH		DO		Sp. Cond.		(mg/L)			
					New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
D	0	8/14	HL	26	8.01		8.0		649					
	1	8/15	HL	26	7.88	7.84	8.2	8.4	627	563				
	2	8/16	AR	26	7.90	7.84	8.3	8.4	458	581				
	3	8/17	AR	25	7.92	7.81	8.4	8.3	633	571				
	4	8/18	AR	26	7.88	7.82	8.4	8.3	629	580				
	5	8/19	HL	26	7.90	7.81	8.4	8.3	508	467				
	6	8/20	HL	26			7.8	8.2	748	622				
	7													
	8													
1	0	8/14	HL	26			8.0		552					
	1	8/15	HL	26		7.84	8.2	8.1	529	548				
	2	8/16	AR	26		7.86	8.3	8.3	540	581				
	3	8/17	AR	25		7.83	8.3	8.2	517	573				
[redacted]	4	8/18	AR	26		7.87	8.3	8.2	574	588				
	5	8/19	HL	26			8.3	8.2	545	587				
	6	8/20	HL	26			8.3	8.0	566	564				
	7													
	8													
3	0	8/14	HL	26			8.2							
	1	8/15	HL	26		7.88	8.2	8.1	407	592				
[redacted]	2	8/16	AR	26		7.90	8.3	8.3	541	589				
	3	8/17	AR	25		7.85	8.3	8.2	522	583				
	4	8/18	AR	26		7.89	8.2	8.2	555	587				
	5	8/19	HL	26		7.87	8.2	8.2	552	589				
	6	8/20	HL	26			8.2	8.1	578	570				
	7													
	8													
5	0	8/14	HL	26			8.2		477					
[redacted]	1	8/15	HL	26		7.86	8.2	8.2		589				
	2	8/16	AR	26		7.90	8.3	8.3	563	598				
	3	8/17	AR	25		7.88	8.2	8.1	550	591				
	4	8/18	AR	26		7.91	8.2	8.0	570	599				
	5	8/19					8.3	8.2	560	596				
	6	8/20					8.2	8.2	573	601				
	7													
	8													

SCOEPA00027233

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Job Number: _____
Custabbr: Wacker
Sa ile/Source Name: _____

Test Organism: c.dub
Dates Delivered: _____
Dates Collected: _____

Test Initiation: _____
Test Conclusion: _____
Dechlorination: _____

Analyst(s): _____
Reviewed by: _____

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
10	0	8/14	HL	26			8.5		430					
	1	8/15	HL	26		7.84	8.4	8.3	461	590				
	2	8/16	AR	26		7.89	8.4	8.3	559	619				
	3	8/17	AR	25		7.88	8.2	8.1	562	601				
	4	8/18	AR	26		7.91	8.2	8.1	563	611				
	5	8/19	HL	26		7.87	8.2	8.1	553	610				
	6	8/20	HL	26			8.3	8.0	531	588				
	7													
	8													
20	0	8/14	HL	26	7.81		8.5		561					
	1	8/15	HL	26	7.84	7.83	8.3	8.3	567	649				
	2	8/16	AR	26	7.89	7.88	8.3	8.4	645	655				
	3	8/17	AR	25	7.93	7.88	8.2	8.2	568	639				
	4	8/18	AR	26	7.88	7.91	8.3	8.0	569	630				
	5	8/19	HL	26	7.86	7.88	8.3	8.2	565	646				
	6	8/20	HL	26			8.3	8.3	590	660				
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													

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Revision #: 1.02
Revision Date: 11/26/97

CHRONIC RENEWAL CERIODAPHNIA TOXICITY TEST: SURVIVAL AND REPRODUCTION DATA

b Number: _____ Test Organism: C. dub Test Initiation: 5-14-01 Analyst(s): AR / HT
is br: Wacker Dates Delivered: 5-14-01 Test Conclusion: 5-21-01 Reviewed by: _____
m y/Source Name: Effluent Dates Collected: 5-21-01 H_2O Batch #: _____ Randomization Chart #: _____
Feeding Regime: _____

Conc.	Rep.	Number Organisms @ Start	0	1	2	3	4	5	6	7	8	Total Mort.	0	1	2	3	4	5	6	7	8	Total Offspring
	1	1	0	0	0	0	0	1				1	0	0	0	0	0	0				0
	2	1						0	0								2	2	3	0		6
	3	1															0	2	4	0		6
	4	1															0	0	2	3		5
	5	1															0	2	3	0		5
	6	1								1		1					0	0	1	0		1
	7	1															1	0	2	3		6
	8	1															0	0	2	2		4
	9	1															0	0	1	0		1
	10	1															1	1	2	3		7
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	2	2	3	3		10
	2	1															3	3	5	6		17
	3	1															0	0	5	7		12
	4	1															0	1	3	3		7
	5	1															0	3	6	6		15
	6	1															2	0	4	5		11
	7	1															0	2	3	4		9
	8	1															3	3	4	3		13
	9	1															0	3	3	5		11
	10	1															3	0	4	4		11
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	3	4	5	3		14
	2	1															0	3	2	7		12
	3	1															2	4	4	6		16
	4	1															2	4	4	7		17
	5	1															3	0	4	0		7
	6	1															4	1	3	6		14
	7	1															0	1	0	0		1
	8	1															1	0	3	3		7
	9	1															3	2	3	4		10
	10	1															0	4	5	3		12
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	1	3	5	8		18
	2	1															0	4	4	0		8
	3	1															3	5	5	9		22
	4	1															0	0	5	8		13
	5	1															2	0	5	9		16
	6	1															1	2	3	6		11
	7	1															3	0	3	6		12
	8	1															3	0	5	8		16
	9	1															3	3	5	8		19
	10	1															2	0	6	7		15
	1	1	0	1									0	0								0
	2	1		1																		0
	3	1	0	1											0							0
	4	1		0	1							1			0	0						0
	5	1		0	0	0	0	0	0	0					0	0	0	1	0	2		3
	6	1		0	1							1			0	0						0
	7	1		0	0	0	0	0	0	0					0	0	0	0	0	2		2
	8	1		0											0							0
	9	1		0	1										0	0						0
	10	1		0											0							0
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	0	1	7	5		13
	2	1															0	0	4	7		11
	3	1															0	0	4	5		9
	4	1															0	0	5	5		10
	5	1															2	0	2	4		8
	6	1															0	1	3	2		6
	7	1															0	0	2	2		4
	8	1															2	0	6	5		13
	9	1															3	1	2	3		9
	10	1															1	0	1	2		4
ANALYST:			HT	AR	AR	HT	AR	HL	HL	AR												

:nts:

SCOEPA00027235

~~CERIODAPHNIA~~ TOXICITY TEST: WATER QUALITY PARAMETERS

Job Number: _____
Client abbr: Wacker
Sample/Source Name: Effluent

Test Organism: Fathead
Dates Delivered: 8-14-01
Dates Collected: 8-31-01

Test Initiation: 8-14-01
Test Conclusion: 8-21-01
Dechlorination: _____

Analyst(s): AR/HT
Reviewed by: _____

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
D	0	8/14	NL		7.79		7.5		618					
	1	8/15	NL		6.09	6.12	8.0	7.7	593	657				
	2	8/16	AR		6.96	7.34	8.2	7.5	478	512				
	3	8/17	AR		6.86	7.22	8.4	7.8	501	605				
	4	8/18	AR		6.90	7.33	8.3	7.3	520	631				
	5	8/19	NL		6.81	7.25	8.4	7.3	510	621				
	6	8/20	NL				7.5	6.6	508	527				
	7													
	8													
1	0	8/14	NL				7.8		526					
	1	8/15	NL			6.11	8.0	7.6	515	596				
	2	8/16	AR			7.01	8.2	7.6	490	512				
	3	8/17	AR			7.31	8.3	7.6	513	603				
	4	8/18	AR			7.39	8.3	7.2	525	603				
	5	8/19	NL			7.35	8.3	7.5	515	603				
	6	8/20	NL				7.4	6.7	503	528				
	7													
	8													
3	0	8/14	NL				7.6		513					
	1	8/15	NL			6.12	8.0	7.5	514	524				
	2	8/16	AR			7.63	8.2	7.6	506	514				
	3	8/17	AR			7.39	8.3	7.4	520	601				
	4	8/18	AR			7.45	8.2	7.4	509	611				
	5	8/19	NL			7.40	8.3	7.4	525	615				
	6	8/20	NL				7.7	6.8	503	532				
	7													
	8													
5	0	8/14	NL				7.5		494					
	1	8/15	NL			6.14	8.1	7.5	518	522				
	2	8/16	AR			7.62	8.4	7.6	518	528				
	3	8/17	AR			7.40	8.3	7.4	521	597				
	4	8/18	AR			7.50	8.3	7.2	533	601				
	5	8/19	NL			7.45	8.3	7.4	530	601				
	6	8/20	NL				7.8	6.9	506	532				
	7													
	8													

~~CERIODAPHNIA~~ TOXICITY TEST: WATER QUALITY PARAMETERS

Job Number: _____ Test Organism: fathead Test Initiation: _____ Analyst(s): _____
Custabbr: Wacker Dates Delivered: _____ Test Conclusion: _____ Reviewed by: _____
Sample/Source Name: _____ Dates Collected: _____ Dechlorination: _____

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS									
					pH		DO		Sp. Cond.		(mg/L)			
					New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
10	0	8/14	AR				7.8		504					
	1	8/15	AR		7.15	720	8.1	7.6	538	534				
	2	8/16	AR			761	8.4	7.5	556	559				
	3	8/17	AR			7.41	8.3	7.4	583	566				
	4	8/18	AR			7.50	8.3	7.1	541	598				
	5	8/19	NL			715	8.1	7.3	535	534				
	6	8/20	NL				7.7	7.0	576	573				
	7													
	8													
20	0	8/14	AR		7.74		8.0		508					
	1	8/15	AR	7.34	7.19		8.1	7.8	586	555				
	2	8/16	AR	7.62	7.60	7.60	8.4	7.9	641	612				
	3	8/17	AR	7.59	7	7.43	8.3	7.5	571	568				
	4	8/18	AR	7.63		7.52	8.2	7.0	590	601				
	5	8/19	NL	7.62	7.7		8.3	7.3	588	565				
	6	8/20	NL				8.0	7.2	535	582				
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													

SCOEPA00027237

CHRONIC RENEWAL LARVAE TOXICITY TEST

Job Number: _____
Lustabbr: Wacker
Sample/Source Name: effluent

Test Organism: Fathead
Dates Delivered: 3-14-01
Dates Collected: 3-21-01

Test Initiation: 3-14-01
Test Conclusion: 3-21-01
H,O Batch #: _____
Feeding Regime: _____

Analyst(s): AR/HT
Reviewed by: _____
Randomization Chart #: _____

Conc.	Rep.	Number Organisms/ Container	Immobile/Mortality 0	24	48	72	96	120	144	168	Total Mort.	Temperature (°C) 0	24	48	72	96	120	144	168
[redacted]	1	10	0	0	0	0	0	0	0	0	0						26	26	25
	2	1	1	1	1	1	1	1	1	1	1								
	3	1	1	1	1	1	1	0	1	1	0								
	4	1	1	1	1	1	1	0	1	1	0								
[redacted]	1	10	0	0	0	0	0	1	0	0	1								
	2	1	1	1	1	1	1	0	1	1	0								
	3	1	1	1	1	1	1	0	1	1	0								
	4	1	1	1	1	1	1	0	1	1	0								
[redacted]	1	10	0	0	0	0	0	1	0	0	1								
	2	1	1	1	1	1	1	0	1	1	0								
	3	1	1	1	1	1	1	0	1	1	0								
	4	1	1	1	1	1	1	0	1	1	0								
	1	10	0	0	0	0	0	0	0	0	0								
	2	1	1	1	1	1	1	1	1	1	0								
	3	1	1	1	1	1	1	1	1	1	0								
	4	1	1	1	1	1	1	1	1	1	0								
	1	10	0	0	0	0	0	0	0	0	0								
	2	1	1	1	1	1	1	1	1	1	0								
	3	1	1	1	1	1	1	1	1	1	0								
	4	1	1	1	1	1	1	1	1	1	0								
	1	10	0	0	0	0	0	0	0	0	0								
	2	1	1	1	1	1	1	1	1	0	0								
	3	1	1	1	1	1	1	1	1	1	1								
	4	1	1	1	1	1	1	1	1	0	0								
	1																		
	2																		
	3																		
	4																		
		ANALYST:	AR	AR	AR	AR	AR	HT	HT	AR									

Comments: _____

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Revision #: 1.01
Revision Date:2/13/01

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number:
Test Dates: 8-14-01 → 8-21-01
Weighing Date: 8-22-01
Analyst: AR / HL

Custabbr: Wacker
Drying Temp. (°C): 101°C
Drying Time (h): 15.00
Reviewed by:

Conc. % / 1/L	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (g)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (g)	Remarks
Control 0	1	0.93906	0.94505				
	2	0.94077	0.94713				
	3	0.93956	0.94459				
	4	0.93814	0.94452				
Conc. 1 ~~6.25~~	1	0.94054	0.94601				
	2	0.94071	0.94681				
	3	0.93822	0.94409				
	4	0.93887	0.94507				
Conc. 3 ~~12.5~~	1	0.93899	0.94562				
	2	0.93957	0.94415				
	3	0.93908	0.94517				
	4	0.93935	0.94510				
Conc. 5 ~~25~~	1	0.93809	0.94358				
	2	0.93944	0.94573				
	3	0.94049	0.94601				
	4	0.94291	0.94765				
Conc. 10 ~~50~~	1	0.94174	0.94742				
	2	0.94018	0.94642				
	3	0.94030	0.94761				
	4	0.93756	~~0.94805~~	0.94320			
Conc. 20 ~~100~~	1	0.94045	0.94726				
	2	0.94225	0.94823				
	3	0.94243	0.94863				
	4	0.93522	0.94081				

Larval Fish Growth and Survival Test-96 Hr Survival

Start Date:	8/14/2001	Test ID:	A18013AL-F	Sample ID:	Wackersilt
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	Effluent
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

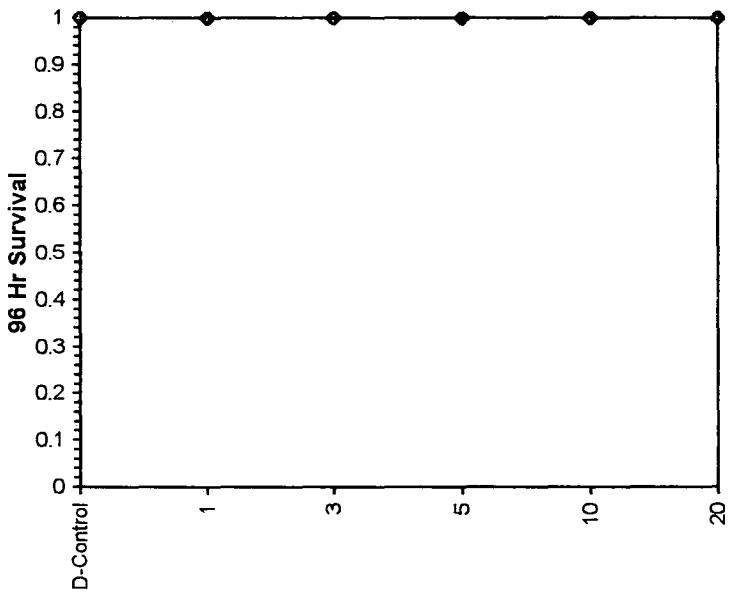
Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
20	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical		
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
3	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
5	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
10	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
20	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	1	0.884		
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	20	>20		5

Dose-Response Plot



SCOEPA00027240

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	8/14/2001	Test ID:	A18013AL-F	Sample ID:	Wackersilt
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	Effluent
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.5990	0.6360	0.5030	0.6380
1	0.5470	0.6100	0.5870	0.6200
3	0.6630	0.4580	0.6090	0.5750
5	0.5490	0.6290	0.5520	0.4740
10	0.5680	0.6240	0.7310	0.5640
20	0.6810	0.5980	0.6200	0.5590

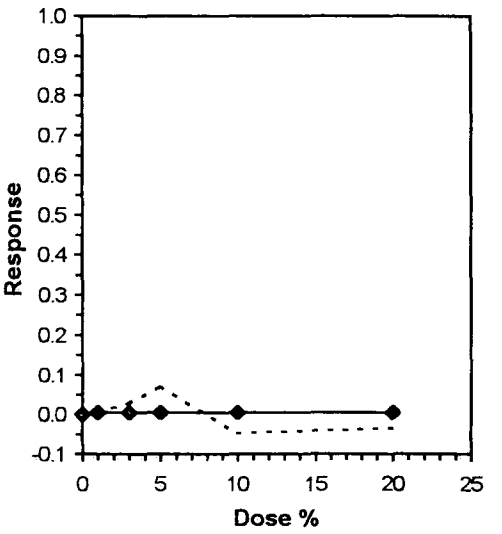
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5940	1.0000	0.5940	0.5030	0.6380	10.650	4				0.5940	1.0000
1	0.5910	0.9949	0.5910	0.5470	0.6200	5.486	4	0.065	2.410	0.1105	0.5910	0.9949
3	0.5762	0.9701	0.5762	0.4580	0.6630	15.056	4	0.387	2.410	0.1105	0.5909	0.9947
5	0.5510	0.9276	0.5510	0.4740	0.6290	11.487	4	0.938	2.410	0.1105	0.5909	0.9947
10	0.6218	1.0467	0.6218	0.5640	0.7310	12.515	4	-0.605	2.410	0.1105	0.5909	0.9947
20	0.6145	1.0345	0.6145	0.5590	0.6810	8.300	4	-0.447	2.410	0.1105	0.5909	0.9947

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98014	0.884	-0.1307	-0.3281
Bartlett's Test indicates equal variances (p = 0.74)	2.71048	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	20	>20		5	0.11054	0.18609	0.00266	0.00421	0.67794	5, 18

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>20			
IC10	>20			
IC15	>20			
IC20	>20			
IC25	>20			
IC40	>20			
IC50	>20			



SCOEPA00027241

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/14/2001	Test ID:	A18013AL-F	Sample ID:	Wackersilt
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	Effluent
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	0.9000	1.0000
5	0.9000	1.0000	1.0000	1.0000
10	0.9000	1.0000	1.0000	1.0000
20	1.0000	0.9000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
3	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
5	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
10	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
20	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40

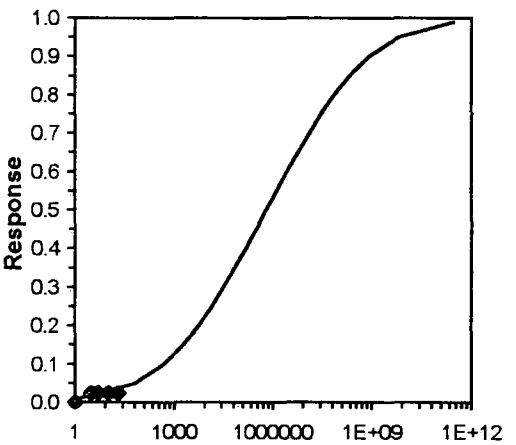
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.66392	0.884	-1.5103	0.921
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	20	>20		5

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	0.41014	0.49816	-0.5663	1.38654	0	0.81636	7.81472	0.85	5.78293	2.43817	4
Intercept	2.62817	0.46281	1.72106	3.53528							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	1.29089	
EC05	3.355	59.223	
EC10	3.718	455.285	
EC15	3.964	1802.7	
EC20	4.158	5381.59	
EC25	4.326	13753.3	
EC40	4.747	146293	
EC50	5.000	606637	
EC60	5.253	2515554	
EC75	5.674	2.7E+07	
EC80	5.842	6.8E+07	
EC85	6.036	2E+08	
EC90	6.282	8.1E+08	
EC95	6.645	6.2E+09	
EC99	7.326	2.9E+11	



SCOEPA00027242

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	8/14/2001	Test ID:	A18013AL-C	Sample ID:	Wackersilt
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	Effluent
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
20	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000

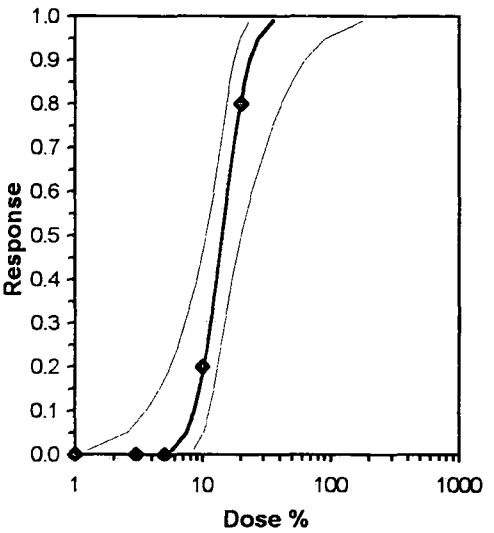
Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
1	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
3	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
10	0.8000	0.8000	2	8	10	10	0.2368	0.0500	2	10
*20	0.2000	0.2000	8	2	10	10	0.0004	0.0500	8	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	10	20	14.1421	10

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	5.84189	1.8584	2.19942	9.48436	0	0.05633	7.81472	1	1.15267	0.17118	3
Intercept	-1.7337	2.13332	-5.915	2.44756							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	5.68129	1.26113	8.3919
EC05	3.355	7.43197	2.51954	10.1159
EC10	3.718	8.57616	3.61415	11.267
EC15	3.964	9.44608	4.58175	12.192
EC20	4.158	10.2	5.50079	13.0555
EC25	4.326	10.8945	6.3969	13.9271
EC40	4.747	12.8617	8.99682	17.0461
EC50	5.000	14.2123	10.6268	20.0084
EC60	5.253	15.7048	12.1627	24.2373
EC75	5.674	18.5406	14.4693	35.0711
EC80	5.842	19.8031	15.3342	41.0533
EC85	6.036	21.3835	16.3313	49.5566
EC90	6.282	23.5526	17.5914	63.1121
EC95	6.645	27.1786	19.5132	90.9017
EC99	7.326	35.5537	23.4355	182.278

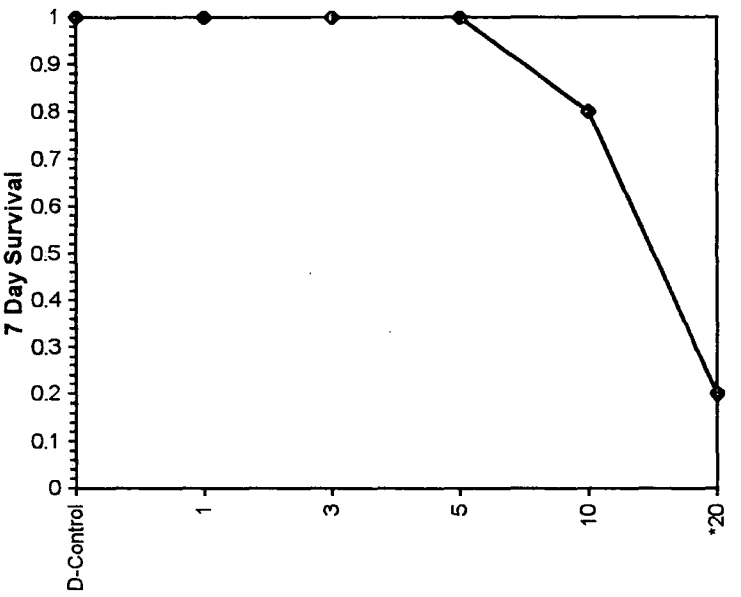


SCOEPA00027243

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	8/14/2001	Test ID:	A18013AL-C	Sample ID:	Wackersilt
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	Effluent
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027244

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	8/14/2001	Test ID:	A18013AL-C	Sample ID:	Wackersilt
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	Effluent
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

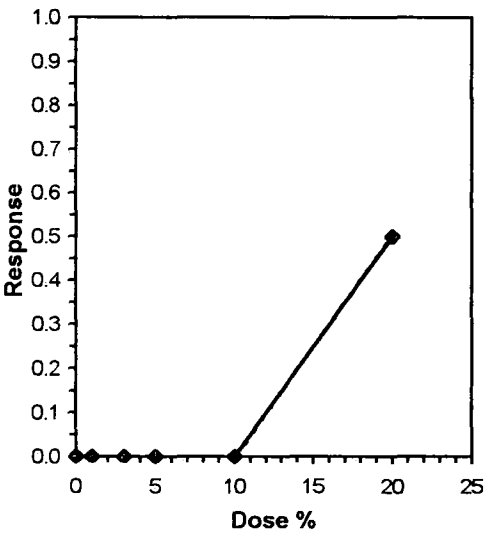
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
20	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	0.0000

Conc-%	Mean	N-Mean		Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
D-Control	1.0000	1.0000	1.0472	0	10	10	10			1.0000	1.0000
1	1.0000	1.0000	1.0472	0	10	10	10	1.0000	0.0500	1.0000	1.0000
3	1.0000	1.0000	1.0472	0	10	10	10	1.0000	0.0500	1.0000	1.0000
5	1.0000	1.0000	1.0472	0	10	10	10	1.0000	0.0500	1.0000	1.0000
10	1.0000	1.0000	1.0472	0	10	10	10	1.0000	0.0500	1.0000	1.0000
*20	0.5000	0.5000	0.7854	5	5	10	10	0.0163	0.0500	0.5000	0.5000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	10	20	14.1421	10

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL	Skew
IC05	11.000			
IC10	12.000			
IC15	13.000			
IC20	14.000			
IC25	15.000			
IC40	18.000			
IC50	>20			

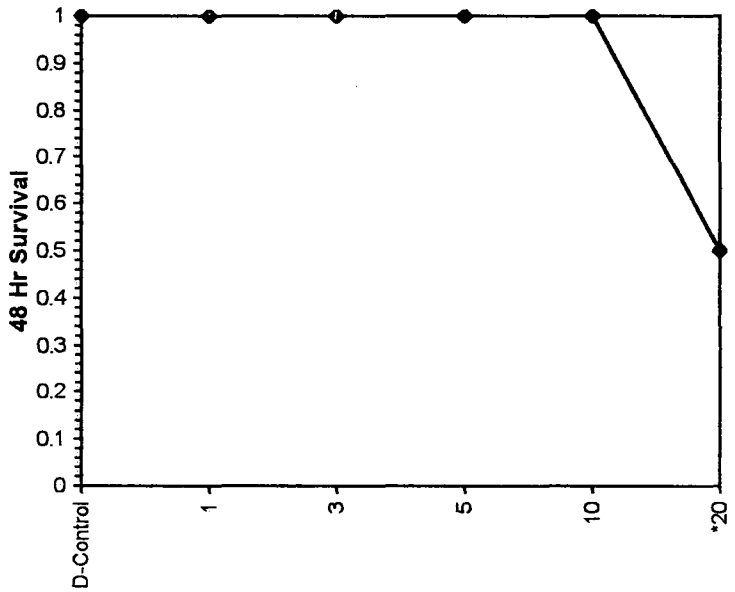


SCOEPA00027245

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	8/14/2001	Test ID:	A18013AL-C	Sample ID:	Wackersilt
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	Effluent
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027246

APPENDIX B

REFERENCE TOXICANT DATA SHEETS

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way ● Portland, OR ● 97230 ● (503) 254-1794 ● FAX (503) 254-1452

Doc ID: I:\Clom\Port.BRN\LifeSci.SEC\Forms\Reprodat.for
Revision #: 1.02
Revision Date: 11/26/97

CHRONIC RENEWAL CERIODAPHNIA TOXICITY TEST: SURVIVAL AND REPRODUCTION DATA

) Number: _____
st r: Aix Re-Ex 01
mp Source Name: NaCl

Test Organism: C dub
Dates Delivered: 5-14-01
Dates Collected: 5-21-01

Test Initiation: 5-14-01
Test Conclusion: 5-21-01
H_20 Batch #: _____
Feeding Regime: _____

Analyst(s): HRAH
Reviewed by: _____
Randomization Chart #: _____

Conc. %	Rep.	Number Organisms @ Start	Day 0	1	2	3	4	5	6	7	8	Total Mort.	Day 0	1	2	3	4	5	6	7	8	Total Offspring
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	0	1	0	2		3
	2	1						1				1					3	0				3
	3	1						0	0	0							2	2	0	3		7
	4	1															0	0	0	2		2
	5	1															0	0	3	0		3
	6	1															3	0	0	1		4
	7	1															1	0	1	2		4
	8	1															0	1	0	0		1
	9	1															1	3	0	3		7
	10	1															0	2	0	0		2
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	2	6	0	3		11
	2	1															3	0	0	5		8
	3	1															3	0	4	6		13
	4	1															3	4	0	8		15
	5	1										1					0					0
	6	1					0	0	0	0							2	4	0	6		12
	7	1															0	5		3		8
	8	1															3	4		4		11
	9	1															2	2		3		7
	10	1															1	2		3		6
	1	1	0	0	1							1	0	0	0							0
	2	1			0	0	0	0	1			1			0	0	0	0	0			0
	3	1			1							1			0							0
	4	1			1							1			0							0
	5	1			1							1			0							0
	6	1			1							1			0							0
	7	1			1							1			0							0
	8	1	1	0	0	0	0	0	0	0				0	0	0	0	0	0	0		0
	9	1		0	0							1		0	0			0	0			0
	10	1		0	0							1		0	0			0				0
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	3	7	8	0		18
	2	1															4	8	0	6		18
	3	1															2	5	0	8		15
	4	1															3	6	0	6		15
	5	1															0	5	1	6		9
	6	1															0	6		7		13
	7	1															0	6		7		13
	8	1															3	5		6		14
	9	1															4	6		8		18
	10	1															3	7		5		15
	1	1	0	1								1	0	0								0
	2	1		1								1		0								0
	3	1		1								1		0								0
	4	1		1								1		0								0
	5	1		1								1		0								0
	7	1		1								1		0								0
	8	1		1								1		0								0
	9	1		1								1		0								0
	10	1		1								1		0								0
	1	1	0	1								1	0	0								0
	2	1		0	0	0	0	0	0	0					0	0	0	0	5	4		9
	3	1																3	0	6		9
	4	1																0	2	4		6
	5	1																1	0	3		4
	6	1																1	0	0		1
	7	1																2		3		5
	8	1																2		2		4
	9	1																2		3		5
	10	1																1		5		6
ANALYST:			HA	HR	HR	HR	HR	HL	HL	HR												

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SCOEPA00027248

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

b Number: _____ Test Organism: C. dub Test Initiation: _____ Analyst(s): _____
istabbr: Avg Rd-Tox Dates Delivered: _____ Test Conclusion: _____ Reviewed by: _____
mj /Source Name: _____ Dates Collected: _____ Dechlorination: _____

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0	8/14	HL			8.5		3890					
	1	8/15	HL	8.03	7.97	8.1	8.2	4310	4670				
	2	8/16	AR	8.07	8.03	8.4	8.3	4220	4680				
	3	8/17	AR	8.02	8.05	8.3	8.2	4120	4360				
	4	8/18	AR	8.01	7.99	8.2	8.1	4230	4670				
	5	8/19	HL		8.01	8.3	8.2	4240	4660				
	6	8/20	HL			8.4	8.4	4240	4870				
	7												
	0	8/14	HL	7.75		8.5		18180					
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												

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Revision #: 1.01
Revision Date: 11/18/93

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

b Number: _____
ustabbr: Aug Ro Tox '01
m /Source Name: NaCl

Test Organism: c dub
Dates Delivered: 8-14-01
Dates Collected: 8-21-01

Test Initiation: 8-14-01
Test Conclusion: 8-21-01
Dechlorination: _____

Analyst(s): AR/HT
Reviewed by: _____

Conc.	Day	Date	Initials	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
	0	8/14	HL	7.85		8.1		524					
	1	8/15	HL	7.89	7.88	8.2	8.1	513	613				
	2	8/16	AR	7.93	7.92	8.4	8.4	520	629				
	3	8/17	AR	7.89	7.88	8.3	8.3	519	629				
	4	8/18	AR	7.91	7.90	8.3	8.2	530	647				
	5	8/19	HL	7.92	7.90	8.3	8.2	510	610				
	6	8/20	HL			8.3	8.3	522	577				
	7												
	0	8/14	HL			8.3		1253					
	1	8/15	HL		7.90	8.2	8.1	1389	1535				
	2	8/16	AR		7.89	8.4	8.4	1384	1575				
	3	8/17	AR		7.89	8.3	8.2	1399	1527				
	4	8/18	AR		7.90	8.2	8.2	1298	1496				
	5	8/19	HL		7.90	8.2	8.2	1388	1537				
	6	8/20	HL			8.2	8.4	1438	1745				
	7												
	0	8/14	HL			8.5		2080					
	1	8/15	HL		7.95	8.1	8.1	1880	2660				
	2	8/16	AR		8.02	8.3	8.4	2370	2680				
	3	8/17	AR		8.03	8.3	8.3	1930	2550				
	4	8/18	AR		7.92	8.2	8.3	1970	2330				
	5	8/19	HL		7.96	8.3	8.3	1960	2670				
	6	8/20	HL			8.5	8.3	2330	2750				
	7												
	0	8/14	HL			8.5		2950					
	1	8/15	HL		8.03	8.2	8.2	3320	3610				
	2	8/16	AR		7.99	8.4	8.4	3250	3610				
	3	8/17	AR		8.05	8.3	8.2	3130	3730				
	4	8/18	AR		7.93	8.3	8.2	3090	3840				
	5	8/19	HL			8.3	8.2	3070	3860				
	6	8/20	HL			8.2	8.2	2330	3830				
	7												

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SCOEPA00027250

CHRONIC RENEWAL LARVAE TOXICITY TEST

ot umber: _____
Custabbr: Aug Ref Tox 01
ample/Source Name: NaCl

Test Organism: Fathead
Dates Delivered: 8-14-01
Dates Collected: 8-21-01

Test Initiation: 8-14-01
Test Conclusion: 8-21-01
H_2O Batch #: _____
Feeding Regime: _____

Analyst(s): AR/HT
Reviewed by: _____
Randomization Chart #: _____

Conc.	Rep.	Number Organisms/ Container	Immobile/Mortality 0	24	48	72	96	120	144	168	Total Mort.	Temperature (°C) 0	24	48	72	96	120	144	168
	1	10	0	0	0	0	0	0	0	0	0			26			26	26	25
	2					0					0								
	3					1					1								
	4					0					0								
	1	10	0	0	0	0	0	0	0	0	0								
	2									0	0								
	3									0	0								
	4									1	1								
	1	10	0	0	0	0	0	2	0	0	2								
	2							0	0	0	0								
	3							0	1	0	1								
	4							0	0	0	0								
	1	10	0	0	0	0	0	0	0	0	0								
	2																		
	3																		
	4																		
	1	10	0	0	0	0	0	0	2	1	3								
	2				0	2	0	0	0	0	2								
	3				1	0	2	2	1	1	7								
	4				0	0	1	0	1	1	3								
	1	10	0	0	0	3	1	1	1	1	7								
	2					4	1	0	0	0	5								
	3					1	2	2	2	2	9								
	4					2	3	3	1	0	9								
	1																		
	2																		
	3																		
	4																		
		ANALYST:	AR	AR	HL	AR	AR	HL	HL	AR									

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CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: _____
Test Dates: 8-14-01 → 8-21-01
Weighing Date: 8-22-01
Analyst: AR/HL

Custabbr: RefTox - Avg.
Drying Temp. (°C): 101°C
Drying Time (h): 15:00-
Reviewed by: _____

Conc. %	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (g)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (g)	Remarks
Control	1	0.92966	0.93504				
	2	0.93381	0.93843				
0	3	0.93000	0.93624				
	4	0.93121	0.93775				
Conc.	1	0.93363	0.93992				
	2	0.93747	0.94571				
6.25	3	0.93689	0.94408				
	4	0.93824	0.94462				
Conc.	1	0.93772	0.94469				
	2	0.93572	0.94471				
12.5	3	0.93647	0.94437				
	4	0.93657	0.94206				
Conc.	1	0.93989	0.94487				
	2	0.93719	0.94168				
25	3	0.93858	0.94409				
	4	0.93437	0.94251				
Conc.	1	0.93615	0.93839				
	2	0.93570	0.93834				
50	3	0.93921	0.94071				
	4	0.93988	0.94336				
Conc.	1	0.93921	0.94029				
	2	0.94040	0.94217				
100	3	0.93718	0.93745				
	4	0.93937	0.93981				

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

b Number: _____ Test Organism: Fathead Test Initiation: _____ Analyst(s): _____
istabbr: Aug Port 91 Dates Delivered: _____ Test Conclusion: _____ Reviewed by: _____
mp /Source Name: _____ Dates Collected: _____ Dechlorination: _____

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0	8/14	AR			8.1		8820					
	1	8/15	NL		7.74	8.1	7.9	9530	9760				
	2	8/16	AR		780	8.4	7.6	10710	9870				
	3	8/17	AR		7.45	8.2	7.5	9820	9650				
	4	8/18	AR		7.81	8.3	7.1	9990	9780				
	5	8/19	NL		7.77	8.1	7.3	9560	9780				
	6	8/20	NL			8.1	7.5	9680	11270				
	7												
	0	8/14	AR	7.85		8.2							
	1	8/15	NL	7.84	7.78	8.1	7.9	11870	1143				
	2	8/16	AR	7.85	781	8.4	7.5	14330	12030				
	3	8/17	AR	7.79	7.50	8.3	7.6	13780	11320				
	4	8/18	AR	7.84	7.81	8.3	7.0	14140	12090				
	5	8/19	NL	7.82	7.81	8.3	7.3	13330	12080				
	6	8/20	NL			8.0	7.3	13540	15270				
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												

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_____

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

b Number: _____
istabbr: AraRo96x01
mp Source Name: DOC1

Test Organism: Fathead
Dates Delivered: 5-14-01
Dates Collected: 5-21-01

Test Initiation: 5-14-01
Test Conclusion: 5-21-01
Dechlorination: _____

Analyst(s): AR/HT
Reviewed by: _____

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0	8/14	HL	7.70		7.9		611					
	1	8/15	HL	7.46	7.57	8.4	8.0	499	937				
	2	8/16	AR	7.75	7.76	8.5	7.9	492	845				
	3	8/17	AR	7.53	7.66	8.4	7.8	509	633				
	4	8/18	AR	7.70	7.75	8.4	7.2	523	688				
	5	8/19	HL	7.70	7.77	8.5	7.3	530	645				
	6	8/20	HL			8.1	7.2	568	566				
	7												
	0	8/14	HL			7.9		2170					
	1	8/15	HL		7.60	8.3	7.7	1867	2320				
	2	8/16	AR		7.78	8.5	7.7	2169	1912				
	3	8/17	AR		7.68	8.4	7.8	1993	2120				
	4	8/18	AR		7.79	8.4	7.1	2090	2230				
	5	8/19	HL		7.77	8.4	7.3	2123	2330				
	6	8/20	HL			8.0	7.1	2320	2480				
	7												
	0	8/14	HL			8.1		2250					
	1	8/15	HL		7.63	8.2	7.7	3710	2700				
	2	8/16	AR		7.78	8.5	7.3	5040	4050				
	3	8/17	AR		7.73	8.3	7.6	3890	3990				
	4	8/18	AR		7.80	8.4	7.1	3980	4100				
	5	8/19	HL		7.71	8.3	7.4	4930	5030				
	6	8/20	HL			8.0	7.0	4920	5330				
	7												
	0	8/14	HL			8.0		5950					
	1	8/15	HL		7.71	8.2	7.7	6860	7060				
	2	8/16	AR		7.78	8.5	7.6	7160	7190				
	3	8/17	AR		7.54	8.3	7.6	6980	7130				
	4	8/18	AR		7.80	8.3	7.2	6870	7270				
	5	8/19	HL			8.3	7.3	6970	7130				
	6	8/20	HL			8.0	7.4	7200	8050				
	7												

e: _____

Larval Fish Growth and Survival Test-96 Hr Survival

Start Date:	8/14/2001	Test ID:	AugRef-f	Sample ID:	RefTox
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	NaCl
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
2.5	1.0000	1.0000	0.9000	1.0000
4	1.0000	1.0000	1.0000	1.0000
5.5	1.0000	0.8000	0.7000	0.9000
8	0.6000	0.5000	0.7000	0.5000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
2.5	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
4	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
5.5	0.8500	0.8500	1.1898	0.9912	1.4120	15.281	4	12.00	10.00	6	40
*8	0.5750	0.5750	0.8620	0.7854	0.9912	11.405	4	10.00	10.00	17	40

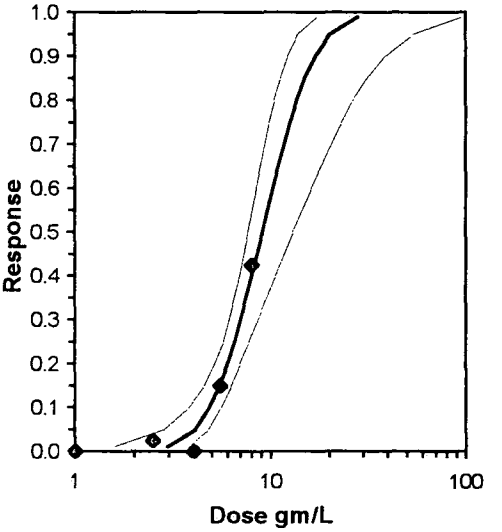
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.86901	0.884	0.22136	2.87439
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	5.5	8	6.63325	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.72175	1.06409	2.63613	6.80736	0	6.36025	7.81472	0.1	0.95795	0.21179	5
Intercept	0.47679	0.84772	-1.1847	2.13832							
TSCR											

Point	Probits	gm/L	95% Fiducial Limits	
EC01	2.674	2.9192	1.58574	3.75699
EC05	3.355	4.07	2.82323	4.81901
EC10	3.718	4.85889	3.78646	5.58029
EC15	3.964	5.47582	4.54664	6.25446
EC20	4.158	6.02154	5.17545	6.95747
EC25	4.326	6.53287	5.70227	7.73222
EC40	4.747	8.02225	6.94522	10.5752
EC50	5.000	9.07719	7.68259	12.9954
EC60	5.253	10.2709	8.4495	16.0616
EC75	5.674	12.6124	9.83564	22.9848
EC80	5.842	13.6834	10.4341	26.5301
EC85	6.036	15.0471	11.1718	31.3754
EC90	6.282	16.9577	12.1672	38.7716
EC95	6.645	20.2446	13.7961	53.1047
EC99	7.326	28.2253	17.4336	95.9697

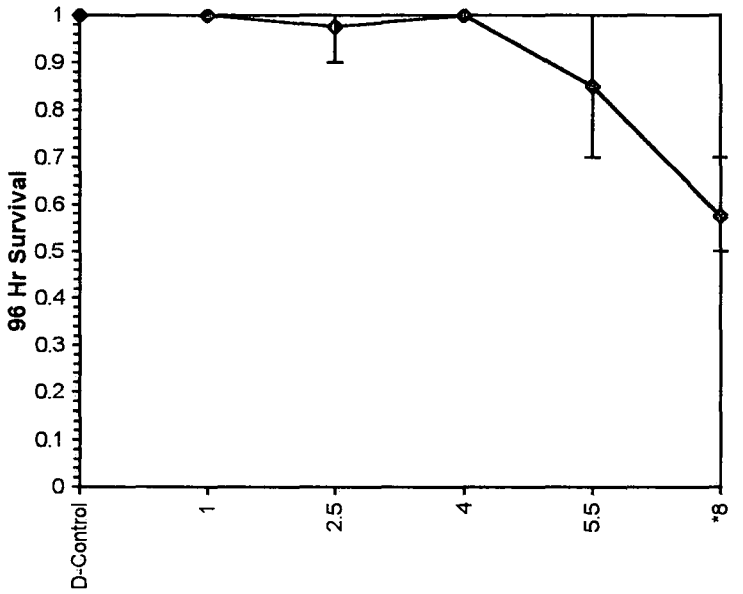


SCOEPA00027255

Larval Fish Growth and Survival Test-96 Hr Survival

Start Date:	8/14/2001	Test ID:	AugRef-f	Sample ID:	RefTox
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	NaCl
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



SCOEPA00027256

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/14/2001	Test ID:	AugRef-f	Sample ID:	RefTox
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	NaCl
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	0.9000
1	1.0000	1.0000	1.0000	1.0000
2.5	1.0000	1.0000	0.9000	1.0000
4	0.8000	1.0000	0.9000	1.0000
5.5	0.7000	0.8000	0.3000	0.7000
8	0.3000	0.5000	0.1000	0.1000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			1	40
1	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0	40
2.5	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	1	40
4	0.9250	0.9487	1.2951	1.1071	1.4120	11.347	4	15.50	10.00	3	40
*5.5	0.6250	0.6410	0.9173	0.5796	1.1071	25.253	4	10.00	10.00	15	40
*8	0.2500	0.2564	0.5021	0.3218	0.7854	44.727	4	10.00	10.00	30	40

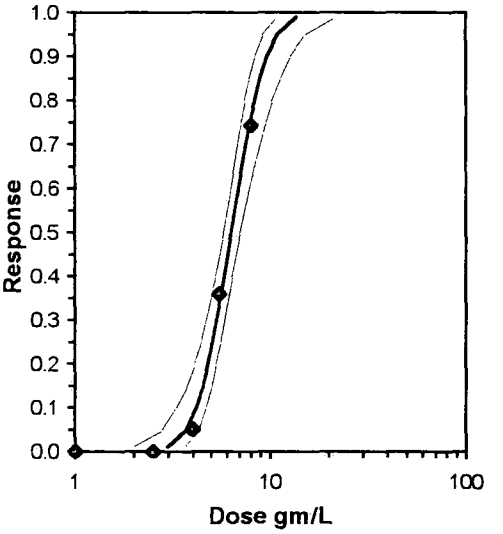
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94318	0.884	-0.5084	0.86716
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	4	5.5	4.69042	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.98667	1.23616	4.56379	9.40955	0.025	1.15149	7.81472	0.76	0.80239	0.14313	4
Intercept	-0.606	0.96973	-2.5067	1.29464							
TSCR	0.01491	0.01154	-0.0077	0.03753							

Point	Probits	gm/L	95% Fiducial Limits	
EC01	2.674	2.94727	1.98014	3.60351
EC05	3.355	3.68945	2.77451	4.28537
EC10	3.718	4.15874	3.31245	4.71238
EC15	3.964	4.50864	3.72559	5.03448
EC20	4.158	4.8076	4.08254	5.3163
EC25	4.326	5.07984	4.40696	5.58192
EC40	4.747	5.83617	5.27047	6.39896
EC50	5.000	6.34439	5.7909	7.04125
EC60	5.253	6.89686	6.29665	7.82932
EC75	5.674	7.92372	7.12446	9.48675
EC80	5.842	8.37241	7.45858	10.2706
EC85	6.036	8.92759	7.85742	11.2814
EC90	6.282	9.67872	8.37798	12.7134
EC95	6.645	10.9098	9.19687	15.2047
EC99	7.326	13.6571	10.9203	21.3371

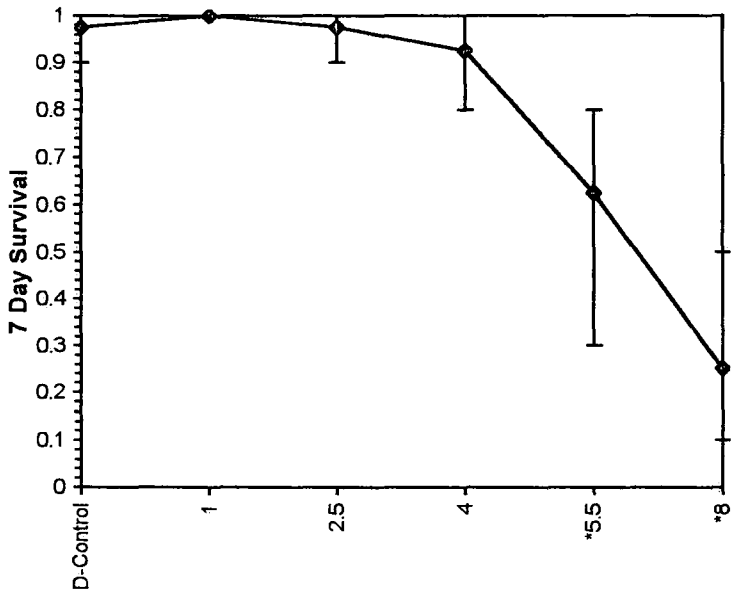


SCOEPA00027257

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/14/2001	Test ID:	AugRef-f	Sample ID:	RefTox
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	NaCl
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



SCOEPA00027258

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	8/14/2001	Test ID:	AugRef-f	Sample ID:	RefTox
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	NaCl
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	0.5980	0.4620	0.6240	0.6540
1	0.6290	0.8240	0.7190	0.6380
2.5	0.6970	0.5990	0.7900	0.5490
4	0.4980	0.4490	0.5510	0.8140
5.5	0.2240	0.2640	0.1500	0.3480
8	0.1080	0.1770	0.0270	0.0440

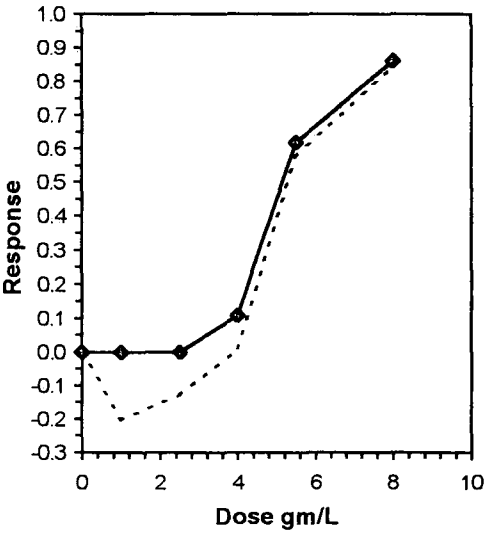
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5845	1.0000	0.5845	0.4620	0.6540	14.510	4				0.6486	1.0000
1	0.7025	1.2019	0.7025	0.6290	0.8240	12.889	4	-1.606	2.410	0.1771	0.6486	1.0000
2.5	0.6587	1.1270	0.6587	0.5490	0.7900	16.233	4	-1.011	2.410	0.1771	0.6486	1.0000
4	0.5780	0.9889	0.5780	0.4490	0.8140	28.158	4	0.088	2.410	0.1771	0.5780	0.8912
*5.5	0.2465	0.4217	0.2465	0.1500	0.3480	33.475	4	4.600	2.410	0.1771	0.2465	0.3801
*8	0.0890	0.1523	0.0890	0.0270	0.1770	76.685	4	6.744	2.410	0.1771	0.0890	0.1372

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95239	0.884	0.69867	0.25399
Bartlett's Test indicates equal variances (p = 0.74)	2.73096	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	4	5.5	4.69042		0.17707	0.30295	0.24745	0.0108	3.2E-07	5, 18

Linear Interpolation (200 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	3.1892	0.7247	0.8326	4.7036	-0.1553
IC10	3.8783	0.5512	1.5652	4.5072	-0.6497
IC15	4.1208	0.4031	2.6333	4.5788	-0.9269
IC20	4.2676	0.3110	3.1232	4.7079	-0.9714
IC25	4.4143	0.2477	3.4765	4.8391	-0.7400
IC40	4.8545	0.1712	4.2554	5.2707	-0.3019
IC50	5.1480	0.1570	4.6714	5.6262	0.0247

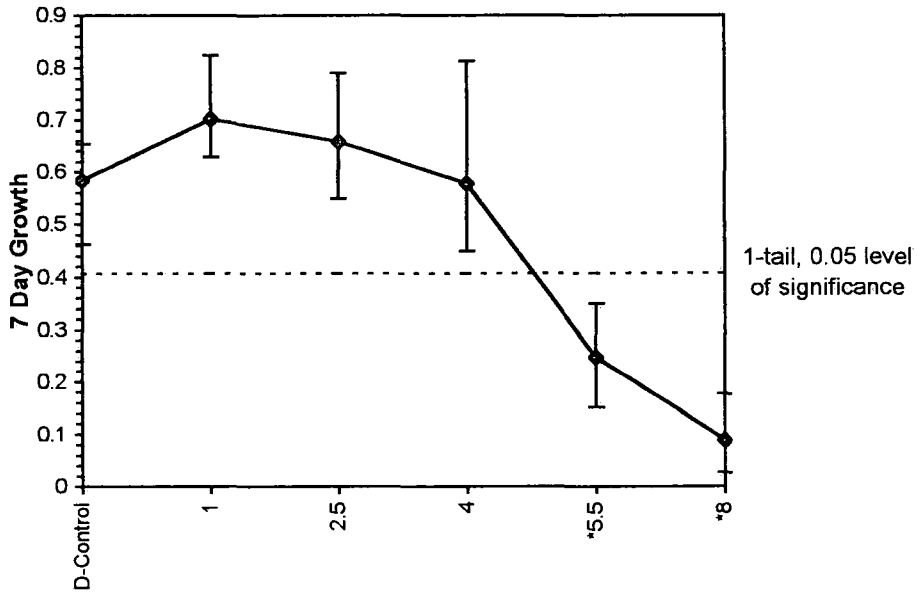


SCOEPA00027259

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	8/14/2001	Test ID:	AugRef-f	Sample ID:	RefTox
End Date:	8/21/2001	Lab ID:	Coffey Laboratories	Sample Type:	NaCl
Sample Date:	8/15/2001	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



SCOEPA00027260

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	8/14/2001	Test ID:	Augrefto-C	Sample ID:	Aug Ref Tox
End Date:	8/21/2001	Lab ID:	Coffey Labortories	Sample Type:	NaCl
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
0.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
1	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
1.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
*2	0.4000	0.4000	6	4	10	10	0.0054	0.0500	6	10
*3	0.0000	0.0000	10	0	10	10	0.0000	0.0500	10	10

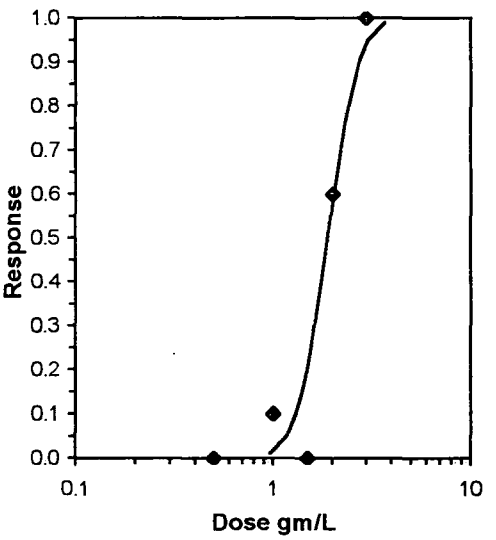
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1.5	2	1.73205	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	7.96309	3.61915	-3.5547	19.4809	0	8.62768	7.81472	3.0E-02	0.27568	0.12558	5
Intercept	2.80477	1.06408	-0.5816	6.19114							
TSCR											

Point	Probits	gm/L	95% Fiducial Limits
EC01	2.674	0.9628	
EC05	3.355	1.17251	
EC10	3.718	1.30238	
EC15	3.964	1.39804	
EC20	4.158	1.47906	
EC25	4.326	1.55229	
EC40	4.747	1.75332	
EC50	5.000	1.88658	
EC60	5.253	2.02998	
EC75	5.674	2.29286	
EC80	5.842	2.40639	
EC85	6.036	2.54583	
EC90	6.282	2.73283	
EC95	6.645	3.03553	
EC99	7.326	3.69672	

Significant heterogeneity detected (p = 3.00E-02)

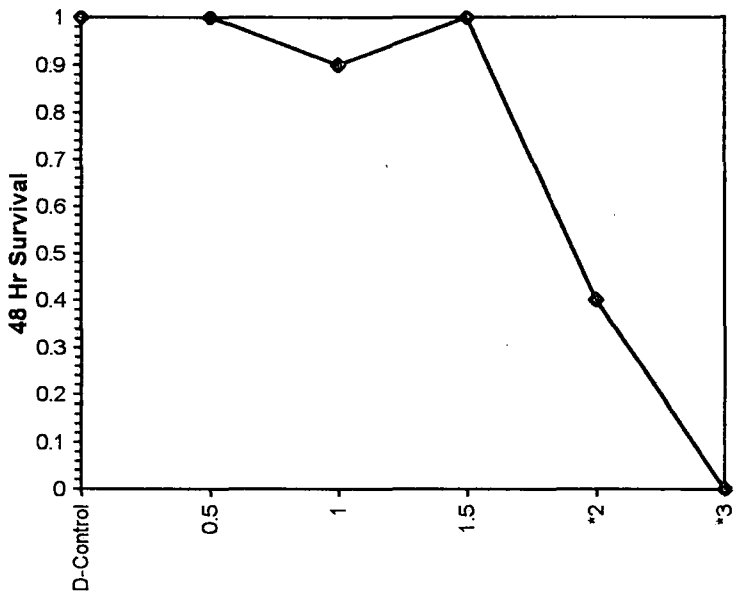


SCOEPA00027261

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	8/14/2001	Test ID:	Augrefto-C	Sample ID:	Aug Ref Tox
End Date:	8/21/2001	Lab ID:	Coffey Labortories	Sample Type:	NaCl
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027262

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	8/14/2001	Test ID:	Augrefto-C	Sample ID:	Aug Ref Tox
End Date:	8/21/2001	Lab ID:	Coffey Labortories	Sample Type:	NaCl
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	18.000	18.000	15.000	15.000	9.000	13.000	13.000	14.000	18.000	15.000
0.5	11.000	8.000	13.000	15.000	0.000	12.000	8.000	11.000	7.000	6.000
1	0.000	9.000	9.000	6.000	4.000	1.000	5.000	4.000	5.000	6.000
1.5	3.000	3.000	7.000	2.000	3.000	4.000	4.000	1.000	7.000	2.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	14.800	1.0000	14.8000	9.0000	18.0000	19.058	10			14.800	1.0000
*0.5	9.100	0.6149	9.1000	0.0000	15.0000	47.038	10	65.50	75.00	9.100	0.6149
*1	4.900	0.3311	4.9000	0.0000	9.0000	59.655	10	56.00	75.00	4.900	0.3311
*1.5	3.600	0.2432	3.6000	1.0000	7.0000	55.863	10	55.00	75.00	3.600	0.2432
*2	0.000	0.0000	0.0000	0.0000	0.0000	0.000	10	55.00	75.00	0.000	0.0000
*3	0.000	0.0000	0.0000	0.0000	0.0000	0.000	10	55.00	75.00	0.000	0.0000

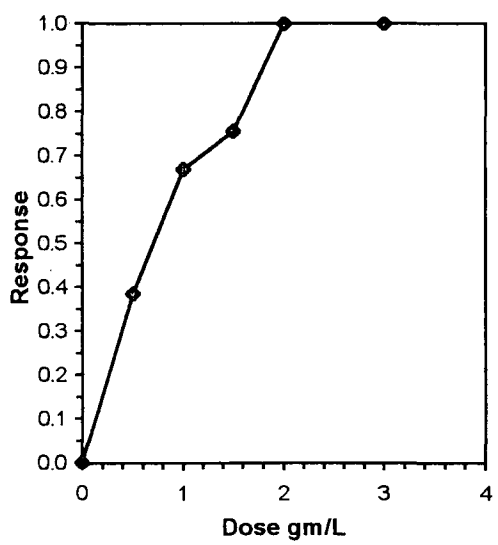
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.58031	1.035	-0.713	3.078
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	<0.5	0.5		

Linear Interpolation (200 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05*	0.0649	0.0188	0.0438	0.1150	1.4199
IC10*	0.1298	0.0376	0.0876	0.2301	1.4199
IC15*	0.1947	0.0563	0.1315	0.3451	1.4199
IC20*	0.2596	0.0725	0.1753	0.4601	1.1736
IC25*	0.3246	0.0840	0.2191	0.5364	0.8268
IC40	0.5262	0.1057	0.3505	0.7223	0.1416
IC50	0.7024	0.1228	0.4382	0.9094	-0.1444

* indicates IC estimate less than the lowest concentration

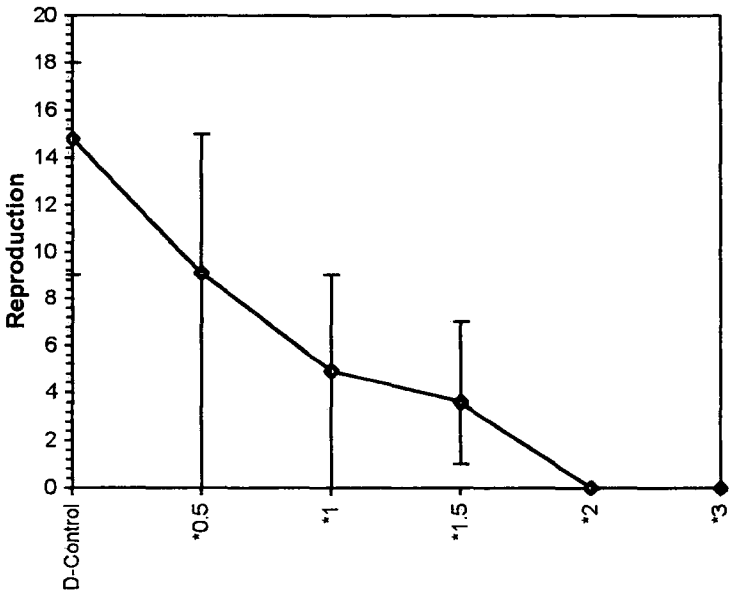


SCOEPA00027263

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	8/14/2001	Test ID:	Augrefto-C	Sample ID:	Aug Ref Tox
End Date:	8/21/2001	Lab ID:	Coffey Labortories	Sample Type:	NaCl
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027264

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	8/14/2001	Test ID:	Augrefto-C	Sample ID:	Aug Ref Tox
End Date:	8/21/2001	Lab ID:	Coffey Labortories	Sample Type:	NaCl
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
0.5	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
1	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
1.5	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
*2	0.1000	0.1000	9	1	10	10	0.0001	0.0500	9	10
*3	0.0000	0.0000	10	0	10	10	0.0000	0.0500	10	10

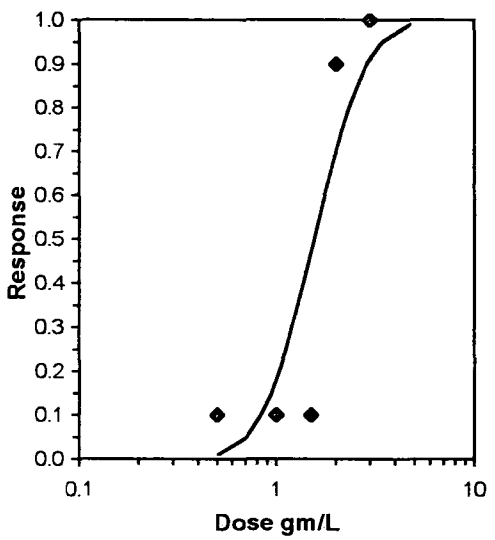
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1.5	2	1.73205	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.78806	2.99299	-4.737	14.3131	0	17.7055	7.81472	5.1E-04	0.18982	0.20885	5
Intercept	4.09113	0.80429	1.53153	6.65074							
TSCR											

Point	Probits	gm/L	95% Fiducial Limits
EC01	2.674	0.50577	
EC05	3.355	0.70192	
EC10	3.718	0.83592	
EC15	3.964	0.9405	
EC20	4.158	1.03287	
EC25	4.326	1.11931	
EC40	4.747	1.37059	
EC50	5.000	1.54817	
EC60	5.253	1.74877	
EC75	5.674	2.14135	
EC80	5.842	2.32057	
EC85	6.036	2.54848	
EC90	6.282	2.86731	
EC95	6.645	3.41469	
EC99	7.326	4.73897	

Significant heterogeneity detected (p = 5.06E-04)

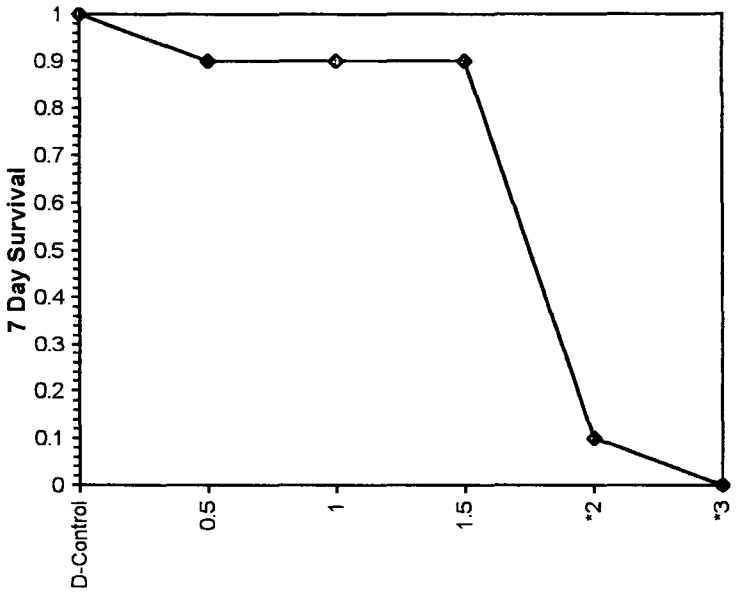


SCOEPA00027265

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	8/14/2001	Test ID:	Augrefto-C	Sample ID:	Aug Ref Tox
End Date:	8/21/2001	Lab ID:	Coffey Labortories	Sample Type:	NaCl
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027266

APPENDIX C

CHAINS-OF-CUSTODY

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way ● Portland, OR ● 97230 ● (503) 254-1794 ● FAX (503) 254-1452

NE A108.7 AV

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Tom Rothschild
Company Name: Wacker Siltronic
Mailing Address: 7200 N. W. Front Ave
Portland, OR
Phone: (503) 219-7374 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):

PO Number: 4500075702
Project Number: 01-93
Project Name: Bioassay Aug. 2001
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- [x] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Reporting Request
- [ ] State Compliance Format
- [ ] FAX Results - Preliminary
- [x] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

Initials: Di

FOR LABORATORY USE ONLY Page ___ of ___
Job Number: MX A108BAL
Custabbr: Wackersilt ☐NEW
☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
01-93				8.17.01	0815	liquid	Acute: Fat head & Cerio Chronic: Fat head + Cerio	
							BOD	
							~~BOD Cr (T)~~ Di	

Sampled By: Dianne Irish
AUTHORIZED CUSTOMER SIGNATURE Dianne Irish DATE: 8.17.01

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Dianne Irish	8.17.01	0900	S M Coffey	Aug 17-01	1500
				LAB Linda B	8/17/01	1744

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Tom Rothschild
Company Name: Wacker Siltronic
Mailing Address: 7200 N. W. Front Ave
Portland, OR
Phone: (503) 219-7374 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):

PO Number: 4500075702
Project Number: 01-91.
Project Name: Bioassay-Aug-2001
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- [x] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Reporting Request
- [ ] State Compliance Format
- [ ] FAX Results - Preliminary
- [x] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

Initials: Di

FOR LABORATORY USE ONLY Page ___ of ___
Job Number: MXA10813AL
Custabbr: Wackersilt ☐NEW
☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
01-91	B5E	2f		8/15/01	0750	liquid	Acute: Fat head & Cerio Chronic: Fat head & Cerio	
	007	2j					BOD	
	N1	2r						
	B1	2x						

Sampled By: Dianne Irish
AUTHORIZED CUSTOMER SIGNATURE Dianne Irish DATE: Aug. 15, '01

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Dianne Irish	8/15/01	0850	[signature]	8-15-01	1050
				LAB [signature]	8/15/01	1502

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

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CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
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Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Tom Rothschild
Company Name: Wacker Siltronic
Mailing Address: 7200 N.W. Front Ave
Portland, OR
Phone: (503) 219-7374 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):

PO Number: 4500075102
Project Number: 01-90
Project Name: Bioassay-Aug-2001
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- [x] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Initials: DL

Reporting Request
- [ ] State Compliance Format
- [ ] FAX Results - Preliminary
- [x] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page ____ of ____
Job Number: MXA 10813AL-1
Custabbr: WACKERSIT ☐NEW

☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
01-90	BF	1F		8.13.01	0815	liquid	Acute: Fathead & Cerio Chronic: Fat head & Cerio	2809
"	07	1		"	"	"	BOD	1902
	06	1F						
	31	1X						

Sampled By: Dianne Thiel
AUTHORIZED CUSTOMER SIGNATURE Dianne Thiel DATE: 8.13.01

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Dianne Thiel	8.13.01	0900		8-13-01	1005
				LAB	8/13/01	1607

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY

APPENDIX D

ORGANISM HISTORY

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way ● Portland, OR ● 97230 ● (503) 254-1794 ● FAX (503) 254-1452

Environmental Consulting & Testing

1423 N. 8th St. Suite 118 • Superior, WI 54880
(715) 392-6635 • Fax (715) 395-2463
www.ectesting.com

SHIPPING DATE: 08-13-01

FROM: ECT SUPERIOR, WI.

TO: COFFEY LAB
12423 N.E. WHITAKER
PORTLAND, OR 97230
503-254-1794

SPECIES: FATHEAD MINNOW (PIMEPHALES PROMELAS)
DATE OF HATCH: 08-13-01 BETWEEN 1000 AND 1100 HR CENTRAL
NUMBER: 500 +
TEMP. AT SHIPPING: 24.6

P.O.#: JOB # verbal HEIDI BRIAN

SHIPPED BY: FEDERAL EX. 1058-1533-3

WATER CHEMISTRY RECORDS

TEMPERATURE	24 to 26	AS Co
CONDUCTIVITY	90 to 120	AS UMHOS/CM
T.HARDNESS	50 to 80	AS CACO3
T.ALKALINITY	40 to 60	AS CACO3
pH	6.9 to 7.3	

RECENT REF. TESTS WITH NACL
(Overall mean (s.d.) = 2.47 (1.03) g/l n=42 *4.73 (1.02) g/l
n=75 (0.41 g/l to 4.53 g/l) (2.69 g/l to 6.77 g/l)

2001		
JAN.	CHRONIC IC25 = 2.36 g/l	ACUTE (01 DAY OLD) LC50 = 6.02 g/l
FEB.	CHRONIC IC25 = 1.94 g/l	ACUTE (01 DAY OLD) LC50 = 5.22 g/l
MAR.	CHRONIC IC25 = 1.98 g/l	ACUTE (01 DAY OLD) LC50 = 3.55 g/l
APR.	CHRONIC IC25 = 2.12 g/l	ACUTE (01 DAY OLD) LC50 = 4.87 g/l
MAY	CHRONIC IC25 = 2.82 g/l	ACUTE (01 DAY OLD) LC50 = 7.56 g/l
JUNE	CHRONIC IC25 = 3.35 g/l	ACUTE (01 DAY OLD) LC50 = 7.05 g/l
JULY	CHRONIC IC25 = 2.01 g/l	ACUTE (01 DAY OLD) LC50 = 4.05 g/l
AUG.	CHRONIC IC25 = g/l	ACUTE (01 DAY OLD) LC50 = g/l
2000		
SEP.	CHRONIC IC25 = 2.73 g/l	ACUTE (01 DAY OLD) LC50 = 6.26 g/l
OCT.	CHRONIC IC25 = 2.17 g/l	ACUTE (01 DAY OLD) LC50 = 4.50 g/l
NOV.	CHRONIC IC25 = 2.34 g/l	ACUTE (01 DAY OLD) LC50 = 6.73 g/l
DEC.	CHRONIC IC25 = 2.20 g/l	ACUTE (01 DAY OLD) LC50 = 4.15 g/l

*Acute Toxicity Data extrapolated from Chronic Data
Origin of brood stock is EPA-Duluth, MN

WACKER
Wacker Siltronic Corporation

January 14, 2003

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER004:JC

Dear Dr. Zais,

The second Bioassay of Wacker's effluent **passes the requirements** of our NPDES permit number 101128.

CH2MHill results for December 2002

Acute (48-hour) Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	30%	30%
ZID Pass Criteria[1]	≥13.4%	≥13.4%
Chronic Results:	**Survival (% Effluent)**	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	7.5%	30%
Mixing Zone Pass Criteria[1]	≥ 1.8%	≥ 1.8%

The first bioassay test did not pass the permit requirements. A QC failure at CH2MHill Biomonitoring Services required that the waste steam be resampled December 8, 2002. The test results were received January 13, 2003.

If you have any questions, please contact Jim Claxton at 503-219-7313.

Regards,

WACKER SILTRONIC CORPORATION

Thomas C. McCue

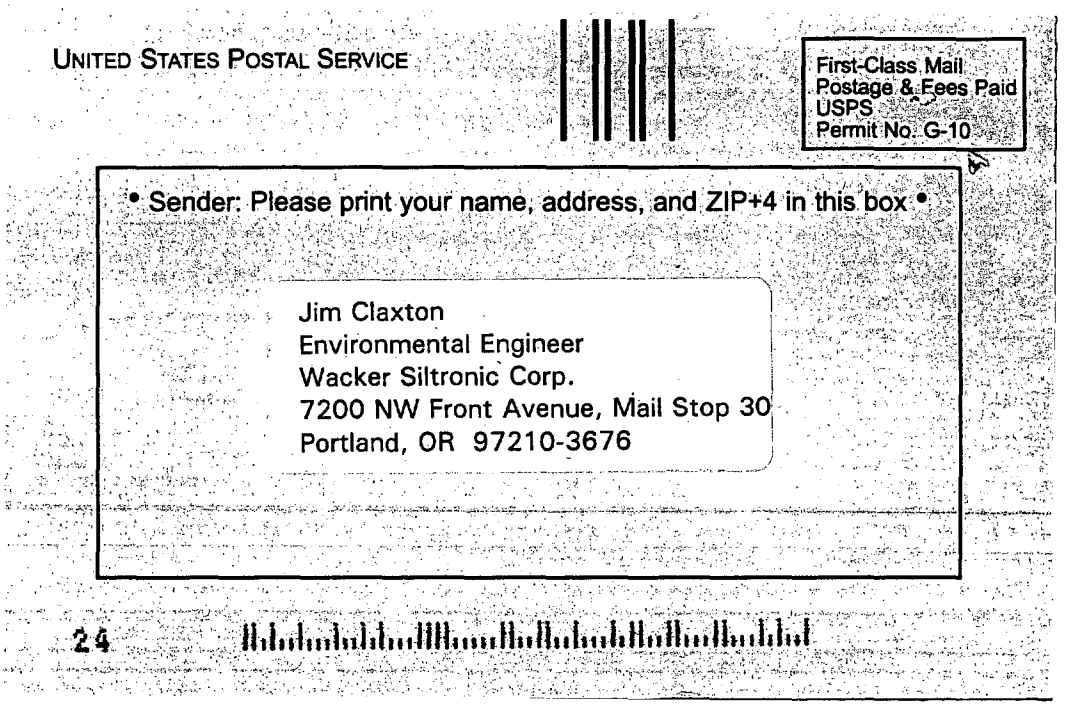
Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
NPDES DMR File

[1] CH2MHILL. Mixing Zone Effluent Dilution Evaluations prepared for Wacker Siltronic Corporation in 1994, 1995 and 1996. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution studies identified worst-case (0.1 feet/ second as current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 7.5:1 and 55.5:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 13.4% effluent at the edge of the ZID and 1.8% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 13.4% effluent, and is considered to be chronically toxic if a chronic test NOEC is less than 1.8% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC≥ 13.4% effluent and the chronic test NOEC ≥ 1.8% effluent.

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

SCOEPA00027273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First-Class Mail
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Permit No. G-10
• Sender: Please print your name, address, and ZIP+4 in this box •
Jim Claxton
Environmental Engineer
Wacker Siltronic Corp.
7200 NW Front Avenue, Mail Stop 30
Portland, OR 97210-3676
24

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Dr. Elliot Zais
Water Quality Source Control, DEQ
State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

COMPLETE THIS SECTION ON DELIVERY

A. Received by *(Please Print Clearly)* B. Date of Delivery
JAN 15 2003

C. Signature
X DEQ/NWR ☐ Agent ☐ Addressee

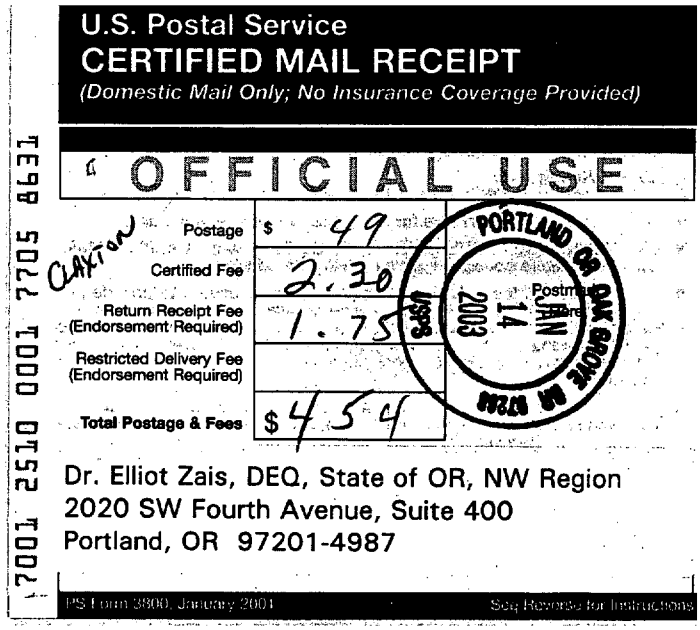
D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☑ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number *(Copy from service label)* 7001 2510 0001 7705 8631

PS Form 3811, July 1999 Domestic Return Receipt 102595-00-M-0952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Clifton

PORTLAND OR
JAN 14 2003
USPS

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7001 2510 0001 7705 8631

Dr. Elliot Zais, DEQ, State of OR, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

PS Form 3800, January 2001 — See Reverse for Instructions

WACKER SILTRONIC

JIM CLAXTON
ENVIRONMENTAL ENGINEER

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Tel. +1 503 7313
Fax +1 503 7599
jim_claxton@siltronic.com

Wacker Siltronic Corporation
7200 NW Front Avenue, Portland OR 97210-3676, USA

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER:053.JWC

Date 2002-Dec-13

Reference August 2002 Bioassay Update

Dear Dr. Zais,

This letter is to inform you that Wacker Siltronic Corporation **did not passed** the Bioassay as required by our NPDES permit number 101128. A complete Bioassay re-test is scheduled for the week of Dec 8, 2002 and the results will be submitted by as soon as possible.

The following table shows the time line of events for this year's bioassay:

Sample Date	Test result	Comments
Week of Aug 5	Test aborted	Due to a miss communication between Coffey Labs and Wacker, the wrong sample dilutions were used for the analysis so the test was aborted.
Week of Aug 26	QC problems no results	Control organisms did not meet the QC requirements of the analysis, no test results. Test re-scheduled
Week of Oct 7	**Samples Failed** Re-test scheduled for the week of Nov. 3.	Testing could not be re-scheduled until the week of Oct 7. There were a number of reasons for this (see letter dated Sept 10, 2002) but briefly: 1. Neither CH2M-Hill nor Coffey labs could re-schedule the test until the week of Sept 23. **2.** Wacker scheduled a partial-manufacturing shutdown to perform plant maintenance from Sept 22 to October 1, so any sampling during this week would not represent the entire waste steam.
Week of Nov 3	QC problems no results	Wacker contacted CH2M-Hill Dec 2 to check on results. Wacker was told that the test would need to be repeated because the control organisms did not meet the QC requirements of the analysis. Test re-scheduled.
Week of Dec 8	In process	The earliest a re-test that could be scheduled was the week of Dec 8. The samples will be analyzed by CH2M-Hill.

If you have any questions, please contact Jim Claxton.

Regards,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
Bioassay 2002 File

WACKER SILTRONIC

JIM CLAXTON
ENVIRONMENTAL ENGINEER

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Wacker Siltronic Corporation
7200 NW Front Avenue, Portland OR 97210-3676, USA

ER:039.JWC

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

Date 2002-Sept-10

Reference August 2002 Bioassay Results

Dear Dr. Zais;

This letter is to inform you that Wacker Siltronic Corporation will not be submitting annual bioassay results by September 15, 2002, as discussed with you last week and as required by our NPDES permit number 101128.

Bioassay samples are normally taken during the first week of August. Samples were taken the week of August 5. Due to a miss communication between Coffey Laboratories and Wacker Siltronic, the wrong dilution factors were used in preparing the test samples. The test was aborted. The test was re-scheduled and samples were taken the week of August 26, 2002. During the performance of the bioassay, the control organisms died and the test was aborted. Please refer to the attached letter from Coffey Laboratories.

Coffey Laboratories is investigating the cause of the deaths of the control organisms. However, due to the investigation Coffey Laboratories has closed their bioassay department until they have completed a series of Quality Control tests to re-certify this area for use. Coffey Laboratories is confident that the re-certification process will be completed by the week of September 23, 2002. CH2M-Hill was contacted but their bioassay schedule is also filled until the week of September 23, 2002.

Beginning September 22 Wacker Siltronic has scheduled a partial-manufacturing shutdown to perform maintenance until October 1. Bioassay samples taken during this period would not be representative of the normal Wacker Siltronic effluent. The bioassay is re-scheduled for the week of October 7,2002. Bioassay results will be submitted by November 15, 2002. If you have any questions, please contact Jim Claxton.

Regards,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
Bioassay 2002 File

WACKER

Wacker Siltronic Corporation

November 8, 2002

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER047:JC

Dear Dr. Zais,

Below are the results of the annual bioassay test performed October 8 through October 15, 2002 as required in our NPDES permit number 101128. **The results of the bioassay do not comply with the conditions of our permit.** A second Bioassay is scheduled for November with sampling dates of November 4, 6 and 8.

Coffey Labs results for October 2002

Acute (48-hour) Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	15%	7.5%
ZID Pass Criteria[1]	≥13.4%	≥13.4%
Chronic Results:	**Survival (% Effluent)**	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	30%	<1.9%
Mixing Zone Pass Criteria[1]	≥ 1.8%	≥ 1.8%

If you have any questions, please contact Jim Claxton at 503-219-7313.

Regards,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
NPDES DMR File

[1] CH2MHILL. Mixing Zone Effluent Dilution Evaluations prepared for Wacker Siltronic Corporation in 1994, 1995 and 1996. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution studies identified worst-case (0.1 feet/ second as current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 7.5:1 and 55.5:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 13.4% effluent at the edge of the ZID and 1.8% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test LC_{50} is less than 13.4% effluent, and is considered to be chronically toxic if a chronic test LC_{50} is less than 1.8% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test $LC_{50} \geq$ 13.4% effluent and the chronic test $LC_{50} \geq$ 1.8% effluent.

Wacker Siltronic Corporation
7200 NW Front Avenue
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Phone (503) 243-2020
TDD (503) 241-7519

SCOEPA00027279

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
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509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

21 December, 2002

Thomas Rothschild
Wacker Siltronics Corporation
7200 N.W. Front
Portland, OR 97210

RE: Bioassay

Enclosed are the results of analyses for samples received by the laboratory on 11/06/02 10:45. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian L Cone

Brian Cone
Industrial Services Manager

Work Orders included in this report:
P2K0143

North Creek Analytical, Inc.
Environmental Laboratory Network

www.ncalabs.com

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541.383.9310 fax 541.382.7588

Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
02-146	P2K0143-01	Water	11/06/02 07:45	11/06/02 10:45

North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Brian L Cone

Brian Cone, Industrial Services Manager

SCOEPA00027281

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
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Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Conventional Chemistry Parameters per APHA/EPA Methods

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-146 (P2K0143-01) Water					Sampled: 11/06/02 Received: 11/06/02				
Ammonia-Nitrogen	**0.749**	0.0500	mg/l	1	EPA 350.1	11/12/02	11/13/02	2110382	

www.ncalabs.com

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541.383.9310 fax 541.382.7588

Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Conventional Chemistry Parameters per North Creek Analytical Methods

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-146 (P2K0143-01) Water						Sampled: 11/06/02	Received: 11/06/02		
Hydrogen Peroxide	**5.10**	2.00	mg/l	1		11/07/02	11/07/02	2110252	I-05

North Creek Analytical - Portland

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Brian L Cone

Brian Cone, Industrial Services Manager

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Anions per EPA Method 300.0

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-146 (P2K0143-01) Water					Sampled: 11/06/02 Received: 11/06/02				
Nitrate-Nitrogen	**52.4**	1.00	mg/l	10	EPA 300.0	11/06/02	11/06/02	2110169	

North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Brian L Cone

Brian Cone, Industrial Services Manager

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
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541.383.9310 fax 541.382.7588

Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Total Alkalinity by Conventional Chemistry Parameters per APHA/EPA Methods
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-146 (P2K0143-01) Water					Sampled: 11/06/02 Received: 11/06/02				
Total Alkalinity	**12.1**	10.0	mg/L as CaCO3	1	EPA 310.1	11/07/02	11/08/02	2110212	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Conventional Chemistry Parameters per APHA/EPA Methods - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2110382 - Wet Chem										
Blank (2110382-BLK1)				Prepared: 11/12/02 Analyzed: 11/13/02						
Ammonia-Nitrogen	ND	0.0500	mg/l							
LCS (2110382-BS1)				Prepared: 11/12/02 Analyzed: 11/13/02						
Ammonia-Nitrogen	2.04	0.0500	mg/l	2.00		102	85-115			
Duplicate (2110382-DUP1)		**Source: P2K0146-01**		Prepared: 11/12/02 Analyzed: 11/13/02						
Ammonia-Nitrogen	ND	0.0500	mg/l		ND				20	
Matrix Spike (2110382-MS1)		**Source: P2K0146-01**		Prepared: 11/12/02 Analyzed: 11/13/02						
Ammonia-Nitrogen	1.67	0.0500	mg/l	2.00	ND	83.5	75-125			
Matrix Spike Dup (2110382-MSD1)		**Source: P2K0146-01**		Prepared: 11/12/02 Analyzed: 11/13/02						
Ammonia-Nitrogen	1.71	0.0500	mg/l	2.00	ND	85.5	75-125	2.37	20	

North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Brian L Cone

Brian Cone, Industrial Services Manager

www.ncalabs.com

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Conventional Chemistry Parameters per North Creek Analytical Methods - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2110252 - Wet Chem										
Blank (2110252-BLK1)				Prepared & Analyzed: 11/07/02						
Hydrogen Peroxide	ND	2.00	mg/l							
Duplicate (2110252-DUP1)		**Source: P2K0050-01**		Prepared & Analyzed: 11/07/02						
Hydrogen Peroxide	5.10	2.00	mg/l		5.10			0.00	200	

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541.383.9310 fax 541.382.7588

Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Anions per EPA Method 300.0 - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2110169 - Wet Chem										
Blank (2110169-BLK1)				Prepared & Analyzed: 11/06/02						
Nitrate-Nitrogen	ND	0.100	mg/l							
LCS (2110169-BS1)				Prepared & Analyzed: 11/06/02						
Nitrate-Nitrogen	4.82	0.100	mg/l	5.00		96.4	85-115			
Duplicate (2110169-DUP1)		**Source: P2K0116-01**		Prepared & Analyzed: 11/06/02						
Nitrate-Nitrogen	0.530	0.100	mg/l		0.520			1.90	20	
Matrix Spike (2110169-MS1)		**Source: P2K0116-01**		Prepared & Analyzed: 11/06/02						
Nitrate-Nitrogen	2.71	0.111	mg/l	2.22	0.520	98.6	75-125			
Matrix Spike Dup (2110169-MSD1)		**Source: P2K0116-01**		Prepared & Analyzed: 11/06/02						
Nitrate-Nitrogen	2.71	0.111	mg/l	2.22	0.520	98.6	75-125	0.00	20	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Total Alkalinity by Conventional Chemistry Parameters per APHA/EPA Methods - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2110212 - Wet Chem										
Blank (2110212-BLK1)				Prepared: 11/07/02 Analyzed: 11/08/02						
Total Alkalinity	ND	10.0	mg/L as CaCO3							
LCS (2110212-BS1)				Prepared: 11/07/02 Analyzed: 11/08/02						
Total Alkalinity	188	10.0	mg/L as CaCO3	200		94.0	85-115			
Duplicate (2110212-DUP1)		**Source: P2J0955-01**		Prepared: 11/07/02 Analyzed: 11/08/02						
Total Alkalinity	563	10.0	mg/L as CaCO3		563			0.00	20	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:07

Notes and Definitions

I-05	This sample was received outside EPA recommended holding time.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis. MRLs are adjusted if %Solids are less than 50%.
wet	Sample results reported on a wet weight basis (as received)
RPD	Relative Percent Difference

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

PZL0326

Client Wacker Siltronic Corp. NPDES# 101128

Address 7200 N.W. Front Avenue
Portland, Oregon 97219

Composite Sample Information _____

Samples/Hour 1 Volume/Sample 6L
Total Hours 24 Total Volume 144L
Initiated: Date ~~0800~~ Time 0800 10 Dec
Ended: Date 11 Dec Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
P. O.# Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

Contact Person: Thomas J. Rothschild
Phone: 503-219-7374

Check Chlorine (Y/N) _____
Temp. Upon Arrival (°C) _____
Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

CH2M HILL Project # _____

~~Analysis Required/Comments~~

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
02-171	11 Dec 2002	0745	X		1		X	X	X	X														Dilutions: 1.9%, 3.75%, 7.5%, 15%, 30% Test for: Ammonia-Nitrogen Alkalinity Nitrate-Nitrogen Hydrogen Peroxide

Sampled By & Title (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 11Dec2002/0745	Relinquished By (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 11Dec2002/10.20
Received By (Please sign and print name) Tommy Elston	Date/Time 12-11-02 /10:20	Relinquished By (Please sign and print name)	Date/Time 12-11-02
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name) Susan Passage	Date/Time 12-11-02 1130
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks 3.4°C		

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Anchorage 3209 Denali Street, Anchorage, AK 99503
907.334.9338 fax 907.334.9339

9 January, 2003

Thomas Rothschild
Wacker Siltronics Corporation
7200 N.W. Front
Portland, OR 97210

RE: Bioassay

Enclosed are the results of analyses for samples received by the laboratory on 12/13/02 11:55. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian L Cone

Brian Cone
Industrial Services Manager

Work Orders included in this report:
P2L0442

North Creek Analytical, Inc.
Environmental Laboratory Network

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
02-173	P2L0442-01	Water	12/13/02 08:00	12/13/02 11:55

North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Brian L Cone

Brian Cone, Industrial Services Manager

SCOEPA00027293

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Conventional Chemistry Parameters per APHA/EPA Methods

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-173 (P2L0442-01) Water						Sampled: 12/13/02	Received: 12/13/02		
Ammonia-Nitrogen	**0.691**	0.0500	mg/l	1	EPA 350.1	12/17/02	12/17/02	2120612	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Conventional Chemistry Parameters per North Creek Analytical Methods

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-173 (P2L0442-01) Water						Sampled: 12/13/02	Received: 12/13/02		
Hydrogen Peroxide	**6.80**	2.00	mg/l	1		12/13/02	12/13/02	2120531	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Anions per EPA Method 300.0

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-173 (P2L0442-01) Water						Sampled: 12/13/02	Received: 12/13/02		
Nitrate-Nitrogen	**56.1**	1.00	mg/l	10	EPA 300.0	12/13/02	12/13/02	2120517	

North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Brian L Cone

Brian Cone, Industrial Services Manager

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Total Alkalinity by Conventional Chemistry Parameters per APHA/EPA Methods
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-173 (P2L0442-01) Water						Sampled: 12/13/02	Received: 12/13/02		
Total Alkalinity	**13.5**	10.0	mg/L as CaCO3	1	EPA 310.1	12/16/02	12/16/02	2120564	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Conventional Chemistry Parameters per APHA/EPA Methods - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2120612 - Wet Chem										
Blank (2120612-BLK1)				Prepared & Analyzed: 12/17/02						
Ammonia-Nitrogen	ND	0.0500	mg/l							
LCS (2120612-BS1)				Prepared & Analyzed: 12/17/02						
Ammonia-Nitrogen	2.00	0.0500	mg/l	2.00		100	85-115			
Duplicate (2120612-DUP1)		**Source: P2L0143-01**		Prepared & Analyzed: 12/17/02						
Ammonia-Nitrogen	ND	0.0500	mg/l		ND				20	
Matrix Spike (2120612-MS1)		**Source: P2L0143-01**		Prepared & Analyzed: 12/17/02						
Ammonia-Nitrogen	1.82	0.0500	mg/l	2.00	ND	91.0	75-125			
Matrix Spike Dup (2120612-MSD1)		**Source: P2L0143-01**		Prepared & Analyzed: 12/17/02						
Ammonia-Nitrogen	1.81	0.0500	mg/l	2.00	ND	90.5	75-125	0.551	20	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Conventional Chemistry Parameters per North Creek Analytical Methods - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2120531 - Wet Chem										
Blank (2120531-BLK1)				Prepared & Analyzed: 12/13/02						
Hydrogen Peroxide	ND	2.00	mg/l							
Duplicate (2120531-DUP1)		**Source: P2L0442-01**		Prepared & Analyzed: 12/13/02						
Hydrogen Peroxide	6.80	2.00	mg/l		6.80			0.00	200	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Anions per EPA Method 300.0 - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2120517 - Wet Chem										
Blank (2120517-BLK1)				Prepared & Analyzed: 12/13/02						
Nitrate-Nitrogen	ND	0.100	mg/l							
LCS (2120517-BS1)				Prepared & Analyzed: 12/13/02						
Nitrate-Nitrogen	4.76	0.100	mg/l	5.00		95.2	85-115			
Duplicate (2120517-DUP1)		**Source: P2L0441-03**		Prepared & Analyzed: 12/13/02						
Nitrate-Nitrogen	7.94	0.100	mg/l		7.87			0.886	20	
Matrix Spike (2120517-MS1)		**Source: P2L0441-03**		Prepared & Analyzed: 12/13/02						
Nitrate-Nitrogen	10.2	0.111	mg/l	2.22	7.87	105	75-125			
Matrix Spike Dup (2120517-MSD1)		**Source: P2L0441-03**		Prepared & Analyzed: 12/13/02						
Nitrate-Nitrogen	10.2	0.111	mg/l	2.22	7.87	105	75-125	0.00	20	

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541.383.9310 fax 541.382.7588

Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Total Alkalinity by Conventional Chemistry Parameters per APHA/EPA Methods - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2120564 - Wet Chem										
Blank (2120564-BLK1)				Prepared & Analyzed: 12/16/02						
Total Alkalinity	ND	10.0	mg/L as CaCO3							
LCS (2120564-BS1)				Prepared & Analyzed: 12/16/02						
Total Alkalinity	186	10.0	mg/L as CaCO3	200		93.0	85-115			
Duplicate (2120564-DUP1)		**Source: P2L0326-01**		Prepared & Analyzed: 12/16/02						
Total Alkalinity	12.4	10.0	mg/L as CaCO3		12.1			2.45	20	

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541.383.9310 fax 541.382.7588

Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: PO# 4500186654	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	01/09/03 15:50

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis. MRLs are adjusted if %Solids are less than 50%.
wet	Sample results reported on a wet weight basis (as received)
RPD	Relative Percent Difference

North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Brian L Cone

Brian Cone, Industrial Services Manager

SCOEPA00027302

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

P2K00510

Client Wacker Siltronic
Address 7200 N.W. Front Ave
Portland, OR 97210
Contact Person: Tom Rothschild
Phone: 503-219-7374
CH2M HILL Project #

NPDES# 101128
Composite Sample Information
Samples/Hour 1/hr Volume/Sample 6L/hr
Total Hours 24 Total Volume 144L
Initiated: Date 10/3/02 Time 0800
Ended: Date 10/4/02 Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160
P. O.#

Check Chlorine (Y/N) _____
Temp. Upon Arrival (°C) _____
Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

~~Analysis Required/Comments~~

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
02-145	10/4/02	0800	X		1		X	X	X	X														Conc. used: 1.9%
																								3.75%, 7.5%, 15%
																								30%
																								Test for:
																								Ammonia - Nitrate
																								Alkalinity
																								Nitrate Nitrogen
																								Hydrogen Peroxide

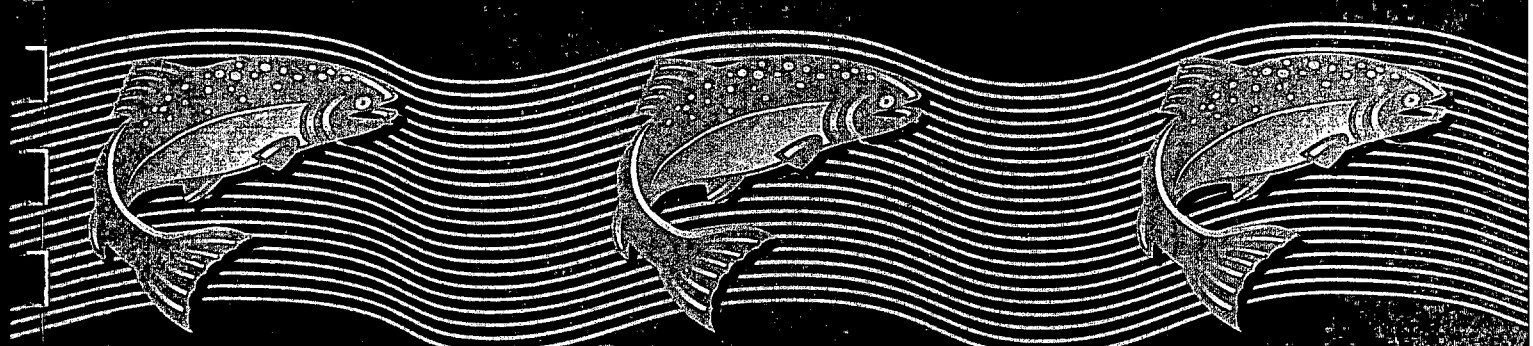
Sampled By & Title (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 4 Nov 2002 0800	Relinquished By (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 4 Nov 2002 0920
Received By (Please sign and print name) Tammy Elston	Date/Time Nov 4, 09:20	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Kim Davis	Date/Time 11/4/02 1000	Relinquished By (Please sign and print name) Kim Davis 1000	Date/Time 11/4/02 1000
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

7.1°C

Rev. 10/97

BIOMONITORING SERVICES

BIOASSAY REPORT
CHRONIC BIOASSAYS
Conducted December 10 through 17, 2002



CH2MHILL

SCOEPA00027304

BIOASSAY REPORT
CHRONIC BIOASSAYS
Conducted December 10 through 17, 2002

Prepared for

WACKER SILTRONICS
(via North Creek Analytical)
PORTLAND, OREGON

Prepared by

CH2M HILL
2300 NW Walnut Boulevard
Corvallis, Oregon 97330

January 7, 2003
Lab I.D. No. C04164

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SCOEPA00027306

INTRODUCTION

CH2M HILL conducted chronic bioassays from December 10 through 17, 2002. This was a repeat test event for testing conducted November 5 through 12, 2002. The samples were provided by the Wacker Siltronics, Portland, Oregon. The organisms tested were the fathead minnow (*Pimephales promelas*) and the water flea (*Ceriodaphnia dubia*). Forty eight hour acute data was obtained from the chronic tests (dual-endpoint testing).

METHODS AND MATERIALS

TEST METHODS

The chronic test methods were performed according to: Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Weber, C. et al. (1994); EPA/600/4-91/002.

TEST ORGANISMS

The *Ceriodaphnia dubia* used in the test were obtained from CH2M HILL's in-house cultures and were less than 24 hours old and within an eight hour age range, respectively, at test initiation. The fathead minnows were obtained from Aquatox, Inc., Hot Springs, Arkansas, and were less than 24 hours old at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (1994). The test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used in the tests was moderately hard reconstituted water (EPA, 1994) with a total hardness of 96 and 96 mg/l as $CaCO_3$, alkalinity of 64 and 70 mg/l as $CaCO_3$, and a pH of 7.9 and 7.7.

TEST CONCENTRATIONS

The concentrations tested in the chronic tests were 1.90, 3.75, 7.50, 15.0, and 30.0 percent effluent and dilution water for the control. For the fathead minnow chronic test, 10 organisms per chamber with four chambers per concentration, for a total of 40 organisms per concentration were used. For the *Ceriodaphnia* chronic test, 1 organism per chamber with ten chambers per concentration for a total of 10 organisms per concentration were used.

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SAMPLE COLLECTION

Samples were collected by Wacker Siltronics personnel on December 9, 11, and 13, 2002. All samples were delivered to CH2M HILL's Aquatic Toxicology Laboratory by Greyhound bus (via North Creek Analytical personnel) and stored in the dark at 4°C until test solutions were prepared and tested. Chain of custody for sample collection is provided in Appendix C.

SAMPLE PREPARATION

The samples were filtered through a 60 µm net upon arrival and temperature was adjusted prior to each daily renewal on samples used during the tests.

MONITORING OF BIOASSAYS

Samples were monitored on arrival for hardness, total residual chlorine, ammonia, and temperature.

For the chronic test, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in the control and all concentrations tested. Conductivity was measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was measured daily in the chronic tests. According to EPA (1994), *Ceriodaphnia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia* in the controls have produced their third brood and at least 15 neonates per adult are produced. Fathead minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the fathead minnow chronic test. Temperature was monitored continuously throughout the testing period.

DATA ANALYSIS

The effect measured during the dual-endpoint acute tests was survival during the 48 hour exposure period. The effects measured during the *Ceriodaphnia* chronic test included survival and reproduction over the 6-day exposure period. The effects measured during the fathead minnow chronic test included survival and growth over the 7-day exposure period. The statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, using Toxcalc version 5.0. Dunnett's Procedure, Bonferroni's T-Test or Fisher's Exact Test was used to compare the survival data and Dunnett's Procedure or Bonferroni's T-Test was used to compare the reproduction or growth data between the control and each effluent treatment. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test with Bonferroni Adjustment could not be met, Steel's Many-One Rank Test or Wilcoxon Rank Sum with Bonferroni Adjustment was used to analyze the data.

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RESULTS AND DISCUSSION

ACUTE DUAL ENDPOINT

Table 1 summarizes the acute dual-endpoint survival data taken from the chronic tests.

Table 1
Acute Dual-Endpoint Survival Data

Sample Concentration (%)	*Ceriodaphnia dubia* 48 hour percent survival	Fathead minnow 48 hour percent survival
Control	100	97.5
1.90	100	100
3.75	100	100
7.50	100	100
15.0	100	100
30.0	100	100

The acute dual-endpoint test results showed no statistically significant reduction in survival when compared to the control at the 30 percent effluent concentration for both species. The dual-endpoint LC_{50} was greater than 30 percent for both species.

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CHRONIC BIOASSAY

Table 2 summarizes the survival and growth data for the samples tested on the fathead minnow.

Table 2
Chronic Fathead Minnow
Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight (mg)
Control	97.5	0.42
1.90	100	0.41
3.75	100	0.43
7.50	100	0.41
15.0	97.5	0.39
30.0	100	0.42

The fathead minnow test results showed no statistically significant reduction in survival or growth at any effluent concentration tested when compared to the control. Control survival was 97.5 percent. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 30 and greater than 30 percent effluent, respectively.

The IC_{25} value (the concentration of effluent causing a 25 percent reduction in biological measurement, e.g. growth) calculated on the fathead minnow growth was greater than 30 percent.

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Table 3 summarizes the survival and reproduction data for the effluent tested on the *Ceriodaphnia dubia.*

Table 3 ***Ceriodaphnia Dubia* Chronic Results**		
Concentration (%)	**Percent Survival**	**No. Young Per Adult**
Control	100	29.5
1.9	100	24.1
3.75	100	21.2
7.50	100	21.6
15.0	100	19.1[a]
30.0	100	5.5 [a]
[a] Indicates a statistically significant reduction when compared to the control at p equal to 0.05 using Steel's Many-One Rank test.		

The test results show a statistically significant reduction in reproduction at the 15 and 30 percent sample concentrations when compared to the control. Control survival was 100 percent. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 7.5 and 15 percent sample, respectively.

The IC_{25} value (the concentration of sample causing a 25 percent reduction in biological measurement, e.g. growth) was calculated on the *Ceriodaphnia dubia* reproduction. The IC_{25} value for reproduction was 3.3 percent sample.

The dissolved oxygen levels in the chronic tests remained above 40 percent saturation throughout the test period. Test temperatures remained at 25±1°C. The tests proceeded without interruption or incidents that could have affected test results.

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REFERENCE TOXICANT TESTS

The results of the reference toxicant tests conducted in December with sodium chloride (*Ceriodaphnia* and fathead minnow) indicate that the test organisms were within their respective sensitivity range based on EPA guidelines (EPA 1989), except as noted below:

- For the *Ceriodaphnia dubia* chronic test initiated on December 10, 2002, the IC_{25} value for reproduction was slightly above the upper cusum chart limit (AVE + 2 SD for the previous 20 test events) indicating the organisms were potentially overly tolerant. The test was more than two standard deviations away from the control chart mean, but less than three standard deviations.

- As a corrective action, an additional reference toxicant test was initiated on December 17, 2002. The second test met test acceptability and was within the control chart limits.

According to EPA if more than one out of 20 tests fall outside the control chart limits, the effluent tests conducted during the month of the second occurrence should be considered provisional and subject to careful review. The results from the December 10 test was the third such occurrence in the previous 20 tests. However, EPA also recognizes that laboratories that develop very narrow control limits may be unfairly penalized if a test which falls just outside the control limits is rejected *de facto*. For this reason, the width of the control chart limits should be considered by the permitting authority in determining whether the outliers should be rejected. CH2M HILL's reference toxicant control chart coefficient of variation was 0.38 as of the December 10 test, indicating the control chart width is typical.

The IC_{25}, LC_{50}, and 95 percent confidence intervals of the reference toxicant test conducted are listed in the tables below.

Table 4
Chronic Reference Toxicant Tests (g/L)
Initiated December 3, 2002

Species (test)	IC_{25}	Control Chart
Pimephales promelas (survival)	2.7	1.7 to 4.5
Pimephales promelas (growth)	2.1	1.4 to 3.6

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Table 5 Chronic Reference Toxicant Tests (g/L) Initiated December 10, 2002		
Species (test)	**IC_{25}**	**Control Chart**
Ceriodaphnia dubia (survival)	1.88	0.52 to 2.42
Ceriodaphnia dubia (reproduction)	1.00	0.13 to 0.98

Table 6 Chronic Reference Toxicant Tests (g/L) Initiated December 17, 2002		
Species (test)	**IC_{25}**	**Control Chart**
Ceriodaphnia dubia (survival)	1.61	0.52 to 2.42
Ceriodaphnia dubia (reproduction)	0.77	0.14 to 1.00

Table 7 Acute Reference Toxicant Test (g/L) Initiated December 10, 2002		
Species	**LC_{50}**	**Control Chart**
Pimephales promelas (FHM 1044)	7.3	6.5 to 7.8

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APPENDIX A
RAW DATA SHEETS

CH2M HILL **TOXICITY TEST ORGANISM AND WATER QUALITY DATA**

Client Wacker Siltronics — Test Initiation: Date 12-10-02 Time 1330 — Test Termination: Date 12-17-02 Time 0910

Contact — Technician Winn, Erin

Test Species/ID *Pimephales promelas* / FHM 6044 — /

Ceriodaphnia dubia / Cd 1497 — /

Sample Information								Test Species Information	ID# FHM 1014	ID# Cd 1497	ID#	ID#
Sample ID Number	Field ID	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Dechlor.	Ammonia NH_3-N mg/l	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$	Age or Size	< 24 hours —	< 24 hours within an 8 hour span		
4164 -01		12/9/02	0735	0.06 / -	0.74	202	-	Test Container Size	800 ml	30 ml		
-02		12/11/02	0745	0.04 / -	1.60	212	-	Test Volume	400 ml	15 ml		
-03		12/13/02	0740	0.04 / -	0.68	260	-	Feeding: Type	0.1 ml *Artemia*	0.1 ml Algae &		
				/				Amount	2 x daily	YCT daily		
				/				Aeration: Began	None	None		
				/				Amount	—	—		
				/				Dilution Water ID#	2218 + 2220	2218 + 2220		
				/				Acclimation Period	< 24 hours	< 24 hours		
				/				Test Location	# 4	# 5		
				/				Condition of Survivors				
				/				Size (mm)	—	—		
				/				Loading Rate	—	—		
				/				Comments				

Dilution Water Source	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	2218	96	64
↓	2220	96	70

Water Quality Meters Used/ID#

Dissolved Oxygen #2 pH #3 Temperature ____

Conductivity #1 Refractometer ____ Other ____

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CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client: Wacker Siltronics — Date Initiated: 12-10-2002 — Time: 1620

Sample Description: CO 4164 — Date Terminated: 12-16-02 (17th) — Time: ~~1100~~ 0910

Technician: Day 0 [illegible] Day 1 MS Day 2 [illegible] Day 3 [illegible] Day 4 [illegible] Day 5 [illegible] Day 6 DL Day 7 [illegible]

Time: Day 0 1620 Day 1 1050 Day 2 1355 Day 3 1140 Day 4 0955 Day 5 1145 Day 6 ~~1100~~ 1545 Day 7 0910

Concentration or Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
CONTROL	0	10	10	10	10		8.0		7.7	24.5	287
	1	10	10	10	10	7.4	8.0	7.8	7.9	25.7	
	2	10	9	10	10	7.6	8.1	7.5	7.8	24.8	290
	3	10	9	10	10	7.8	8.2	7.5	7.9	24.7	
	4	10	9	10	10	7.2	7.8	7.8	7.8	24.2	309
	5	10	9	10	10	7.4	7.9	7.7	7.9	24.3	
	6	10	9	10	10	7.3	7.9	7.8	8.0	24.6	
	7	10	9	10	10	7.0		7.7		25.6	
1.90 %	0	10	10	10	10		8.2		7.8	24.4	295
	1	10	10	10	10	7.4	8.0	7.8	7.9	25.3	
	2	10	10	10	10	7.6	8.2	7.5	7.8	24.6	300
	3	10	10	10	10	7.7	8.2	7.6	7.9	24.7	
	4	10	10	10	10	7.2	7.8	7.8	7.8	24.1	305
	5	10	10	10	10	7.4	7.9	7.8	7.9	24.5	
	6	10	10	10	10	7.6	7.9	7.8	8.0	24.6	
	7	10	10	10	10	7.4		7.7		25.1	
3.75 %	0	10	10	10	10		8.2		7.8	24.4	301
	1	10	10	10	10	7.3	8.2	7.8	7.9	25.1	
	2	10	10	10	10	7.5	8.2	7.5	7.8	24.7	311
	3	10	10	10	10	7.7	8.2	7.6	7.8	24.7	
	4	10	10	10	10	7.2	7.9	7.7	7.8	24.3	314
	5	10	10	10	10	7.4	8.0	7.8	7.9	24.3	
	6	10	10	10	10	7.5	8.2	7.8	7.9	24.6	
	7	10	10	10	10	7.4		7.7		24.9	
7.50 %	0	10	10	10	10		8.3		7.7	24.4	316
	1	10	10	10	10	7.4	8.2	7.8	7.9	25.4	
	2	10	10	10	10	7.5	8.2	7.5	7.7	24.8	329
	3	10	10	10	10	7.6	8.2	7.7	7.8	24.7	
	4	10	10	10	10	7.2	8.0	7.7	7.8	24.2	332
	5	10	10	10	10	7.4	8.0	7.8	7.9	24.4	
	6	10	10	10	10	7.5	8.2	7.8	7.9	24.5	
	7	10	10	10	10	7.5		7.7		24.8	
15.0 %	0	10	10	10	10		8.3		7.7	24.4	346
	1	10	10	10	10	7.3	8.1	7.8	7.8	25.2	
	2	10	10	10	10	7.5	8.2	7.5	7.7	24.9	364
	3	9	10	10	10	7.5	8.2	7.8	7.9	24.6	
	4	9	10	10	10	7.1	8.2	7.7	7.7	24.2	373
	5	9	10	10	10	7.3	8.1	7.7	7.8	24.4	
	6	9	10	10	10	7.5	8.2	7.8	7.9	24.6	
	7	9	10	10	10	7.5		7.7		24.9	
30.0 %	0	10	10	10	10		8.3		7.7	24.4	406
	1	10	10	10	10	7.4	8.2	7.7	7.8	25.6	
	2	10	10	10	10	7.5	8.2	7.4	7.6	24.8	433
	3	10	10	10	10	7.5	8.2	8.0	7.7	24.4	
	4	10	10	10	10	7.2	8.2	7.6	7.7	24.1	446
	5	10	10	10	10	7.3	8.2	7.7	7.8	24.3	
	6	10	10	10	10	7.5	8.2	7.7	7.8	24.6	
	7	10	10	10	10	7.4		7.6		25.0	

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: Wacker Siltronics | Species ID#: FHM 1044

Lab ID: CO 4164 | Start Date: 12/10/2002

Sample Description: P2L0326-01

Technician: dw JPF

Date: 12/13/2002 12/18/2002

Concentration or Percent	Replicate	Tare Weight (mg)	Total Weight (mg)	No. of Fish
Control	A	1138.62	1143.22	10
	B	1138.10	1141.88	9
	C	1140.28	1144.52	10
	D	1139.84	1143.96	10
1.9 %	A	1135.07	1139.26	10
	B	1136.37	1140.00	10
	C	1125.37	1129.68	10
	D	1131.31	1135.46	10
3.75 %	A	1145.23	1149.47	10
	B	1139.61	1143.52	10
	C	1142.64	1147.36	10
	D	1138.42	1142.85	10
7.5 %	A	1139.48	1144.24	10
	B	1145.75	1149.61	10
	C	1132.71	1137.07	10
	D	1138.04	1141.60	10
15 %	A	1141.26	1145.39	9
	B	1138.78	1142.27	10
	C	1143.94	1148.19	10
	D	1139.46	1143.26	10
30 %	A	1140.06	1144.62	10
	B	1142.91	1146.93	10
	C	1140.77	1144.99	10
	D	1134.68	1138.82	10

weigh to 0.01 mg

Larval Fish Growth and Survival Test-48 Hr Survival

Start Date:	12/10/2002 16:20	Test ID:	416401ppc	Sample ID:	WACKER-SILTRONICS
End Date:	12/17/2002 09:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

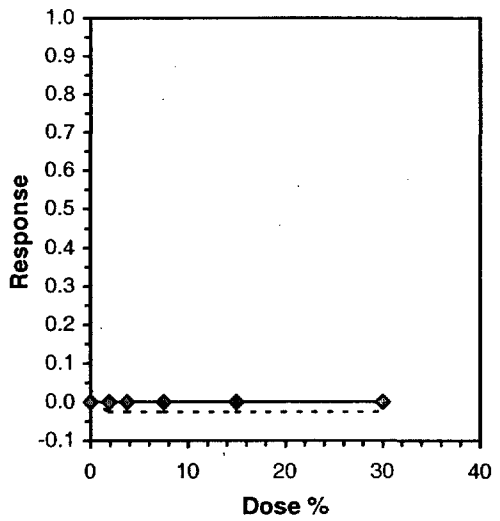
Conc-%	1	2	3	4
LAB-Control	1.0000	0.9000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	1.0000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
LAB-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			0.9958	1.0000
1.9	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9958	1.0000
3.75	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9958	1.0000
7.5	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9958	1.0000
15	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9958	1.0000
30	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0.9958	1.0000

Auxiliary Tests				Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)				0.46508	0.884	-3.0206	13.9892
Equality of variance cannot be confirmed							
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**			
Steel's Many-One Rank Test	30	>30		3.33333			

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>30			
IC10	>30			
IC15	>30			
IC20	>30			
IC25	>30			
IC40	>30			
IC50	>30			



SCOEPA00027318

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	12/10/2002 16:20	Test ID:	416401ppc	Sample ID:	WACKER-SILTRONICS
End Date:	12/17/2002 09:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

Conc-%	1	2	3	4
LAB-Control	1.0000	0.9000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	1.0000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000
15	0.9000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
LAB-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4		
1.9	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
3.75	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
7.5	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
15	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00
30	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00

Auxiliary Tests				Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)				0.61382	0.884	-2.1359	5.27706
Equality of variance cannot be confirmed							
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**			
Steel's Many-One Rank Test	30	>30		3.33333			

SCOEPA00027319

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	12/10/2002 16:20	Test ID:	416401ppc	Sample ID:	WACKER-SILTRONICS
End Date:	12/17/2002 09:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

Conc-%	1	2	3	4
LAB-Control	0.4600	0.3780	0.4240	0.4120
1.9	0.4190	0.3630	0.4310	0.4150
3.75	0.4240	0.3910	0.4720	0.4430
7.5	0.4760	0.3860	0.4360	0.3560
15	0.4130	0.3490	0.4250	0.3800
30	0.4560	0.4020	0.4220	0.4140

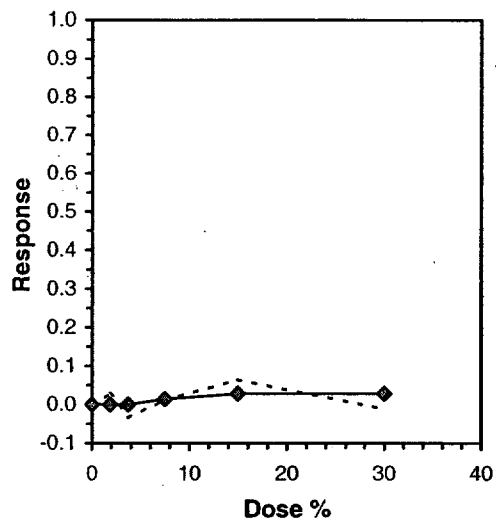
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	0.4185	1.0000	0.4185	0.3780	0.4600	8.086	4				0.4193	1.0000
1.9	0.4070	0.9725	0.4070	0.3630	0.4310	7.398	4	0.453	2.410	0.0612	0.4193	1.0000
3.75	0.4325	1.0335	0.4325	0.3910	0.4720	7.858	4	-0.551	2.410	0.0612	0.4193	1.0000
7.5	0.4135	0.9881	0.4135	0.3560	0.4760	12.854	4	0.197	2.410	0.0612	0.4135	0.9861
15	0.3918	0.9361	0.3918	0.3490	0.4250	8.747	4	1.053	2.410	0.0612	0.4076	0.9721
30	0.4235	1.0119	0.4235	0.4020	0.4560	5.472	4	-0.197	2.410	0.0612	0.4076	0.9721

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97377	0.884	-0.0572	-0.76
Bartlett's Test indicates equal variances (p = 0.84)	2.04813	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	30	>30		3.33333	0.06122	0.14628	0.0008	0.00129	0.68828	5, 18

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>30			
IC10	>30			
IC15	>30			
IC20	>30			
IC25	>30			
IC40	>30			
IC50	>30			



SCOEPA00027320

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client: Wacker Siltronics
Test Start Date: 12·10·02
Sample Description:
Sample ID#: CO 9164
Ceriodaphnia Lot#: Cd 1497
Statistician: BW

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	38	39	23	32	35	39	16	30	14	29	10	295
1.9	32	19	35	30	19	32	31	5	5	33	10	241
3.75	35	35	17	18	19	26	14	16	13	19	10	212
7.5	23	~~35~~ 18 MS	14	17	18	33	15	25	30	23	10	216
15	26	30	25	20	13	14	13	10	14	22	10	191
30	4	9	5	4	4	5	5	6	6	7	10	55

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Wacker Siltronics Test Beginning : Date 12-10-02 Time 1330

Sample Description CO 4164 Test Ending : Date 12-16-02 Time 1100

Ceriodaphnia Lot# Cd 1497 Dilution Water Recon MH (FHM) ID# 2218 & 2220

Technician Day 1 DW Day 2 DW Day 3 DW Day 4 KS Day 5 DW Day 6 DW Day 7 ____

Time Day 1 0945 Day 2 1245 Day 3 1030 Day 4 1115 Day 5 0745 Day 6 1100 Day 7 ____

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	5	0	0	4	0	4	10	13
	4	11	11	0	7	0	9	7	0	6	1	10	52
	5	10	12	10	11	13	12	9	11	8	10	10	106
	6	~~8~~17	16	13	14	17	18	0	15	0	14	10	124
	7												
1.90 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	5	0	5	5	0	0	0	10	15
	4	5	0	7	0	7	0	0	0	5	5	10	29
	5	12	7	11	9	12	12	10	0	0	11	10	84
	6	15	12	17	16	0	15	16	5	0	17	10	113
	7												
3.75 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	8	7	5	5	3	5	2	2	4	3	10	44
	5	9	13	0	0	0	10	0	0	0	0	10	32
	6	18	15	12	13	16	11	12	14	9	16	10	136
	7												
7.50 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	4	0	10	4
	4	4	7	4	5	5	7	4	3	1	2	10	42
	5	8	11	0	0	0	12	0	9	11	10	10	61
	6	11	0	10	12	13	14	11	13	14	11	10	109
	7												
15.0 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	5	7	3	0	3	3	4	3	3	4	10	35
	5	9	8	10	5	0	8	0	0	0	9	10	49
	6	12	15	12	15	10	7	9	7	11	9	10	107
	7												
30.0 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	2	1	2	2	0	2	3	0	3	10	15
	5	4	7	0	0	0	4	0	0	4	4	10	23
	6	0	0	4	2	2	1	3	3	2	0	10	17
	7												

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client: Wacker Siltronics — Initiated Date: 12-10-02 Time: 1330 — Adults Isolated Date: 12-9-02 Time: 2330

Sample Description: CO 4164 — Terminated Date: 12-16-02 Time: 1100 — Neo's Collected Date: 12-10-02 Time: 0700

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	DW	DW	DW	DW	IC	DW	DW	
Time	1330	0945	1245	1030	1435	0745	1100	

~~Percent~~ or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Temperature (C) / Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	8.0	8.0 / 8.1	8.2 / 8.1	8.0 / 8.1	8.0 / 8.0	7.9 / 7.9	7.9 / –		7.9	7.8 / 7.8	8.0 / 7.8	7.9 / 7.7	8.0 / 7.9	7.9 / 7.8	8.1 / –		24.6 / 279	25.4	24.7 / 285	24.9	25.2 / 291	24.8	25.5	
1.9	8.0	8.0 / 8.1	8.0 / 8.1	8.0 / 8.1	8.0 / 7.7	7.9 / 7.9	7.9 / –		7.9	7.8 / 7.7	7.9 / 7.7	7.9 / 7.7	8.0 / 7.7	7.9 / 7.7	8.1 / –									
3.75	8.0	8.0 / 8.1	8.0 / 8.1	8.0 / 8.1	8.0 / 7.7	7.9 / 7.8	7.9 / –		7.8	7.8 / 7.7	8.0 / 7.6	7.9 / 7.7	8.0 / 7.7	7.9 / 7.6	8.1 / –									
7.5	8.0	8.0 / 8.1	8.0 / 8.1	8.0 / 8.1	8.0 / 7.7	7.9 / 7.7	7.9 / –		7.7	7.9 / 7.7	8.0 / 7.6	7.9 / 7.7	8.0 / 7.7	7.9 / 7.6	8.0 / –									
15	8.0	8.1 / 8.1	8.0 / 8.1	8.0 / 8.1	8.0 / 7.6	7.9 / 7.6	7.9 / –		7.6	7.9 / 7.6	7.9 / 7.6	7.9 / 7.6	7.9 / 7.6	7.8 / 7.5	8.0 / –									
30	8.0	8.1 / 8.1	8.0 / 8.0	8.0 / 8.1	8.0 / 7.6	7.9 / 7.6	7.9 / –		7.6	7.8 / 7.5	7.8 / 7.5	7.9 / 7.5	7.9 / 7.6	7.8 / 7.5	7.9 / –		24.3 / 402	25.7	24.4 / 426	24.6	25.1 / 459	24.6	25.9	

COMMENTS:

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	12/10/2002 13:30	Test ID:	416401cdc	Sample ID:	WACKER-SILTRONICS
End Date:	12/16/2002 11:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

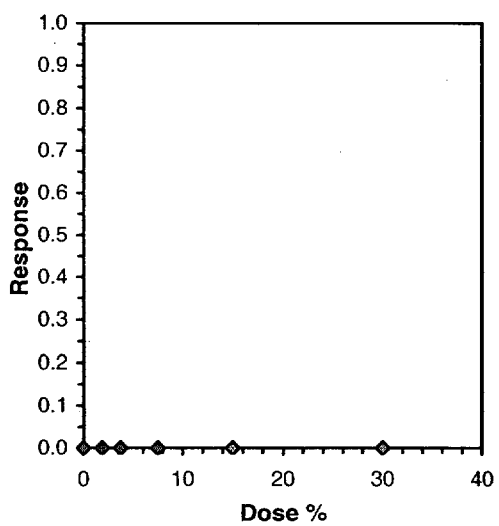
Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
LAB-Control	1.0000	1.0000	0	10	10	10			1.0000	1.0000
1.9	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
3.75	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
7.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
15	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
30	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	30	>30		3.33333

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL	Skew
IC05	>30			
IC10	>30			
IC15	>30			
IC20	>30			
IC25	>30			
IC40	>30			
IC50	>30			



SCOEPA00027324

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	12/10/2002 13:30	Test ID:	416401cdc	Sample ID:	WACKER-SILTRONICS
End Date:	12/16/2002 11:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
LAB-Control	1.0000	1.0000	0	10	10	10		
1.9	1.0000	1.0000	0	10	10	10	1.0000	0.0500
3.75	1.0000	1.0000	0	10	10	10	1.0000	0.0500
7.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500
15	1.0000	1.0000	0	10	10	10	1.0000	0.0500
30	1.0000	1.0000	0	10	10	10	1.0000	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	30	>30		3.33333

SCOEPA00027325

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/10/2002 13:30	Test ID:	416401cdc	Sample ID:	WACKER-SILTRONICS
End Date:	12/16/2002 11:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	38.000	39.000	23.000	32.000	35.000	39.000	16.000	30.000	14.000	29.000
1.9	32.000	19.000	35.000	30.000	19.000	32.000	31.000	5.000	5.000	33.000
3.75	35.000	35.000	17.000	18.000	19.000	26.000	14.000	16.000	13.000	19.000
7.5	23.000	18.000	14.000	17.000	18.000	33.000	15.000	25.000	30.000	23.000
15	26.000	30.000	25.000	20.000	13.000	18.000	13.000	10.000	14.000	22.000
30	4.000	9.000	5.000	4.000	4.000	5.000	5.000	6.000	6.000	7.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
LAB-Control	29.500	1.0000	29.500	14.000	39.000	31.037	10			29.500	1.0000
1.9	24.100	0.8169	24.100	5.000	35.000	47.651	10	92.00	75.00	24.100	0.8169
3.75	21.200	0.7186	21.200	13.000	35.000	38.114	10	81.00	75.00	21.400	0.7254
7.5	21.600	0.7322	21.600	14.000	33.000	29.459	10	81.00	75.00	21.400	0.7254
*15	19.100	0.6475	19.100	10.000	30.000	34.681	10	72.00	75.00	19.100	0.6475
*30	5.500	0.1864	5.500	4.000	9.000	28.748	10	55.00	75.00	5.500	0.1864

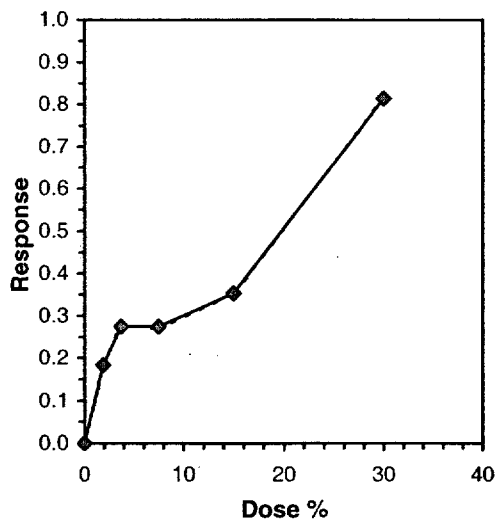
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.43787	1.035	-0.3631	0.13053
Bartlett's Test indicates unequal variances (p = 1.97E-04)	24.221	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	7.5	15	10.6066	13.3333

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL		Skew
IC05*	0.519	1.352	0.255	4.813	2.8785
IC10*	1.038	2.284	0.510	8.814	3.5784
IC15*	1.557	3.075	0.764	10.615	2.6406
IC20	2.243	3.532	1.019	13.405	2.1857
IC25	3.253	4.799	1.274	16.072	1.2142
IC40	16.544	4.253	3.157	19.957	-1.5175
IC50	19.798	1.910	15.482	22.547	-0.0863

* indicates IC estimate less than the lowest concentration



SCOEPA00027326

APPENDIX B
REFERENCE TOXICANT DATA SHEETS

FHM 1042

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client: Ref Tox - December
Sample Description: NaCl - 50 g/L STOCK (1B008-04)
Date Initiated: 12-3-2002 Time: 1415
Date Terminated: 12-10-2002 Time: 1120

Technician: Day 0 DW Day 1 BM Day 2 BM Day 3 MS Day 4 MS Day 5 MS Day 6 BM Day 7 LEE
Time: Day 0 1415 Day 1 1010 Day 2 1055 Day 3 0900 Day 4 0910 Day 5 1100 Day 6 1135 Day 7 1120

Concentration or g/L Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
Control	0	10	10	10	10		8.1		7.9	25.1	300
	1	10	10	10	10	7.8	8.2	7.9	8.3	24.7	300
	2	10	10	10	10	7.7	8.2	7.7	8.2	24.8	295
	3	10	10	10	10	7.5	8.2	7.8	8.1	24.3	295
	4	10	10	10	10	7.3	8.2	7.8	7.9	24.3	295
	5	10	10	10	10	7.3	7.8	7.8	8.0	25.1	300
	6	10	10	10	10	7.6	8.1	7.7	8.1	24.0	305
	7	10	10	10	10	7.2		7.7		24.1	—
0.3	0	10	10	10	10		8.1		7.9	25.3	812
	1	10	10	10	10	7.9	8.2	7.9	8.3	24.7	817
	2	10	10	10	10	7.6	8.2	7.7	8.2	24.7	528
	3	10	10	10	10	7.5	8.3	7.7	8.1	24.4	570
	4	10	10	10	10	7.4	8.3	7.6	8.0	24.4	680
	5	10	10	10	10	7.4	7.9	7.6	8.1	25.3	690
	6	10	10	10	10	7.7	8.2	7.7	8.0	24.0	695
	7	10	10	10	10	7.3		7.7		24.2	—
1.0	0	10	10	10	10		8.1		7.9	24.8	1725
	1	10	10	10	10	7.9	8.2	7.8	8.1	24.7	1674
	2	10	10	10	10	7.6	8.3	7.6	8.0	24.7	1716
	3	10	10	10	10	7.5	8.2	7.7	8.0	24.6	1660
	4	10	10	10	10	7.4	8.3	7.6	7.9	24.7	1540
	5	10	10	10	10	7.2	7.9	7.8	8.0	25.2	1580
	6	10	10	10	10	7.7	8.2	7.7	8.0	24.3	1610
	7	10	10	10	10	7.6		7.7		24.5	—
2.0	0	10	10	10	10		8.1		7.9	25.2	2720
	1	10	10	10	10	7.9	8.2	7.8	8.1	25.4	2760
	2	10	10	10	10	7.6	8.3	7.6	8.0	25.1	2740
	3	10	10	9	10	7.5	8.3	7.7	7.9	24.4	2680
	4	10	10	9	10	7.4	8.3	7.4	7.8	24.8	2640
	5	10	10	9	10	7.2	8.0	7.5	7.9	25.3	2650
	6	10	9	8	8	7.6	8.2	7.6	7.8	24.2	2710
	7	10	9	7	8	7.5		7.7		24.3	—
4.0	0	10	10	10	10		8.1		7.8	25.1	4170
	1	10	10	10	9	7.9	8.2	7.7	8.0	25.1	4230
	2	10	10	10	9	7.6	8.3	7.6	7.9	25.1	4170
	3	10	9	10	9	7.5	8.3	7.6	7.9	24.6	4120
	4	10	9	9	8	7.4	8.3	7.4	7.7	24.5	4040
	5	9	missing	8	8	7.3	8.0	7.4	7.8	25.5	4030
	6	8	7	7	7	7.6	8.2	7.6	7.8	24.1	4120
	7	6	5	5 M	5 M	7.5		7.6		24.4	—
8.0	0	10	10	10	10		8.0		7.7	24.9	5820
	1	10	10	10	10	7.9	8.2	7.7	7.8	25.0	5900
	2	2	4	3	2	7.6	8.3	7.4	7.8	25.0	5900
	3	1	1	0	0	7.4	8.3	7.6	7.7	25.1	5780
	4	1	1			7.5	8.2	7.4	7.6	25.0	5790
	5	0	1			7.2	8.0	7.5	7.8	25.3	5780
	6		0			7.7	—	7.6	—	24.2	—
	7					L				—	—

Endpoint	IC25	Cusum Chart Limits	
Survival	2.7	1.7 to	4.5
Growth	2.1	1.4 to	3.6

Task Manager
Project Manager
QA Officer

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: QA/QC Species ID# FHM 1042

Lab ID: na Start Date: 12/03/2002

Sample Description: NaCl

Technician: dw BM

Date: 12/02/2002 12/11/2002

Concentration or Percent	Replicate	Tare Weight (mg)	Total Weight (mg)	No. of Fish
Control	A	1057.84	1064.35	10
	B	1041.43	1047.94	10
	C	1037.58	1044.65	10
	D	1046.45	1053.18	10
0.3 g/L	A	1041.72	1048.22	10
	B	1046.54	1053.46	10
	C	1049.43	1055.98	10
	D	1057.10	1061.08	10 - 3 = 7 *
1.0 g/L	A	1049.37	1056.90	10
	B	1052.61	1059.01	10
	C	1038.78	1045.49	10
	D	1046.30	1051.58	10
2.0 g/L	A	1040.24	1046.08	10
	B	1048.73	1054.77	9
	C	1045.36	1050.37	7
	D	1046.42	1049.97	8
4.0 g/L	A	1035.26	1038.87	6
	B	1047.43	1050.25	5
	C	1041.46	1043.27	7
	D	1034.93	1037.51	5
8.0 g/L	A	1054.13		0
	B	1044.02		0
	C	1044.17		0
	D	1043.37		0

weigh to 0.01 mg

* = 3 fish lost during transfer to tin for drying. BM

SCOEPA00027329

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	12/03/2002 14:15	Test ID:	rpp21042	Sample ID:	REFTOX-Reference Toxicant test
End Date:	12/10/2002 11:20	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

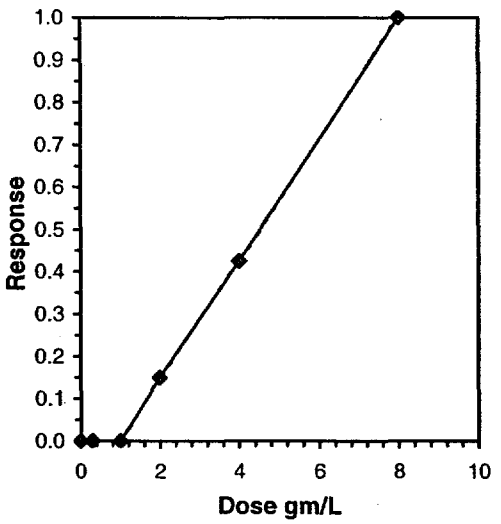
Conc-gm/L	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
0.3	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
2	1.0000	0.9000	0.7000	0.8000
4	0.6000	0.5000	0.7000	0.5000
8	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	1.0000	1.0000
0.3	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	1.0000	1.0000
1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	1.0000	1.0000
2	0.8500	0.8500	1.1898	0.9912	1.4120	15.281	4	0.8500	0.8500
4	0.5750	0.5750	0.8620	0.7854	0.9912	11.405	4	0.5750	0.5750
8	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.81437	0.868	0.4258	3.44708
Equality of variance cannot be confirmed				

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	1.3333	0.2203	1.1193	2.5692	2.0173
IC10	1.6667	0.2597	1.2385	2.7076	0.8230
IC15	2.0000	0.2750	1.3578	2.9164	0.3114
IC20	2.3636	0.2907	1.4589	3.1540	-0.3061
IC25	2.7273	0.2897	1.5600	3.3922	-0.9728
IC40	3.8182	0.2650	3.1930	4.6069	0.0845
IC50	4.5217	0.2595	3.6870	5.1684	-0.3801



SCOEPA00027330

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	12/03/2002 14:15	Test ID:	rpp1042	Sample ID:	REFTOX-Reference Toxicant test
End Date:	12/10/2002 11:20	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

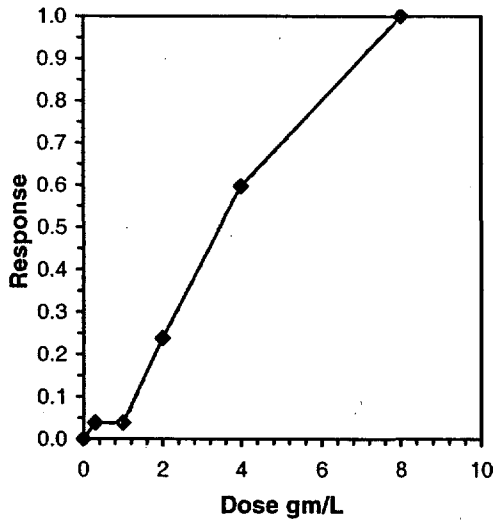
Conc-gm/L	1	2	3	4
LAB-Control	0.6510	0.6510	0.7070	0.6730
0.3	0.6500	0.6920	0.6550	0.5686
1	0.7530	0.6400	0.6710	0.5280
2	0.5840	0.6040	0.5010	0.3550
4	0.3610	0.2820	0.1810	0.2580
8	0.0000	0.0000	0.0000	0.0000

			Transform: Untransformed					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	0.6705	1.0000	0.6705	0.6510	0.7070	3.945	4	0.6705	1.0000
0.3	0.6414	0.9566	0.6414	0.5686	0.6920	8.113	4	0.6447	0.9615
1	0.6480	0.9664	0.6480	0.5280	0.7530	14.371	4	0.6447	0.9615
2	0.5110	0.7621	0.5110	0.3550	0.6040	22.144	4	0.5110	0.7621
4	0.2705	0.4034	0.2705	0.1810	0.3610	27.407	4	0.2705	0.4034
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	4	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94835	0.868	-0.5911	0.20508
Bartlett's Test indicates equal variances (p = 0.27)	5.21173	13.2767		

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	1.0578	0.4412	0.0000	1.5598	-0.1370
IC10	1.3085	0.3164	0.0000	2.0692	-0.3643
IC15	1.5593	0.2858	0.8250	2.5297	0.7873
IC20	1.8100	0.2902	1.0799	2.7434	0.5760
IC25	2.0676	0.3032	1.3391	2.9524	0.3329
IC40	2.9040	0.3030	1.6805	3.6101	-0.5933
IC50	3.4615	0.2651	2.6478	4.1959	-0.1701



SCOEPA00027331

CORRECTIVE-ACTION REPORT

ORIGINATOR: Brett Mudrey

DATE: 12-16-02

SUBJECT (i.e., Test method, instrument, sample nos.): Chronic Reftox test conducted on Ceriodaphnia dubia (CD1497) started on Dec 10, 2002

CONDITION/SITUATION: The IC25 for survival fell within cusum chart range. The IC25 value for reproduction (1.00 %/c) fell out of the cusum chart range (0.13 to 0.98 %/c). This is the third such occurance in the last 20 tests, however the previous two involved the survival endpoint rather than the reproduction.

RECOMMENDED ACTION: Immediate retest, double check conductivities vs. past tests. It should be noted the previous two test that were outside of cusum range were below the limits and this test was above the limits.

Approved by Department Manager/Designate: [signature]

Date: 12/19/02

ACTION TAKEN/RESULTS: Conductivities were consistent with previous test events. Repeat reftox initiated on Dec 17, 2002 indicated IC_{25} values within normal range. Jm

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Reference Toxicant Test Data Summary

Client QA/QC - December Test Start Date 12-10-02

Sample Description (18008-04) NaCl - 50 g/L STOCK Sample ID# ——

Ceriodaphnia Lot# Cd 1497 Statistician SD

Percent or (Concentration)	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	36	34	13	35	33	11	21	33	33	14	10	263
0.25 g/L	31	17	31	29	24	18	21	27	36	17	10	251
0.5 g/L	29	18	20	31	28	*5 0	20	31	28	26	9/9	231
1.0 g/L	26	23	6	26	10	13	24	24	25	20	10	197
1.5 g/L	(AD) 2	5	5	5	7	2	1	2	12	5	9	46
2.0 g/L	0	0	0	0	(AD) 0	0	0	(AD) 0	0	(AD) 0	7	0
4.0 g/L	(AD) 0	(AD) 0	(AD) 0	(AD) 0	(AD) 0	(AD) 0	(AD) 0	(AD) 0	(AD) 0	(AD) 0	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Endpoint	IC25	Cusum Chart Limits
Survival	1.88	0.52 to 2.42
Reproduction	1.00	0.13 to 0.98

Task Manager Doug Winn

Project Manager

QA Officer

* Adult lost in transfer - do not use in Statistics

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/10/2002 14:20	Test ID:	rcdc1497	Sample ID:	REFTOX-Reference Toxicant test
End Date:	12/16/2002 13:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

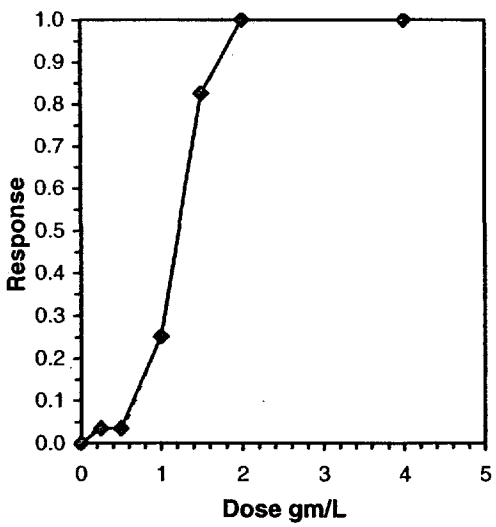
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	36.000	34.000	13.000	35.000	33.000	11.000	21.000	33.000	33.000	14.000
0.25	31.000	17.000	31.000	29.000	24.000	18.000	21.000	27.000	36.000	17.000
0.5	29.000	18.000	20.000	31.000	28.000	20.000	31.000	28.000	26.000	
1	26.000	23.000	6.000	26.000	10.000	13.000	24.000	24.000	25.000	20.000
1.5	2.000	5.000	5.000	5.000	7.000	2.000	1.000	2.000	12.000	5.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	26.300	1.0000	26.300	11.000	36.000	39.149	10	26.300	1.0000
0.25	25.100	0.9544	25.100	17.000	36.000	26.789	10	25.383	0.9651
0.5	25.667	0.9759	25.667	18.000	31.000	19.578	9	25.383	0.9651
1	19.700	0.7490	19.700	6.000	26.000	37.152	10	19.700	0.7490
1.5	4.600	0.1749	4.600	1.000	12.000	70.406	10	4.600	0.1749
2	0.000	0.0000	0.000	0.000	0.000	0.000	10	0.000	0.0000
4	0.000	0.0000	0.000	0.000	0.000	0.000	10	0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94075	0.929	-0.5695	-0.5398
Bartlett's Test indicates equal variances (p = 0.02)	11.3014	13.2767		

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	0.5350	0.2502	0.0544	0.7799	0.2096
IC10	0.6507	0.2705	0.1087	1.0066	-0.1519
IC15	0.7664	0.2760	0.1631	1.0400	-0.5258
IC20	0.8821	0.2547	0.2174	1.0752	-0.8101
IC25	0.9978	0.1851	0.4747	1.1104	-0.7463
IC40	1.1298	0.0777	0.9174	1.2160	-0.6045
IC50	1.2169	0.0613	1.0769	1.2910	-0.5675



SCOEPA00027334

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client QA/QC - December Test Beginning: Date 12-10-02 Time 1420

Sample Description NaCl - 50 g/L 18008-04 Test Ending: Date 12-16-02 Time 1300

Ceriodaphnia Lot# Cd 1497 Dilution Water Recon MH (EHM) ID# 2218 + 2220

Technician Day 1 DW Day 2 DW Day 3 DW Day 4 IS Day 5 ~~DW~~ DW Day 6 ~~DW~~ DW Day 7 ____

Time Day 1 0900 Day 2 0900 Day 3 0955 Day 4 1220 Day 5 ~~1247~~ 0710 Day 6 ~~0710~~ 1300 Day 7 ____

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	4	0	0	0	5	0	10	9
	4	7	6	4	6	1	5	0	8	0	4	10	41
	5	13	11	0	12	12	0	7	12	11	0	10	78
	6	16	17	9	17	16	6	14	13	17	10	10	135
	7												
0.25 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	5	0	0	0	0	4	5	0	10	14
	4	8	6	0	6	6	5	6	0	0	7	10	44
	5	9	0	11	13	11	0	0	11	13	0	10	68
	6	14	11	15	10	7	13	15	12	18	10	10	125
	7												
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	5	5	4	~~10~~ 10	14
	4	2	7	6	7	6	*5	0	0	0	0	~~9~~ 9	33 (28)
	5	13	0	0	12	9	*0	8	11	13	10	9	76
	6	14	11	14	12	13	*	12	15	10	12	9	113
	7						*↓						
1.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	3	0	3	2	2	10	10
	4	6	5	2	7	3	1	4	0	0	0	10	28
	5	9	8	0	7	0	9	6	10	11	8	10	68
	6	11	10	4	12	7	0	14	11	12	10	10	91
	7												
1.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	2	0	2	1	2	0	1	0	0	2	10	10
	5	0	3	0	4	0	0	0	0	7	0	10	14
	6	0/AD	2	3	0	5	2	0	2	5	3	~~10~~ 9	22
	7	↓											
2.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0/AD	0	0	0/AD	0	0/AD	7	0
	3	0	0	0	0	|	0	0	|	0	|	7	0
	4	0	0	0	0	|	0	0	|	0	|	7	0
	5	0	0	0	0	|	0	0	|	0	|	7	0
	6	0	0	0	0	|	0	0	|	0	|	7	0
	7					↓			↓		↓		
4.0 g/L	1	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0
	2	(	(	(	(	(	(	(	(	(	(	(	
	3	(	(	(	(	(	(	(	(	(	(	(	

* cerio kept trapped over and organism lost | Remove from stats.

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client OA / QC - December — Initiated Date 12-10-02 Time 1420 — Adults Isolated Date 12-9-02 Time 2330

Sample Description NaCl Reagent Log # 1B008-04 — Terminated Date 12-16-02 Time 1300 — Neo's Collected Date 12-10-02 Time 0700

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	DW	DW	DW	DW	KS	DW	DW	
Time	1420	0900	0900	0955	1445	0710	1300	

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Temperature (C) / Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	8.0	8.1 / 8.1	7.9 / 7.9	8.0 / 8.0	8.0 / 7.6	8.0 / 7.9	7.9 / –		7.7	8.0 / 8.0	7.9 / 7.8	8.0 / 7.9	8.0 / 7.9	7.9 / 7.9	7.9 / –		25.4 / 279	24.7 / 293	25.3 / 287	24.9 / –	25.2 / 295	24.7 / 296	25.2 / –	
0.25 g/L	7.9	8.1 / 8.1	7.9 / 7.9	8.0 / 8.0	8.0 / 7.6	8.0 / 7.8	7.9 / –		7.6	7.9 / 7.9	7.9 / 7.7	7.9 / 7.8	8.0 / 7.7	7.9 / 7.8	7.9 / –		25.1 / 674	24.5 / 691	25.2 / 695	24.5 / –	25.2 / 712	24.9 / 706	25.0 / –	
0.50 g/L	7.9	8.1 / 8.1	7.9 / 7.9	8.0 / 8.2	7.9 / 7.6	8.0 / 7.7	7.9 / –		7.6	7.9 / 7.9	7.9 / 7.6	7.9 / 7.8	8.0 / 7.7	7.9 / 7.7	7.9 / –		25.2 / 1037	24.8 / 1054	24.9 / 1055	24.8 / –	25.3 / 1075	24.6 / 1063	25.3 / –	
1.0 g/L	7.9	8.1 / 8.1	7.9 / 7.9	8.0 / 8.2	7.9 / 7.6	7.9 / 7.5	7.9 / –		7.6	7.9 / 7.9	8.0 / 7.6	7.9 / 7.8	8.0 / 7.7	7.9 / 7.7	7.9 / –		24.8 / 1676	24.4 / 1619	25.2 / 1670	24.7 / –	25.2 / 1709	24.8 / 1699	24.9 / –	
1.5 g/L	7.8	8.1 / 8.1	7.9 / 7.8	8.0 / 8.0	7.9 / 7.6	7.9 / 7.5	7.9 / –		7.6	7.9 / 7.8	8.0 / 7.6	7.9 / 7.7	8.0 / 7.7	7.9 / 7.7	7.9 / –		24.7 / 2230	24.6 / 2240	25.4 / 2240	24.8 / –	25.2 / 2270	24.7 / 2240	25.2 / –	
2.0 g/L	7.8	8.1 / 8.1	7.9 / 7.8	8.0 / 8.1	7.8 / 7.3	7.9 / 7.5	7.9 / –		7.6	7.9 / 7.8	8.0 / 7.7	7.9 / 7.7	8.0 / 7.6	7.9 / 7.7	8.0 / –		25.1 / 2100	24.5 / 2110	25.0 / 2100	24.6 / –	25.1 / 2160	24.7 / 2110	25.0 / –	
4.0 g/L	7.8	8.1 / –							7.6	7.9 / –							25.0 / ~~2700~~ 4130	24.4 / –						

COMMENTS:

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	12/10/2002 14:20	Test ID:	rcdc1497	Sample ID:	REFTOX-Reference Toxicant test
End Date:	12/16/2002 13:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

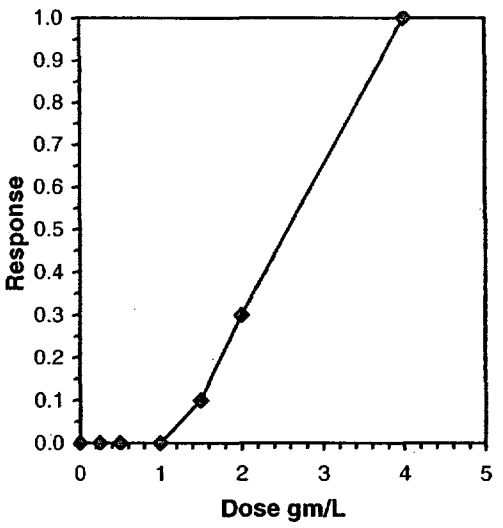
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	0.0000	1.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
0.25	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
0.5	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	9	1.0000	1.0000
1	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
1.5	0.9000	0.9000	0.9948	0.5236	1.0472	16.644	10	0.9000	0.9000
2	0.7000	0.7000	0.8901	0.5236	1.0472	28.414	10	0.7000	0.7000
4	0.0000	0.0000	0.5236	0.5236	0.5236	0.000	10	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	3.36332	1.035	-2.3666	7.08719
Equality of variance cannot be confirmed				

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	1.2500	0.2473	1.0996	2.0000	0.9909
IC10	1.5000	0.2597	1.1992	2.1053	0.5387
IC15	1.6250	0.2601	1.2988	2.2105	0.3019
IC20	1.7500	0.2673	1.3983	2.3158	0.2464
IC25	1.8750	0.2620	1.5589	2.4211	0.2845
IC40	2.2857	0.2819	1.7500	2.7368	-0.1505
IC50	2.5714	0.2840	1.8746	2.9474	-0.7640



SCOEPA00027337

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Reference Toxicant Test Data Summary

Client _____ QA/QC – December Test Start Date 12-17-2002

Sample Description (1B008-04) NaCl 50 g/L STOCK Sample ID# _____

Ceriodaphnia Lot# Cd 1500 Statistician DW

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	16	17	16	15	22	21	21	19	17	21	10	185
0.25 g/L	18	19	18	15	3/AD	22	25	18	20	22	9	180
0.5 g/L	23	15	20	22	17	26	18	23	23	17	10	204
1.0 g/L	4	5	13	12	15	16	13	11	13	0	10	102
1.5 g/L	5	5	9	4	11	4	6	8	14	0/AD	9	66
2.0 g/L	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	2	0/0	0/AD	2	2
4.0 g/L	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Endpoint	IC25	Cusum Chart Limits
Survival	1.61	0.52 to 2.42
Reproduction	0.77	0.14 to 1.00

Task Manager Doug Winn

Project Manager _____

QA Officer _____

CHMHILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client QA/QC - December Test Beginning: Date 12-17-02 Time 1000

Sample Description NaCl - 50 g/L STOCK (1B008-04) Test Ending: Date 12-24-02 Time 0920

Ceriodaphnia Lot# Cd 1500 Dilution Water Recon MH (FHM) ID# 2221 + 2223

Technician Day 1 DN Day 2 FM Day 3 DN Day 4 DN Day 5 BM Day 6 BM Day 7 BM

Time Day 1 1100 Day 2 1015 Day 3 1030 Day 4 1510 Day 5 1407 Day 6 1200 Day 7 0920

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	3	3	3	4	5	2	4	4	3	3	10	34
	5	7	6	7	7	8	10	9	6	8	8	10	76
	6	4	0	0	0	0	0	8	9	0	0	10	21
	7	2	8	6	4	9	9	0	0	6	10	10	54
0.25 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	1	2	4	0	3	0	3	2	3	3	10	20
	5	9	0	3	7	0 AD	10	10	8	8	8	9	63
	6	0	8	0	0	1	0	0	0	0	0	9	8
	7	8	9	11	12		12	12	8	10	11	9	89
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	0	5	3	2	4	0	3	3	2	10	20
	5	10	0	0	9	6	0	0	10	9	4	10	48
	6	0	8	7	0	0	10	7	0	0	0	10	32
	7	13	7	10	10	9	12	11	10	11	11	10	104
1.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	0	2	0	3	2	2	3	2	0	10	14
	5	3	3	7	6	6	8	6	6	7	0	10	52
	6	0	0	0	0	0	0	0	0	0	0	10	0
	7	1	2	4	6	6	6	5	2	4	0	10	36
1.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	0	0	0	2	0	0	0	2	0	10	4
	5	0	0	0	0	0	0	2	6	5	0 MD	9	13
	6	0	0	5	0	4	0	0	0	0	1	9	9
	7	5	5	4	4	5	4	4	2	7		9	31 40 (R)
2.0 g/L	1	AD/0	AD/0	AD/0	AD/0	AD/0	AD/0	0	0	0	AD/0	3 10 DN	0
	2	0/AD	|	|	|	|	0	0	0	0	|	3	0
	3	|	|	|	|	|	|	0	0	0	|	3	0
	4	|	|	|	|	|	|	AD/0	0	0	|	2	0
	5	|	|	|	|	|	|	|	0	0	|	2	0
	6	|	|	|	|	|	|	|	0	0	|	2	0
	7	↓	↓	↓	↓	↓	↓	+	2	0	↓	2	2
4.0 g/L	1	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0
	2												
	3												

SCOEPA00027339

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client QA/QC - December — Initiated Date 12-17-02 Time 1000 — Adults Isolated Date 12-16-02 Time 2205

Sample Description NaCl Reagent Log # 18008-04 — Terminated Date 12-24-02 Time 1030 — Neo's Collected Date 12-17-02 Time 0615

Technician Day 0 DW Day 1 DW Day 2 BW Day 3 DW Day 4 [illegible] Day 5 BW Day 6 [illegible] Day 7 BM

Time Day 0 1000 Day 1 1100 Day 2 1440 Day 3 1030 Day 4 1530 Day 5 1450 Day 6 1325 Day 7 1030

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	8.1	7.9 / 8.1	8.4 / 8.3	7.9 / 8.1	7.9 / 8.2	8.3 / 8.3	7.9 / 7.6	7.7
0.25 g/L	8.1	7.9 / 8.1	8.4 / 8.3	7.9 / 8.0	7.9 / 8.1	8.3 / 8.2	8.0 / 7.6	7.7
0.50 g/L	8.1	7.9 / 8.1	8.5 / 8.3	7.9 / 8.0	7.9 / 8.1	8.3 / 8.1	8.0 / 7.8	7.8
1.0 g/L	8.1	7.9 / 8.1	8.4 / 8.3	7.9 / 8.0	7.9 / 8.0	8.2 / 8.1	8.0 / 7.9	7.7
1.5 g/L	8.0	7.9 / 8.1	8.5 / 8.3	7.9 / 8.0	7.8 / 8.0	8.2 / 8.2	8.0 / 7.9	7.9
2.0 g/L	8.0	7.9 / 8.0	8.4 / 8.0	7.8 / 7.9	7.8 / 8.0	8.3 / 8.2	8.0 / 7.8	7.8
4.0 g/L	7.8	7.9 / –						

Percent or Concentration	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.8	7.7 / 7.7	7.8 / 7.5	7.9 / 7.7	7.9 / 7.6	7.9 / 7.8	7.9 / 7.8	7.9
0.25 g/L	7.8	7.7 / 7.7	7.9 / 7.5	7.9 / 7.6	7.9 / 7.6	7.9 / 7.7	7.9 / 7.6	7.8
0.50 g/L	7.8	7.7 / 7.7	7.9 / 7.5	7.9 / 7.6	7.9 / 7.6	7.9 / 7.6	7.9 / 7.6	7.8
1.0 g/L	7.8	7.7 / 7.6	7.9 / 7.5	7.9 / 7.6	7.9 / 7.6	7.9 / 7.6	7.9 / 7.6	7.8
1.5 g/L	7.8	7.7 / 7.6	7.9 / 7.5	7.9 / 7.6	7.9 / 7.6	7.9 / 7.6	7.9 / 7.5	7.8
2.0 g/L	7.8	7.8 / 7.6	7.9 / 7.5	7.9 / 7.5	7.9 / 7.4	7.9 / 7.6	7.9 / 7.5	7.8
4.0 g/L	7.7	7.8 / –						

Percent or Concentration	Temperature (C) / Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	25.4 / 284	24.7 / 289	24.8 / 237	25.1 / 286	24.2 / 310	25.0 / 300	24.3 / 292	24.5
0.25 g/L	25.1 / 681	24.6 / 703	24.7 / 699	24.8 / 701	24.5 / 715	24.7 / 739	24.5 / 713	25.2
0.50 g/L	24.9 / 1055	24.7 / 1078	24.6 / 1053	25.0 / 1068	24.6 / 1100	24.8 / 1114	24.7 / 1095	24.0
1.0 g/L	25.2 / 1708	24.5 / 1721	24.7 / 1703	24.6 / 1730	24.4 / 1740	25.1 / 1778	24.2 / 1736	24.9
1.5 g/L	25.5 / 2270	24.6 / 2280	24.7 / 2270	24.8 / 2270	24.4 / 2270	24.7 / 2310	24.5 / 2300	24.1
2.0 g/L	25.4 / 2740	24.9 / 2770	24.8 / 2780	24.7 / 2790	24.2 / 2800	24.6 / 2820	24.3 / 2800	24.0
4.0 g/L	25.6 / 4230	24.8 / –						

COMMENTS:

Ceriodaphnia Survival and Reproduction Test-7 Day survival

Start Date:	12/17/2002 10:00	Test ID:	rcdc1500	Sample ID:	REFTOX-Reference Toxicant test
End Date:	12/24/2002 09:20	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	Ceriodaphnia dubia 1500 Chronic Ref. Tox. for December!				

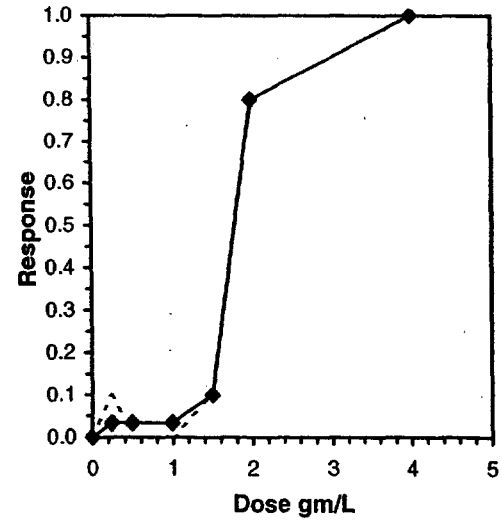
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.25	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
0.25	0.9000	0.9000	0.9948	0.5236	1.0472	16.644	10	0.9667	0.9667
0.5	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	0.9667	0.9667
1	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	0.9667	0.9667
1.5	0.9000	0.9000	0.9948	0.5236	1.0472	16.644	10	0.9000	0.9000
2	0.2000	0.2000	0.6283	0.5236	1.0472	35.136	10	0.2000	0.2000
4	0.0000	0.0000	0.5236	0.5236	0.5236	0.000	10	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	3.02078	1.035	-0.6547	10.8381
Equality of variance cannot be confirmed				

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	1.1250	0.4835	0.1250	1.5357	-1.1115
IC10	1.5000	0.2079	1.0714	1.5716	-3.1044
IC15	1.5357	0.1220	1.1786	1.6091	-1.4692
IC20	1.5714	0.0957	1.2857	1.6667	-1.8464
IC25	1.6071	0.0830	1.3929	1.7090	-1.4951
IC40	1.7143	0.0727	1.5833	1.8755	0.3949
IC50	1.7857	0.0918	1.6667	2.0000	2.5376



SCOEPA00027341

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/17/2002 10:00	Test ID:	rcdc1500	Sample ID:	REFTOX-Reference Toxicant test
End Date:	12/24/2002 09:20	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	Ceriodaphnia dubia 1500 Chronic Ref. Tox. for December!				

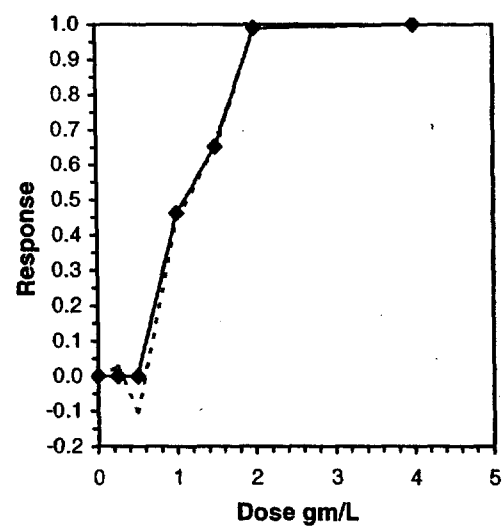
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	16.000	17.000	16.000	15.000	22.000	21.000	21.000	19.000	17.000	21.000
0.25	18.000	19.000	18.000	15.000	3.000	22.000	25.000	18.000	20.000	22.000
0.5	23.000	15.000	20.000	22.000	17.000	26.000	18.000	23.000	23.000	17.000
1	4.000	5.000	13.000	12.000	15.000	16.000	13.000	11.000	13.000	0.000
1.5	5.000	5.000	9.000	4.000	11.000	4.000	6.000	8.000	14.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	18.500	1.0000	18.500	15.000	22.000	14.015	10	18.967	1.0000
0.25	18.000	0.9730	18.000	3.000	25.000	33.127	10	18.967	1.0000
0.5	20.400	1.1027	20.400	15.000	26.000	17.323	10	18.967	1.0000
1	10.200	0.5514	10.200	0.000	16.000	52.042	10	10.200	0.5378
1.5	6.600	0.3568	6.600	0.000	14.000	60.690	10	6.600	0.3480
2	0.200	0.0108	0.200	0.000	2.000	316.228	10	0.200	0.0105
4	0.000	0.0000	0.000	0.000	0.000	0.000	10	0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.5043	1.035	-1.2181	4.0835
Equality of variance cannot be confirmed				

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	0.5541	0.1379	0.1159	0.5695	-2.1517
IC10	0.6082	0.0788	0.2318	0.6390	-3.8683
IC15	0.6623	0.0393	0.5681	0.7085	-0.7537
IC20	0.7163	0.0429	0.6294	0.7781	-0.2670
IC25	0.7704	0.0484	0.6808	0.8476	0.0245
IC40	0.9327	0.0741	0.8202	1.0776	0.3852
IC50	1.0995	0.1293	0.9086	1.3158	0.6181



SCOEPA00027342

REFERENCE TOXICANT DATA SHEET

Client: QA/QC
Test Organism: *Pimephales promelas*
Source: Aquatox Inc.
ID#: FHM 1044
Age: <24 hrs.
Size: na
Loading: na

Reference Toxicant: Sodium chloride
Solvent: distilled water Stock Solution: 20 g/L
Reagent Log ID #: 1B008-06
*Dilution Water: Recon MH (FHM) ID#: 2218
Total Hardness as CaCO3: 96 Total Alkalinity as CaCO3: 64
(Conductivity (µmhos/cm)) Salinity (ppt): 312 Temperature: 20 ± 1 °C

Test Begin: Date 12-10-02 Time 1625
Test End: Date 12-12-02 Time 1605

	0 hr	24 hr	48 hr	72 hr	96 hr
Technician	BM	DW	BM		
Time	1625	1445	1605		

Toxicant Concen. (g/L)	Test Chamber Number	Number Surviving					Dissolved Oxygen (mg/l)					pH					Temperature °C					Cond.
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0
Control		10	10	10			8.6	8.5	8.6			8.0	7.8	7.9			19.3	20.2	20.3			274
4		10	10	10			8.6	8.4	8.6			7.8	7.7	7.7			19.3	20.0	20.3			4110
6		10	10	10			8.6	8.4	8.6			7.8	7.7	7.7			19.3	19.8	20.2			5120
8		10	7	2			8.6	8.4	8.6			7.7	7.6	7.6			19.3	20.2	20.2			5920
10		10	0	–			8.6	8.4	–			7.6	7.6	–			19.3	20.1	–			6540
12		10	0	–			8.6	8.5	–			7.5	7.5	–			19.3	20.3	–			7080
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ± 1 °C					

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 hr LC50: 7.3
Cusum Chart Limits: 6.5 to 7.8
Statistical Method: Spearman-Kaber

We verify this data is true and correct.
Task Manager: Doug Winn
Project Manager: BM Anderson
QA Officer:

Acute Test-48 Hr Survival

Start Date:	12/10/2002 16:25	Test ID:	rppa1044	Sample ID:	REFTOX-Reference Toxicant test
End Date:	12/12/2002 16:05	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	PP
Comments:					

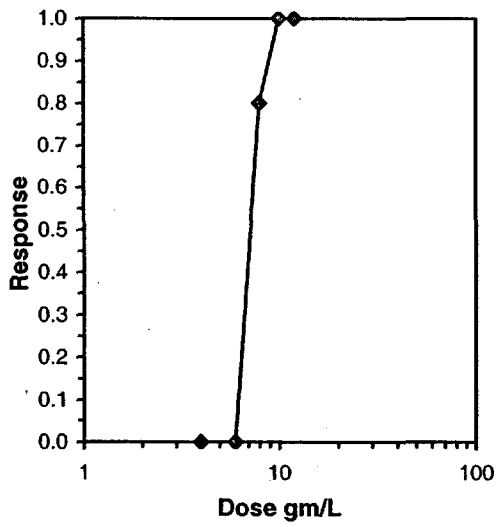
Conc-gm/L	1
LAB-Control	1.0000
4	1.0000
6	1.0000
8	0.2000
10	0.0000
12	0.0000

			Transform: Arcsin Square Root					Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Resp	Number
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	1	0	10
4	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	1	0	10
6	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	1	0	10
8	0.2000	0.2000	0.4636	0.4636	0.4636	0.000	1	8	10
10	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	1	10	10
12	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	1	10	10

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

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	7.2913	6.8351	7.7780
5.0%	7.2501	6.7600	7.7757
10.0%	7.2159	6.7102	7.7597
20.0%	7.1819	6.7849	7.6021
Auto-0.0%	7.2913	6.8351	7.7780



SCOEPA00027344

APPENDIX C
CHAIN OF CUSTODY

SUBCONTRACT ORDER

North Creek Analytical - Portland

P2L0227

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Brian Cone

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P2L0227-01	**Water**	**Sampled: 12/09/02 07:35**		
Subcontract Outside	12/23/02 17:00	06/07/03 07:35		Bioassay
Containers Supplied:				
Other (A)				

4164-01

3°C on arrival to CH2M

Released By	Date	Received By	Date
	12-9-02		12-10-02
Released By	Date	Received By	Date

SCOEPA00027346

SUBCONTRACT ORDER

North Creek Analytical - Portland

P2L0326

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Brian Cone

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P2L0326-01	**Water**	**Sampled: 12/11/02 07:45**		
Subcontract Outside	12/27/02 17:00	06/09/03 07:45		Bioassay
Containers Supplied:				
Other (A)				

CO4164-02

3°C on arrival

Released By	Date	Received By	Date
	12-11-02		12-12-02 1130
Released By	Date	Received By	Date

SCOEPA00027347

SUBCONTRACT ORDER

North Creek Analytical - Portland

P2L0442

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Brian Cone

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Copy/Relog from P2L0326.

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P2L0442-01	**Water**	**Sampled: 12/13/02 00:00**		
Subcontract Outside	12/31/02 17:00	06/11/03 00:00		Bioassay
Containers Supplied:				
Other (A)				

04164-03

2.4°C upon arrival

Released By	Date	Received By	Date
[signature]	12-17-02	[signature]	
Released By	Date	Received By	Date

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SPACE AVAILABLE
PREPAID

Pcs: 1 of 1

GPX

11DEC02 1:45P ** LABEL **

GLI 300-749-664-6

Schd: GLI 6537

CORVALLIS, OR 97330

From:
North Creek Analytical
(503) 906-9200

CH2M HILL
2300 Nw Walnut
Corvallis, OR 97330
(541) 758-0235

Manual Wght:
72.0 LB
Tariff Wght:
72.0 LB

1-800-739-5020 WWW.SHIPGREYHOUND.COM

SPACE AVAILABLE
PREPAID

Pcs: 1 of 1

GPX

11DEC02 1:45P ** ORIGIN **

GLI 300-749-664-6

Schd: GLI 6537

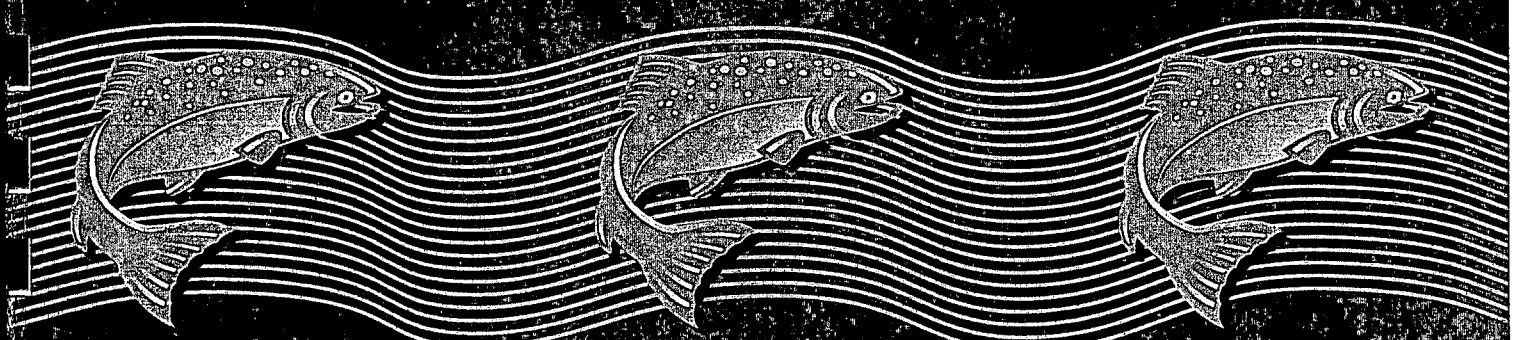
From:
PORTLAND, OR

To:
CORVALLIS, OR

EXPRESS $ 30.55
VALUE $ = 0

BIOMONITORING SERVICES

BIOASSAY REPORT
CHRONIC BIOASSAYS
Conducted November 5 through 12, 2002



CH2MHILL

SCOEPA00027350

BIOASSAY REPORT
CHRONIC BIOASSAYS
Conducted November 5 through 12, 2002

Prepared for

WACKER SILTRONICS
(via North Creek Analytical)
PORTLAND, OREGON

Prepared by

CH2M HILL
2300 NW Walnut Boulevard
Corvallis, Oregon 97330

December 13, 2002
Lab I.D. No. C04146

SCOEPA00027351

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SCOEPA00027352

INTRODUCTION

CH2M HILL conducted chronic bioassays from November 5 through 12, 2002. The samples were provided by the Wacker Siltronics, Portland, Oregon. The organisms tested were the fathead minnow (*Pimephales promelas*) and the water flea (*Ceriodaphnia dubia*). Forty eight hour acute data was obtained from the chronic tests (dual-endpoint testing).

The *Ceriodaphnia dubia* chronic test did not meet EPA test acceptability criteria for control reproduction. The laboratory bench sheets are included in Appendix A. Additional samples were collected by Wacker Siltronics and both tests were repeated from December 10 through 17, 2002, and reported separately.

METHODS AND MATERIALS

TEST METHODS

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Weber, C. et al. (1994); EPA/600/4-91/002.

TEST ORGANISMS

The *Ceriodaphnia dubia* used in the test were obtained from CH2M HILL's in-house cultures and were less than 24 hours old and within an eight hour age range, respectively, at test initiation. The fathead minnows were obtained from Aquatic Biosystems, Inc., Fort Collins, Colorado, and were less than 24 hours old at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (1994). The test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used in the tests was moderately hard reconstituted water (EPA, 1994) with a total hardness of 88 and 86 mg/l as $CaCO_3$, alkalinity of 64 and 60 mg/l as $CaCO_3$, and a pH of 7.9 and 7.3.

TEST CONCENTRATIONS

The concentrations tested in the chronic tests were 1.90, 3.75, 7.50, 15.0, and 30.0 percent effluent and dilution water for the control. For the fathead minnow chronic test, 10 organisms per chamber with four chambers per concentration, for a total of 40 organisms per concentration were used. For the *Ceriodaphnia* chronic test, 1 organism per chamber with ten chambers per concentration for a total of 10 organisms per concentration were used.

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SAMPLE COLLECTION

Samples were collected by Wacker Siltronics personnel on November 4, 6 and 8, 2002. All samples were delivered to CH2M HILL's Aquatic Toxicology Laboratory by Greyhound bus (via North Creek Analytical personnel) and stored in the dark at 4°C until test solutions were prepared and tested. Chain of custody for sample collection is provided in Appendix C.

SAMPLE PREPARATION

The samples were filtered through a 60 µm net upon arrival and temperature was adjusted prior to each daily renewal on samples used during the tests.

MONITORING OF BIOASSAYS

Samples were monitored on arrival for hardness, total residual chlorine, ammonia, and temperature.

For the chronic test, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in the control and all concentrations tested. Conductivity was measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was measured daily in the chronic tests. According to EPA (1994), *Ceriodaphnia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia* in the controls have produced their third brood and at least 15 neonates per adult are produced. Fathead minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the fathead minnow chronic test. Temperature was monitored continuously throughout the testing period.

A subsample of the November 4, 2002 sample was taken for Nitrate analysis. The data is included in Appendix A.

DATA ANALYSIS

The effect measured during the dual-endpoint acute tests was survival during the 48 hour exposure period. The effects measured during the *Ceriodaphnia* chronic test included survival and reproduction over the 7-day exposure period. The effects measured during the fathead minnow chronic test included survival and growth over the 7-day exposure period. The statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, using Toxcalc version 5.0. Dunnett's Procedure, Bonferroni's T-Test or Fisher's Exact Test was used to compare the survival data and Dunnett's Procedure or Bonferroni's T-Test was used to compare the reproduction or growth data between the control and each effluent treatment. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test

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with Bonferroni Adjustment could not be met, Steel's Many-One Rank Test or Wilcoxon Rank Sum with Bonferroni Adjustment was used to analyze the data.

RESULTS AND DISCUSSION

ACUTE DUAL ENDPOINT

Table 1 summarizes the acute dual-endpoint survival data taken from the chronic tests.

Table 1
Acute Dual-Endpoint Survival Data

Sample Concentration (%)	*Ceriodaphnia dubia* 48 hour percent survival	Fathead minnow 48 hour percent survival
Control	100	100
1.90	100	100
3.75	100	100
7.50	100	100
15.0	100	100
30.0	100	97.5

The acute dual-endpoint test results showed no statistically significant reduction in survival when compared to the control at the 100 percent effluent concentration for both species. The dual-endpoint LC_{50} was greater than 100 percent for both species.

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CHRONIC BIOASSAY

Table 2 summarizes the survival and growth data for the samples tested on the fathead minnow.

Table 2
Chronic Fathead Minnow
Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight (mg)
Control	100	0.54
1.90	97.5	0.51
3.75	100	0.54
7.50	97.5	0.49
15.0	100	0.56
30.0	100	0.56

The fathead minnow test results showed no statistically significant reduction in survival or growth at any effluent concentration tested when compared to the control. Control survival was 100 percent. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 30 and greater than 30 percent effluent, respectively.

The IC_{25} value (the concentration of effluent causing a 25 percent reduction in biological measurement, e.g. growth) calculated on the fathead minnow growth was greater than 30 percent.

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Table 3 summarizes the survival and reproduction data for the effluent tested on the *Ceriodaphnia dubia*.

Table 3
***Ceriodaphnia Dubia* Chronic Results**

Concentration (%)	Percent Survival	No. Young Per Adult
Control	90	3.8
1.90	90	3.0
3.75	100	2.4
7.50	80	3.1
15.0	90	2.7
30.0	100	1.4

The *Ceriodaphnia dubia* chronic test did not meet EPA test acceptability criteria for control reproduction. *Ceriodaphnia* reproduction in the controls was 4.2 neonates per surviving adult. EPA test protocols require a minimum of 15.0 neonates per surviving control organism for the test to be considered valid. Statistics were not performed on this data set and care should be given to any attempt at data interpretation.

The dissolved oxygen levels in the chronic tests remained above 40 percent saturation throughout the test period. Test temperatures remained at 25±1°C. The tests proceeded without interruption or incidents that could have affected test results with the exception of the *Ceriodaphnia dubia* reproduction.

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REFERENCE TOXICANT TESTS

The results of the reference toxicant tests conducted in November with sodium chloride (*Ceriodaphnia* and fathead minnow) indicate that the test organisms were within their respective sensitivity range based on EPA guidelines (EPA 1989). The IC_{25} values and 95 percent confidence intervals are listed in the tables below.

Table 4
Chronic Reference Toxicant Tests (g/L)

Species (test)	IC_{25}	Control Chart
Pimephales promelas (survival)	3.2	1.75 to 4.51
Pimephales promelas (growth)	3.0	1.44 to 3.56
Ceriodaphnia dubia (survival)	0.81	0.52 to 2.42
Ceriodaphnia dubia (reproduction)	0.52	0.14 to 0.96

SCOEPA00027358

APPENDIX A
RAW DATA SHEETS

CH2M HILL *TOXICITY TEST ORGANISM AND WATER QUALITY DATA*

Client: Wacker Siltronics

Test Initiation: Date 11-05-02 Time 1800 Test Termination: Date 11-12-02 Time 1400

Contact:

Technician: Oldham, Mucken, Frich, Winn

Test Species/ID: *Pimephales promelas* / FHM 1035 /

Ceriodaphnia dubia / Cd 1486 /

Sample Information

Sample ID Number	Field ID	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Dechlor.	Ammonia NH_3-N mg/l	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
4146 -01	02-145	11-04-02	0800	0.04 / -	0.48	194	18
-02		11-6-02		0.00 / -	0.74	224	16
-03		11-8-02		0.00 / -	0.74	252	18
				/			
				/			
				/			
				/			
				/			
				/			
				/			
				/			
				/			
				/			

Test Species Information	ID# FHM 1035	ID# Cd 1486	ID#	ID#
Age or Size	< 24 hours	< 24 hours within		
	—	an 8 hour span		
Test Container Size	800 ml	30 ml		
Test Volume	500 ml	15 ml		
Feeding: Type	0.1 ml *Artemia*	0.1 ml Algae &		
Amount	2 x daily	YCT daily		
Aeration: Began	none	none		
Amount	—	—		
Dilution Water ID#	2205, 2206	2205, 2206		
Acclimation Period	< 24 hours	< 24 hours		
Test Location	# 4	# 5		
Condition of Survivors				
Size (mm)	—	—		
Loading Rate	—	—		

Comments

Dilution Water Source	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	2205	88	64
Recon MA (FHM)	2206	86	60

Water Quality Meters Used/ID#

Dissolved Oxygen _____ pH _____ Temperature _____

Conductivity _____ Refractometer _____ Other _____

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CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client: Wacker Siltronics — Date Initiated: 11-5-02 — Time: 1500

Sample Description: CO 4146 — Date Terminated: 11-12-02 — Time: 1400

Technician: Day 0 (BB) Day 1 3w Day 2 3w Day 3 (BB) 3w Day 4 3w Day 5 (BB) Day 6 3w Day 7 DW

Time: Day 0 1500 Day 1 1340 Day 2 1525 Day 3 ~~1300~~ 1340 Day 4 1352 Day 5 1400 Day 6 1440 Day 7 1400

Concentration or Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
CONTROL	0	10	10	10	10		8.0		7.9	24.5	312
	1	10	10	10	10	7.6	8.0	8.0	8.0	24.6	
	2	10	10	10	10	7.0	8.0	7.8	8.1	24.4	309
	3	10	10	10	10	7.6	8.1	8.0	8.2	24.8	
	4	10	10	10	10	7.4	8.1	8.1	8.1	24.7	302
	5	10	10	10	10	7.5	8.0	8.0	8.2	24.8	
	6	10	10	10	10	7.4	8.1	8.0	8.2	24.3	
	7	10	10	10	10	7.1		7.8		24.4	
3w ~~3~~ 1.9 %	0	10	10	10	10		8.2		8.1	24.4	312
	1	10	10	10	10	7.6	8.0	8.0	8.0	24.5	
	2	10	10	10	10	6.9	8.1	7.8	8.1	24.4	317
	3	10	10	10	10	7.7	8.2	8.0	8.2	24.8	
	4	10	10	10	10	7.4	8.2	8.1	8.1	24.6	305
	5	10	10	10	10	7.5	8.2	8.0	8.1	24.8	
	6	10	10	10	9	7.4	8.1	8.0	8.2	24.3	
	7	10	10	10	9	7.0		7.8		24.4	
3w ~~10~~ 3.75 %	0	10	3w ~~10~~ 9	10	10		8.2		8.1	24.5	~~460~~ 360
	1	10	9	10	10	7.5	8.0	8.0	8.0	24.7	
	2	10	9	10	10	7.8	8.1	7.8	8.1	24.5	323
	3	10	9	10	10	7.7	8.2	7.9	8.2	24.8	
	4	10	9	10	10	7.5	8.2	8.1	8.1	24.7	324
	5	10	9	10	10	7.6	8.2	8.0	8.1	24.7	
	6	10	9	10	10	7.4	8.2	7.9	8.2	24.2	
	7	10	9	10	10	7.1		7.8		24.5	
3w ~~17~~ 7.5 %	0	10	10	10	10		8.3		8.1	24.2	~~440~~ 360
	1	10	10	10	10	7.4	8.1	7.9	7.9	24.6	
	2	10	10	10	10	6.9	8.2	7.8	8.0	24.4	342
	3	10	10	10	10	7.7	8.3	7.9	8.2	24.9	
	4	10	10	10	10	7.5	8.2	8.0	8.1	24.7	346
	5	10	10	10	10	7.6	8.2	7.9	8.1	24.8	
	6	10	10	10	10	7.5	8.2	7.9	8.1	24.4	
	7	10	10	10	9	7.1		7.9		24.4	
3w ~~50~~ 15 %	0	10	10	10	10		8.3		8.0	24.1	363
	1	10	10	10	10	7.5	8.2	7.8	7.9	24.4	
	2	10	10	10	10	7.0	8.3	7.7	8.0	24.5	377
	3	10	10	10	10	7.6	8.3	7.9	8.1	24.9	
	4	10	10	10	10	7.5	8.2	8.0	8.0	24.6	385
	5	10	10	10	10	7.5	8.2	7.9	8.0	24.7	
	6	10	10	10	10	7.4	8.2	7.8	8.1	24.3	
	7	10	10	10	10	7.1		7.7		24.6	
3w ~~100~~ 30 %	0	3w ~~10~~ 9	10	10	10		8.3		7.9	24.2	428
	1	9	10	10	10	7.5	8.2	7.8	7.8	24.4	
	2	9	10	10	10	6.9	8.3	7.7	7.9	24.7	449
	3	9	10	10	10	7.6	8.3	7.8	8.0	24.7	
	4	9	10	10	10	7.6	8.2	7.9	7.9	24.8	469
	5	9	10	10	10	7.6	8.2	7.8	8.0	24.7	
	6	9	10	10	10	7.4	8.2	7.8	8.0	24.3	
	7	9	10	10	10	7.0		7.7		24.7	

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: Wacker Siltronics Species ID#: FHM1035

Lab ID: CO4146 Start Date: 11/5/2002

Sample Description:

Technician:	DW	BM
Date:	11/12/2002	11/14/2002

Concentration or Percent	Replicate	Tare Weight (mg)	Total Weight (mg)	No. of Fish
Control	A	1047.67	1052.87	10
	B	1032.37	1038.01	10
	C	1055.97	1062.31	10
	D	1043.04	1047.51	10
1.9 %	A	1043.32	1048.34	10
	B	1043.80	1049.89	10
	C	1041.44	1046.51	10
	D	1049.44	1053.62	9
3.75 %	A	1053.17	1058.39	10
	B	1040.80	1046.23	9
	C	1057.32	1062.80	10
	D	1039.69	1044.63	10
7.5 %	A	1037.40	1042.24	10
	B	1037.66	1043.39	10
	C	1035.35	1040.51	10
	D	1032.31	1036.37	9
15 %	A	1046.63	1052.33	10
	B	1053.19	1059.70	10
	C	1053.98	1059.59	10
	D	1048.64	1053.37	10
30 %	A	1040.60	1045.97	9
	B	1034.45	1040.64	10
	C	1038.65	1044.55	10
	D	1040.19	1044.48	10
	A			
	B			
	C			
	D			

weigh to 0.01 mg

Larval Fish Growth and Survival Test-48 Hr Survival

Start Date:	11/05/2002 15:00	Test ID:	414601ppc	Sample ID:	Wacker-SILTRONICS
End Date:	11/12/2002 14:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

Conc-%	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000
3.75	1.0000	1.0000	1.0000	1.0000
7.5	1.0000	1.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000

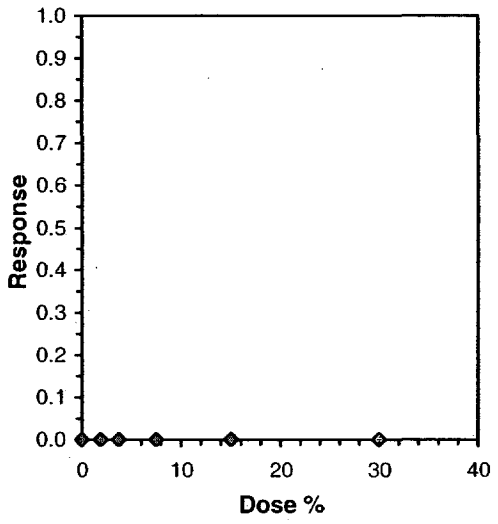
			Transform: Arcsin Square Root					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			1.0000	1.0000
1.9	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
3.75	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4	16.00	10.00	1.0000	1.0000
7.5	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
15	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
30	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4	16.00	10.00	1.0000	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.61382	0.884	-2.1359	5.27706
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	30	>30		3.33333

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>30			
IC10	>30			
IC15	>30			
IC20	>30			
IC25	>30			
IC40	>30			
IC50	>30			



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Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	11/05/2002 15:00	Test ID:	414601ppc	Sample ID:	Wacker-SILTRONICS
End Date:	11/12/2002 14:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

Conc-%	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	0.9000
3.75	1.0000	1.0000	1.0000	1.0000
7.5	1.0000	1.0000	1.0000	0.9000
15	1.0000	1.0000	1.0000	1.0000
30	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
1.9	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
3.75	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4	16.00	10.00
7.5	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
15	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
30	1.0000	1.0000	1.4098	1.4033	1.4120	0.307	4	16.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.64313	0.884	-2.1272	5.22804
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	30	>30		3.33333

SCOEPA00027364

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	11/05/2002 15:00	Test ID:	414601ppc	Sample ID:	Wacker-SILTRONICS
End Date:	11/12/2002 14:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

Conc-%	1	2	3	4
LAB-Control	0.5200	0.5640	0.6340	0.4470
1.9	0.5020	0.6090	0.5070	0.4180
3.75	0.5220	0.6033	0.5480	0.4940
7.5	0.4840	0.5730	0.5160	0.4060
15	0.5700	0.6510	0.5610	0.4730
30	0.5967	0.6190	0.5900	0.4290

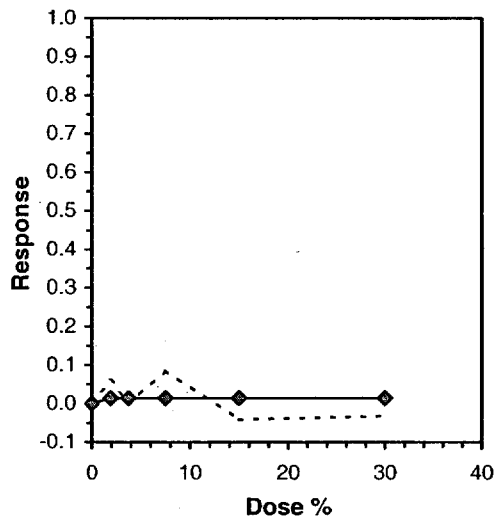
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	0.5412	1.0000	0.5412	0.4470	0.6340	14.491	4				0.5412	1.0000
1.9	0.5090	0.9404	0.5090	0.4180	0.6090	15.359	4	0.622	2.410	0.1249	0.5336	0.9859
3.75	0.5418	1.0011	0.5418	0.4940	0.6033	8.592	4	-0.011	2.410	0.1249	0.5336	0.9859
7.5	0.4947	0.9141	0.4947	0.4060	0.5730	14.084	4	0.898	2.410	0.1249	0.5336	0.9859
15	0.5637	1.0416	0.5637	0.4730	0.6510	12.912	4	-0.434	2.410	0.1249	0.5336	0.9859
30	0.5587	1.0322	0.5587	0.4290	0.6190	15.632	4	-0.336	2.410	0.1249	0.5336	0.9859

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95222	0.884	-0.3213	-0.6642
Bartlett's Test indicates equal variances (p = 0.96)	1.07227	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	30	>30		3.33333	0.12486	0.23069	0.00301	0.00537	0.72809	5, 18

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>30			
IC10	>30			
IC15	>30			
IC20	>30			
IC25	>30			
IC40	>30			
IC50	>30			



SCOEPA00027365

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client: Wacker Siltronics
Test Start Date: 11-5-02
Sample Description:
Sample ID#: CO 4146
Ceriodaphnia Lot#: Cd 1426
Statistician: BM

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	6	8	0 (AD)	9	5	9	0	0	1	0	9	38
~~3~~ 1.9%	5	0	0	4	5	0 (AD)	0	11	2	3	9	30
~~10~~ 3.75%	9	0	2	6	3	1	0	0	0	3	10	24
~~17~~ 7.5%	3	10	0 (AD)	7	6	0	0 (AD)	3	0	2	8	31
~~50~~ 15%	12	3	0 (AD)	1	3	2	0	3	0	3	9	27
~~100~~ 30%	5	3	0	0	0	1	0	5	0	0	10	14

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Wacker Siltronics Test Beginning : Date 11-5-02 Time 1440

Sample Description CO 4446 Test Ending : Date 11-12-02 Time 1350

Ceriodaphnia Lot# Cd 1486 Dilution Water Recon MH (FHM) ID# 2205

Technician Day 1 BM Day 2 BM Day 3 BM Day 4 BM Day 5 KB Day 6 BM Day 7 BM

Time Day 1 1120 Day 2 1315 Day 3 1130 Day 4 1215 Day 5 1245 Day 6 1345 Day 7 1350

Percent or Concentration	Day	Replicate										No. Live Adults	Total Live Young
		A	B	C	D	E	F	G	H	I	J		
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	3	4	0	2	2	5	0	0	0	0	10	16
	5	3	3	0 AD	4	2	2	0	0	0	0	9	14
	6	0	0	|	0	1	0	0	0	0	0	9	1
	7	0	1	|	3	0	2	0	0	1	0	9	7
1.9 % 3 ~~8~~	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	3	0	0	2	3	0	0	1	0	1	10	10
	5	2	0	0	0	2	0	0	3	2	0	10	9
	6	0	0	0	2	0	0 AD	0	1	0	2	9	5
	7	0	0	0	0	0	1	0	6	0	0	9	6
3.75 % 3 ~~10~~	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	3	0	0	1	3	1	0	0	0	2	10	10
	5	4	0	0	2	0	0	0	0	0	0	10	6
	6	0	0	0	3	0	0	0	0	0	1	10	4
	7	2	0	2	0	0	0	0	0	0	0	10	4
7.5 % 3 ~~17~~	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	3	1	0	0	2	0	0	1	0	0	10	7
	5	0	0	0 AD	0	0	0	0 AD	0	0	0	8	0
	6	0	4	|	2	2	0	|	2	0	2	8	12
	7	0	5	|	5	2	0		0	0	0	8	12
15 % 3 ~~50~~	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	2	2	0	1	3	2	0	0	0	0	10	10
	5	0	1	0	0	0	0	0	0	0	0	10	1
	6	0	0	0 AD	0	0	0	0	3	0	3	9	6
	7	10	0	1	0	0	0	0	0	0	0	9	10
30 % 3 ~~100~~	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	3	0	0	0	0	1	0	0	0	0	10	4
	5	0	0	0	0	0	0	0	0	0	0	10	0
	6	2	3	0	0	0	0	0	5	0	0	10	10
	7	0	0	0	0	0	0	0	0	0	0	10	0

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client: Wacker Siltronics | Initiated Date: 11-5-02 Time: 1440 | Adults Isolated Date: 11-3-02 Time: 0845

Sample Description: CO 4146 | Terminated Date: | Time: | Neo's Collected Date: 11-4-02 Time: 1715

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	RM	BM	BM	BM	BM	YP	BM	BM
Time	1455	1130	1320	1300	1315	1245	1350	1350

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.9	7.7 / 7.4	7.8 / 7.8	7.7 / 7.7	7.6 / 7.9	7.7 / 7.7	7.8 / 7.8	7.5
3 / 1.9% (BM)	7.8	7.8 / 7.4	7.8 / 7.9	7.9 / 7.7	7.7 / 7.9	7.7 / 7.8	7.6 / 7.8	7.6
~~10~~ 3.75% (BM)	7.8	7.8 / 7.4	7.9 / 7.9	8.1 / 7.8	7.7 / 7.9	7.8 / 7.9	7.7 / 7.9	7.7
~~17~~ 7.5% (BM)	7.8	7.8 / 7.5	7.9 / 7.9	8.1 / 7.8	7.8 / 8.0	7.8 / 7.9	7.7 / 7.8	7.8
~~50~~ 15% (BM)	7.9	7.8 / 7.6	7.9 / 7.9	8.1 / 7.8	7.8 / 8.0	7.8 / 7.9	7.7 / 7.9	7.6
~~100~~ 30% (BM)	7.9	7.7 / 7.7	7.9 / 8.0	7.9 / 7.8	7.8 / 8.2	7.8 / 8.0	7.6 / 8.0	7.6

Percent or Concentration	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.3	7.7 / 7.5	8.0 / 7.7	8.1 / 7.7	8.1 / 7.7	8.1 / 7.7	7.9 / 7.5	7.7
3 / 1.9% (BM)	7.4	7.8 / 7.5	8.1 / 7.7	8.1 / 7.7	8.1 / 7.7	8.1 / 7.7	7.9 / 7.5	7.3
~~10~~ 3.75% (BM)	7.4	7.8 / 7.4	8.1 / 7.7	8.1 / 7.6	8.1 / 7.7	8.1 / 7.7	7.9 / 7.5	7.8
~~17~~ 7.5% (BM)	7.4	7.8 / 7.4	8.1 / 7.7	8.1 / 7.6	8.1 / 7.7	8.1 / 7.7	7.8 / 7.4	7.8
~~50~~ 15% (BM)	7.4	7.8 / 7.4	8.1 / 7.6	8.0 / 7.6	8.0 / 7.6	8.0 / 7.6	7.8 / 7.4	7.8
~~100~~ 30% (BM)	7.3	7.8 / 7.3	8.0 / 7.6	7.9 / 7.5	8.0 / 7.5	8.0 / 7.6	7.7 / 7.3	7.8

Percent or Concentration	Temperature (C) / Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	24.8 / 303	25.4	25.6 / 302	25.3	24.3 / 302	24.7 / 306	25.3	
3 / 1.9% (BM)								
~~10~~ 3.75% (BM)								
~~17~~ 7.5% (BM)								
~~50~~ 15% (BM)								
~~100~~ 30% (BM)	24.6 / 438	24.9	25.5 / 451	24.3	24.8 / 483	24.9	24.2	

COMMENTS:

CH2M HILL
Applied Sciences Group
2300 NW Walnut Blvd
Corvallis, OR
97330-3538
P.O. Box 428
Corvallis, OR
97339-0428
Tel 541.752.4271
Fax 541.752.0276

CH2MHILL
Applied Sciences Group

November 12, 2002

Bioassay Lab

112534.00.AC

RE: Laboratory Report for Bioassay Lab
Applied Sciences Group Reference No. 8440

Mike Stanaway/CVO:

On November 05, 2002, CH2M HILL Applied Sciences Group received one sample with a request for analysis of selected parameters. All analyses were performed by CH2M HILL unless otherwise indicated below.

The analytical results and associated quality control data are enclosed. Any unusual difficulties encountered during the analysis of your samples are discussed in the case narrative.

This report does not meet NELAC requirements for the following reasons:

- Samples were received at a temperature of 21°C with no ice.

CH2M HILL Applied Sciences Group appreciates your business and looks forward to serving your analytical needs again. If you should have any questions concerning the data, or if you need additional information, please call Kathy McKinley at (541) 758-0235, extension 3144.

Sincerely,

Kathy McKinley

Kathy McKinley
Analytical Manager

Enclosures

ACCREDITED IN ACCORDANCE WITH nelac
OR100022

SCOEPA00027369

CLIENT SAMPLE CROSS-REFERENCE

CH2M HILL Applied Sciences Group Reference No. 8440

Sample ID	Client Sample ID	Date Collected	Time Collected
844001	C04146-01	11/05/2002	

CASE NARRATIVE
GENERAL CHEMISTRY

Lab Reference No.: 8440

Client/Project: Bioassay Lab

I. Holding Time:
All acceptance criteria were met.

II. Digestion Exceptions:
None

III. Analysis:

A. Calibration:
All acceptance criteria were met.

B. Matrix Spike Sample(s):
All acceptance criteria were met.

C. Duplicate Sample(s):
All acceptance criteria were met.

D. Lab Control Sample(s):
All acceptance criteria were met.

E. Other:
Not applicable.

IV. Documentation Exceptions:
None.

V. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Prepared by: _____

Reviewed by: _____

CH2M Hill Applied Sciences Laboratory

Client Information		Lab Information	
Project Name:	Bioassay Lab	**Lab Batch ID:**	**8440**
Project Manager:	Mike Stanaway/CVO		
Sampled By:	Not Provided	Analysis Method:	EPA 300.0-A
Sampling Date:	11/05/2002	Units:	mg/L
Sampling Time:	Not Provided	Date Rec'd:	11/05/2002
Type:	Grab	Report Revision No.:	0
Matrix:	Water	Reported By:	YL
Basis:	As Received	Reviewed By:	

Nitrate

Client ID	Lab ID	Reporting Limit	Sample Result	Qualifier	Date Analyzed
C04146-01	844001	0.10	41.5		11/05/2002
METHOD BLANK	WB1-1105	0.10	0.10	U	11/05/2002

U=Not detected at specified reporting limit

CH2M HILL
Applied Sciences Group

2300 NW Walnut Blvd., Corvallis, OR 97330-3538
P.O. Box 428, Corvallis, OR 97339-0428
Tel 541.752.4271 Fax 541.752.0276

CH2MHILL Applied Sciences Lab
CHAIN OF CUSTODY RECORD
AND AGREEMENT TO PERFORM SERVICES

CVO 2300 NW Walnut Boulevard
Corvallis, OR 97330-3538
(541) 752-4271 FAX (541) 752-0276

COC # _____

Project #	
Purchase Order #	
Project Name	Wacker Siltronics
Company Name	
Report to:	Bioassay
Phone No:	
Requested Completion Date:	
Sample Disposal:	Dispose ☐ Return ☐

Requested Analytical Method #: Nitrate

THIS AREA FOR LAB USE ONLY
Lab # 8440 Page 1 of 1

EPA Tier QC Level: 1 (Screening) 2 3 4

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	Matrix AIR	Matrix Other	CLIENT SAMPLE ID (8 CHARACTERS)	LAB QC	TOTAL # OF CONTAINERS	Nitrate	Alternate Description	Lab ID
								C04146-01		1	X		-1

Relinquished By	Date/Time	Received By	Date/Time
Sampled By and Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Dayna Kaumann	11/5/12 Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS Fed-Ex Other _____	Shipping #

Special Instructions:

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client
Rev 2/01 Lab form 340

SCOEPA00027373

CH2MHILL
Applied Sciences Group

Sample Receipt Record

Batch Number: 8440 Date/Time Received: 11/5/02

Client/Project Biossay Temperature: 21°C

VERIFICATION OF SAMPLE CONDITIONS (verify all items) * HD = Client Hand delivered Samples

Observation	YES	NO	*HD
Were custody seals intact and on the outside of the cooler?			✓
Was the Chain of Custody inside the cooler?			✓
Was the Chain of Custody properly filled out?	✓		
Were the sample containers in good condition?	✓		
Was there ice in the cooler? 21°C		✓	

If the answer to any of the questions above is NO, a Sample Receipt Exceptions Report Must be written.

VERIFICATION OF SAMPLE PRESERVATION (verify all preserved samples except HAAs, HANs and CH)

Sample No	Nutrients pH <2	Metals pH <2	Volatiles pH <2	Cyanides pH >12	TOC pH <2	Phenol pH <2, FAS	Other (specify)	N/A (soils/unpres)
1								✓
2								
3								
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								

LOGIN AND pH VERIFICATIONS PERFORMED BY

Dayna Kampard 11/5/02

Date/Time Date/Time

CH2M HILL
Applied Sciences Group

2300 NW Walnut Blvd., Corvallis, OR 97330-3538
P.O. Box 428, Corvallis, OR 97339-0428
Tel 541.752.4271 Fax 541.752.0276

APPENDIX B
REFERENCE TOXICANT DATA SHEETS

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

FHM 1035

Client Ref Tox - November Date Initiated 11-5-02 Time 1430

Sample Description NaCl - 50 g/L STOCK 15003-9 Date Terminated 11-12-02 Time 1300

Technician: Day 0 BW Day 1 BW Day 2 BW Day 3 BW Day 4 BW Day 5 BW Day 6 BW Day 7 DW

Time Day 0 1430 Day 1 1015 Day 2 1455 Day 3 1340 Day 4 1330 Day 5 1330 Day 6 1426 Day 7 1300

Concentration or g/L Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
Control	0	10	10	10	10		8.0		7.8	24.6	292
	1	10	10	10	10	7.6	8.0	7.6	8.1	24.5	310
	2	10	10	10	10	7.3	8.2	7.5	8.2	24.5	301
	3	10	10	10	10	7.7	8.2	7.7	8.3	24.6	302
	4	10	10	10	10	7.5	8.1	7.7	8.2	24.7	302
	5	10	10	10	10	7.5	8.1	7.7	8.2	24.8	306
	6	10	10	10	10	7.6	8.2	7.6	8.2	24.2	315
	7	10	10	10	10	6.9		7.5		24.3	-
0.3	0	10	10	10	10		8.1		7.4	24.5	745
	1	10	10	10	10	7.5	8.0	7.6	8.0	24.6	831
	2	10	10	10	10	7.3	8.2	7.5	8.1	24.6	847
	3	10	10	10	10	7.7	8.2	7.7	8.2	24.8	795
	4	10	10	10	10	7.5	8.1	7.7	8.1	24.7	819
	5	10	10	10	10	7.5	8.2	7.7	8.2	24.8	817
	6	10	10	10	10	7.6	8.2	7.6	8.1	24.3	871
	7	10	10	10	10	7.0		7.4		24.5	-
1.0	0	10	10	10	10		8.1		7.4	24.4	1635
	1	10	10	10	10	7.6	8.1	7.6	8.0	24.7	1684
	2	10	10	10	10	7.3	8.2	7.5	8.0	24.7	1702
	3	10	10	10	10	7.7	8.2	7.7	8.1	24.8	1715
	4	10	10	10	10	7.6	8.1	7.7	8.0	24.9	1742
	5	10	10	10	10	7.5	8.2	7.7	8.1	24.8	1749
	6	10	10	10	10	7.6	8.2	7.6	8.0	24.4	1741
	7	10	10	10	10	7.0		7.4		24.5	-
2.0	0	10	10	10	10		8.2		7.4	24.3	2760
	1	10	10	10	10	7.5	8.1	7.6	7.9	24.8	2760
	2	10	10	10	10	7.3	8.2	7.5	8.0	24.4	2790
	3	10	10	10	10	7.7	8.2	7.7	8.0	24.7	2780
	4	10	10	10	10	7.6	8.1	7.6	8.0	24.7	2860
	5	10	10	10	10	7.6	8.2	7.7	8.0	24.7	2840
	6	10	10	10	8	7.7	8.2	7.7	8.0	24.2	2840
	7	10	10	10	8	6.9		7.4		24.6	-
4.0	0	10	10	10	10		8.2		7.7	24.4	4240
	1	10	10	10	10	7.5	8.1	7.5	7.8	24.6	4280
	2	10	9	10	10	7.4	8.1	7.5	7.9	24.7	4290
	3	10	9	9	10	7.7	8.2	7.6	7.9	24.7	4250
	4	10	7	9	10	7.7	8.0	7.6	7.9	24.6	4320
	5	10	7	6	6	7.6	8.2	7.6	7.9	24.9	4310
	6	8	7	5	5	7.7	8.2	7.7	7.9	24.4	4330
	7	8	7	5	5	7.1		7.6		24.4	-
8.0	0	10	10	10	10		8.2		7.6	24.5	5980
	1	9	10	10	10	7.5	8.1	7.5	7.7	24.6	5900
	2	9	10	10	9	7.4	8.1	7.4	7.8	24.4	5810
	3	9	10	10	9	7.8	8.3	7.7	7.8	24.8	~~6060~~ 6010
	4	3	6	7	7	7.6	8.0	7.5	7.7	24.7	6070
	5	0	0	0	2	7.6	8.2	7.6	7.8	24.8	6060
	6	1	1	1	0	7.7	8.2	7.6	7.8	24.2	6100
	7	1	1	1	1	-		-		-	-

Endpoint	IC25	Cusum Chart Limits	
Survival	3.2	1.75 to	4.51
Growth	3.0	1.44 to	3.56

Task Manager

Project Manager

QA Officer

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: QA/QC November Species ID# FHM 1035

Lab ID: na Start Date

Sample Description: NaCl

Technician: DW BM

Date: 11/12/2002 11/14/2002

Concentration or Percent	Replicate	Tare Weight (mg)	Total Weight (mg)	No. of Fish
Control	A	1040.39	1045.75	10
	B	1055.47	1061.36	10
	C	1047.69	1053.00	10
	D	1047.72	1052.70	10
0.3 g/L	A	1043.95	1048.98	10
	B	1055.05	1060.72	10
	C	1037.62	1043.38	10
	D	1051.84	1057.26	10
1.0 g/L	A	1053.79	1059.41	10
	B	1033.01	1038.71	10
	C	1029.65	1034.89	10
	D	1044.44	1048.96	10
2.0 g/L	A	1055.80	1061.44	10
	B	1043.06	1048.31	10
	C	1034.04	1039.12	10
	D	1045.73	1050.16	8
4.0 g/L	A	1053.52	1056.59	8
	B	1053.95	1056.50	7
	C	1032.75	1035.85	5
	D	1043.10	1046.19	5
8.0 g/L	A			0
	B			0
	C			0
	D			0

weigh to 0.01 mg

SCOEPA00027377

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	11/05/2002 14:30	Test ID:	rppc1035	Sample ID:	REFTOX-Reference Toxicant test
End Date:	11/12/2002 13:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

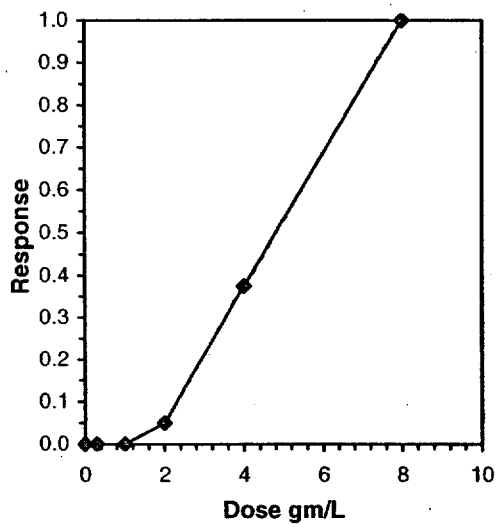
Conc-gm/L	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
0.3	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
2	1.0000	1.0000	1.0000	0.8000
4	0.8000	0.7000	0.5000	0.5000
8	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	1.0000	1.0000
0.3	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	1.0000	1.0000
1	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	1.0000	1.0000
2	0.9500	0.9500	1.3358	1.1071	1.4120	11.411	4	0.9500	0.9500
4	0.6250	0.6250	0.9173	0.7854	1.1071	17.385	4	0.6250	0.6250
8	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.82315	0.868	-0.6914	2.29516
Equality of variance cannot be confirmed				

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	2.0000	0.3202	0.9333	2.5333	-0.3885
IC10	2.3077	0.2579	1.2821	2.8821	-0.4330
IC15	2.6154	0.2517	1.6308	3.2308	-0.3751
IC20	2.9231	0.2519	2.1573	3.5843	0.0446
IC25	3.2308	0.2892	2.4615	4.1076	0.3087
IC40	4.1600	0.3449	3.1040	5.0074	-0.1357
IC50	4.8000	0.3499	3.5200	5.5062	-0.6164



SCOEPA00027378

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	11/05/2002 14:30	Test ID:	rppc1035	Sample ID:	REFTOX-Reference Toxicant test
End Date:	11/12/2002 13:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

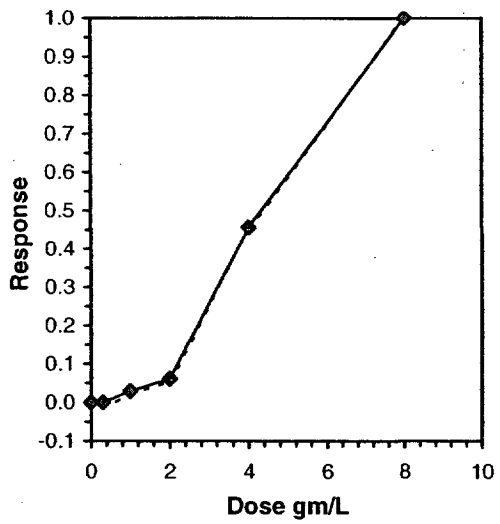
Conc-gm/L	1	2	3	4
LAB-Control	0.5360	0.5890	0.5310	0.4980
0.3	0.5030	0.5670	0.5760	0.5420
1	0.5620	0.5700	0.5240	0.4520
2	0.5640	0.5250	0.5080	0.4430
4	0.3070	0.2550	0.3100	0.3090
8	0.0000	0.0000	0.0000	0.0000

			Transform: Untransformed					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	0.5385	1.0000	0.5385	0.4980	0.5890	6.992	4	0.5428	1.0000
0.3	0.5470	1.0158	0.5470	0.5030	0.5760	5.973	4	0.5428	1.0000
1	0.5270	0.9786	0.5270	0.4520	0.5700	10.223	4	0.5270	0.9710
2	0.5100	0.9471	0.5100	0.4430	0.5640	9.891	4	0.5100	0.9397
4	0.2952	0.5483	0.2952	0.2550	0.3100	9.098	4	0.2952	0.5440
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	4	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94178	0.868	-0.5653	-0.3741
Bartlett's Test indicates equal variances (p = 0.78)	1.73481	13.2767		

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	1.6699	0.5929	0.0000	2.5451	-0.1724
IC10	2.2005	0.3580	0.0320	2.5933	-1.8830
IC15	2.4532	0.1834	1.7350	2.7995	-0.2309
IC20	2.7059	0.1585	2.1022	3.0058	-0.1693
IC25	2.9587	0.1369	2.4940	3.2325	-0.0826
IC40	3.7169	0.1091	3.3609	4.0606	-0.0618
IC50	4.3235	0.1564	3.7109	4.7566	-0.5803



SCOEPA00027379

APPENDIX C
CHAIN OF CUSTODY

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Reference Toxicant Test Data Summary

Client QA/QC – November Test Start Date 11-20-2002

Sample Description 50 g/L NaCl (1B008-01) Sample ID# —

Ceriodaphnia Lot# Cd 1491 Statistician Sm

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	37	13	34	25	33	35	30	17	9	18	10	251
0.25 g/L	20	5	32	28	31	32	34	29	16	19	10	246
0.5 g/L	21	28	3	26	32	27	28	0	12	17	10	194
1.0 g/L	15	1/AD	3/AD	3/AD	3/AD	6	2	7	5	9	6	54
1.5 g/L	0/AD	0/AD	1	0/AD	0/AD	3	1	0/AD	0/AD	0/AD	3	5
2.0 g/L	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0	0	0/AD	3	0
4.0 g/L	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Endpoint	IC25	Cusum Chart Limits	
Survival	0.81	0.52 to 2.42	Task Manager Doug Winn
Reproduction	0.52	0.14 to 0.96	Project Manager
			QA Officer

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client QA/QC - November Test Beginning : Date 11-20-02 Time 1500

Sample Description NaCl - 50 g/L 18008-04 Test Ending : Date 11-26-02 Time 0810

Ceriodaphnia Lot# Cd 1491 Dilution Water Recon MH (FHM) ID# 22087

Technician Day 1 DW Day 2 DW Day 3 DW Day 4 DW Day 5 DW Day 6 DW Day 7 ____

Time Day 1 1000 Day 2 0830 Day 3 1145 Day 4 1115 Day 5 0910 Day 6 0810 Day 7 ____

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	5	4	5	6	5	5	5	0	0	0	10	35
	4	0	6	0	0	0	14	0	6	1	6	10	33
	5	15	3	13	7	10	0	13	11	8	12	10	92
	6	17	0	16	12	18	16	12	0	0	0	10	91
	7												
0.25 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	6	0	5	5	4	5	5	0	0	0	10	30
	4	0	1	0	0	0	0	0	5	5	6	10	17
	5	3	4	9	10	10	12	10	9	11	0	10	78
	6	11	0	18	13	17	15	19	15	0	13	10	121
	7												
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	5	0	3	4	5	4	4	0	0	0	10	25
	4	6	0	0	7	6	10	0	0	5	4	10	38
	5	10	9	0	0	0	0	9	0	0	8	10	36
	6	0	19	0	15	21	13	15	0	7	5	10	95
	7												
1.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	3	2	2	0	0	0	10	7
	4	5	1	3 AD	3 AD	0	4	0	0	5	3	8	24
	5	10	%AD	|	|	%AD	0	0	0	0	0	6 10 DW	10
	6	0	↓	↓	↓	↓	0	0	7	0	6	6	DW 7 13
	7												
1.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	%AD	%AD	0	0	%AD	0	0	7	0
	3	0	0	0	|	|	0	0	|	0	0	7	0
	4	0	0	1	|	|	3	1	|	0	0	7	5
	5	%AD	%AD	0	|	|	0	0	|	%AD	%AD	3	0
	6	↓	↓	0	↓	↓	0	0	↓	↓	↓	3	0
	7												
2.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	%AD	0	0	%AD	0	0	0	0	0	%AD	7	0
	3	|	0	0	|	0	0	0	0	0	|	7	0
	4	|	0	0 AD	|	0	0	0	0	0	|	6	0
	5	|	%AD	|	|	%AD	%AD	0	0	0	|	3	0
	6	|	↓	|	|	↓	↓	0	0	0	|	3	0
	7	↓	↓	↓	↓	↓	↓				↓		
4.0 g/L	1	%AD	%AD	%AD	%AD	%AD	%AD	%AD	%AD	%AD	%AD	0	0
	2												
	3												

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client: QA / QC - November
Initiated Date: 11-20-02 Time: 1500
Adults Isolated Date: 11-19-02 Time: 0815
Sample Description: NaCl Reagent Log #: 18008-04
Terminated Date: 11-26-02 Time: 0810
Neo's Collected Date: 11-19-02 Time: 1600

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	DW	DW	DW	DW	(DP)	DW	DW	
Time	1500	1000	0830	1145	1220	0910	0810	

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	8.1	7.9 / 8.1	8.0 / 8.1	7.9 / 8.0	7.9 / 8.0	7.8 / 8.1	7.9 / -	
0.25 g/L	8.0	7.9 / 8.1	8.0 / 8.1	7.9 / 8.0	7.9 / 8.1	7.8 / 8.1	7.9 / -	
0.50 g/L	8.0	7.9 / 8.1	8.0 / 8.1	7.9 / 8.1	7.9 / 8.1	7.8 / 8.1	7.9 / -	
1.0 g/L	7.9	7.9 / 8.1	8.0 / 8.1	7.9 / 8.1	7.9 / 8.1	7.8 / 8.1	7.9 / -	
1.5 g/L	7.8	7.9 / 8.1	8.0 / 8.1	7.9 / 8.1	7.9 / 8.1	7.8 / 8.1	7.9 / -	
2.0 g/L	7.8	7.9 / 8.0	8.0 / 8.1	7.8 / 8.0	7.9 / 8.1	7.8 / 8.0	7.8 / -	
4.0 g/L	7.8	8.0 / -						

Percent or Concentration	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.6	7.8 / 7.6	7.9 / 7.9	7.7 / 7.8	7.7 / 7.8	7.9 / 7.8	7.9 / -	
0.25 g/L	7.6	7.8 / 7.7	7.9 / 7.8	7.7 / 7.8	7.7 / 7.8	7.9 / 7.8	7.9 / -	
0.50 g/L	7.6	7.8 / 7.7	7.9 / 7.8	7.7 / 7.8	7.7 / 7.8	7.9 / 7.8	7.9 / -	
1.0 g/L	7.6	7.8 / 7.7	7.9 / 7.8	7.7 / 7.8	7.7 / 7.8	7.8 / 7.8	7.9 / -	
1.5 g/L	7.6	7.8 / 7.7	7.9 / 7.8	7.8 / 7.7	7.8 / 7.8	7.8 / 7.7	7.8 / -	
2.0 g/L	7.6	7.9 / 7.7	7.9 / 7.8	7.8 / 7.7	7.8 / 7.7	7.7 / 7.7	7.8 / -	
4.0 g/L	7.6	7.9 / -						

Percent or Concentration	Temperature (C) / Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	24.7 / 281	24.1 / 290	25.2 / 291	24.7 / 288	24.8 / 351	25.1 / 307	24.4 / -	
0.25 g/L	24.9 / 713	24.3 / 702	24.8 / 706	24.6 / 705	24.9 / 844	24.6 / 826	24.9 / -	
0.50 g/L	25.1 / 1088	24.4 / 1074	25.1 / 1070	25.2 / 1071	25.0 / 1121	24.7 / 1063	24.5 / -	
1.0 g/L	24.8 / 1732	24.0 / 1732	24.9 / 1726	25.0 / 1717	24.8 / 1865	24.9 / 1792	25.0 / -	
1.5 g/L	25.1 / 2250	24.6 / 2270	24.8 / 2260	24.8 / 2270	24.7 / 2390	24.7 / 2310	24.5 / -	
2.0 g/L	24.9 / 2770	24.2 / 2740	25.1 / 2720	25.0 / 2760	24.9 / 2940	24.5 / 2880	24.6 / -	
4.0 g/L	25.2 / 4230	24.4 / -						

COMMENTS:

SCOEPA00027383

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	11/20/2002 15:00	Test ID:	rcdc1491	Sample ID:	REFTOX-Reference Toxicant test
End Date:	11/26/2002 08:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

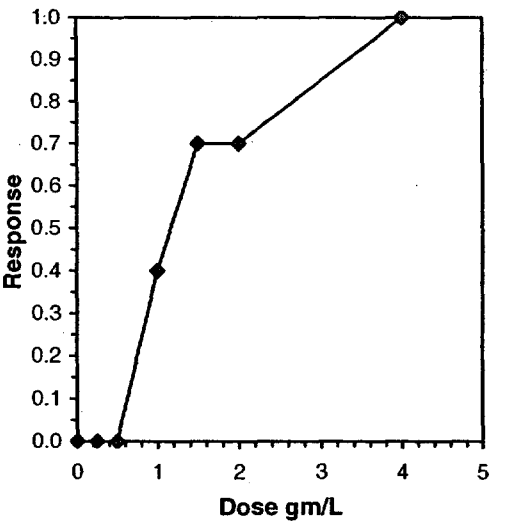
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
0.25	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
0.5	1.0000	1.0000	1.0472	1.0472	1.0472	0.000	10	1.0000	1.0000
1	0.6000	0.6000	0.8378	0.5236	1.0472	32.275	10	0.6000	0.6000
1.5	0.3000	0.3000	0.6807	0.5236	1.0472	37.157	10	0.3000	0.3000
2	0.3000	0.3000	0.6807	0.5236	1.0472	37.157	10	0.3000	0.3000
4	0.0000	0.0000	0.5236	0.5236	0.5236	0.000	10	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	2.35371	1.035	0.56236	0.17905
Equality of variance cannot be confirmed				

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	0.5625	0.0425	0.5384	0.7500	2.5444
IC10	0.6250	0.0849	0.5768	1.0000	2.5444
IC15	0.6875	0.0997	0.6152	1.0419	1.4667
IC20	0.7500	0.1184	0.6536	1.0838	0.9727
IC25	0.8125	0.1250	0.6920	1.1256	0.6610
IC40	1.0000	0.1588	0.8071	1.3781	0.5814
IC50	1.1667	0.2660	0.8839	2.0045	1.5567



SCOEPA00027384

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	11/20/2002 15:00	Test ID:	rcdc1491	Sample ID:	REFTOX-Reference Toxicant test
End Date:	11/26/2002 08:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

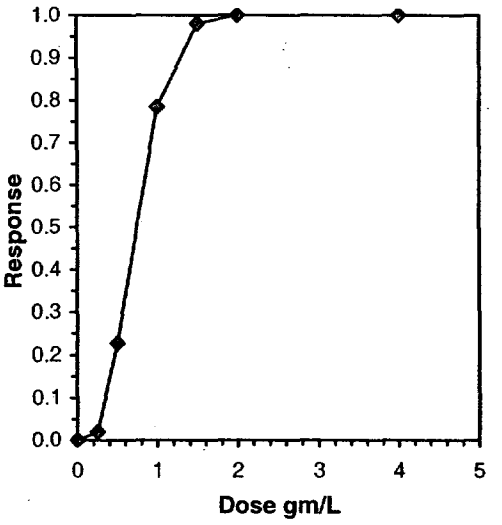
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	37.000	13.000	34.000	25.000	33.000	35.000	30.000	17.000	9.000	18.000
0.25	20.000	5.000	32.000	28.000	31.000	32.000	34.000	29.000	16.000	19.000
0.5	21.000	28.000	3.000	26.000	32.000	27.000	28.000	0.000	12.000	17.000
1	15.000	1.000	3.000	3.000	3.000	6.000	2.000	7.000	5.000	9.000
1.5	0.000	0.000	1.000	0.000	0.000	3.000	1.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	25.100	1.0000	25.1000	9.0000	37.0000	40.432	10	25.100	1.0000
0.25	24.600	0.9801	24.6000	5.0000	34.0000	37.853	10	24.600	0.9801
0.5	19.400	0.7729	19.4000	0.0000	32.0000	57.410	10	19.400	0.7729
1	5.400	0.2151	5.4000	1.0000	15.0000	77.198	10	5.400	0.2151
1.5	0.500	0.0199	0.5000	0.0000	3.0000	194.365	10	0.500	0.0199
2	0.000	0.0000	0.0000	0.0000	0.0000	0.000	10	0.000	0.0000
4	0.000	0.0000	0.0000	0.0000	0.0000	0.000	10	0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93429	0.93	-0.7416	0.36697
Bartlett's Test indicates unequal variances (p = 2.04E-07)	36.7396	13.2767		

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	0.2863	0.1174	0.0422	0.5112	0.0680
IC10	0.3466	0.1155	0.0843	0.5473	-0.0904
IC15	0.4070	0.1158	0.1265	0.5793	-0.1736
IC20	0.4673	0.1131	0.1687	0.6113	-0.3647
IC25	0.5205	0.1093	0.2108	0.6433	-0.5204
IC40	0.6550	0.0927	0.4315	0.7455	-0.4154
IC50	0.7446	0.0896	0.5027	0.8411	-0.7869



SCOEPA00027385

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic
Address 7200 N.W. Front Ave
Portland, OR 97210
Contact Person: Tom Rothschild
Phone: 503-219-7374

NPDES# 101128
Composite Sample Information
Samples/Hour 1/hr Volume/Sample 6L/hr
Total Hours 24 Total Volume 144L
Initiated: Date 10/31/02 Time 0800
Ended: Date 11/1/02 Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160
P. O.#

Check Chlorine (Y/N)
Temp. Upon Arrival (°C) 1.3°C
Check Ammonia (Y/N) Dechlorinate (Y/N)

CH2M HILL Project #

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste	Concentrations and/or Comments
02-145	11/4/02	0800	X	~~X~~	1	4146-01	X	X	X	X											Conc. used: 1.9%
																					3.75%, 7.5%, 15%
																					30%
																					Test for:
																					Ammonia-Nitrate
																					Alkalinity
																					Nitrate Nitrogen
																					Hydrogen Peroxide

Sampled By & Title (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 4 Nov 2002 0800	Relinquished By (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 4 Nov 2002 0920
Received By (Please sign and print name) Tammy Elston	Date/Time Nov 4, 09:20	Relinquished By (Please sign and print name)	Date/Time 09:50 Nov 4 2002
Received By (Please sign and print name) Kim Davis	Date/Time 11/4/02 1000	Relinquished By (Please sign and print name) Kim Davis 1000	Date/Time 11/4/02 1000
Received By (Please sign and print name) Brett Markey	Date/Time 11/5/02 1045	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks The dates listed as above were in error. Diane Irish called on 11-5-02 and asked these numbers be corrected by Chem Hill. Done By Brett Markey 11-5-02 7.1°C.		

Rev. 10/97

SCOEPA00027386

SUBCONTRACT ORDER

North Creek Analytical - Portland

P2K0050

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Brian Cone

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P2K0050-01	**Water**	**Sampled: 11/04/02 08:00**		
Subcontract Outside	11/18/02 17:00	05/03/03 08:00		Bioassay
Containers Supplied:				
Other (A)				

Released By	Date	Received By	Date
	11-4-02		11-5-02 1455
Released By	Date	Received By	Date

SCOEPA00027387

SUBCONTRACT ORDER

North Creek Analytical - Portland

P2K0250

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Brian Cone

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P2K0250-01	**Water**	**Sampled: 11/08/02 12:00**		
Subcontract Outside	11/22/02 17:00	05/07/03 12:00		Bioassay
Containers Supplied:				
Other (A)				

4°C on arrival

Released By	Date	Received By	Date
Aaron Passey	11-8-02	Brett Mackey	11-9-02
Released By	Date	Received By	Date

SCOEPA00027388

SPACE AVAILABLE

PREPAID

Pcs: 1 of 1

GPX

06NOV02 12:58P ** ORIGIN **

GLI 300-684-717-3

Schd: GLI 6537

From:
PORTLAND, OR

To:
CORVALLIS, OR

EXPRESS $ 31.40
VALUE $ = 0

SUBCONTRACT ORDER

North Creek Analytical - Portland

P2K0143

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Brian Cone

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P2K0143-01	**Water**	**Sampled: 11/06/02 07:45**		
Subcontract Outside	11/20/02 17:00	05/05/03 07:45		Bioassay
Containers Supplied:				
Other (C)				

5°C on arrival

Released By	Date	Received By	Date
Sarah Massey	11-6-02	Brett Mackey	11-7-02 1210
Released By	Date	Received By	Date

SCOEPA00027390

SPACE AVAILABLE
PREPAID

Pcs: 1 of 1

GPX

08NOV02 12:15P ** LABEL ** GLI 300-689-258-1

Schd: GLI 6537

CORVALLIS, OR 97330

From:
North Creek Analytical
(206) 481-9200

MIKE STANAWAY
2300 Nw Walnut
Corvallis, OR 97330
(541) 758-0235

Manual Wght:
70.5 LB
Tariff Wght:
71.0 LB

1-800-739-5020 WWW.SHIPGREYHOUND.COM

SPACE AVAILABLE
PREPAID

Pcs: 1 of 1

GPX

08NOV02 12:15P ** ORIGIN **

GLI 300-689-258-1

Schd: GLI 6537

From:
PORTLAND, OR

To:
CORVALLIS, OR

EXPRESS $ 30.30
VALUE $ = 0

CH2M

Client
Sample Descrip
Technician
Time

Date Time
Date Time
Day 7
Day 7

Percent or Concentration	uctivity (µmhos/cm) Day 3	4	5	6	7
Control					
1					
3					
10					
30					
100					

COMMENTS:

AQUATIC TOXICOLOGY REPORT:

CHRONIC DEFINITIVE
BIOASSAYS CONDUCTED
October 8 through October 15, 2002
MXA21007T

Ceriodaphnia dubia
Pimephales promelas

Prepared for:

WACKER SILTRONIC CORPORATION
7200 NW Front Ave.
Portland, OR 97210

Prepared by:

COFFEY LABORATORIES, INC.
12423 NE Whitaker Way
Portland, OR 97230

October 23, 2002

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NOEC ≥ 13.4 %
Chronic ≥ 1.8 %

ANALYTICAL NARRATIVE

Mr. Thomas J. Rothschild
Wacker Siltronic
7200 NW Front Ave
Portland, OR 97210

October 23, 2002
Job #: MXA21007T

Re: Statistical Analysis - Toxicity Tests

Coffey Laboratories, Inc. has completed the statistical analysis of the data collected from dual endpoint toxicity tests which were conducted from 10/8/02 through 10/15/02 on effluent provided by Wacker, Inc. The enclosed report includes a summary of the *Ceriodaphnia dubia* and Fathead Minnow tests and results, along with the raw data and statistical summaries for the effluent and reference toxicant.

In summary of the results, hypothesis tests method showed a statistically significant reduction in survival of both the Fathead Minnow and *Ceriodaphnia dubia* at <1.9 percent effluent and >30 percent effluent concentration, respectively. Therefore, the No-Observed-Effect-Concentration (NOEC) was at the <1.9 percent effluent concentration for Fathead Minnows and 30 percent effluent concentration for *Ceriodaphnia dubia*. The LC_{50}, the concentration of effluent estimated to kill 50 percent of the test organisms, for both Fathead Minnow and *Ceirodaphnia* was >30 percent effluent. *Ceirodaphnia* reproduction tests showed statistically significant reductions at <1.9 percent effluent concentrations, yielding a NOEC of <1.9 percent. Statistically significant reductions in Fathead Minnow growth at 30 percent effluent concentration yielded a NOEC of 15 percent effluent concentration. In addition, the chronic IC_{25} values (an estimate of the effluent concentration causing a 25 percent reduction in biological growth) for Fathead Minnow growth and *Ceriodaphnia dubia* reproduction were 24.4 percent effluent and <1.9 percent effluent, respectively.

Chronic

Acute data was derived from the chronic test data in the Fathead Minnow tests. Data from the Fathead Minnow 96-hour acute test showed a statistically significant reduction in survival at the 30 percent effluent concentration. In the separate 48-hour acute test performed for the *Ceriodaphnia dubia* a statistically significant difference was found at the 15 percent effluent concentration. Thus, the acute NOEC values for *Ceriodaphnia dubia* and Fathead Minnow survival were 15 percent effluent and 7.5 percent effluent, respectively.

Acute

Coffey Laboratories' Aquatic Toxicology Department is accredited by the Washington State Department of Ecology which demonstrates the high priority we place on Quality Assurance. It is our goal to meet all of your needs by offering the highest quality services in the most efficient manner possible. If you would like further assistance, or should you have other questions regarding Aquatic testing, please feel free to contact Peter at (503) 254-1794. We look forward to working with you in the future to ensure the health of our Northwest waterways.

Sincerely,
COFFEY LABORATORIES, INC.

Peter Farrelly
Aquatic Biologist

Approved by,

Ragheda Kaady
Quality Assurance

SCOEPA00027394

INTRODUCTION

Coffey Laboratories, Inc. conducted two chronic and two acute definitive bioassay tests using the water flea (Ceriodaphnia dubia) and the Fathead Minnow (Pimephales promelas) on samples provided by Wacker Siltronic The tests were conducted from October 8 through October 15, 2002.

METHODS AND MATERIALS

Test Methods: The chronic test methods were performed according to Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Lewis, P.A. *et al.*; EPA/600/4-91/002 (1994). The acute Fathead Minnow test results were derived from the chronic data and were analyzed according to *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* Weber, C.I. *et al.*; EPA/600/4-90/027F (1993). The *Ceriodaphnia dubia* acute 48-hour survival test was performed in a separate test and not derived from the chronic test.

Test Organisms: The Ceriodaphnia dubia used in the chronic test were obtained from Coffey Laboratories, Inc. in-house cultures and were less than 24 hours old and within an 8-hour age range at test initiation. The Fathead Minnows used in the chronic test were obtained from Aquatic Biosystems, Inc., Ft. Collins, CO (See Appendix D) and were 24 - 36 hours old at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA/600/4-91/002 (1994). The test organisms appeared vigorous and in good condition prior to testing.

Dilution Water: The dilution water used for the Fathead Minnow and *Ceriodaphnia dubia* tests was reconstituted moderately hard water (EPA/600/4-91/002) with a total hardness and alkalinity of 61 and 96 mg/L as $CaCO_3$, respectively.

Test Concentrations: The concentrations tested in the chronic tests were 1.9, 3.75, 7.5, 15, and 30 percent effluent and dilution water alone for the control. Ten fish were placed in each of four replicates per concentration for the Fathead Minnow chronic test. For the chronic Ceriodaphnia test, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel. The concentrations tested in the acute tests were the same as in the chronic tests. Five organisms were placed in each of four replicates per concentration for the Ceriodaphnia acute test

Sample Collection: Samples were collected by Wacker Siltronic personnel on October 6, 8, and 10, 2002 (See Chain-of-Custody). The samples were picked up by Coffey Laboratories personnel and transported to the laboratory. Samples were stored in the dark at 4° C until test solutions were prepared.

SCOEPA00027395

Sample Preparation: The samples used during the chronic tests were diluted and temperature adjusted prior to each daily renewal. Acute tests were static and were not renewed.

Monitoring of Bioassays: Pre- and post-renewal solutions were monitored for dissolved oxygen daily in each concentration, as well as for pH in the control and 100 percent effluent concentration. Additionally, the pH was measured in all the post-renewal solutions of every concentration. Conductivity, alkalinity, and hardness were measured in each new sample (100 percent effluent) and in the control. Ceriodaphnia dubia survival and neonate production was monitored daily in the chronic test. According to EPA/600/4-91/002 (1994), Ceriodaphnia dubia tests should be terminated when 60 percent or more of the surviving female Ceriodaphnia in the controls have produced their third brood and at least 15 neonates per adult. In addition, control organism survival must be equal to or greater than 80 percent. Fathead Minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the Fathead Minnow chronic test. Temperature was monitored continuously throughout the 7-day period.

Data Analysis: All statistical analyses were performed using WEST, Inc. computer package, Toxstat, Version 3.5. This program utilizes, among others, Dunnett's, Steel's Many One Rank Sum, and Wilcoxon's Rank Sum Analyses for the hypothesis endpoint estimates, and Probit, Spearman-Karber, and Linear Interpolation methods for point estimates.

The effect measured for acute tests is survival over the exposure period. The effects measured for Ceriodaphnia dubia chronic tests are survival and reproduction over the 7-day exposure period. The effects measured for Fathead Minnow chronic tests are survival and growth over the 7-day exposure period. The statistical analyses performed are those outlined in Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA/600/4-91/002, and *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms,* EPA/600/4-90/027F. Dunnett's, T-test with Bonferroni Adjustment, Steel's Many-One Rank Sum, or Wilcoxon Rank Sum Tests are used to determine the No-Observed-Effect-Concentration (NOEC) and the Lowest-Observed-Effect-Concentration (LOEC) when analyzing the survival and growth data of the Fathead Minnow, as well as the reproduction data of the *Ceriodaphnia dubia*. Fisher's Exact Test or Steel's Many-One Rank Sum Test is used to analyze the survival data of the *Ceriodaphnia dubia* tests. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test with Bonferroni Adjustment cannot be met, Steel's Many-One Rank Sum Test or Wilcoxon Rank Sum with Bonferroni Adjustment is used to analyze the data. In addition, the Linear Interpolation method is used to determine the chronic IC_{25} values (the concentration of effluent causing a 25 percent reduction in biological growth) for the Fathead Minnow growth data and the *Ceriodaphnia dubia* reproduction data.

SCOEPA00027396

RESULTS AND DISCUSSION

Chronic Bioassays:

Table 1 summarizes the survival and growth data for the Fathead Minnow test conducted.

Table 1
Fathead Minnow Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight per Fish (mg)
Control	100	0.549
1.9	85 *	0.421 *
3.75	90	0.446
7.5	82.5 *	0.492
15	87.5 *	0.533
30	70 *	0.375 *

* Indicates a statistically significant reduction from control at $p \leq$ to 0.05 using Steel's Many-One Rank Test.

Results using Steel's Many-One Rank Test showed a statistically significant reduction in survival when compared to the control at the 1.9 percent effluent concentration. Dunnett's Test showed a statistically significant difference in growth of Fathead Minnows at the 30 percent effluent concentration (the significant difference observed at the 1.9 percent concentration has been identified as an anomalous result). Therefore, the NOEC values for survival and growth were <1.9 percent effluent and 30 percent effluent, respectively. Control survival was 100 percent.

The chronic LC_{50} value (an estimate of the effluent concentration which is lethal to 50 percent of the test organisms) for Fathead Minnow survival was >30 percent effluent. The chronic IC_{25} value for Fathead Minnow growth was 24.4 percent effluent.

The dissolved oxygen levels remained above 40 percent saturation throughout the tests. Test temperatures were steady at 25±1°C. The tests proceeded without interruption or incident that could have affected test results.

RESULTS AND DISCUSSION (Cont.)

Chronic Bioassays (Cont.):

Table 2 summarizes the survival and reproduction data for the Ceriodaphnia dubia test.

Table 2
Ceriodaphnia dubia Results

Concentration (%)	Percent Survival	Number of Young per Adult
Control	80	24.5
1.9	80	1.2*
3.75	40	1.7*
7.5	70	0.1*
15	80	0.6*
30	40	0.3*

* Indicates a statistically significant reduction from control at $p \leq$ to 0.05 using Fisher's Exact Test or Steel's Many One Rank Test.

Results using Fisher's Exact Test showed no statistically significant reduction in survival when compared to the control at any effluent concentration. Steel's Many One Rank Test showed reduction in reproduction when compared to the controls at every effluent concentration. Therefore, the NOEC values for survival and reproduction were 30 percent and <1.9 percent effluent, respectively. Control survival was 80 percent.

The chronic LC_{50} value for *Ceriodaphnia dubia* survival was >30 percent effluent. The chronic IC_{25} value for *Ceriodaphnia dubia* reproduction was 0.5 percent effluent.

The dissolved oxygen levels in the tests remained above 40 percent saturation throughout the test. Test temperatures were steady at 25±1°C. The tests proceeded without interruption or incident that could have affected test results.

RESULTS AND DISCUSSION (Cont.)

Acute Results:

Table 3 summarizes the survival data for the acute screening tests using the Fathead Minnow and the Ceriodaphnia dubia.

Table 3
Summary of Acute Results

Species	Concentration (%)	Percent Survival		
		0 Hour	24 Hours	96/48 Hours
Fathead Minnow (96 Hours)	Control	100	100	100
	100	100	92.5	75*
Ceriodaphnia dubia (48 Hours)	Control	100	90	80
	100	100	50	25*

* Indicates a statistically significant reduction from the control at $p \leq 0.05$ using Steel's Many One Rank Test or Wilcoxon's Rank-Sum Test.

Dual-endpoint testing allows the acute test results to be derived from the chronic Fathead Minnow test data. In the Fathead Minnow 96-hour acute test, Steel's Many One Rank Test showed a statistically significant reduction in survival between the control organisms and those in the 30 percent effluent concentrations. Steel's Many One Rank Test showed a significant reduction in survival between the control organisms and those in the 30 percent effluent concentrations in the *Ceriodaphnia dubia* 48-hour acute test. Further analysis reveals acute NOEC values for Fathead Minnow and *Ceriodaphnia dubia* survival were 15 percent effluent and 7.5 percent effluent, respectively.

RESULTS AND DISCUSSION (Cont.)

Reference Toxicant Tests:

Tables 4 & 5 summarize the results from the *Ceriodaphnia dubia* and the Fathead Minnow chronic and acute reference toxicant tests conducted in October.

Table 4
Chronic Reference Toxicant Tests with Sodium Chloride

Species (test)	Point Estimates	95% C.I.
Pimephales promelas (survival - LC_{50})	2.8 %	2.38 - 3.22 %
Pimephales promelas (growth - IC_{25})	1.68 %	0.17 - 2.11 %
Ceriodaphnia dubia (survival - LC_{50})	3.85 %	---
Ceriodaphnia dubia (reproduction - IC_{25})	0.38 %	---

Table 5
Acute Reference Toxicant Tests

Species	LC_{50}	95% C.I.
Pimephales promelas	4.9 %	---
Ceriodaphnia dubia	4.5 %	---

The results of the reference toxicant tests with sodium chloride (*Ceriodaphnia dubia* and Fathead Minnow) conducted in October indicate that the test organisms were within their respective sensitivity range based on EPA guidelines (EPA/600/4-91/002, 1994). The chronic IC_{25} values, as well as the LC_{50} values and the respective 95 percent confidence intervals are listed in the Tables above. The data sheets for the reference toxicant tests are provided in Appendix B.

WATER QUALITY PARAMETERS

Lab Sample ID: A21007T-1
Field ID: 02-125
Date/Time: 10/07/02 0800
Matrix: Waste Water

EPA Category: Inorganic Chemicals

Parameter	Method	Detection Limit	Analytical Result	Units
Ammonia Nitrogen	sm4500nh3bc	1.	ND	mg/L
Ammonia Nitrogen	sm4500nh3bc	1.	1.	mg/L
Conductivity	EPA 120.1	0.5	960.	µmhos/cm
Nitrate	EPA 300.0	0.1	29.	mg/L
Alkalinity	EPA 310.1	5.	18.	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Total Hardness	SM 2340-B	2.	170.	mg/L
Calcium	EPA 200.7	0.5	65.	mg/L
Magnesium	EPA 200.7	0.5	1.8	mg/L
Hydrogen Peroxide	Scott Method	0.5	9.6	mg/L

ND means none detected at or above the detection limit listed.

WATER QUALITY PARAMETERS (cont.)

Lab Sample ID: A21007T-2
Field ID: 02-131
Date/Time: 10/09/02 0745
Matrix: Waste Water

EPA Category: Inorganic Chemicals

Parameter	Method	Detection Limit	Analytical Result	Units
Ammonia Nitrogen	sm4500nh3bc	1.	ND	mg/L
Ammonia Nitrogen	sm4500nh3bc	1.	ND	mg/L
Conductivity	EPA 120.1	0.5	1000.	µmhos/cm
Nitrate	EPA 300.0	0.1	44.	mg/L
Alkalinity	EPA 310.1	5.	15.	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Total Hardness	SM 2340-B	2.	220.	mg/L
Calcium	EPA 200.7	0.5	84.	mg/L
Magnesium	EPA 200.7	0.5	2.	mg/L
Hydrogen Peroxide	Scott Method	0.5	7.74	mg/L

ND means none detected at or above the detection limit listed.

* NITRATE (NITROGEN)

WATER QUALITY PARAMETERS (cont.)

Lab Sample ID: A21007T-3
Field ID: 02-132
Date/Time: 10/11/02 0730
Matrix: Waste Water

EPA Category: Inorganic Chemicals

Parameter	Method	Detection Limit	Analytical Result	Units
Ammonia Nitrogen	sm4500nh3bc	1.	1.	mg/L
Conductivity	EPA 120.1	0.5	950.	µmhos/cm
Nitrate	EPA 300.0	0.1	72.	mg/L
Alkalinity	EPA 310.1	5.	13.	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Total Hardness	SM 2340-B	2.	310.	mg/L
Calcium	EPA 200.7	0.5	120.	mg/L
Magnesium	EPA 200.7	0.5	2.4	mg/L
Hydrogen Peroxide	Scott Method	0.5	14.2	mg/L

ND means none detected at or above the detection limit listed.

Larval Fish Growth and Survival Test-96 Hr Survival

Start Date:	10/8/02	Test ID:	A21007T	Sample ID:	WACKER SIL
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

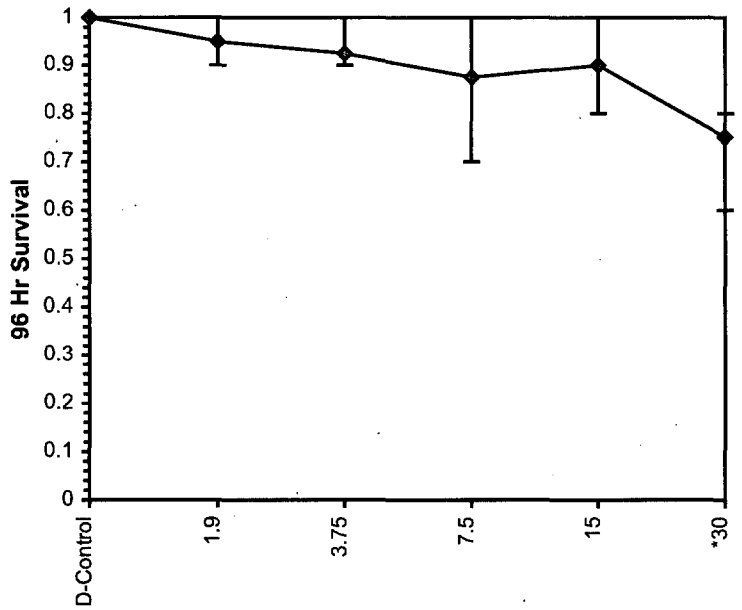
Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1.9	0.9000	1.0000	0.9000	1.0000
3.75	1.0000	0.9000	0.9000	0.9000
7.5	0.9000	0.7000	1.0000	0.9000
15	0.9000	0.9000	1.0000	0.8000
30	0.8000	0.6000	0.8000	0.8000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
1.9	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00
3.75	0.9250	0.9250	1.2898	1.2490	1.4120	6.318	4	12.00	10.00
7.5	0.8750	0.8750	1.2253	0.9912	1.4120	14.199	4	12.00	10.00
15	0.9000	0.9000	1.2543	1.1071	1.4120	9.935	4	12.00	10.00
*30	0.7500	0.7500	1.0519	0.8861	1.1071	10.508	4	10.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96931	0.884	-0.4041	0.55786
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	15	30	21.2132	6.66667

Dose-Response Plot



SCOEPA00027404

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	10/8/02	Test ID:	A21007T	Sample ID:	WACKER SIL
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas

Comments:

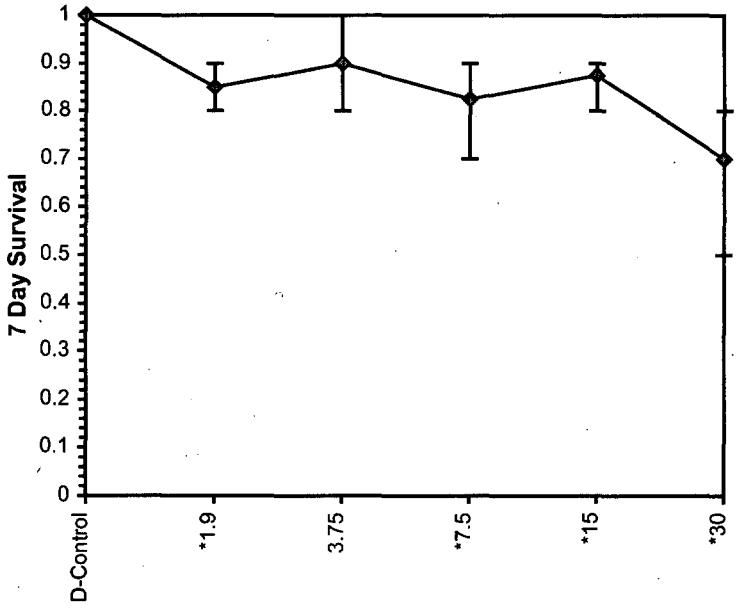
Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1.9	0.9000	0.8000	0.9000	0.8000
3.75	1.0000	0.9000	0.8000	0.9000
7.5	0.9000	0.7000	0.9000	0.8000
15	0.9000	0.9000	0.9000	0.8000
30	0.8000	0.5000	0.8000	0.7000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
*1.9	0.8500	0.8500	1.1781	1.1071	1.2490	6.954	4	10.00	10.00
3.75	0.9000	0.9000	1.2543	1.1071	1.4120	9.935	4	12.00	10.00
*7.5	0.8250	0.8250	1.1491	0.9912	1.2490	10.856	4	10.00	10.00
*15	0.8750	0.8750	1.2136	1.1071	1.2490	5.846	4	10.00	10.00
*30	0.7000	0.7000	0.9977	0.7854	1.1071	15.209	4	10.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95674	0.884	-0.5542	-0.0179
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	<1.9	1.9		

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:_____

SCOEPA00027405

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/8/02	Test ID:	A21007T	Sample ID:	WACKER SIL
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.5600	0.6300	0.5390	0.4670
1.9	0.4620	0.4390	0.4480	0.3330
3.75	0.4670	0.3800	0.4490	0.4860
7.5	0.5880	0.4160	0.4770	0.4880
15	0.5290	0.5670	0.5760	0.4610
30	0.5020	0.2560	0.4450	0.2980

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5490	1.0000	0.5490	0.4670	0.6300	12.222	4				0.5490	1.0000
*1.9	0.4205	0.7659	0.4205	0.3330	0.4620	14.054	4	2.502	2.410	0.1238	0.4729	0.8613
3.75	0.4455	0.8115	0.4455	0.3800	0.4860	10.372	4	2.015	2.410	0.1238	0.4729	0.8613
7.5	0.4922	0.8966	0.4922	0.4160	0.5880	14.476	4	1.105	2.410	0.1238	0.4729	0.8613
15	0.5333	0.9713	0.5333	0.4610	0.5760	9.807	4	0.307	2.410	0.1238	0.4729	0.8613
*30	0.3753	0.6835	0.3753	0.2560	0.5020	31.199	4	3.383	2.410	0.1238	0.3753	0.6835

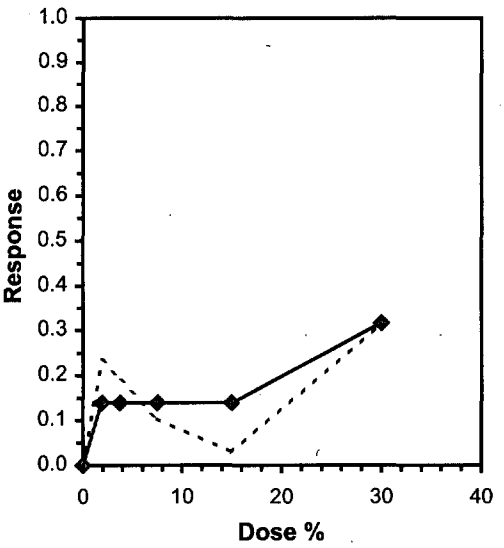
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96257	0.884	-0.0727	-0.6474
Bartlett's Test indicates equal variances (p = 0.67)	3.22715	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<1.9	1.9			0.12377	0.22544	0.01821	0.00527	0.02314	5, 18

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	0.685			
IC10*	1.370			
IC15	15.956			
IC20	20.174			
IC25	24.392			
IC40	>30			
IC50	>30			

* indicates IC estimate less than the lowest concentration

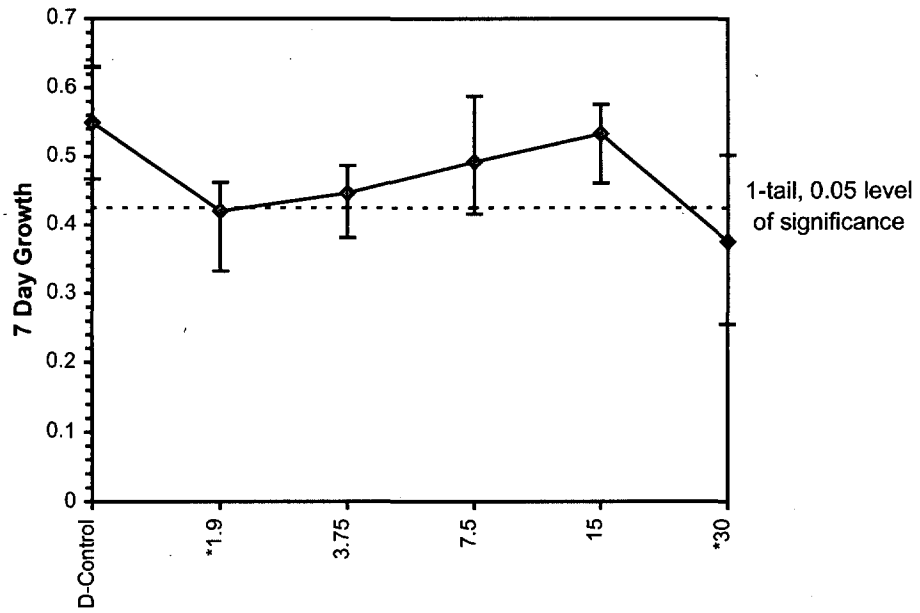


SCOEPA00027406

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/8/02	Test ID:	A21007T	Sample ID:	WACKER SIL
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



SCOEPA00027407

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	10/8/02	Test ID:	A21007T	Sample ID:	WACKER SIL
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	0.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000
3.75	1.0000	0.0000	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	0.0000
7.5	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
15	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	0.0000	1.0000	1.0000
30	1.0000	0.0000	0.0000	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	1.0000

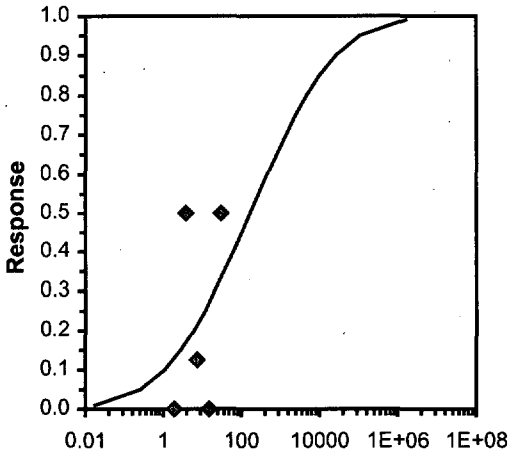
Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	0.8000	1.0000	2	8	10	10			2	10
1.9	0.8000	1.0000	2	8	10	10	0.7090	0.0500	2	10
3.75	0.4000	0.5000	6	4	10	10	0.0849	0.0500	6	10
7.5	0.7000	0.8750	3	7	10	10	0.5000	0.0500	3	10
15	0.8000	1.0000	2	8	10	10	0.7090	0.0500	2	10
30	0.4000	0.5000	6	4	10	10	0.0849	0.0500	6	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	30	>30		3.33333

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	0.58459	0.78145	-0.9471	2.11623	0.2	6.5407	7.81472	0.09	2.22376	1.7106	4
Intercept	3.70001	0.93629	1.86489	5.53514							
TSCR	0.20227	0.12668	-0.046	0.45056							

Point	Probits	%	95% Fiducial Limits
EC01	2.674	0.01755	
EC05	3.355	0.25708	
EC10	3.718	1.07532	
EC15	3.964	2.82381	
EC20	4.158	6.08249	
EC25	4.326	11.7483	
EC40	4.747	61.7139	
EC50	5.000	167.401	
EC60	5.253	454.081	
EC75	5.674	2385.28	
EC80	5.842	4607.17	
EC85	6.036	9923.85	
EC90	6.282	26060.3	
EC95	6.645	109004	
EC99	7.326	1596641	

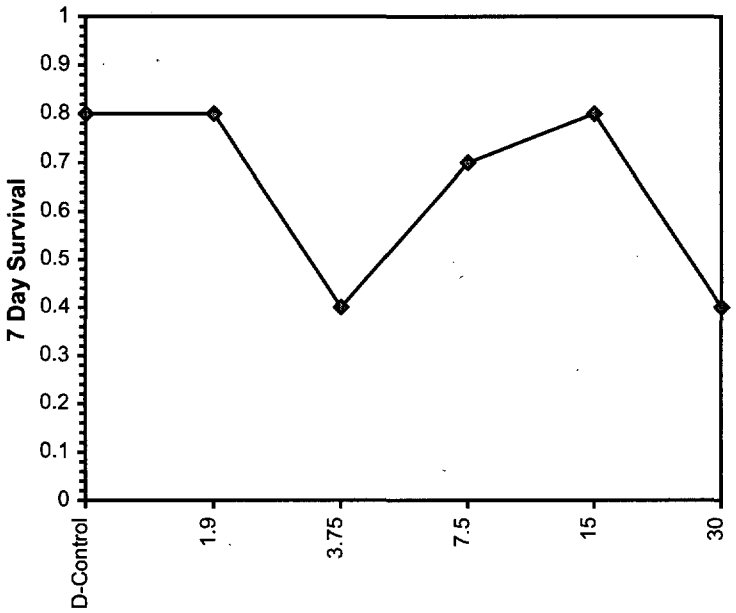


SCOEPA00027408

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	10/8/02	Test ID:	A21007T	Sample ID:	WACKER SIL
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027409

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/8/02	Test ID:	A21007T	Sample ID:	WACKER SIL
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	33.000	34.000	29.000	0.000	31.000	28.000	0.000	30.000	29.000
1.9	4.000	5.000	0.000	0.000	0.000	1.000	0.000	2.000	0.000	0.000
3.75	5.000	0.000	7.000	0.000	5.000	0.000	0.000	0.000	0.000	0.000
7.5	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000
15	1.000	0.000	1.000	1.000	0.000	2.000	1.000	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000	1.000	2.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	24.500	1.0000	24.5000	0.0000	34.0000	53.227	10			24.500	1.0000
*1.9	1.200	0.0490	1.2000	0.0000	5.0000	156.150	10	69.00	75.00	1.450	0.0592
*3.75	1.700	0.0694	1.7000	0.0000	7.0000	164.168	10	68.00	75.00	1.450	0.0592
*7.5	0.100	0.0041	0.1000	0.0000	1.0000	316.228	10	66.00	75.00	0.350	0.0143
*15	0.600	0.0245	0.6000	0.0000	2.0000	116.534	10	70.00	75.00	0.350	0.0143
*30	0.300	0.0122	0.3000	0.0000	2.0000	224.983	10	67.00	75.00	0.300	0.0122

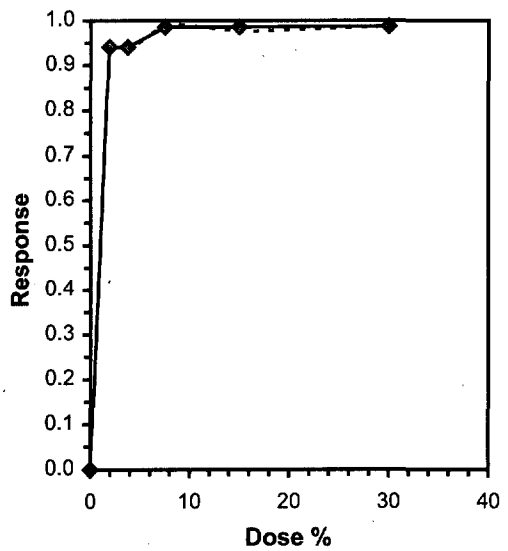
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	2.66977	1.035	-3.1944	14.7967
Bartlett's Test indicates unequal variances (p = 8.95E-28)	136.71	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	<1.9	1.9		

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05*	0.1010	0.0025	0.0979	0.1078	0.8996
IC10*	0.2020	0.0049	0.1958	0.2156	0.8996
IC15*	0.3029	0.0074	0.2936	0.3234	0.8996
IC20*	0.4039	0.0099	0.3915	0.4313	0.8996
IC25*	0.5049	0.0124	0.4894	0.5391	0.8996
IC40*	0.8078	0.0198	0.7830	0.8625	0.8996
IC50*	1.0098	0.0247	0.9788	1.0782	0.8996

* indicates IC estimate less than the lowest concentration

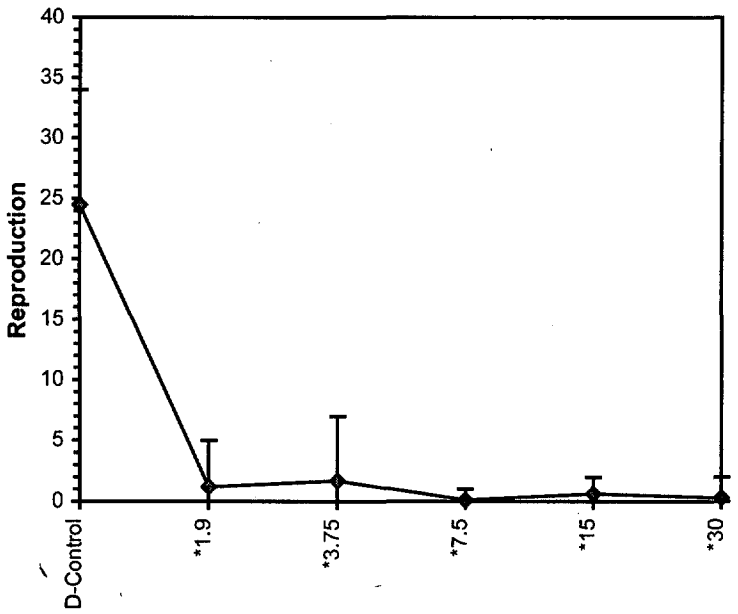


SCOEPA00027410

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/8/02	Test ID:	A21007T	Sample ID:	WACKER SIL
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027411

Acute Fish Test-48 Hr Survival

Start Date:	10/8/02	Test ID:	A21007Tca	Sample ID:	Wacker
End Date:	10/12/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:	Acute				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1.9	1.0000	1.0000	1.0000	1.0000
3.75	0.6000	1.0000	0.8000	1.0000
7.5	0.6000	1.0000	0.8000	1.0000
15	0.2000	0.8000	0.4000	0.2000
30	0.2000	0.2000	0.4000	0.2000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
1.9	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
3.75	0.8500	0.8500	1.1709	0.8861	1.3453	18.840	4	14.00	10.00	3	20
7.5	0.8500	0.8500	1.1709	0.8861	1.3453	18.840	4	14.00	10.00	3	20
*15	0.4000	0.4000	0.6798	0.4636	1.1071	44.627	4	10.00	10.00	12	20
*30	0.2500	0.2500	0.5189	0.4636	0.6847	21.301	4	10.00	10.00	15	20

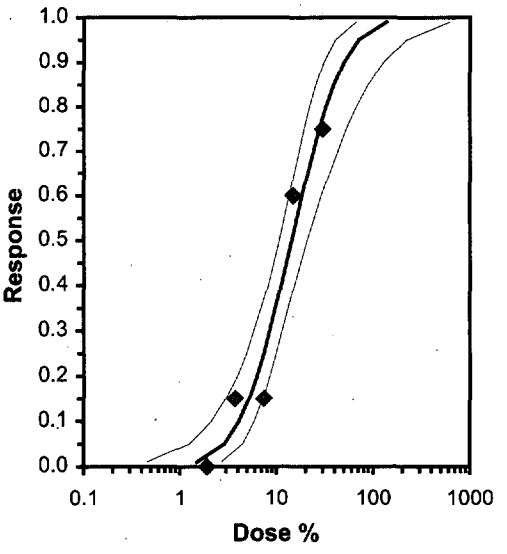
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.90726	0.884	0.40433	1.08977
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	7.5	15	10.6066	13.3333

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.37033	0.44042	1.5071	3.23356	0	3.25425	7.81472	0.35	1.15695	0.42188	3
Intercept	2.25764	0.48162	1.31366	3.20162							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	1.49799	0.45451	2.69303
EC05	3.355	2.90415	1.25495	4.48849
EC10	3.718	4.13323	2.1332	5.95811
EC15	3.964	5.24446	3.02495	7.27557
EC20	4.158	6.33707	3.96019	8.59764
EC25	4.326	7.45415	4.94786	10.006
EC40	4.747	11.222	8.23173	15.4478
EC50	5.000	14.3534	10.7089	20.9442
EC60	5.253	18.3584	13.5507	29.1943
EC75	5.674	27.6381	19.2886	52.6791
EC80	5.842	32.5101	22.0189	67.1008
EC85	6.036	39.2831	25.6072	89.2625
EC90	6.282	49.8445	30.8534	128.285
EC95	6.645	70.9394	40.473	220.661
EC99	7.326	137.53	66.7495	615.728

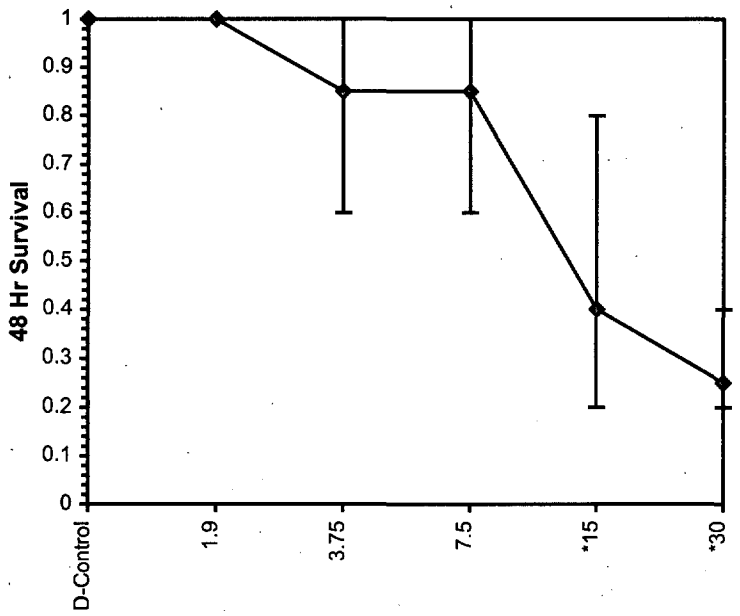


SCOEPA00027412

Acute Fish Test-48 Hr Survival

Start Date:	10/8/02	Test ID:	A21007Tca	Sample ID:	Wacker
End Date:	10/12/02	Lab ID:	COFFEY LAB	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:	Acute				

Dose-Response Plot



SCOEPA00027413

Acute Fish Test-48 Hr Survival

Start Date:	10/8/02	Test ID:	OctRefTxA	Sample ID:	REF-Ref Toxicant
End Date:	10/12/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:	Acute				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
2.5	1.0000	0.8000	1.0000	1.0000
4	1.0000	0.8000	1.0000	1.0000
5.5	0.0000	0.2000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
1	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
2.5	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1	20
4	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1	20
*5.5	0.0500	0.0500	0.2850	0.2255	0.4636	41.771	4	10.00	10.00	19	20
8	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4			20	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.87944	0.868	-0.5381	1.53159
Equality of variance cannot be confirmed				

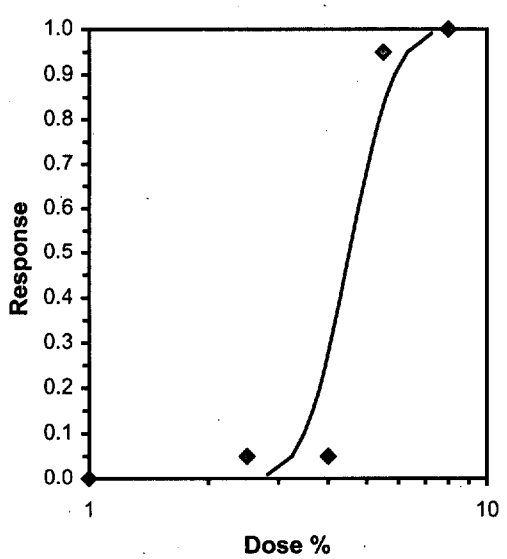
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	4	5.5	4.69042	25

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	11.326	8.62056	-16.108	38.7605	0	33.1988	7.81472	2.9E-07	0.65529	0.08829	8
Intercept	-2.4219	5.77657	-20.805	15.9618							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	2.81769	
EC05	3.355	3.23641	
EC10	3.718	3.4845	
EC15	3.964	3.66254	
EC20	4.158	3.81051	
EC25	4.326	3.94221	
EC40	4.747	4.29461	
EC50	5.000	4.5216	
EC60	5.253	4.76059	
EC75	5.674	5.18614	
EC80	5.842	5.36538	
EC85	6.036	5.58214	
EC90	6.282	5.86736	
EC95	6.645	6.31713	
EC99	7.326	7.25589	

Significant heterogeneity detected (p = 2.92E-07)

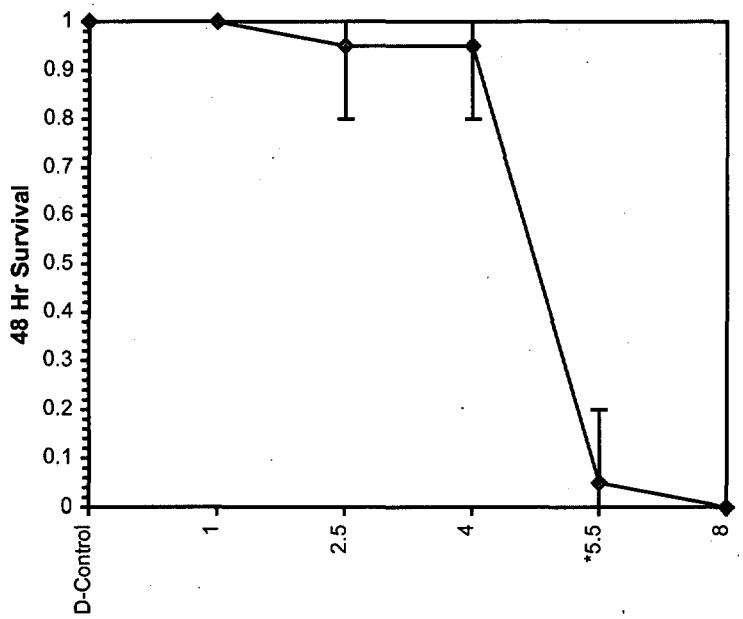


SCOEPA00027414

Acute Fish Test-48 Hr Survival

Start Date:	10/8/02	Test ID:	OctRefTxA	Sample ID:	REF-Ref Toxicant
End Date:	10/12/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:	Acute				

Dose-Response Plot



SCOEPA00027415

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	10/8/02	Test ID:	OctRefToxC	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2.5	0.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5.5	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
1	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
2.5	0.8000	0.8000	2	8	10	10	0.2368	0.0500	2	10
4	0.9000	0.9000	1	9	10	10	0.5000	0.0500	1	10
*5.5	0.1000	0.1000	9	1	10	10	0.0001	0.0500	9	10
8	0.0000	0.0000	10	0	10	10			10	10

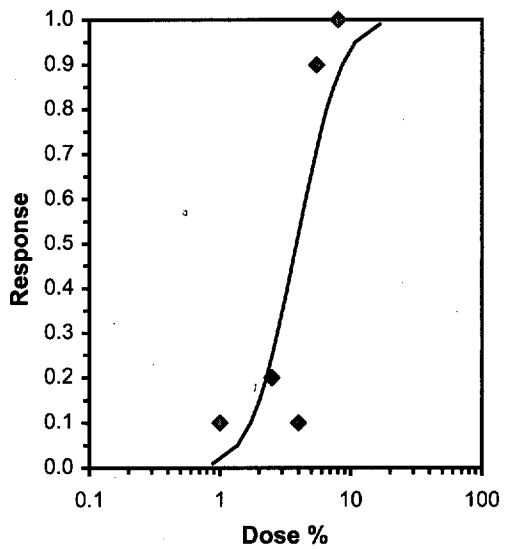
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	4	5.5	4.69042	25

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.6591	2.1781	-3.2726	10.5908	0	14.8796	7.81472	1.9E-03	0.58576	0.27329	5
Intercept	2.85664	1.41535	-1.6476	7.36092							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	0.89123	
EC05	3.355	1.36847	
EC10	3.718	1.71998	
EC15	3.964	2.00684	
EC20	4.158	2.26858	
EC25	4.326	2.52016	
EC40	4.747	3.28491	
EC50	5.000	3.85267	
EC60	5.253	4.51855	
EC75	5.674	5.88971	
EC80	5.842	6.54288	
EC85	6.036	7.39622	
EC90	6.282	8.62975	
EC95	6.645	10.8464	
EC99	7.326	16.6545	

Significant heterogeneity detected (p = 1.92E-03)

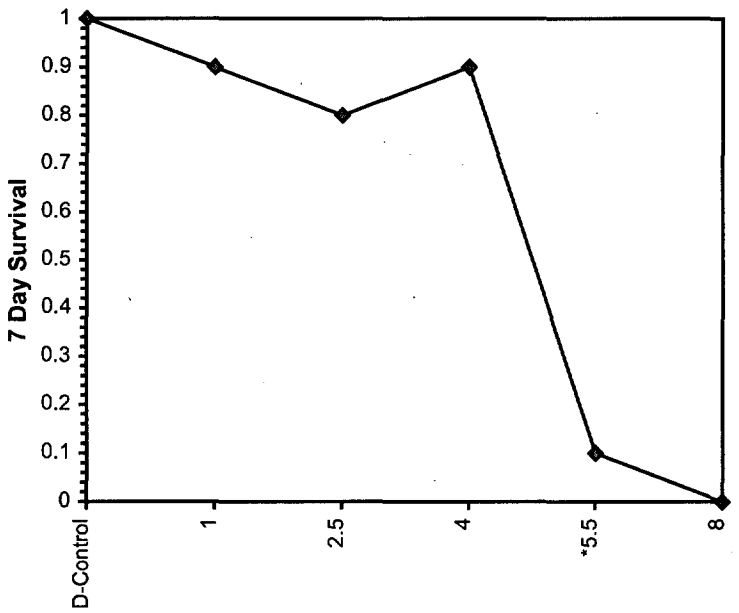


SCOEPA00027416

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	10/8/02	Test ID:	OctRefToxC	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027417

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/8/02	Test ID:	OctRefToxC	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	32.000	34.000	23.000	28.000	32.000	27.000	34.000	32.000	24.000
1	14.000	16.000	9.000	25.000	0.000	14.000	16.000	0.000	1.000	8.000
2.5	0.000	0.000	8.000	0.000	0.000	0.000	0.000	0.000	7.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	29.600	1.0000	29.600	23.000	34.000	13.344	10				29.600	1.0000
*1	10.300	0.3480	10.300	0.000	25.000	80.198	10	7.714	1.999	5.001	10.300	0.3480
*2.5	1.500	0.0507	1.500	0.000	8.000	211.403	10	11.232	1.999	5.001	1.500	0.0507
4	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000
5.5	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000
8	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

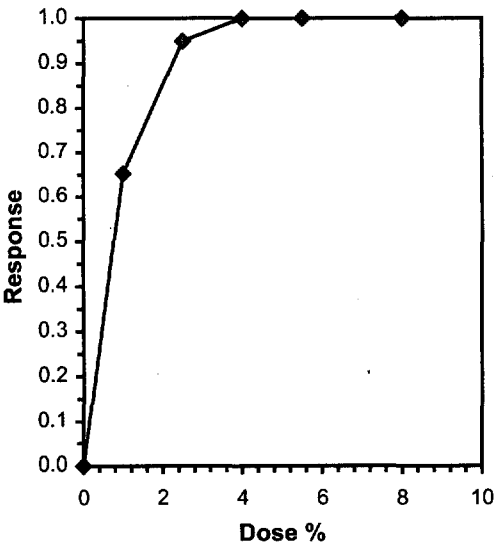
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94094	0.9	0.18443	0.94577
Bartlett's Test indicates equal variances (p = 0.01)	9.0239	9.21035		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<1	1			5.00092	0.16895	2065.9	31.2963	4.0E-11	2, 27

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05*	0.0767	0.0108	0.0630	0.1052	0.8425
IC10*	0.1534	0.0215	0.1261	0.2104	0.8425
IC15*	0.2301	0.0323	0.1891	0.3156	0.8425
IC20*	0.3067	0.0430	0.2522	0.4208	0.8425
IC25*	0.3834	0.0538	0.3152	0.5259	0.8425
IC40*	0.6135	0.0861	0.5044	0.8415	0.8425
IC50*	0.7668	0.1110	0.6305	1.0706	0.9959

* indicates IC estimate less than the lowest concentration

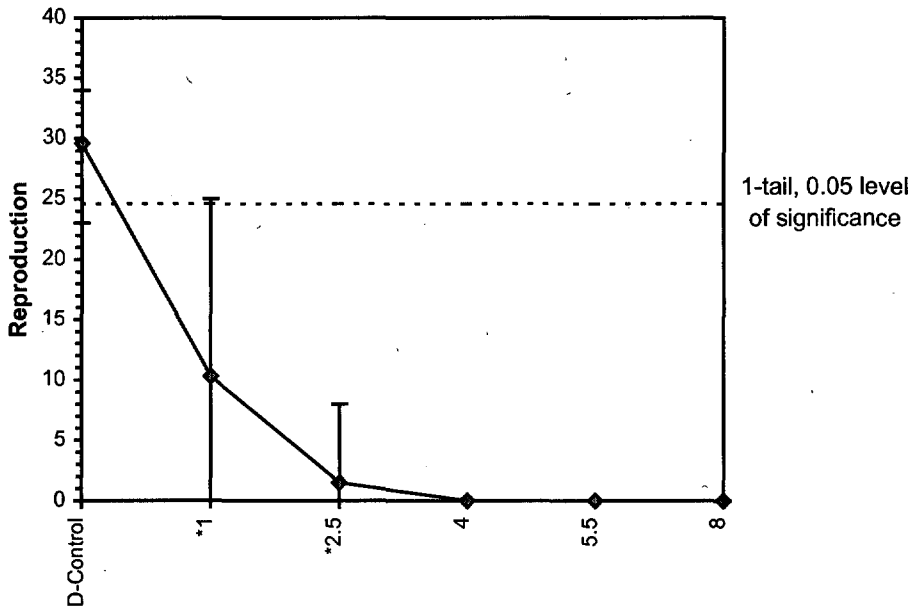


SCOEPA00027418

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/8/02	Test ID:	OctRefToxC	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



SCOEPA00027419

Larval Fish Growth and Survival Test-96 Hr Survival

Start Date:	10/8/02	Test ID:	OctRefToxF	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1	1.0000	0.8000	1.0000	1.0000
2.5	0.9000	0.8000	1.0000	0.9000
4	0.7000	0.9000	0.9000	0.9000
5.5	0.7000	0.1000	0.4000	0.8000
8	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
1	0.9500	0.9500	1.3358	1.1071	1.4120	11.411	4	16.00	10.00	2	40
2.5	0.9000	0.9000	1.2543	1.1071	1.4120	9.935	4	12.00	10.00	4	40
*4	0.8500	0.8500	1.1846	0.9912	1.2490	10.885	4	10.00	10.00	6	40
*5.5	0.5000	0.5000	0.7762	0.3218	1.1071	45.283	4	10.00	10.00	20	40
8	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4			40	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92434	0.868	-0.7974	2.09237
Equality of variance cannot be confirmed				

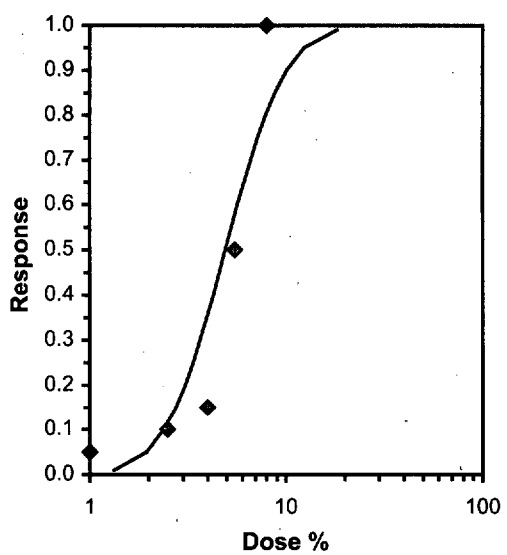
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	2.5	4	3.16228	40

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.10123	2.64133	-4.3047	12.5071	0	58.1389	7.81472	1.5E-12	0.69175	0.24383	6
Intercept	2.16299	1.83354	-3.6722	7.99813							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	1.33203	
EC05	3.355	1.95291	
EC10	3.718	2.39479	
EC15	3.964	2.74811	
EC20	4.158	3.06573	
EC25	4.326	3.36733	
EC40	4.747	4.26553	
EC50	5.000	4.91752	
EC60	5.253	5.66918	
EC75	5.674	7.18137	
EC80	5.842	7.88785	
EC85	6.036	8.79953	
EC90	6.282	10.0978	
EC95	6.645	12.3826	
EC99	7.326	18.1543	

Significant heterogeneity detected (p = 1.47E-12)

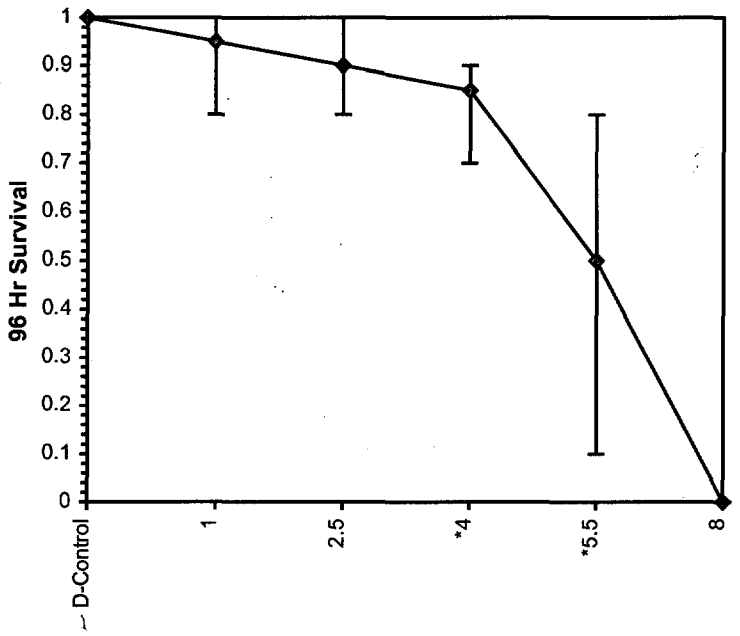


SCOEPA00027420

Larval Fish Growth and Survival Test-96 Hr Survival

Start Date:	10/8/02	Test ID:	OctRefToxF	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



SCOEPA00027421

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	10/8/02	Test ID:	OctRefToxF	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
1	1.0000	0.7000	1.0000	1.0000
2.5	0.8000	0.4000	0.5000	0.6000
4	0.3000	0.5000	0.1000	0.4000
5.5	0.3000	0.0000	0.0000	0.5000
8	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
1	0.9250	0.9250	1.3068	0.9912	1.4120	16.103	4	16.00	10.00	3	40
*2.5	0.5750	0.5750	0.8658	0.6847	1.1071	20.865	4	10.00	10.00	17	40
*4	0.3250	0.3250	0.5929	0.3218	0.7854	33.619	4	10.00	10.00	27	40
*5.5	0.2000	0.2000	0.4206	0.1588	0.7854	74.606	4	10.00	10.00	32	40
8	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4			40	40

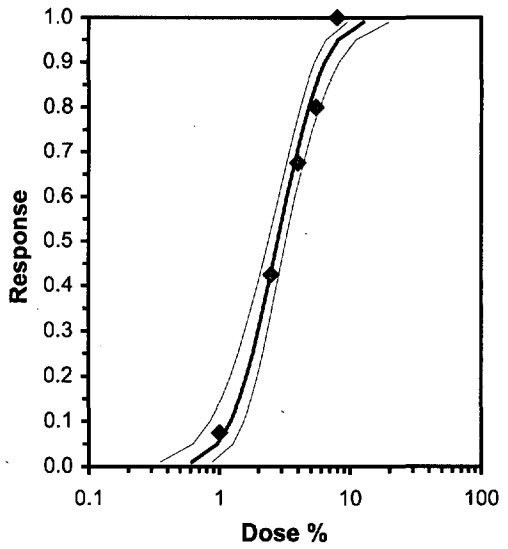
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95081	0.868	-0.1471	-0.4468
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	1	2.5	1.58114	100

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.53965	0.43268	2.69159	4.38771	0	3.50189	7.81472	0.32	0.44759	0.28251	3
Intercept	3.41569	0.25513	2.91563	3.91575							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	0.61711	0.35186	0.87881
EC05	3.355	0.96138	0.62566	1.26602
EC10	3.718	1.21768	0.84845	1.54143
EC15	3.964	1.42818	1.04047	1.76301
EC20	4.158	1.62114	1.22204	1.96416
EC25	4.326	1.80732	1.4011	2.15764
EC40	4.747	2.37692	1.96135	2.75639
EC50	5.000	2.80278	2.37966	3.2229
EC60	5.253	3.30494	2.85784	3.80706
EC75	5.674	4.34652	3.77463	5.15469
EC80	5.842	4.84573	4.18212	5.85956
EC85	6.036	5.50043	4.69378	6.8315
EC90	6.282	6.45128	5.40312	8.32392
EC95	6.645	8.17116	6.61732	11.2219
EC99	7.326	12.7296	9.58459	19.8467

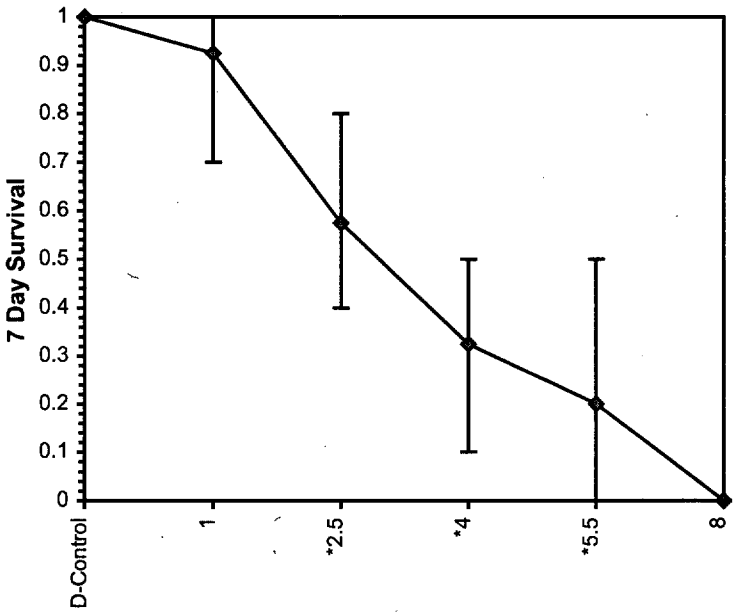


SCOEPA00027422

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	10/8/02	Test ID:	OctRefToxF	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



SCOEPA00027423

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/8/02	Test ID:	OctRefToxF	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.4100	0.5880	0.6910	0.5760
1	0.7370	0.3260	0.6320	0.5100
2.5	0.3820	0.1300	0.2980	0.2710
4	0.0770	0.2150	0.0060	0.1210
5.5	0.0710	0.0000	0.0000	0.0160
8	0.0000	0.0000	0.0000	0.0000

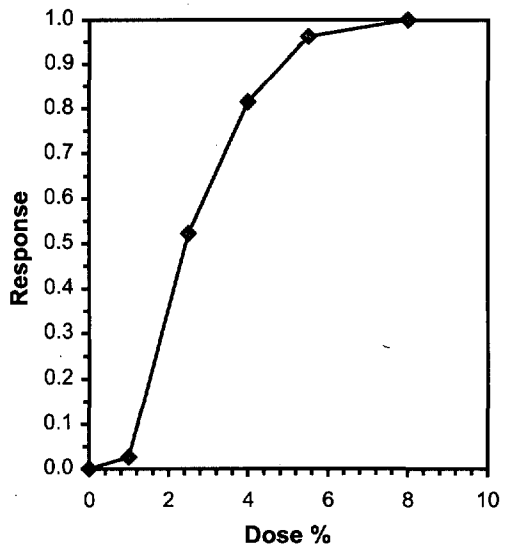
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5662	1.0000	0.5662	0.4100	0.6910	20.530	4				0.5662	1.0000
1	0.5513	0.9735	0.5513	0.3260	0.7370	32.019	4	0.187	2.360	0.1894	0.5513	0.9735
*2.5	0.2703	0.4773	0.2703	0.1300	0.3820	38.767	4	3.688	2.360	0.1894	0.2703	0.4773
*4	0.1048	0.1850	0.1048	0.0060	0.2150	83.481	4	5.750	2.360	0.1894	0.1048	0.1850
*5.5	0.0218	0.0384	0.0218	0.0000	0.0710	154.890	4	6.784	2.360	0.1894	0.0218	0.0384
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	4				0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97009	0.868	-0.4166	0.25964
Bartlett's Test indicates equal variances (p = 0.22)	5.77364	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1	2.5	1.58114	100	0.18943	0.33453	0.25041	0.01289	8.5E-06	4, 15

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	1.0711	0.3977	0.0000	1.2590	-0.5026
IC10	1.2222	0.3463	0.0000	1.4700	-0.8794
IC15	1.3733	0.3166	0.0000	1.6809	-1.0849
IC20	1.5245	0.3035	0.0277	1.8919	-1.1287
IC25	1.6756	0.2992	0.1726	2.1123	-1.0893
IC40	2.1290	0.2829	0.9765	2.8163	-0.3212
IC50	2.4313	0.2917	1.6053	3.2091	0.0927

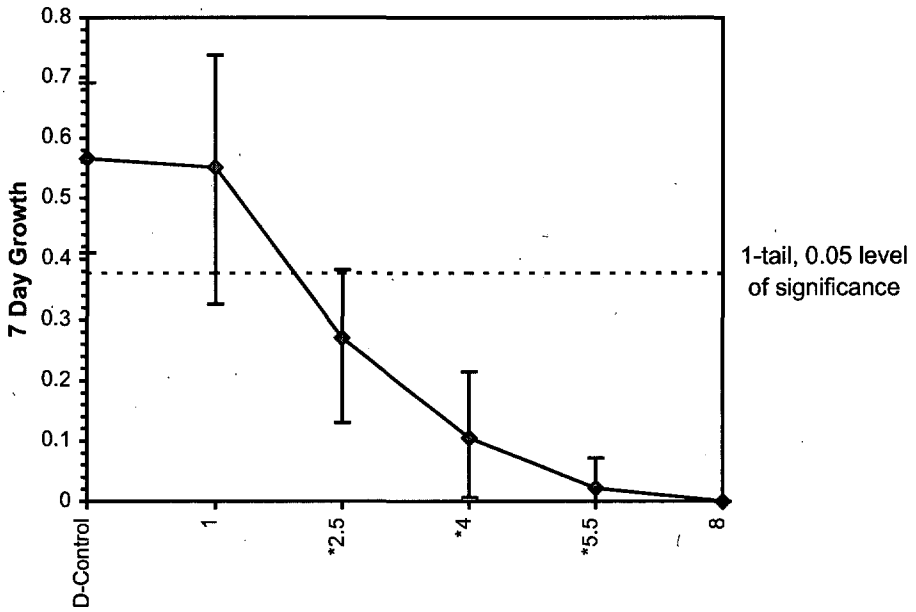


SCOEPA00027424

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/8/02	Test ID:	OctRefToxF	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	COFFEY LAB	Sample Type:	NACL-Sodium chloride
Sample Date:	10/6/02	Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



SCOEPA00027425

APPENDIX A

RAW DATA SHEETS

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

Doc ID: O:\Clom\Port.BRN\LifeSci.SEC\Forms\CRLarvQC.FOR
Revision #: 1.01
Revision Date: 11/18/93

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

mber: A21007T
bbr: Wacker Silt
le/Source Name: CFF

Test Organism: F.H.M.
Dates Delivered: 10-7,9,11
Dates Collected: 10-6,8,10

Test Initiation: 10-8-02
Test Conclusion: 10-15-02
Dechlorination:

Analyst(s): HRC/BWD
Reviewed by:

1/2

Conc.	Day	Date	Initials	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
	0	10/8		7.70		8.0		480					
	1	10/9		7.72	7.86	8.0	7.8						
	2	10/10		7.36	7.70	8.1	7.0						
	3	10/11		[illegible]	[illegible]	7.20	7.40						
	4	10/12		9.27	8.12	8.4	7.7						
	5	10/13		6.36	7.90	8.2	7.4						
	6												
	7												
	0			7.92		7.9		353					
	1				7.87	7.9	8.0						
	2				7.63	8.4	6.5						
	3				[illegible]	7.40	7.20						
	4				7.94	8.8	7.6						
	5				7.96	8.2	7.2						
	6												
	7												
	0			7.94		8.0		378					
	1				[illegible]	8.0	8.1						
	2				7.66	8.1	6.6						
					7.85	7.4	7.3						
					7.89	8.7	7.9						
					7.94	8.1	7.1						
	6												
	7												
	0			7.95		8.0		392					
	1				7.87	8.0	8.0						
	2				7.64	8.1	7.0						
	3				7.83	7.60	7.3						
	4				7.85	8.7	8.0						
	5				7.94	8.2	7.5						
	6												
	7												

: Wacker

SCOEPA00027427

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

mber: A91007 1 | Test Organism: F. H. M. | Test Initiation: 10-8-02 | Analyst(s): | 2/7
bbr: Wackersilt | Dates Delivered: | Test Conclusion: | Reviewed by:
le/Source Name: | Dates Collected: | Dechlorination:

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0			7.93		8.0		.441					
	1				7.82	8.0	8.1						
	2				7.88	8.2	7.1						
	3				7.87	7.6	7.4						
	4				7.80	87	75						
	5				7.90	82	73						
	6												
	7												
	0			7.84		8.0		429					
	1			7.81	7.79	7.9	7.9						
	2				7.59	8.2	6.6						
	3				7.79	7.8	7.6						
	4			7.84	7.75	87	79						
	5			7.92	7.83	81	71						
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												

Doc ID: [illegible]
Revision #: [illegible]
Revision Date: 11/26/97

CHRONIC RENEWAL LARVAE TOXICITY TEST

Number: A21007T
tabbr: Wackersilt
mple/Source Name: eff

Test Organism: F.H.M.
Dates Delivered: 10-7,9,11
Dates Collected: 10-6,8,10

Test Initiation: 10-8-02
Test Conclusion: 10-15-02
H_2O Batch #:
Feeding Regime: Daily

Analyst(s): HRL / BWD
Reviewed by:
Randomization Chart #:

Conc.	Rep.	Number Organisms/ Container	Immobile/Mortality 0	24	48	72	96	120	144	168	Total Mort.	Temperature (°C) 0	24	48	72	96	120	144	168
[redacted]	1	10	0	0	0	1	0	0	0	0	1	26	25	25	25	25	25	26	25
	2	10			0	0	0	1	1	0	2								
	3	10			0	0	1	0	1	0	2								
	4	10			0	0	0	1	1	1	~~2~~ 3								
	1	10	0	2	0	0	0	0	0	0	2								
	2	10		1	1	2	0	1			5								
	3	10		0	2	0	0	0			2								
	4	10		0	0	1	1	1			3								
	1	10	0	0	0	0	1	0	0	0	1								
	2	10			1	0	0			0	1								
	3	10			0	0	0			1	1								
	4	10			0	1	~~0~~ 1			0	2								
[redacted]	1	10	0	0	0	0	0	0	0	0	0								
	2	10			0	0	0				0								
	3	10			0	0	0				0								
	4	10			0	0	0				0								
[redacted]	1	10	0	0	0	1	0	0	0	0	1								
	2	10			0	2	1		0		3								
	3	10			0	0	0		1		1								
	4	10			0	1	0		1		2								
[redacted]		10	0	0	0	0	0	0	0	0	0								
		10			0	1	0			0	1								
		10			0	1	0			1	2								
	4	10			1	0	0			0	1								
	1																		
	2																		
	3																		
	4																		
		ANALYST:	BD	HL	HL	HL	HL	HL	HL	HL									

nts:

SCOEPA00027429

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Revision #: 1.01
Revision Date:2/13/01

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: A21007T
Test Dates: 10-8-02
Weighing Date: 10-16-02
Analyst: NRL

Custabbr: Wacker Silt
Drying Temp. (°C): 101°C
Drying Time (h):
Reviewed by:

Conc.	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (g)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (g)	Remarks
Control	1	0.74647	0.75207				
	2	0.74873	0.75503				
0	3	0.74642	0.75181				
	4	0.74807	0.75274				
Conc.	1	0.75039	0.75501				
	2	0.75074	0.75513				
1.9	3	0.74704	0.75152				
	4	0.74723	0.75056				
Conc.	1	0.74868	0.75335				
	2	0.74646	0.75026				
3.75	3	0.74592	0.75041				
	4	0.74862	0.75348				
Conc.	1	0.74782	0.75370				
	2	0.74550	0.74966				
7.5	3	0.74671	0.75148				
	4	0.74871	0.75359				
Conc.	1	0.73836	0.74365				
	2	0.73940	0.74507				
15	3	0.74432	0.75008				
	4	0.74198	0.74659				
Conc.	1	0.75037	0.75539				
	2	0.74676	0.74932				
30	3	0.74820	0.75265				
	4	0.74461	0.74759				

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Revision #: 1.00
Revision Date: 11/04/92

STATIC ACUTE TOXICITY TEST - HAZARDOUS WASTE

Job Number: A21007T Source: eff Analyst: NRC/BWD

Custabbr: Wacker Silt Test Fish: F.H.M. Reviewed By: _____ 1/2

Start Date: 10-9-92 Time: 13:15 End Date: 10-12-92

Conc. (mg/L)	Rep.	Number of organisms/ container	Mortality / 24 hrs.					Total Mortality	pH					Specific Cond.		Dissolved Oxygen (mg/L)					Temperature (°C)				
			0	24	48	72	96		0	24	48	72	96	0	96	0	24	48	72	96	0	24	48	72	96
M0																									
0	1	15	0	0	0	0	0	0	7.70				7.37			8.0		8.0		8.0	26	25	25	25	25
	2	15	↓	↓	↓	↓	↓	↓																	
	3	15	↓	↓	↓	↓	↓	↓																	
1.9	1	15	0	0	1	0	2	3	7.82				7.96			8.2				7.9					
	2	15	↓	↓	0	2	0	2																	
	3	15	↓	↓	0	0	0	0																	
3.75	1	15	0	0	0	1	1	2	7.85				7.84			8.0				7.50					
	2	15	↓	↓	↓	2	0	2																	
	3	15	↓	↓	↓	0	0	0																	
7.5	1	15	0	0	3	0	0	3	7.85				7.94			8.2				7.49					
	2	15	↓	↓	2	1	0	3																	
	3	15	↓	↓	1	1	1	3																	
15	1	15	0	0	2	1	0	3	7.93				7.90			8.0				7.60					
	2	15	↓	↓	3	1	0	4																	
	3	15	↓	↓	2	1	1	3																	

Comments: _____

Doc ID: O:\Clom\Port.BRN\LifeSci.SEC\Forms\ToxHzWst.FOR
Revision #: 1.00
Revision Date: 11/04/92

STATIC ACUTE TOXICITY TEST - HAZARDOUS WASTE

Job Number: A21007T Source: _____ Analyst: _____ 2/2

Custabbr: Wacker Silit Test Fish: F.H.M.-1 Reviewed By: _____

Start Date: 10-8-92 Time: _____ End Date: _____

Conc (mg/L)	Rep.	Number of organisms/ container	Mortality / 24 hrs.					Total Mortality	pH					Specific Cond.		Dissolved Oxygen (mg/L)					Temperature (°C)				
			0	24	48	72	96		0	24	48	72	96	0	96	0	24	48	72	96	0	24	48	72	96
7%																									
30%	1	15	0	3	0	0	0	3	7.86				7.92			8.0				6.6	26	26	25	25	25
	2	15	↓	0	2	2	0	4													↓	↓	↓	↓	↓
	3	15	↓	0	1	1	1	3																	

SCOEPA00027432

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

ber: A21007T
WACKEGIT
urce Name: Eff

Test Organism: C. dub
Dates Delivered: 10-7-11
Dates Collected: 10-6,9,10

Test Initiation: 10-8-02
Test Conclusion: 10-15-02
Dechlorination:

Analyst(s): HRC/BWD
Reviewed by:

12

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS									
					pH		DO		Sp. Cond.		(mg/L)			
					New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0				7.92		8.2							
	1				8.00	8.01	8.1	8.0						
	2				7.91	7.96	8.1	8.2						
	3				8.1	8.01								
	4				8.09		8.0	8.9						
	5				8.15	8.48	8.2	8.3						
	6				8									
	7													
	8													
	0				7.95		8.2							
	1					7.99	8.0	8.0						
	2					7.97	8.2	8.2						
	3					8.20								
	4					8.09	8.8	8.9						
	5					8.45	8.1	8.2						
	6													
	7													
	8													
	0				7.86		8.2							
	1					7.88	7.8	7.9						
	2					7.95	8.0	8.2						
	3					8.10								
	4					8.06	8.8	9.0						
	5					8.40	8.2	8.5						
	6													
	7													
	8													
	0				7.98		8.1							
	1					7.94	7.8	7.8						
	2					7.94	8.2	8.1						
	3					8.11								
	4					8.34	8.7	8.9						
	5					8.49	8.3	8.4						
	6													

SCOEPA00027433

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Number: A21007T
Lab: _____
Effluent/Source Name: _____

Test Organism: _____
Dates Delivered: _____
Dates Collected: _____

Test Initiation: 10-8-02
Test Conclusion: _____
Dechlorination: _____

Analyst(s): _____
Reviewed by: _____

2b

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS									
					pH		DO		Sp. Cond.		(mg/L)			
					New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0				7.96		8.2							
	1					7.94	7.7	7.8						
	2					7.90	8.1	8.1						
	3					8.10								
	4					8.19	8.7	8.7						
	5					8.39	8.3	8.0						
	6													
	7													
	8													
	0				7.84		8.1							
	1				7.82	7.88	7.6	7.7						
	2					7.89	8.0	8.9						
	3					8.05								
	4				8.01	8.21	8.4	8.7						
	5				8.18	8.33	8.2	8.3						
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													

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Revision #: 1.02
Revision Date: 11/26/97

CHRONIC RENEWAL CERIODAPHNIA TOXICITY TEST: SURVIVAL AND REPRODUCTION DATA

Number: A2100TT
tabbr: Wackersit
ple/Source Name: Eff

Test Organism: C. dub
Dates Delivered: 10-7 9 11
Dates Collected: 10-7, 8, 10

Test Initiation: 10-8-02
Test Conclusion: 10-15-02
H_2O Batch #:
Feeding Regime: daily

Analyst(s): NRL / BWD
Reviewed by:
Randomization Chart #:

Conc. % g/L	Rep.	Number Organisms @ Start	0	1	2	3	4	5	6	7	8	Total Mort.	0	1	2	3	4	5	6	7	8	Total Offspring
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	2	0	3	0		
	2	1			1							1										0
		1				0	0	0	0	0						0	0	4	0	3		
		1			1							1										0
		1			1							1										0
		1			0	0	0	0	0	0						0	3	0	2	0		
		1			1							1										0
		1			1							1										0
	9	1		0	0	0	0	0	0	0						0	0	0	0	0		
	10	1		0	0	1						1				0						0
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	1	0	0	0		
	2	1														0						
		1														1						
		1										1										
		1	0	0	0	0	0	0	0	0						0	2	0	0	0		
		1			0	0	0	0	0	0						0	1	0	0	0		
		1			1							1										
	9	1			0	0	0	0	0	0						0	0	0	0	0		
	10	1			0	0	0	0	0	0						0	0	0	0	0		
	1	1	0	0	0	0	0	0	0	0			0	0	0	1	3	1	11	17		
	2	1														2	0	2	13	13		
	3	1														2	1	0	12	19		
		1														0	2	2	10	15		
		1			1							1										0
		1		0	0	0	0	0	0	0						1	0	4	10	16		
	7	1		0	0	0	0	0	0	0						0	4	0	12	12		
	8	1		0	1							1										0
	9	1		0	0	0	0	0	0	0						0	3	0	13	14		
	10	1		0	0	0	0	0	0	0						1	3	3	12	10		
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	2	0	2	0		
	2	1															3		2			
		1															0		0			
		1			1							1										
		1			0	0	0	0	0	0						0	1	0	0	0		
		1			1							1										
	8	1			0	0	0	0	0	0						0	2	0	0	0		
	9	1			1							1					0					
	10	1			1							1					0					
	1	1	0	0	0							1	0	0	0	0						0
		1			1							1										0
		1			1							1										0
		1			1							1										0
		1			0	0	0	0	0	0						0	1	0	0	0		
		1			0	0	0	1				1				0	2	0				2
		1			0	0	0	0	0	0						0	0	0	0	0		
	8	1			1							1										0
	9	1			1							1										0
	10	1		↓	0	0	0	0	0	0				↓		0	0	0	0	0		
	1	1	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0		
		1			1							1										
		1			1							1										
		1	0	0	0	0	0	0	0	0						0	0	0	0	0		
		1			1																	
		1			1																	
	8	1			1							1										
	9	1	0	0	0	0	0	0	0	0						0	0	0	0	0		
	10	1	0	0	0	0	0	0	0	0						0	0	0	0	0		
	ANALYST:		BD	BD	BD	HL	HL	HL	HL	HL												

nts:

Wacker

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Revision #: 1.00
Revision Date: 11/04/92

STATIC ACUTE TOXICITY TEST - HAZARDOUS WASTE

Job Number: A 21007T Source: eff Analyst: NRL/BWD

Custabbr: Wackersilt Test Fish: C. dub Reviewed By: _____

Start Date: 10-7-92 Time: 15:30 End Date: 10-9-92

Conc (mg/L) %	Rep.	Number of organisms/ container	Mortality / 24 hrs. 0	24	48	72	96	Total Mortality	pH 0	24	48	72	96	Specific Cond. 0	96	Dissolved Oxygen (mg/L) 0	24	48	72	96	Temperature (°C) 0	24	48	72	96
0	1	5	0	0	0			0	8.00		8.15					8.0		8.1			25	25	25		
	2	5	↓	↓	↓			↓													↓	↓	↓		
	3	5																							
	4	5																							
1.9	1	5	0	0	0			0	7.95		8.60					8.2		8.4							
	2	5	↓	↓	↓			↓																	
	3	5																							
	4	5																							
3.75	1	5	0	0	2			2	7.86		8.68					8.7		8.5							
	2	5	↓	↓	0			0																	
	3	5			1			1																	
	4	5			0			0																	
7.5	1	5	0	0	2			2	7.98		8.56					8.1		8.4							
	2	5	↓	0	0			0																	
	3	5		1	0			1																	
	4	5		0	0			0																	

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Revision #: 1.00
Revision Date: 11/04/92

STATIC ACUTE TOXICITY TEST - HAZARDOUS WASTE

Job Number: A2100MT Source: _____ Analyst: _____

Custabbr: Wackersilt Test Fish: _____ Reviewed By: _____

Start Date: 10-7-92 Time: _____ End Date: _____

2/2

Conc. (mg/L)	Rep.	Number of organisms/ container	Mortality / 24 hrs.					Total Mortality	pH					Specific Cond.		Dissolved Oxygen (mg/L)					Temperature (°C)				
			0	24	48	72	96		0	24	48	72	96	0	96	0	24	48	72	96	0	24	48	72	96
15	1	5	0	2	2			4	7.93		8.50					8.2		8.2			25	25	25		
	2	5	|	0	1			1																	
	3	5	|	1	2			3																	
	4	5	|	3	1			4																	
30	1	5	0	4	0			4	7.96		8.19					8.1		7.8							
	2	5	|	2	2			4																	
	3	5	|	1	2			3																	
	4	5	|	3	1			4																	

Comments: _____

APPENDIX B

REFERENCE TOXICANT DATA SHEETS

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

n: Oct Ref Tox
r:
Source Name: NaCl

Test Organism: F. H. M.
Dates Delivered: 10-7, 9, 11, 14
Dates Collected:

Test Initiation: 10-8-02
Test Conclusion: 10-15-02
Dechlorination:

Analyst(s): HRL/BWD
Reviewed by:

1/2

Conc.	Day	Date	Initials	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
	0			7.87		7.8		336					
	1			7.79	7.87	7.7	7.8						
	2			7.73	7.68	8.1	6.7						
	3			8.05	7.91								
	4			8.05	7.93	9.0	8.0						
	5			8.15	8.14	8.4	7.5						
	6												
	7												
	0			7.81		7.9		2220					
	1				7.80	7.9	8.0						
	2				7.65	8.1	6.9						
	3				7.91								
	4				7.85	8.3	7.9						
	5				8.00	7.9	7.4						
	6												
	7												
	0			7.79		7.9		4910					
	1				7.79	8.1	7.9						
	2				7.64	8.2	7.3						
	3				7.87								
	4				7.81	8.5	8.0						
	5				7.94	8.0	7.6						
	6												
	7												
	0			7.77		7.9		~~2260~~ 6900					
	1				7.77	8.0	8.0						
	2				7.57	8.1	6.8						
	3				7.45								
	4				7.60	8.6	8.1						
	5				7.89	8.0	7.1						
	6												
	7												

Ref Tox

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Revision #: 1.01
Revision Date: 11/18/93

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

[illegible]: Dc+RefTox
[illegible]: _____
/Source Name: _____

Test Organism: _____
Dates Delivered: _____
Dates Collected: _____

Test Initiation: _____
Test Conclusion: _____
Dechlorination: _____

Analyst(s): _____
Reviewed by: _____

2/2

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0			7.81		7.9		1002					
	1				7.74	8.1	7.9						
	2				7.60	8.1	7.2						
	3				7.83								
	4				7.79	8.4	8.1						
	5				7.85	7.9	7.3						
	6												
	7												
	0			7.79		7.8		8710					
	1			7.81	7.76	7.9	7.9						
	2				7.62	8.0	7.0						
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												

SCOEPA00027440

CHRONIC RENEWAL LARVAE TOXICITY TEST

Number: Oct Ref Tox
Test Organism: F.H.M.
Dates Delivered: 10-7,9,11,14
Dates Collected:
Test Initiation: 10-8-02
Test Conclusion: 10-15-02
H_2O Batch #:
Feeding Regime:
Analyst(s): HRL/BWD
Reviewed by:
Randomization Chart #:
Sample/Source Name: NaCl

Conc.	Rep.	Number Organisms/ Container	Immobile/Mortality 0	24	48	72	96	120	144	168	Total Mort.	Temperature (°C) 0	24	48	72	96	120	144	168
	1	10	0	0	0	0	0	0	0	0	0	26	25	25	25	25	25	26	25
	2	10	1	2	0					1	3								
	3	10	1	0	0					0	0								
	4	10	↓	0	0	↓	↓	↓	↓	0	0								
	1	10	0	1	2	0	0	3	1	0	7								
	2	10	1	0	1	1	0	1	2	1	5								
	3	10	1	0	0	1	1	2	5	1	9								
	4	10	↓	1	0	↓	0	2	3	0	6								
	1	10	0	0	0	0	0	0	0	0	0								
	2	10	1	1	0	1	1	1	1	1	0								
	3	10	1	1	0	1	1	1	1	1	0								
	4	10	↓	↓	0	↓	↓	↓	↓	↓	0								
	1	10	0	1	0	0	0	0	1	0	2								
	2	10	1	2	0	1	1	0	3	1	6								
	3	10	1	0	0	1	1	0	5	0	5								
	4	10	↓	1	0	↓	↓	2	1	0	3								
	1	10	0	8	2	—	—	—	—	—	10								
	2	10	1	8	2	—	—	—	—	—	10								
	3	10	1	9	1	—	—	—	—	—	10								
	4	10	↓	10	—	—	—	—	—	—	10								
	1	10	0	1	0	2	0	2	1	1	7								
	2	10	1	6	3	0	0	0	1	—	10								
	3	10	1	4	1	0	1	1	3	—	10								
	4	10	↓	1	1	0	0	1	2	0	5	↓	↓	↓	↓	↓	↓	↓	↓
	1																		
	2																		
	3																		
	4																		
		ANALYST:	HL	HL	HL	HL	HL	HL	HL	HL									

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: Oct Ref Tox
Test Dates: 10-8-02
Weighing Date: 10-16-02
Analyst: WDL

Custabbr: _____
Drying Temp. (°C): _____
Drying Time (h): _____
Reviewed by: _____

Conc.	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (g)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (g)	Remarks
Control	1	0.74458	0.74868				
	2	0.74832	0.75420				
0	3	0.74584	0.75275				
	4	0.74529	0.75105				
Conc.	1	0.74560	0.75297				
	2	0.74709	0.75035				
1.0	3	0.74789	0.75421				
	4	0.74676	0.75186				
Conc.	1	0.74755	0.75137				
	2	0.74848	0.74978				
2.5	3	0.74667	0.74965				
	4	0.74580	0.74851				
Conc.	1	0.74448	0.74525				
	2	0.74530	0.74745				
4.0	3	0.74643	0.74649				
	4	0.75007	0.75128				
Conc.	1	0.74728	0.74799				
	2	0.75083	0.75099				
5.5	3						
	4						
Conc.							
8.0							

Doc ID: O:\Clom\Port.BRN\LifeSci.SEC\Forms\ToxHzWat.FOR
Revision #: 1.00
Revision Date: 11/04/92

STATIC ACUTE TOXICITY TEST - HAZARDOUS WASTE

Job Number: Oct Ref Tox Source: NaCl Analyst: HRC / BWD

Custabbr: _____ Test Fish: F.H.M. Reviewed By: _____

Start Date: 10-8-02 Time: 1315 End Date: 10-12-02

1/2

Conc (mg/L) %	Rep.	Number of organisms/ container	Mortality / 24 hrs. 0	24	48	72	96	Total Mortality	pH 0	24	48	72	96	Specific Cond. 0	96	Dissolved Oxygen (mg/L) 0	24	48	72	96	Temperature (°C) 0	24	48	72	96
0	1	15	0	0	0	0	0	0	781				805			78					26	25	25	25	25
	2	15	↓	↓	↓	↓	↓	↓																	
	3	15	↓	↓	↓	↓	↓	↓																	
1.0%	1	15	0	0	0	0	0	0	781				790			79									
	2	15	↓	↓	↓	↓	↓	↓																	
	3	15	↓	↓	↓	↓	↓	↓																	
2.5%	1	15	0	0	1	0	0	1	777				788			79									
	2	15	↓	↓	0	0	1	1																	
	3	15	↓	↓	0	0	0	0																	
4.0%	1	15	0	0	3	0	2	5	781				785			79									
	2	15	↓	2	0	0	0	2																	
	3	15	↓	0	2	2	0	4																	
5.5%	1	15	0	1	3	2	1	7	780				785			79									
	2	15	↓	1	4	3	2	10																	
	3	15	↓	2	4	3	0	9																	

Comments:

Doc ID: O:\Clom\Port.BRN\LifeSci.SEC\Forms\ToxHzWst.FOR
Revision #: 1.00
Revision Date: 11/04/92

STATIC ACUTE TOXICITY TEST - HAZARDOUS WASTE

Job Number: Oct Ref Tox Source: _____ Analyst: _____

Custabbr: _____ Test Fish: F.H.M. Reviewed By: _____ 2/2

Start Date: 10-8-02 Time: _____ End Date: _____

Conc (mg/L)	Rep.	Number of organisms/ container	Mortality / 24 hrs.					Total Mortality	pH					Specific Cond.		Dissolved Oxygen (mg/L)					Temperature (°C)				
			0	24	48	72	96		0	24	48	72	96	0	96	0	24	48	72	96	0	24	48	72	96
8.0%	1	15	0	12	3	—	—	15	779				780			78					26				
	2	15	|	10	5	—	—	15													|				
	3	15	|	15	—	—	—	15													|				

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

[redacted] Oct Ref Tox
[redacted]
Source Name: NaCl

Test Organism: C. dub
Dates Delivered: 10-7-02
Dates Collected: _____

Test Initiation: 10-
Test Conclusion: _____
Dechlorination: _____

Analyst(s): IRC/BWD
Reviewed by: _____

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
[redacted]	0													
	1				8.04	8.06	7.8	7.9						
					8.00	8.04								
					8.35	8.20								
					8.12	8.14	86	85						
	5				8.31	8.34	83	83						
	6													
	7													
	8													
	0													
	1					8.01	7.9	7.8						
						8.02								
						8.14								
						8.14	85	85						
						8.07	80	80						
	6													
	7													
	8													
	0													
	1					8.00	7.9	7.8						
						8.02								
						8.14								
						8.15	85	84						
						8.07	81	80						
	6													
	7													
	8													
	0													
						7.96	7.9	7.8						
						7.98								
						8.11								
						8.18	85	87						
	5					8.32	82	82						
	6													
	7													
	8													

12 Ref Tox

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

[illegible]: Oct Ref Tox
Source Name:

Test Organism:
Dates Delivered:
Dates Collected:

Test Initiation: 10-
Test Conclusion:
Dechlorination:

Analyst(s):
Reviewed by:

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS									
					pH		DO		Sp. Cond.		(mg/L)			
					New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0													
	1					7.95	8.0	7.8						
	2													
						8.10								
						8.13	8.6	8.6						
						6.30	8.0	8.2						
	6													
	7													
	8													
	0													
	1				7.95	7.93	7.8	7.6						
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													

CHRONIC RENEWAL CERIODAPHNIA TOXICITY TEST: SURVIVAL AND REPRODUCTION DATA

Number: Oct Ref Tox
Lab:
Sample/Source Name: NaCl

Test Organism: C dub
Dates Delivered: 10-7
Dates Collected:

Test Initiation: 10-8-02
Test Conclusion: 10-15-02
H_2O Batch #:
Feeding Regime: daily

Analyst(s): HRC/BLD
Reviewed by:
Randomization Chart #:

Rep.	Number Organisms @ Start	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Total Mort.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Total Offspring
1	1	C	O	O	C	C	O	O	O			O	-	C	O	2	C	5	7		
2	1				O										O	O	L	6	9		
3	1				O										O	C	C	4	5		
4	1				O										3	C	1	11	11		
5	1				-						1				C						0
6	1				O	O	O	O	O						1	C	1	6	6		
7	1				O										O	O	O	7	9		
8	1				O										O	O	O	O	O		
9	1				O										1	O	O	O	O		
10	1				O										O	O	C	5	3		
1	1	O	O	O	C	C	C	O	O			O	O	O	O	C	O	O	O		
2	1			O															O		
3	1			O	-														O		
4	1			O	O	O	C	O	O							O	O	O	O		
5	1																		O		
6	1																		O		
7	1																		O		
8	1																		O		
9	1																		O		
10	1																		O		
1	1	O	O	O	O	O	O	O	O			O	O	O	O	2	O	13	15		
2	1													O		2		14	16		
3	1													O		3		12	14		
4	1													O		O		10	13		
5	1													O	2	1		12	13		
6	1													O	O	4		13	15		
7	1													O		3		12	12		
8	1													O		4		11	19		
9	1													O		5		13	14		
10	1													O		3		11	10		
1	1	O	O	1	-							O	O	O-							0
2	1			O	O	O	O	O	O						O	O	O	O	O		
3	1			O													O	5	3		
4	1			O													O	O	O		
5	1			O	O	O	O	O	O												0
6	1														O	O	O	O	O		
7	1														O	O	O	O	O		
8	1														O	O	O	O	O		
9	1														O	O	O	4	2		
10	1														O	O	O	O	O		
1	1	O										O	O-								0
2	1																				0
3	1																				0
4	1																				0
5	1																				0
6	1																				0
7	1																				0
8	1																				0
9	1																				0
10	1																				0
1	1	O	O	O	O	O	O	O	O			O	O	O	O	O	O	O	O		0
2	1																				0
3	1																				0
4	1																				0
5	1																				0
6	1																				0
7	1																				0
8	1																				0
9	1																				0
10	1																				0
ANALYST:		HC	HL	BD	HC	HL	HL	HL	HL												

Ref Tox

SCOEPA00027447

Doc ID: O:\Clom\Port.BRN\LifeSci.SEC\Forms\ToxHzWat.FOR
Revision #: 1.00
Revision Date: 11/04/92

STATIC ACUTE TOXICITY TEST - HAZARDOUS WASTE

Job Number: Oct Ref Tox Source: NaCl C. dub Analyst: NRC/BWD 1/2

Custabbr: _____ Test Fish: _____ Reviewed By: _____

Start Date: 10-12-02 Time: 1700 End Date: 10-14-02

Conc. (mg/L)	Rep.	Number of organisms/ container	Mortality / 24 hrs. 0	24	48	72	96	Total Mortality	pH 0	24	48	72	96	Specific Cond. 0	96	Dissolved Oxygen (mg/L) 0	24	48	72	96	Temperature (°C) 0	24	48	72	96
0	1	5	0	0	0			0																	
	2	5																							
	3	5																							
	4	5																							
0.5%	1	5	0	0	0			0																	
	2	5			0			0																	
	3	5			0			0																	
	4	5			0			0																	
1.0%	1	5	0	0	0			0																	
	2	5		1	0			1																	
	3	5		0	0			0																	
	4	5		0	0			0																	
1.5%	1	5	0	0	0			0																	
	2	5			1			1																	
	3	5			0			0																	
	4	5			0			0																	

Comments: _____

SCOEPA00027448

Doc ID: O:\Clom\Port.BRN\LifeSci.SEC\Forms\ToxHzWst.FOR
Revision #: 1.00
Revision Date: 11/04/92

STATIC ACUTE TOXICITY TEST - HAZARDOUS WASTE

Job Number: Oct Ref Tox Source: _____ Analyst: _____ 2/2

Custabbr: _____ Test Fish: _____ Reviewed By: _____

Start Date: _____ Time: _____ End Date: _____

Conc (mg/L)	Rep.	Number of organisms/ container	Mortality / 24 hrs.					Total Mortality	pH					Specific Cond.		Dissolved Oxygen (mg/L)					Temperature (°C)				
			0	24	48	72	96		0	24	48	72	96	0	96	0	24	48	72	96	0	24	48	72	96
20%	1	5	0	4	1	—	—	5																	
	2	5	|	3	1	0		4																	
	3	5	|	4	1	—	—	5																	
	4	5	V	4	1	—	—	5																	
30%	1	5	0	5	—	—	—	5																	
	2	5	|	5	—	—	—	5																	
	3	5	|	5	—	—	—	5																	
	4	5	V	4	1	—	—	5																	

Comments: _____

SCOEPA00027449

APPENDIX C

CHAIN-OF-CUSTODY

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

COFFEY LABORATORIES, INC. - CHAIN OF CUSTODY AGREEMENT

12423 NE Whitaker Way, Portland, OR 97230
(503) 254-1794 (503) 254-1452 (fax)
www.coffeylabs.com

Company: WACKER SILTRONIC
Address: 7200 NW Front Avenue
Portland, OR 97210

Attn: Tom Rothschild/Dianne Irish

Phone: (503) 219-7374; Fax (503) 417-4144

PO # 4500-75102
Project: Bioassay
Project #: 02-125

Sample Turnaround
[ ] Standard
[ ] Priority – Additional Fee
[ ] Rush – Additional Fee
[ ] Emergency – Additional Fee
Initials:_____

Report Instructions & Sample Comments:
Dilutions Required: 30%, 15%, 7.5%, 3.75%, and 1.9%.

FOR LABORATORY USE ONLY:
Samples received with proper bottle & preservative
[ ] Yes [ ] No,
Explain_____
Sample Temperature OK
Job # MXA21007T-1
Custabbr: wackersilt

Sample ID:	02-125			2809
Date Collected:	7oct2002			1902
Time Collected:	0800			
Sampled by:	JJR			

Analysis	1	2	3	4	Prices	P Code	Comments
Metals: As, Cu, Cr, Pb, Hg, Ag, Se (please circle) Note: Cr needs DL of 0.001, EPA 218.2 Other:					Digestion Fee $20.00 $10.00 per metal	J	
BOD					$30.00	R	
TOX or EOX (please circle)					$80.00	E	
Volatile Organics EPA 8260					$140.00	U	
Semi Volatiles (EPA 8270) And 1-2 Diphenylhydrazine					$290.00	A	
Solvent Scan IPA					$125.00	A	
Bioassay, Acute/Chronic		X					
Amonia- Nitrogen		X					
Alkalinity		X					
Nitrate- Nitrogen		X					
Hydrogen Peroxide		X					

Relinquished by: (Sign) Thomas J. Rothschild	(Date) 7 October 2002		
Received by: (Sign) [signature]	(Date) 10/7/02		
Relinquished by: (Sign)	(Date)	(Time)	
Received by:(Lab Use Only) [signature]	(Date) 10/7/02	(Time) 1417	

SCOEPA00027451

[redacted] CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Jom Rothschild
Company Name: Wacker Siltronic
Mailing Address: 7200 NW Front Ave
Portland, Oregon
Phone: (503) 219-7374 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):
Required Dilutions for Bioassay:
30%, 15%, 7.5%, 3.75% & 1.9%

PO Number: 4500075102
Project Number: 02-131
Project Name: Bioassay
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- [X] Standard
- [ ] Priority (Additional Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Initials: DT

Reporting Request
- [ ] State Compliance Format
- [X] FAX Results - Preliminary
- [X] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page 2 of 2
Job Number: MX-A2100ZT-3
Custabbr: Wacker Silt ☐NEW
☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
02-131				10/1/02	0745	WW	Bioassay: Acute & Chronic	
"				"	"	↓	Ammonia-Nitrogen, Alkalinity	
"				"	"	↓	Nitrate-Nitrogen	
"				"	"	↓	Hydrogen Peroxide	

Sampled By: Jom Rothschild
AUTHORIZED CUSTOMER SIGNATURE: Dianne Thiel DATE: 10-9-02

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Dianne Thiel	10-9-02	0830	RLC	10/9/02	1115
				LAB		

White Copy-Laboratory Yellow Copy -Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

CASCADE LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Jom Rothschild
Company Name: Wacker Siltronic
Mailing Address: 7200 NW Front Ave
Portland, Oregon
Phone: (503) 219-7374 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):
Dilutions required for Bioassay:
30%, 15%, 7.5%, 3.75%, & 1.9%

PO Number: 4500075102
Project Number:
Project Name: Bioassay
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- [X] Standard
- [ ] Priority (Additional Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Initials: DR

Reporting Request
- [ ] State Compliance Format
- [X] FAX Results - Preliminary
- [X] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page 3 of 3
Job Number: MX-A21007T-3
Custabbr: Wacker Silt ☐NEW
☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC: $ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS (LAB) CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
02-132	B1	3x	1	10/11/02	0730	WW	Bioassay: Acute & Chronic	
	N3	3r	1			↓	Ammonia-Nitrogen, Alkalinity	
	B5E	3f	1				Nitrate-Nitrogen	
	006	3j	1			↓	Hydrogen Peroxide	

Sampled By: Jom Rothschild
AUTHORIZED CUSTOMER SIGNATURE: Dianne Irish DATE: 10/11/02

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Dianne Irish	10/11/02	0830	DR	10/11/02	1615
				LAB MW Todd	10/11/02	1600

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

APPENDIX D

ORGANISM HISTORY

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524

Toll Free: 800/331-5916
Tel: 970/484-5091 Fax:970/484-2514

Wacker
Ref Tox

ORGANISM HISTORY

DATE: 10/7/02

SPECIES: Pimephales promelas

AGE: N/A

LIFE STAGE: Embryo

HATCH DATE: 10/7/02

BEGAN FEEDING: N/A

FOOD: N/A

Water Chemistry Record:	Mean	Range
TEMPERATURE:	25 °C	--
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	103 mg/l	--
TOTAL ALKALINITY (as $CaCO_3$):	72 mg/l	--
pH:	8.07	--

Comments:

Facility Supervisor

SCOEPA00027455

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

21 December, 2002

Thomas Rothschild
Wacker Siltronics Corporation
7200 N.W. Front
Portland, OR 97210

RE: Bioassay

Enclosed are the results of analyses for samples received by the laboratory on 11/04/02 10:00. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian L Cone

Brian Cone
Industrial Services Manager

Work Orders included in this report:
P2K0050

www.ncalabs.com

Seattle 11720 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8244
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:02

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
02-145	P2K0050-01	Water	11/04/02 08:00	11/04/02 10:00

North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Brian L Cone

Brian Cone, Industrial Services Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

SCOEPA00027457

www.ncalabs.com

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:02

Conventional Chemistry Parameters per North Creek Analytical Methods

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
02-145 (P2K0050-01) Water						Sampled: 11/04/02	Received: 11/04/02		
Hydrogen Peroxide	**5.10**	2.00	mg/l	1		11/07/02	11/07/02	2110252	I-05

North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Brian L Cone

Brian Cone, Industrial Services Manager

www.ncalabs.com

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:02

Conventional Chemistry Parameters per North Creek Analytical Methods - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2110252 - Wet Chem										
Blank (2110252-BLK1)				Prepared & Analyzed: 11/07/02						
Hydrogen Peroxide	ND	2.00	mg/l							
Duplicate (2110252-DUP1)		**Source: P2K0050-01**		Prepared & Analyzed: 11/07/02						
Hydrogen Peroxide	5.10	2.00	mg/l		5.10			0.00	200	

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Wacker Siltronics Corporation	Project: Bioassay	
7200 N.W. Front	Project Number: November/2002	**Reported:**
Portland, OR 97210	Project Manager: Thomas Rothschild	12/21/02 10:02

Notes and Definitions

I-05	This sample was received outside EPA recommended holding time.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis. MRLs are adjusted if %Solids are less than 50%.
wet	Sample results reported on a wet weight basis (as received)
RPD	Relative Percent Difference

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

P2L0442

Client Wacker Siltronic Corp. NPDES# 101128

Address 7200 NW Front Avenue
Portland, Oregon 97210

Composite Sample Information _____

Samples/Hour 24 Volume/Sample 6L

Total Hours 24 Total Volume 144L

Contact Person: Thomas J. Rothschild

Phone: 503-219-7374

Initiated: Date 12 Dec Time 0800

Ended: Date 13 Dec Time 0800

Chilled During Collection Yes ☐ No ☒

CH2M HILL ~~Project~~ # _____

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

P. O.# _____

Check Chlorine (Y/N) _____

Temp. Upon Arrival (°C) _____

Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

Analysis Required/Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
C2-173	13 Dec 2002	0800	X		1		X	X	X	X														Dilutions: 1.9%, 3.75%, 7.5%, 15%, 30%. Test for Ammonia-Nitrogen Alkalinity Nitrate-Nitrogen Hydrogen Peroxide.

Sampled By & Title (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 13 Dec 2002 / 0800	Relinquished By (Please sign and print name) Thomas J. Rothschild Thomas J. Rothschild	Date/Time 13 Dec 2002 / 11:20
Received By (Please sign and print name) Tammy Elston	Date/Time 12-13-02 / 11:20	Relinquished By (Please sign and print name)	Date/Time 12/13/02
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks 3.3°C		

Rev. 10/97

WACKER SILTRONIC

JIM CLAXTON
ENVIRONMENTAL ENGINEER

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland OR 97210-3676, USA
Tel. +1 503 7313
Fax +1 503 7599
jim_claxton@siltronic.com

Wacker Siltronic Corporation
7200 NW Front Avenue, Portland OR 97210-3676, USA

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER:053.JWC

Date 2002-Dec-13

Reference August 2002 Bioassay Update

Dear Dr. Zais,

This letter is to inform you that Wacker Siltronic Corporation **did not passed** the Bioassay as required by our NPDES permit number 101128. A complete Bioassay re-test is scheduled for the week of Dec 8, 2002 and the results will be submitted by as soon as possible.

The following table shows the time line of events for this year's bioassay:

Sample Date	Test result	Comments
Week of Aug 5	Test aborted	Due to a miss communication between Coffey Labs and Wacker, the wrong sample dilutions were used for the analysis so the test was aborted.
Week of Aug 26	QC problems no results	Control organisms did not meet the QC requirements of the analysis, no test results. Test re-scheduled
Week of Oct 7	**Samples Failed** Re-test scheduled for the week of Nov. 3.	Testing could not be re-scheduled until the week of Oct 7. There were a number of reasons for this (see letter dated Sept 10, 2002) but briefly: 1. Neither CH2M-Hill nor Coffey labs could re-schedule the test until the week of Sept 23. **2.** Wacker scheduled a partial-manufacturing shutdown to perform plant maintenance from Sept 22 to October 1, so any sampling during this week would not represent the entire waste steam.
Week of Nov 3	QC problems no results	Wacker contacted CH2M-Hill Dec 2 to check on results. Wacker was told that the test would need to be repeated because the control organisms did not meet the QC requirements of the analysis. Test re-scheduled.
Week of Dec 8	In process	The earliest a re-test that could be scheduled was the week of Dec 8. The samples will be analyzed by CH2M-Hill.

If you have any questions, please contact Jim Claxton.

Regards,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
Bioassay 2002 File

WACKER
Wacker Siltronic Corporation

November 8, 2002

ER047:JC

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

Dear Dr. Zais,

Below are the results of the annual bioassay test performed October 8 through October 15, 2002 as required in our NPDES permit number 101128. **The results of the bioassay do not comply with the conditions of our permit.** A second Bioassay is scheduled for November with sampling dates of November 4, 6 and 8.

Coffey Labs results for October 2002

Acute (48-hour) Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	15%	7.5%
ZID Pass Criteria[1]	≥13.4%	≥13.4%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	30%	<1.9%
Mixing Zone Pass Criteria[1]	≥ 1.8%	≥ 1.8%

If you have any questions, please contact Jim Claxton at 503-219-7313.

Regards,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
NPDES DMR File

[1] CH2MHILL. Mixing Zone Effluent Dilution Evaluations prepared for Wacker Siltronic Corporation in 1994, 1995 and 1996. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution studies identified worst-case (0.1 feet/ second as current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 7.5:1 and 55.5:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 13.4% effluent at the edge of the ZID and 1.8% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test LC_{50} is less than 13.4% effluent, and is considered to be chronically toxic if a chronic test LC_{50} is less than 1.8% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test $LC_{50} \geq$ 13.4% effluent and the chronic test $LC_{50} \geq$ 1.8% effluent.

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

SCOEPA00027463

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Jim Claxton
Environmental Engineer
Wacker Siltronic Corp.
7200 NW Front Avenue, Mail Stop 30
Portland, OR 97210-3676

34

SENDER:

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Dr. Elliot Zais
Water Quality Source Control, DEQ
State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

A. Signature
X
☐ Agent
☐ Addressee

B. Received by (Printed Name)

C. Date of Delivery
NOV 12 2002

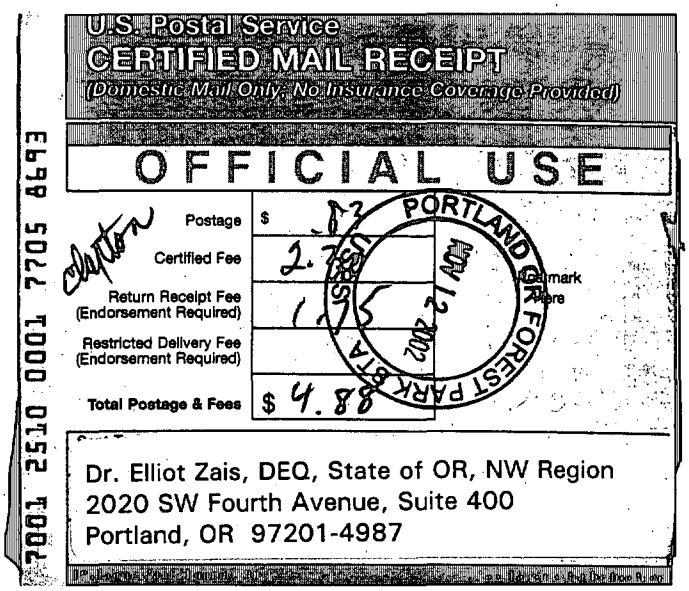
D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number
(Transfer from service label) 7001 2510 0001 7705 8493

PS Form 3811, August 2001 Domestic Return Receipt 102595-01-M-2509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MAY 12 2002
Postmark Here
7001 2510 0001 7705 8693
Dr. Elliot Zais, DEQ, State of OR, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)
NAME Wacker Siltronic Corporation Site ID 93450
ADDRESS PO Box 83180
Portland, OR 97283-0810
FACILITY 7200 NW Front Ave.
LOCATION Portland, OR 97210

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

(2-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER
101128	Outfall 001

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	2002	10	1	TO	2002	10	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Process Waste Water Flow	SAMPLE MEASUREMENT	917,000	1,024,000	gal/day	--	--	--	--		Continuous totalizing recorder	
	PERMIT REQUIREMENT	--	--		--	--	--				
BOD	SAMPLE MEASUREMENT	73.9	221.1	lbs/day	--	9.8	30.0	mg/l		1/7	24HC
	PERMIT REQUIREMENT	339	753		--	15	30				
TSS	SAMPLE MEASUREMENT	19.3	20.5	lbs/day	--	2.5	2.8	mg/l		1/7	24HC
	PERMIT REQUIREMENT	520	1532		--	23	61				
Cr^{+6} (1)	SAMPLE MEASUREMENT			lbs/day	--			mg/l		Batch	
	PERMIT REQUIREMENT	0.11	0.27		--	0.02	0.05				
Cr^{Total}	SAMPLE MEASUREMENT	<0.01	0.01	lbs/day	--	<0.01	<0.01	mg/l		1/7	24HC
	PERMIT REQUIREMENT	0.2	0.6		--	0.3	1.0				
Fluoride	SAMPLE MEASUREMENT	64.0	71.2	lbs/day	--	8.3	8.9	mg/l		1/7	24HC
	PERMIT REQUIREMENT	393	804		--	17.4	32				
Total Phosphate	SAMPLE MEASUREMENT	--	--	--	--	0.2	0.5	mg/l		1/7	24HC
	PERMIT REQUIREMENT	--	--		--	23	61				

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
Tom McCue
Environmental Manager
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 USC § 1001 AND 33 USC § 1319. (Penalties under these statutes may include fines up to $10,000 and imprisonment of between 6 months and 5 years.)

Wacker Siltronic Corp. by:
Thomas C. McCue
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 503 | NUMBER 243-2020
DATE: YEAR 02 | MO 11 | DAY 8

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
Chrome batches are no longer being treated on site.

ER048.JWC

SCOEPA00027467

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)

NAME Wacker Siltronic Corporation Site ID 93450

ADDRESS PO Box 83180
Portland, OR 97283-0810

FACILITY 7200 NW Front Ave.

LOCATION Portland, OR 97210

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

(3-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER
101128	Outfall 001

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	2002	10	1	TO	2002	10	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

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TTO	SAMPLE MEASUREMENT	--	--	lbs/day	--	--	<0.01	mg/l		1/ 30	Grab
	PERMIT REQUIREMENT	--	--		--	--	1.37				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
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	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

Tom McCue
Environmental Manager

TYPED OR PRINTED

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Wacker Siltronic Corp. by:

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 503 | NUMBER 243-2020

DATE: YEAR 02 | MO 11 | DAY 8

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

SCOEPA00027468

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)

NAME Wacker Siltronic Corporation Site ID 93450

ADDRESS PO Box 83180
Portland, OR 97283-0810

FACILITY 7200 NW Front Ave.

LOCATION Portland, OR 97210

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

(2-16)	(17-19)
101128	Outfall 002
PERMIT NUMBER	DISCHARGE NUMBER

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OMB No. 2040-0004
Approval expires 10-31-94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	2002	10	1	TO	2002	10	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
MV-3 Flow	SAMPLE MEASUREMENT	128,000	201,000	gal/day	--	--	--	--		Continuous	
	PERMIT REQUIREMENT	--	--		--	--	--				
MV-3 Total phosphates	SAMPLE MEASUREMENT	--	--	--	--	0.1	0.2	mg/l		1/ 7	Grab
	PERMIT REQUIREMENT	--	--		--	2.0	5.0				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

Tom McCue
Environmental Manager

TYPED OR PRINTED

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Wacker Siltronic Corp. by:

Thomas C. McCue

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
503	243-2020	02	11	8
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

SCOEPA00027469

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)
NAME Wacker Siltronic Corporation Site ID 93450
ADDRESS PO Box 83180
Portland, OR 97283-0810
FACILITY 7200 NW Front Ave.
LOCATION Portland, OR 97210

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)
(2-16): 101128 PERMIT NUMBER
(17-19): Outfall 003 DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	2002	10	1	TO	2002	10	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) (46-53) QUANTITY OR LOADING (54-61) AVERAGE	MAXIMUM	UNITS	(4 Card Only) (38-45) QUALITY OR CONCENTRATION (46-53) MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX (62-65)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Outfall flow	SAMPLE MEASUREMENT	1,045,000	1,137,000	gal/day	--	--	--	--		Continuous	
	PERMIT REQUIREMENT	--	--		--	--	--				
Outfall temperature	SAMPLE MEASUREMENT	--	--	--	--	--	69.8	°F		1/7	Grab
	PERMIT REQUIREMENT	--	--		--	--	85				
Outfall pH	SAMPLE MEASUREMENT	--	--	--	>6.0	7.0	<9.0			Continuous	
	PERMIT REQUIREMENT	--	--		6.0	--	9.0				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
Tom McCue
Environmental Manager
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and imprisonment of between 6 months and 5 years).

Wacker Siltronic Corp. by:
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 503 NUMBER 243-2020

DATE: YEAR 02 MO 11 DAY 8

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

SCOEPA00027470

RECEIVED OCT 3 1 2002

Report Date: October 31, 2002
Job Number: A21017R
PO Number: 4500075102
Project No: 02-135-CE
Project Name: None Provided

Tom Rothschild
Wacker Siltronic
7200 NW Front Avenue
Portland, OR 97210-3676

Analytical Narrative

The sample was received on 10/17/02 by Coffey Laboratories, Inc. (CLI) Sample Reception personnel under strict chain of custody protocol. The following information was provided at the time of sample reception:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
A21017R-1	02-135-CE	Water	10/17/02	0730

The recommended holding time for each batch of analyses was in accordance with the data quality objectives as specified in the CLI Quality Assurance Plan unless otherwise noted.

Acceptable precision and accuracy were achieved for all analyses associated with this work order as demonstrated by the recoveries of the quality control samples analyzed concurrently with each batch.

The data submitted in this report is for the sole and exclusive use of the above-named client. All samples associated with the work order will be retained a maximum of 15 days from the report date or until the maximum holding time expires. All results pertain only to samples submitted.

Thank you for allowing Coffey Laboratories to be of service to you. If you have questions or need further assistance, please do not hesitate to call our Customer Services Department.

Sincerely,

Technical Services

TS /atc

Coffey Laboratories, Inc.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

Analytical Data

Wacker Siltronic

Job Number: A21017R
Page Number: 2 of 2

Lab Sample ID: A21017R-1
Field ID: 02-135-CE
Date/Time: 10/17/02 0730
Matrix: Water

EPA Category: Inorganic Chemicals

Parameter	Method	Detection Limit	Analytical Result	Units
Chromium	EPA 218.2	0.0007	0.0019	mg/L
Biochemical Oxygen Demand*	EPA 405.1	30.	30. (1)	mg/L

*NOTE: The sample was reanalyzed past the analyte hold time, as requested by the client.

(1) BOD = 30mg/L is the second analysis. 1st analysis was incorrectly diluted. Per Mark Leed. 31oct2002. JJR

WWTP Log Book shows nothing unusual on 16-17Oct2002. JJR

Coffey Laboratories, Inc.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

SCOEPA00027472

WACKER SILTRONIC

JIM CLAXTON
ENVIRONMENTAL ENGINEER

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland OR 97210-3676, USA
Tel. +1 503 7313
Fax +1 503 7599
jim_claxton@siltronic.com

Wacker Siltronic Corporation
7200 NW Front Avenue, Portland OR 97210-3676, USA

ER:039.JWC

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

Date 2002-Sept-10

Reference August 2002 Bioassay Results

Dear Dr. Zais,

This letter is to inform you that Wacker Siltronic Corporation will not be submitting annual bioassay results by September 15, 2002, as discussed with you last week and as required by our NPDES permit number 101128.

Bioassay samples are normally taken during the first week of August. Samples were taken the week of August 5. Due to a miss communication between Coffey Laboratories and Wacker Siltronic, the wrong dilution factors were used in preparing the test samples. The test was aborted. The test was re-scheduled and samples were taken the week of August 26, 2002. During the performance of the bioassay, the control organisms died and the test was aborted. Please refer to the attached letter from Coffey Laboratories.

Coffey Laboratories is investigating the cause of the deaths of the control organisms. However, due to the investigation Coffey Laboratories has closed their bioassay department until they have completed a series of Quality Control tests to re-certify this area for use. Coffey Laboratories is confident that the re-certification process will be completed by the week of September 23, 2002. CH2M-Hill was contacted but their bioassay schedule is also filled until the week of September 23, 2002.

Beginning September 22 Wacker Siltronic has scheduled a partial-manufacturing shutdown to perform maintenance until October 1. Bioassay samples taken during this period would not be representative of the normal Wacker Siltronic effluent. The bioassay is re-scheduled for the week of October 7,2002. Bioassay results will be submitted by November 15, 2002. If you have any questions, please contact Jim Claxton.

Regards,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild + Tim Dean
Bioassay 2002 File

Report Date: September 10, 2002
Job Number: A20826J
PO Number: 4500075102
Project No: None Provided
Project Name: Bioassay - August 2002

Tom Rothschild
Wacker Siltronic
7200 NW Front Avenue
Portland, OR 97210-3676

Analytical Narrative

The sample was received on 08/26/02 by Coffey Laboratories, Inc. (CLI) Sample Reception personnel under strict chain of custody protocol. The following information was provided at the time of sample reception:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
A20826J-1	02-110	Waste Water	08/26/02	0750
A20826J-2	02-111	Waste Water	08/28/02	0735
A20826J-3	02-112	Waste Water	08/30/02	0725

The recommended holding time for each batch of analyses was in accordance with the data quality objectives as specified in the CLI Quality Assurance Plan unless otherwise noted.

Acceptable precision and accuracy were achieved for the chemical analyses associated with this work order as demonstrated by the recoveries of the quality control samples analyzed concurrently with each batch. The tests for the Acute 96 hour Fathead Minnow and the 48 hour Ceriadaphnia EPA 6004-90-027 were run, but the control organisms died and the test was invalid. Another test could not be started immediately because the cause of death of the control organisms needed to be resolved before another test could be performed. The test is rescheduled for October 7, 2002.

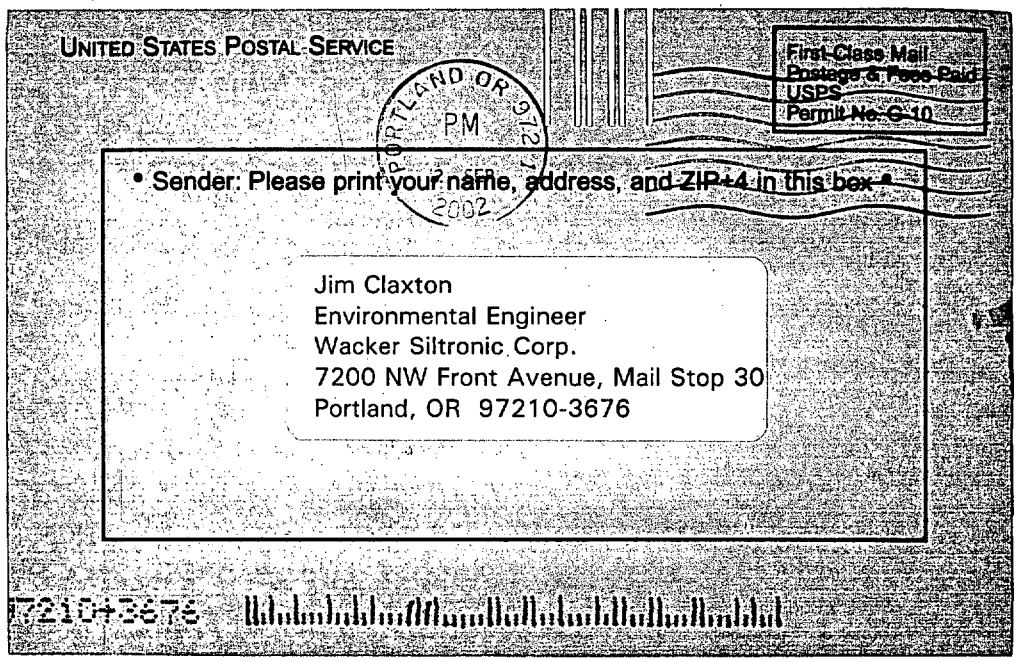
The data submitted in this report is for the sole and exclusive use of the above-named client. All samples associated with the work order will be retained a maximum of 15 days from the report date or until the maximum holding time expires. All results pertain only to samples submitted.

Thank you for allowing Coffey Laboratories to be of service to you. If you have questions or need further assistance, please do not hesitate to call our Customer Services Department.

Sincerely,

Technical Services

TS /atc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Environmental Engineer
Wacker Siltronic Corp.
7200 NW Front Avenue, Mail Stop 30
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97210+3676

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Tim Dean
Bureau of Environmental Services
City of Portland
6543 N. Burlington Avenue
Portland, OR 97203-5452

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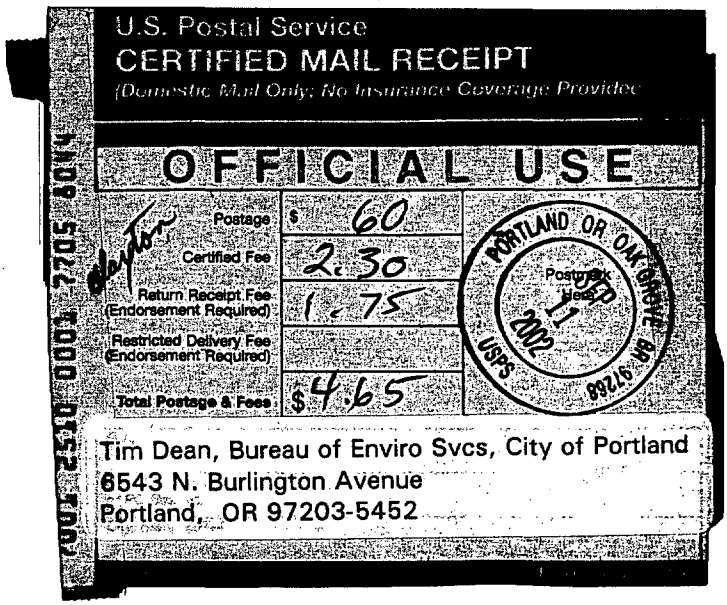

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Tim Dean, Bureau of Enviro Svcs, City of Portland
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Jim Claxton
Environmental Engineer
Wacker Siltronic Corp.
7200 NW Front Avenue, Mail Stop 30
Portland, OR 97210-3676

24

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1. Article Addressed to:

Dr. Elliot Zais
Water Quality Source Control, DEQ
State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

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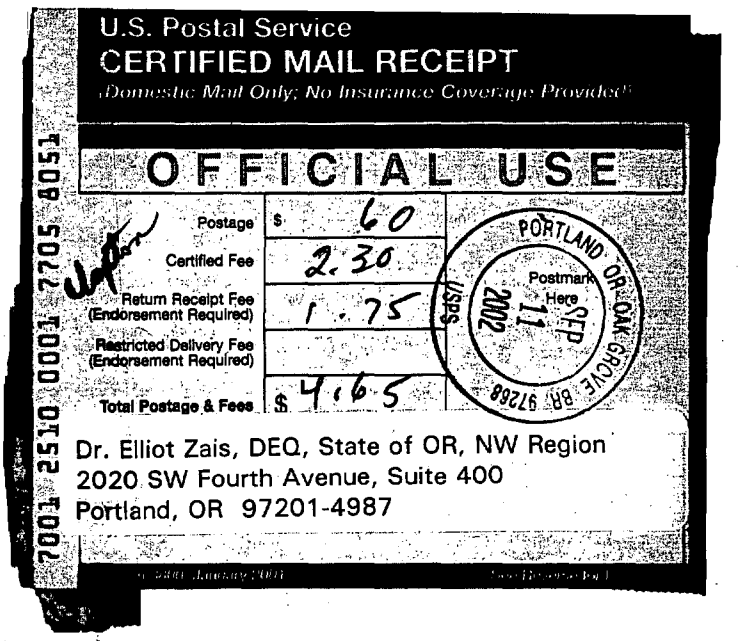
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Dr. Elliot Zais, DEQ, State of OR, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

WACKER

Wacker Siltronic Corpora

April 11, 2001

Dr. Elliot Zais
Water Quality Source Control
Dept. of Environmental Quality
State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

ER:014TM

RE: Annual Bioassay Results

Dear Dr. Zais:

Previously reported evaluations of bioassay test results submitted in our October 2000 DMR were over-reported and did not take into account the correct dilution data to describe the effluent concentration within the zone of immediate dilution and the dilution at the edge of the mixing zone. This effected the test results and the percent of effluent used to determine the no observable effect concentration (NOEC). Using actual dilution data from three mixing zone studies, Wacker Siltronic Corporation is currently in compliance with all NPDES permit conditions in Schedule D, Section 6, Bioassay requirements.

The error occurred when we failed to take into account the effluent dilution data produced by the mixing zone studies when conducting the bioassay testing. Data used for effluent dilution determination up to this point were early estimated dilution values suggested in 1994 before the ZID was established in the permit.

A total of three mixing zone studies have been performed at the outfall in the years 1994, 1995, and 1999. These studies have been submitted to DEQ in the past. Each of these studies model the dilution conditions within the mixing zone and at the edge of the mixing zone. This data is used to define the pass/fail criteria for bioassay tests.

All mixing zone data that is valid for the existing permit has been used to calculate the average dilution a 5 foot radius for the ZID and at a 50 foot radius for the edge of the mixing zone. All dilution data points are based on 7Q10 worst case low flow conditions at 0.1 feet per second current velocity during both average and maximum permitted discharge volumes. Under these conditions the NOEC test criteria is:

Acute: NOEC $\geq$13.4% effluent (10-17.5% based on ZID dilutions of 5.7-10)

Chronic: NOEC $\geq$1.8% effluent (1.5-3.0% based on mixing zone dilutions of 33-72)

Test results have been re-evaluated based on the above average effluent dilutions:

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

Test Date (2000)	Test	Ceriodaphnia dubia Survival (% Effluent)	Pimephales promelas Survival (% Effluent)
Aug 8-15	Acute NOEC	17%	100%
	Chronic NOEC	<3%	<3%
Oct 10-17	Acute NOEC	50%	100%
	Chronic NOEC	3%	100%
Dec 5-12	Acute NOEC	50%	100%
	Chronic NOEC	<6.25	100%

The bioassay tests conducted in October and December pass under all mixing zone conditions. The August bioassay test appears to pass but a lack of data at the lower concentration make the results questionable. Future bioassay tests will be conducted at lower effluent concentrations to bracket the test criteria.

A Toxicity Identification Evaluation study has been conducted on the total effluent and upstream from the discharge point to determine the cause for periodic test failures. Testing is ongoing and it is hoped that it will assist in the design of long term solutions.

If you have any questions, please contact me at 503-219-7532

Very truly yours,

Wacker Siltronic Corporation;

Thomas C McCue

Thomas C. McCue
Environmental Manager

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

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Jim Claxton
Environmental Engineer
Wacker Siltronic Corp.
7200 NW Front Avenue, Mail Stop 30
Portland, OR 97210-3676

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Dr. Elliot Zais
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State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
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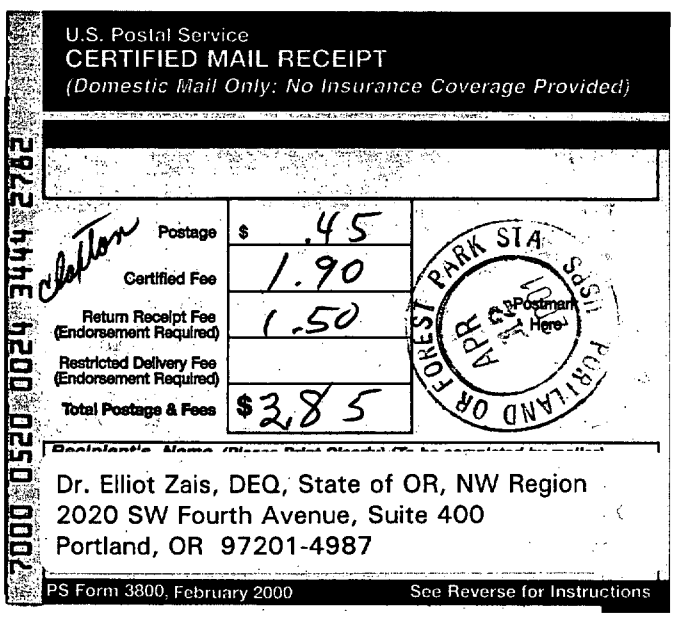

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Dr. Elliot Zais, DEQ, State of OR, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

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WACKER
Wacker Siltronic Corporation

November 13, 2000

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER066:JC

Dear Dr. Zais,

Below are the results of the annual bioassay test performed August 8 through August 15, 2000 as required in our NPDES permit number 101128. The results of the bioassay **fail** the conditions of our permit. Bioassay testing was conducted by **CH2M**Hill.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	17%	100%
ZID Pass Criteria[1]	≥50%	≥50%
Chronic Results:	**Survival (% Effluent)**	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	<3%	<3%
Mixing Zone Pass Criteria[1]	≥ 17%	≥ 17%

A re-test was scheduled for September but was discontinued due to an upset in our waste treatment facility. A second re-test was scheduled for October. Below are the results of the re-test performed October 10 through October 17, 2000 as required in our NPDES permit number 101128. The results of the bioassay pass the conditions of our permit with the exception of the chronic results of the Ceriodaphnia dubia, which fail the conditions of our permit. Bioassay testing was conducted by **CH2M**Hill.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	50%	100%
ZID Pass Criteria[1]	≥50%	≥50%
Chronic Results:	**Survival (% Effluent)**	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	**<3%**	100%
Mixing Zone Pass Criteria[1]	≥ 17%	≥ 17%

If you have any questions please contact me at 219-7532.

Very truly yours,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
NPDES DMR File

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

[1] Raymond, Richard/CH2MHILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution study identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC >/= 50% effluent and the chronic test NOEC >/= 17% effluent.

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1. Article Addressed to:

Dr. Elliot Zias
Water Quality Source Control
Dept. of Environmental Quality
State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

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NOV 13 2000

Recipient's Name *(Please Print Clearly) (To be completed by mailer)*
Dr. Elliot Zais, DEQ, State of Oregon

Street, Apt. No.; or PO Box No.
2020 SW Fourth Avenue, Suite 400

City, State, ZIP+ 4
Portland, OR 97201-4987

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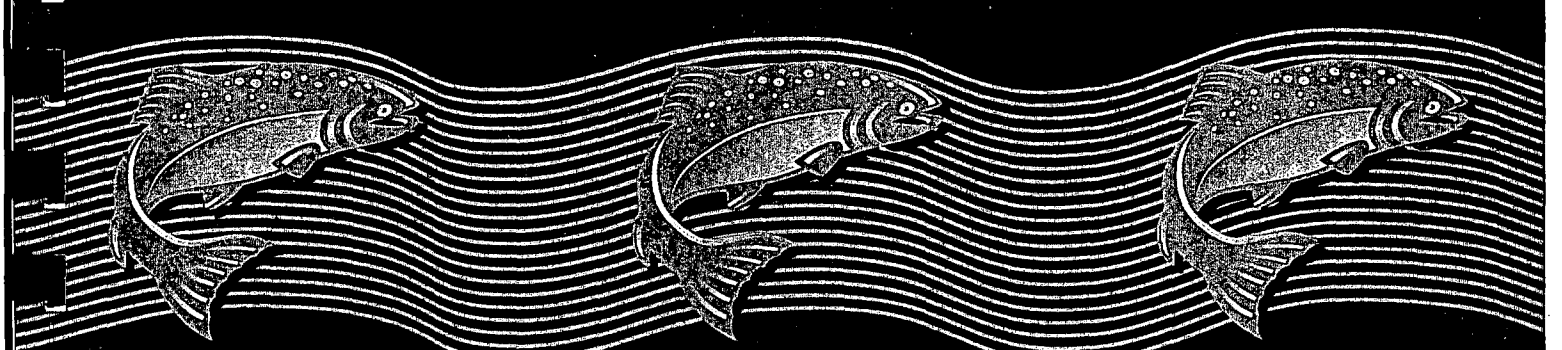
SCOEPA00027490

BIOMONITORING SERVICES

BIOASSAY REPORT
ACUTE AND CHRONIC BIOASSAYS
Conducted August 8 through 15, 2000



CH2MHILL

SCOEPA00027491

BIOASSAY REPORT
ACUTE AND CHRONIC BIOASSAYS
Conducted August 8 through 15, 2000

Prepared for

North Creek Analytical
Wacker Siltronics

Prepared by

CH2M HILL
2300 NW Walnut Boulevard
Corvallis, Oregon 97330

August, 2000
Lab ID No. C02680

SCOEPA00027492

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

8.2°C

P008134 -3

Client: Wacker Siltronic
Address: 7200 NW Front Ave, Portland, OR
Contact Person: Tom Rothschild
Phone: (503) 219-7374
CH2M HILL Project #:

NPDES# 101128
Composite Sample Information:
Samples/Hour: ____ Volume/Sample: ____
Total Hours: 24 Total Volume: 40
Initiated: Date 8.10.00 Time 800 am
Ended: Date 8.11.00 Time 800 am
Chilled During Collection: Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
P.O.# 210162
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

Check Chlorine (Y/N): ____
Temp. Upon Arrival (°C): ____
Check Ammonia (Y/N): ____ Dechlorinate (Y/N): ____

Analysis Required/Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
00.74	8.11.00	0810	X		1		X	X	X	X														

Sampled By & Title (Please sign and print name): Dianne Irish LAB TECH	Date/Time: 8/11/00 0810	Relinquished By (Please sign and print name): Dianne Irish	Date/Time: 8.11.00
Received By (Please sign and print name): David Lankford	Date/Time: 8/11/00 12:50	Relinquished By (Please sign and print name): David Lankford	Date/Time: 8/11/00 13:30
Received By (Please sign and print name): Bob Fahs	Date/Time: 8/11/00 13:30	Relinquished By (Please sign and print name):	Date/Time:
Received By (Please sign and print name):	Date/Time:	Shipped Via: UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #:
Work Authorized By (Please sign and print name):	Remarks:		

SCOEPA00027493

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INTRODUCTION

CH2M HILL conducted acute and chronic definitive tests on samples provided by North Creek Analytical Beaverton, Oregon (Wacker Siltronics). The organisms tested were the water flea (*Ceriodaphnia dubia*) and the fathead minnow (*Pimephales promelas*). The tests were conducted from August 8 through 15, 2000.

METHODS AND MATERIALS

TEST METHODS

The acute tests were performed according to: *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms*, Weber C., et. al. (1993); EPA/600/4-90/027F and *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Weber, C. et al. (1994); EPA/600/4-91/002 and *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.

TEST ORGANISMS

The *Ceriodaphnia dubia* used in the tests were obtained from CH2M HILL's in-house cultures. The *Ceriodaphnia dubia* used in the chronic tests were less than 24 hours old and within an 8-hour age range at test initiation. The *Ceriodaphnia dubia* used in the acute tests were less than 24 hours old at test initiation. The fathead minnows used in the tests were obtained from Aquatic Bio-Systems, Fort Collins, Colorado. The fathead minnows used in the chronic tests were less than 24 hours old at test initiation. The fathead minnows used in the acute tests were 7 days old and acclimated to test conditions for less than 1 day prior to testing. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (1994). The test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used in the tests was moderately hard reconstituted water with a hardness of 90 mg/l as $CaCO_3$, alkalinity of 68 mg/l as $CaCO_3$, and pHs of 8.3.

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TEST CONCENTRATIONS

The concentrations tested in both the acute and chronic tests were 3, 10, 17, 50, and 100 percent effluent with dilution water for the control. The concentrations for the *Ceriodaphnia dubia* acute test were run in quadruplicate with five organisms per replicate. The concentrations for the fathead minnow acute test were run in duplicate with ten organisms per replicate. For the chronic *Ceriodaphnia dubia* tests, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel. For the fathead minnow chronic tests, 10 organisms per chamber with four chambers per concentration for a total of 40 organisms per concentration were used.

SAMPLE COLLECTION

Samples were collected on August 7, 9, and 11, 2000 and transported to CH2M HILL's Corvallis Aquatic Toxicology Laboratory by Greyhound Bus. The samples were stored in the dark at 4°C until test solutions were prepared and tested. Chain of custody forms for sample collection are provided in Appendix C. .

SAMPLE PREPARATION

Samples used during these tests were filtered through a 60 µm net upon arrival and temperature was adjusted prior to each daily renewal.

MONITORING OF BIOASSAYS

Samples were monitored on arrival for hardness, total residual chlorine, ammonia, and temperature.

The acute tests were monitored at initiation for pH, conductivity, and dissolved oxygen, and every 24 hours thereafter for dissolved oxygen, pH, and mortality. Conductivity was again measured at test termination. Temperature was monitored continuously throughout the 48 hour test periods.

For the chronic tests, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in the control and all concentrations tested. Conductivity was measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was monitored daily in the chronic test. According to EPA (1994), *Ceriodaphnia dubia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia dubia* in the controls have produced their third brood and at least 15 neonates per adult are produced. Fathead minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the test.

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DATA ANALYSIS

The effects measured during the acute tests included survival over the exposure period. The effects measured during the *Ceriodaphnia dubia* chronic test included survival and reproduction over the exposure period. The effects measured during the fathead minnow chronic test included survival and growth over the exposure period. For the chronic tests, statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, using Toxcalc, version 5.0. Dunnett's Procedure, Bonferroni T-test, or Fisher's Exact Test was used to compare the survival data and Dunnett's Procedure or Bonferroni T-test was used to compare the reproduction or growth data between the control and each effluent treatment. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or Bonferroni T-test could not be met, Steel's Many-One Rank Test or Wilcoxon Many-One Rank Test with Bonferroni Adjustment was used to analyze the data.

RESULTS AND DISCUSSION

ACUTE BIOASSAYS

The raw data sheets are presented in Appendix A. The results of the *Ceriodaphnia dubia* test are summarized in Table 1.

Table 1
Summary of Acute Results
Ceriodaphnia dubia
Percent Survival

Concentration (%)	0 hr	24 hr	48 hr
Control	100	100	100
3	100	100	100
10	100	100	100
17	100	85	85
50	100	0	0
100	100	0	0

The LC_{50} for the *Ceriodaphnia dubia* test was 25.8 percent effluent. Survival in the 100 percent effluent was 0 percent.

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The results of the fathead minnow acute test are summarized in Table 2.

Table 2
Summary of Acute Results
Fathead minnow
Percent Survival

Concentration (%)	0 hr	24 hr	48 hr
Control	100	100	100
3	100	100	100
10	100	100	100
17	100	100	100
50	100	100	100
100	100	95	95

The LC_{50} for the fathead minnow test was greater than 100 percent effluent. Survival in the 100 percent effluent was 95 percent.

Dissolved oxygen concentrations remained at 40 percent saturation or greater throughout the testing period. Acute test temperatures remained in the range of 20±1°C. The tests proceeded without interruption or incidence that could have affected test results.

CHRONIC BIOASSAYS

Table 3 summarizes the results of the *Ceriodaphnia dubia* chronic test.

Table 3
Ceriodaphnia dubia
Chronic Results

Concentration (%)	**Percent Survival**	**No. Young Per Adult**
Control	100	32.5
3	90	19.8[b]
10	70	11.2[b]
17	50[a]	8.2
50	0[a]	0.0
100	0[a]	0.0

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Dunnett's Test.

The test results indicated a statistically significant reduction in survival at the 17, 50, and 100 percent effluent concentrations when compared to the control and a reduction in reproduction at the 3 and 10 percent effluent concentrations. Control survival was 100 percent. The no

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observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were <3 and 3 percent effluent.

The IC_{25} value (the concentration of effluent causing a 25 percent reduction in biological measurement, e.g. growth) was calculated on the *Ceriodaphnia dubia* reproduction. The IC_{25} value for reproduction was 1.9 percent effluent.

Table 4 summarizes the results of the fathead minnow chronic test.

Table 4
Fathead Minnow
Chronic Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight Per Fish (mg)
Control	100	0.49
3	97.5	0.41[b]
10	95.0	0.42[b]
17	97.5	0.37[b]
50	92.5	0.39[b]
100	77.5[a]	0.36[b]

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Steel's Many-One Rank Test.

The results indicate a statistically significant reduction in survival at the 100 percent effluent concentration and in growth at the 3, 10, 17, and 50 percent when compared to the control. The NOEC and LOEC were and <3 and 3 percent effluent, respectively. Control survival was 100 percent.

The IC_{25} value was calculated on the fathead minnow growth. The IC_{25} value for growth was 67.6 percent effluent.

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REFERENCE TOXICANT TESTS

The results of monthly reference toxicant tests with sodium chloride conducted in July and August indicate that the test organisms were within their respective sensitivity range based on EPA guidelines. The LC_{50} values, IC_{25} values, and Control Chart Limits are listed in the tables below. The data sheets for the reference toxicant tests are provided in Appendix B.

Table 5
Acute Reference Toxicant Tests (g/L)

Species	LC_{50}	Control Chart limits
Pimephales promelas (FHM 864)	7.1	6.1 to 9.1
Pimephales promelas (FHM 865)	6.5	5.9 to 9.2
Ceriodaphnia dubia	2.2	1.4 to 2.8

Table 6
Chronic Reference Toxicant Tests (g/L)

Species (test)	IC_{25}	Control Chart limits
Pimephales promelas (survival)	2.3	2.1 to 5.4
Pimephales promelas (growth)	2.1	1.7 to 4.0
Ceriodaphnia dubia (survival)	1.64	0.78 to 2.53
Ceriodaphnia dubia (reproduction)	0.64	0.06 to 1.18

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APPENDIX A
RAW DATA SHEETS

CH2M HILL *TOXICITY TEST ORGANISM AND WATER QUALITY DATA*

Client Walker Siltronics / North Creek Test Initiation: Date 8-8-00 Time 1445 Test Termination: Date 8-15-00 Time 1410

Contact Howard Holmes Technician Lausser, Mueley, Winn, Oldham, Dalton AAHA

Test Species/ID *Pimephales promelas* / FHM 864 *Pimephales promelas* / FHM 865

Ceriodaphnia dubia / Cd 1223 *Ceriodaphnia dubia* / Cd 1224

Sample Information

Sample ID Number	Field ID	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Dechlor.	Ammonia NH_3-N mg/l	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
02680-01	P008136-01	8/9/00	0815	0.01 / -	0.65	300	—
-02	P008136-02	8-9-00	0800	0.03 / -	0.41	168	—
-03	P008136-03	8-11-00	0810 DN	0.01 / -	0.76	214	—
				/			
				/			
				/			
				/			
				/			
				/			
				/			
				/			
				/			
				/			

Test Species Information	ID# FHM 864	ID# Cd 1223	ID# FHM 865	ID# Cd 1224
Age or Size	< 24 hours	< 24 hours within	7 days	< 24 hours
	—	an 8 hour span	—	—
Test Container Size	400 ml	30 ml	800 ml	30 ml
Test Volume	250 ml	15 ml	500 ml	25 ml
Feeding: Type	0.1 ml *Artemia*	0.1 ml Algae &		Algae & YCT
Amount	2 x daily	YCT daily		prior to test
Aeration: Began	None →			
Amount	—	—	—	—
Dilution Water ID#	1869 /	1869 /	1869	1869
Acclimation Period	< 24 hours	< 24 hours	≤ 1 days	< 24 hours
Test Location	# 4	# 5	# 10	# 10
Condition of Survivors				
Size (mm)	—	—	—	—
Loading Rate	—	—	—	—

Comments

Dilution Water Source	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	1869	90	68

Water Quality Meters Used/ID#

Dissolved Oxygen +1 pH +1 Temperature _____

Conductivity +1 Refractometer _____ Other _____

CH2MHILL

(48) or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Walker Scientific CH2M ID # _____

Sample Description _____

Test Species Ceriodaphnia dubia ID# CD 1224

Beginning, Date 8-8-00 Time 1500

Ending, Date 8-10-00 Time 1400

Technician 0 hr BM 24 hr DW 48 hr DW 72 hr ____ 96 hr ____

Time 0 hr 1500 24 hr 1015 48 hr 1400 72 hr ____ 96 hr ____

Conc or Percent	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Control	A	5	5	5			7.7	–	8.1			8.2	–	8.2			20	20	20			294	–	301		
	B	5	5	5																						
	C	5	5	5																						
↓	D	5	5	5																						
3%	A	5	5	5			7.7	–	8.1			8.3	–	8.3			20	20	20							
	B	5	5	5																						
	C	5	5	5																						
↓	D	5	5	5																						
10%	A	5	5	5			7.7	–	8.1			8.2	–	8.2			20	20	20							
	B	5	5	5																						
	C	5	5	5																						
↓	D	5	5	5																						

CH2M HILL

(48) or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Walker S-Tronics CH2M ID # _____

Sample Description _____

Test Species Ceriodaphnia dubia ID# ct 1224

Beginning, Date 8-8-00 Time 1500

Ending, Date 8-10-00 Time 1400

Technician 0 hr BM 24 hr DW 48 hr DW 72 hr ____ 96 hr ____

Time 0 hr 1500 24 hr 1015 48 hr 1400 72 hr ____ 96 hr ____

Conc or Percent	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
17%	A	5	4	4			7.7	-	8.1			8.2	-	8.2			20	20	20							
	B	5	4	4																						
	C	5	4	4																						
	D	5	5	5																						
50%	A	5	0	-			~~7.8~~	8.4	-			8.0	8.0	-			20	20	-							
	B	5	0	-																						
	C	5	0	-																						
	D	5	0	-																						
100%	A	5	0	-			8.0	8.6	-			7.6	7.7	-			20	20	-			915	962	-		
	B	5	0	-																						
	C	5	0	-																						
	D	5	0	-																						

Acute Test-48 Hr Survival

Start Date:	08/08/2000 15:00	Test ID:	268001cda	Sample ID:	NORTHCRK-ANALYTICAL
End Date:	08/10/2000 14:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/07/2000	Protocol:	EPAA 93	Test Species:	CD
Comments:	Wacker Siltronics				

Conc-%	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
17	0.8000	0.8000	0.8000	1.0000
50	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000

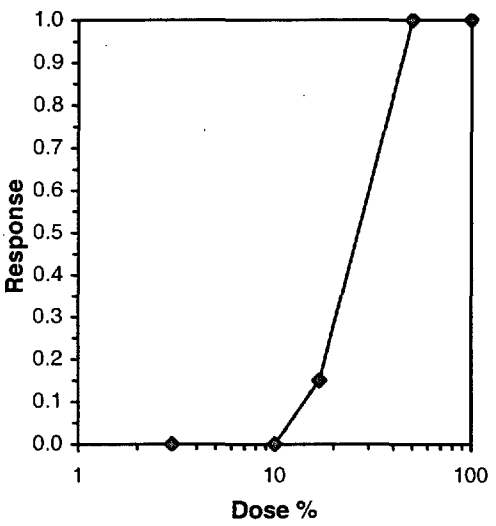
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
LAB-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
17	0.8500	0.8500	1.1667	1.1071	1.3453	10.206	4	12.00	10.00	3	20
*50	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20
*100	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.46508	0.884	3.02059	13.9892
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	17	50	29.1548	5.88235

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	25.840	22.724	29.383
5.0%	26.176	22.582	30.341
10.0%	26.414	22.004	31.708
20.0%	26.508	23.528	29.864
Auto-0.0%	25.840	22.724	29.383



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CH2M HILL

48 or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Walker Stainless CH2M ID # _____

Sample Description _____

Test Species Pimephales promelas ID# FHM #865

Beginning, Date 8-8-00 Time 1520

Ending, Date 8-10-00 Time 1345

Technician 0 hr KC 24 hr DW 48 hr DW 72 hr _____ 96 hr _____

Time 0 hr 1520 24 hr 1030 48 hr 1345 72 hr _____ 96 hr _____

Conc or Percent	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
control	A	10	10	10			7.7	8.4	8.3			8.2	8.2	8.2			20	20	20			294	–	293		
↓	B	10	10	10																						
3%	A	10	10	10			7.7	8.4	8.3			8.3	8.2	8.2			20	20	20							
↓	B	10	10	10																						
10%	A	10	10	10			7.7	8.4	8.2			8.2	8.2	8.2			20	20	20							
↓	B	10	10	10																						
17%	A	10	10	10			7.7	8.4	8.2			8.2	8.2	8.1			20	20	20							
↓	B	10	10	10																						
50%	A	10	10	10			7.8	8.4	8.2			8.0	8.1	8.0			20	20	20							
↓	B	10	10	10																						
100%	A	10	9	9			8.0	8.4	8.2			7.6	7.7	7.5			20	20	20			915	–	934		
↓	B	10	10	10																						

Acute Test-48 Hr Survival

Start Date:	08/08/2000 15:20	Test ID:	268001ppa	Sample ID:	NORTHCRK-ANALYTICAL
End Date:	08/10/2000 13:45	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/07/2000	Protocol:	EPAA 93	Test Species:	PP
Comments:	Wacker Siltronics				

Conc-%	1	2
LAB-Control	1.0000	1.0000
3	1.0000	1.0000
10	1.0000	1.0000
17	1.0000	1.0000
50	1.0000	1.0000
100	0.9000	1.0000

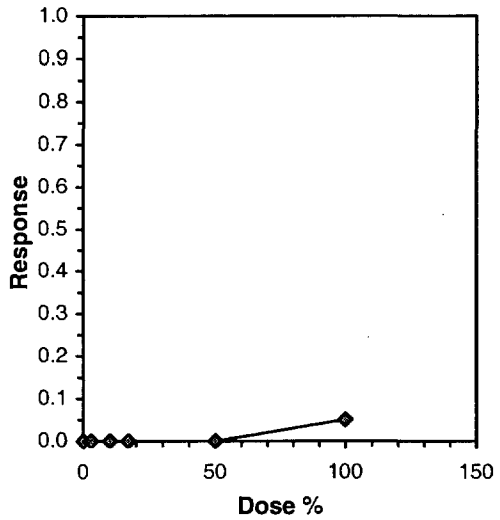
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2				1.0000	1.0000
3	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0.000	2.830	0.1331	1.0000	1.0000
10	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0.000	2.830	0.1331	1.0000	1.0000
17	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0.000	2.830	0.1331	1.0000	1.0000
50	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	2	0.000	2.830	0.1331	1.0000	1.0000
100	0.9500	0.9500	1.3305	1.2490	1.4120	8.661	2	1.732	2.830	0.1331	0.9500	0.9500

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

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.05782	0.05931	0.00221	0.00221	0.48943	5, 6

Linear Interpolation (80 Resamples)

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



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CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client Walker S. Test Start Date 8-8-00

Sample Description _____ Sample ID# CO2680

Ceriodaphnia Lot# Cd 1223 Statistician DW

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	37	29	37	31	30	36	32	33	29	31	10	325
3	26	17	26	23	18	17	23	23	5/AD	20	9	198
10	16	13	21	4/AD	3/AD	8	15	13	16	3/AD	7	112
17	21	8/AD	14	15/AD	5	7/AD	3/AD	2/AD	4	3	5	82
50	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0
100	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

* Day 6 Results.

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Walker Systronics Test Beginning : Date 8-8-00 Time 1500

Sample Description _____ Test Ending : Date 8-15-00 Time 0900

Ceriodaphnia Lot# cd 1223 Dilution Water Recon MH ID# 1869

Technician Day 1 BM Day 2 DW Day 3 DW Day 4 DW Day 5 DW Day 6 DW Day 7 DW

Time Day 1 1500 0945 Day 2 1320 Day 3 0830 Day 4 1010 Day 5 1015 Day 6 1140 Day 7 0900

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
CONTROL	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	7	5	5	4	5	6	5	4	6	4	10	51
	4	12	11	15	11	9	12	11	12	9	12	10	114
	5	0	0	0	0	0	0	0	0	0	0	10	0
	6	18	13	17	16	16	18	16	17	14	15	10	160
	7	15	16	18	11	12	14	11	12	16	13	10	138
3%	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	5	4	4	6	5	5	5	5	5	10	48
	4	11	0	12	11	0	7	9	9	0	0	10	59
	5	0	3	0	0	0	0	0	0	0/AD	4	9	7
	6	11	9	10	8	12	5	9	9	↓	11	9	84
	7	10	8	12	8	5	6	11	6	↓	12	9	78
10%	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	3	4	5	4	3	3	2	4	5	3	10	36
	4	0	1	6	0/AD	0/AD	0	0	2	0	0	8	9
	5	4	0	0	↓	↓	2	3	0	3	0/AD	7	12
	6	9	8	10	↓	↓	3	10	7	8	↓	7	55
	7	0	3	6	↓	↓	0	4/AD	0/AD	0	↓	5	13
17%	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	3	3	3	4	3	3	2	4	3	10	32
	4	9	5/AD	5	3	0	4/AD	0/AD	0/AD	0	0	6	26
	5	0	↓	0	0	1	↓	↓	↓	0	0	6	1
	6	8	↓	6	9/AD	0	↓	↓	↓	0	0	5	23
	7	0/AD	↓	0	↓	0	↓	↓	↓	0	0	4	0
50%	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0
	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	6	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	7	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
100%	1	0AD	0AD	0	0AD	0AD	0AD	0AD	0	0	0AD	3	0
	2	↓	↓	0/AD	↓	↓	↓	↓	0/AD	0/AD	↓	0	0
	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	6	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	7	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client Walker Stittronics — Initiated Date 8-8-00 Time 1445 — Adults Isolated Date 8-7-00 Time 0745

Sample Description — Terminated Date 8-15-00 Time 0900 — Neo's Collected Date 8-7-00 Time 1406

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	KT	DW	DW	DW	DW	DW	DW	DW
Time	1445	1330	1320	0830	1010	1015	1140	0900

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
CONTROL	7.8	8.0 / 8.0	7.8 / 7.6	7.8 / 8.2	7.6 / 8.0	7.4 / 7.7	8.0 / 7.8	7.9	8.1	7.6 / 7.5	8.3 / 8.0	8.2 / 8.0	8.2 / 7.9	8.2 / 7.9	8.3 / 8.0	8.0	282			351			286	
3%	7.8	8.0 / 8.0	7.8 / 7.6	7.8 / 8.2	7.6 / 8.0	7.4 / 7.6	8.0 / 7.8	7.9	8.2	7.9 / 7.8	8.3 / 8.0	8.2 / 7.9	8.1 / 7.9	8.2 / 7.9	8.3 / 7.9	8.0								
10%	7.8	8.0 / 7.8	7.6 / 7.6	7.8 / 8.2	7.6 / 7.8	7.3 / 7.3	8.0 / 7.4	7.9	8.1	7.9 / 7.9	8.2 / 8.0	8.1 / 7.9	8.1 / 7.9	8.2 / 7.8	8.3 / 7.9	8.0								
17%	7.8	7.8 / 7.6	7.4 / 7.6	7.8 / 8.2	7.6 / 7.7	7.3 / 7.2	8.0 / 7.4	7.9	8.1	8.0 / 7.9	8.2 / 8.0	8.1 / 7.9	8.1 / 7.8	8.2 / 7.7	8.2 / 7.9	8.0				366			401	
50%	7.7	7.8 / 7.6	7.4 / —						7.9	8.0 / 8.0	8.0 / —													
100%	7.9	7.8 / 7.6	7.4 / —						7.5	8.2 / 8.1	7.7 / —						922							

COMMENTS:

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	08/08/2000 15:00	Test ID:	268001cdc	Sample ID:	NORTHCRK-ANALYTICAL
End Date:	08/15/2000 09:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/07/2000	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	Walker Siltronics				

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000
10	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000
17	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
LAB-Control	1.0000	1.0000	0	10	10	10		
3	0.9000	0.9000	1	9	10	10	0.5000	0.0500
10	0.7000	0.7000	3	7	10	10	0.1053	0.0500
*17	0.5000	0.5000	5	5	10	10	0.0163	0.0500
50	0.0000	0.0000	10	0	10	10		
100	0.0000	0.0000	10	0	10	10		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	10	17	13.0384	10

SCOEPA00027511

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	08/08/2000 15:00	Test ID:	268001cdc	Sample ID:	NORTHCRK-ANALYTICAL
End Date:	08/15/2000 09:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/07/2000	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	Walker Siltronics				

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	37.000	29.000	37.000	31.000	30.000	36.000	32.000	33.000	29.000	31.000
3	26.000	17.000	26.000	23.000	18.000	17.000	23.000	23.000	5.000	20.000
10	16.000	13.000	21.000	4.000	3.000	8.000	15.000	13.000	16.000	3.000
17	21.000	8.000	14.000	15.000	5.000	7.000	3.000	2.000	4.000	3.000
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	32.500	1.0000	32.500	29.000	37.000	9.649	10				32.500	1.0000
*3	19.800	0.6092	19.800	5.000	26.000	31.297	10	5.238	1.999	4.847	19.800	0.6092
*10	11.200	0.3446	11.200	3.000	21.000	56.438	10	8.785	1.999	4.847	11.200	0.3446
17	8.200	0.2523	8.200	2.000	21.000	77.726	10				8.200	0.2523
50	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000
100	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

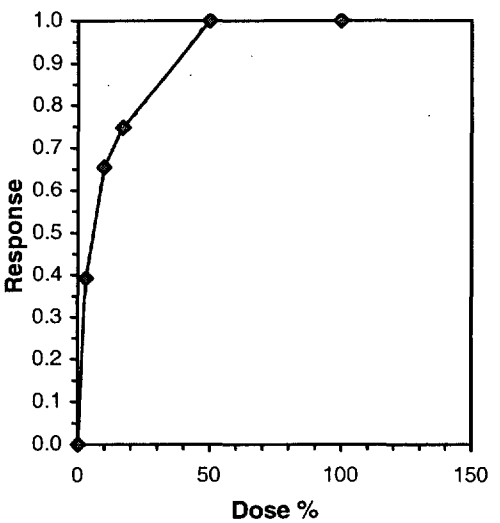
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95548	0.9	-0.743	0.91283
Bartlett's Test indicates equal variances (p = 0.11)	4.46837	9.21035		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<3	3			4.84674	0.14913	1148.23	29.3963	1.1E-08	2, 27

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL		Skew
IC05*	0.3839	0.0647	0.2822	0.5355	0.5425
IC10*	0.7677	0.1294	0.5643	1.0711	0.5425
IC15*	1.1516	0.1941	0.8465	1.6066	0.5425
IC20*	1.5354	0.2589	1.1286	2.1422	0.5425
IC25*	1.9193	0.3236	1.4108	2.6777	0.5425
IC40	3.2442	0.9341	2.2572	5.4535	0.8008
IC50	5.8895	1.2590	2.8215	7.9650	-0.3801

* indicates IC estimate less than the lowest concentration



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CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client Walker-Stanley Date Initiated 8-8-00 Time 1520

Sample Description C02620-01 Date Terminated 8-15-00 Time 1410

Technician: Day 0 DN/BH Day 1 KS Day 2 KS Day 3 NA Day 4 KS Day 5 RK Day 6 KS Day 7 KS

Time Day 0 1520 Day 1 1030 Day 2 1330 Day 3 845 Day 4 1100 Day 5 1120 Day 6 1125 Day 7 1410

Concentration or (Percent)	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
CONTROL	0	10	10	10	10		7.6		8.3	25	311
	1	10	10	10	10	7.4	8.3	8.0	8.3	25	
	2	10	10	10	10	7.1	8.2	8.0	8.3	25	398
	3	10	10	10	10	8.3	8.3	8.2	8.3	—	
	4	10	10	10	10	7.6	8.2	8.2	8.3	25	
	5	10	10	10	10	7.6	8.1	8.1	8.2	25	
	6	10	10	10	10	7.4	8.2	7.9	8.1	25	
	7	10	10	10	10	7.4		7.9		25	
3%	0	10	10	10	10		7.6		8.3		
	1	10	10	10	10	7.5	8.3	8.1	8.3		
	2	10	10	10	10	7.1	8.2	8.0	8.3		
	3	10	10	10	10	8.3	8.3	8.2	8.3		
	4	10	10	10	10	7.7	8.2	8.1	8.2		
	5	10	10	10	10	7.7	8.1	8.0	8.0		
	6	10	10	10	10	7.4	8.2	7.9	8.2		
	7	10	10	10	9	7.4		7.9			
10%	0	10	10	10	10		7.7		8.3		
	1	10	10	10	10	7.7	8.3	8.1	8.2		
	2	10	10	10	10	7.1	8.2	8.0	8.2		
	3	10	10	10	10	8.3	8.3	8.1	8.3		
	4	10	10	10	10	8.0	8.1	8.1	8.2		
	5	10	10	10	9	8.1	8.0	7.9	8.2		
	6	10	10	10	9	7.4	8.2	7.9	8.1		
	7	10	10	9	9	7.4		7.8			
17%	0	10	10	10	10		7.7		8.2		
	1	10	10	10	10	7.8	8.3	8.0	8.2		
	2	10	10	10	10	7.1	8.3	8.0	8.2		
	3	10	10	10	10	8.3	8.3	8.1	8.2		
	4	10	10	10	10	8.2	8.1	8.2	8.2		
	5	10	10	10	10	7.9	8.0	8.1	8.1		
	6	10	10	9	10	7.4	8.2	7.9	8.1		
	7	10	10	9	10	7.5		7.8			
50%	0	10	10	10	10		7.7		8.0		
	1	10	10	10	10	7.8	8.3	7.9	8.0		
	2	10	10	10	10	7.1	8.3	7.9	8.0		
	3	9	10	10	10	8.2	8.3	7.9	8.1		
	4	9	9	10	10	8.2	8.3	7.9	8.0		
	5	9	9	10	10	8.0	8.2	7.9	8.2		
	6	9	9	10	10	7.3	8.3	7.8	8.0		
	7	9	9	10	9	7.4		7.6			
100%	0	10	10	10	10		7.8		7.5	25	974
	1	10	10	10	10	8.0	8.3	7.5	7.5	25	
	2	10	9	9	10	7.0	8.3	7.3	7.6	25	593
	3	10	8	9 8	8	8.1	8.3	7.5	7.5	—	
	4	9	7	9	8	8.3	8.3	7.9	8.0	25	
	5	9	7	9	8	8.2	8.2	7.9	8.1	25	
	6	8 KS	7	9	7	7.4	8.3	7.4	7.6	25	
	7	8	7	9	7	7.2		7.3		25	

FATHEAD MINNOW 7-DAY GROWTH DATA

Client Walker Silltowers Species ID# FHM #864

Sample Description C02680 Start Date 8-8-00

Concentration or Percent	Replicate	Tare Weight (gm)	Total Weight (gm)	No. of Fish
Control	A	1.04380	1.04873	10
	B	1.04746	1.05298	10
	C	1.05053	1.05530	10
	D	1.04736	1.05193	10
3	A	1.04367	1.04795	10
	B	1.02900	1.03302	10
	C	1.02767	1.03170	10
	D	1.04530	1.04951	9
10	A	1.04014	1.04412	10
	B	1.04552	1.04995	10
	C	1.05064	1.05471	9
	D	1.02910	1.03334	9
17	A	1.04371	1.04721	10
	B	1.03447	1.03827	10
	C	1.03183	1.03557	9
	D	1.03966	1.04339	10
50	A	1.03876	1.04261	9
	B	1.04470	1.04877	9
	C	1.05118	1.05511	10
	D	1.04861	1.05233	9
100	A	1.04754	1.05048	8
	B	1.04405	1.04772	7
	C	1.04772	1.05185	9
	D	1.04204	1.04554	7
	A			
	B			
	C			
	D			

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	08/08/2000 15:20	Test ID:	268001ppc	Sample ID:	NORTHCRK-ANALYTICAL
End Date:	08/15/2000 14:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/07/2000	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:	Walker Siltronics				

Conc-%	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	0.9000
10	1.0000	1.0000	0.9000	0.9000
17	1.0000	1.0000	0.9000	1.0000
50	0.9000	0.9000	1.0000	0.9000
100	0.8000	0.7000	0.9000	0.7000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
3	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
10	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00
17	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
50	0.9250	0.9250	1.2898	1.2490	1.4120	6.318	4	12.00	10.00
*100	0.7750	0.7750	1.0846	0.9912	1.2490	11.294	4	10.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95805	0.884	0.13189	-0.3967
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	2

SCOEPA00027515

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	08/08/2000 15:20	Test ID:	268001ppc	Sample ID:	NORTHCRK-ANALYTICAL
End Date:	08/15/2000 14:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	08/07/2000	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:	Walker Siltronics				

Conc-%	1	2	3	4
LAB-Control	0.4930	0.5520	0.4770	0.4570
3	0.4280	0.4020	0.4030	0.4210
10	0.3980	0.4430	0.4070	0.4240
17	0.3500	0.3800	0.3740	0.3730
50	0.3850	0.4070	0.3930	0.3720
100	0.2940	0.3670	0.4130	0.3500

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	0.4948	1.0000	0.4948	0.4570	0.5520	8.269	4				0.4948	1.0000
*3	0.4135	0.8358	0.4135	0.4020	0.4280	3.150	4	5.014	2.360	0.0382	0.4157	0.8403
*10	0.4180	0.8449	0.4180	0.3980	0.4430	4.749	4	4.736	2.360	0.0382	0.4157	0.8403
*17	0.3693	0.7463	0.3693	0.3500	0.3800	3.575	4	7.744	2.360	0.0382	0.3792	0.7665
*50	0.3892	0.7868	0.3892	0.3720	0.4070	3.766	4	6.510	2.360	0.0382	0.3792	0.7665
100	0.3560	0.7196	0.3560	0.2940	0.4130	13.809	4				0.3560	0.7196

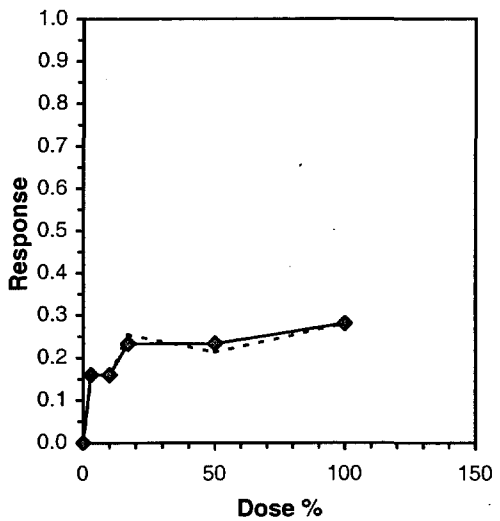
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94115	0.868	0.90197	2.28105
Bartlett's Test indicates equal variances (p = 0.20)	5.97187	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<3	3			0.03825	0.07731	0.00911	0.00053	1.7E-05	4, 15

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	0.939	0.237	0.597	1.875	0.9920
IC10*	1.879	1.489	1.194	8.179	5.0374
IC15*	2.818	4.832	1.792	21.738	0.4388
IC20	13.826				
IC25	67.608				
IC40	>100				
IC50	>100				

* indicates IC estimate less than the lowest concentration



SCOEPA00027516

APPENDIX B
REFERENCE TOXICANT DATA SHEETS

REFERENCE TOXICANT DATA SHEET

Client QA/QC
Test Organism Pimephales promelas
Source Aquatic Bio-Systems
ID# FHM 864 Age <24 hrs.
Size —
Loading —

Reference Toxicant NaCl
CID# 257 Stock Solution 20 g/L
Solvent distilled water
*Dilution Water Recon MH (FHM) ID# 1869
Total Hardness as CaCO3 90 Total Alkalinity as CaCO3 68
Conductivity (µmhos/cm) / Salinity (ppt) 279 Temperature 20±1°C

Test Begin Date 8-8-00 Time 1400
Test End Date 8-10-00 Time 1110

		0 hr	24 hr	48 hr	72 hr	96 hr
Technician		KS	DW	DW		
Time		1400	0930	1110		

Toxicant Concen. g/L	Test Chamber Number	Number Surviving 0	24	48	72	96	Dissolved Oxygen mg/l 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Cond. 0
Control		10	10	10			7.8	8.7	8.1			7.9	8.2	8.2			20	20	20			312
4		10	10	10			7.9	8.7	8.1			8.0	8.0	8.0			20	20	20			5010
6		10	10	10			7.9	8.7	8.1			8.0	7.9	7.9			20	20	20			6910
8		10	8	1			7.9	8.7	8.1			7.9	7.9	7.8			20	20	20			8210
10		10	0	—			7.9	8.8	—			7.8	7.8	—			20	20	—			9220
12		10	0	—			7.9	9.0	—			7.8	7.8	—			20	20	—			9900
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ±1 °C					

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 7.1

Cusum Chart Limits 6.4 PM 1 TO 9.1

Statistical Method Trimmed Spearman Karber

We verify this data is true and correct.

Task Manager Doug Winn

Project Manager Karen Vanasse

QA Officer

SCOEPA00027518

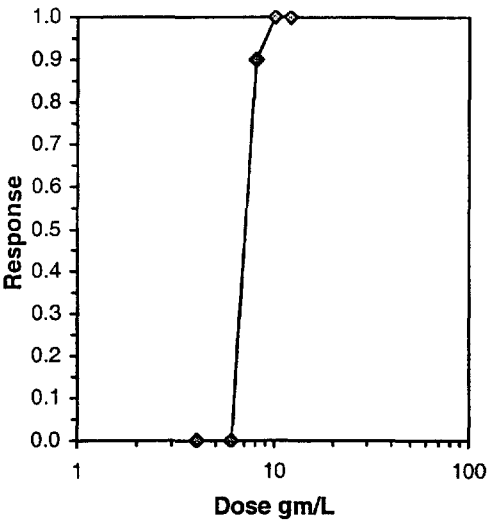
Acute Test-48 Hr Survival

Start Date:	08/08/2000 14:00	Test ID:	rppa864	Sample ID:	REF-Ref Toxicant
End Date:	08/10/2000 11:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	PP
Comments:	FHM864				

Conc-gm/L	1
LAB-Control	1.0000
4	1.0000
6	1.0000
8	0.1000
10	0.0000
12	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	7.1074	6.7712	7.4604
5.0%	7.0585	6.7273	7.4060
10.0%	7.0398	6.8066	7.2811
20.0%	7.0398	6.8066	7.2811
Auto-0.0%	7.1074	6.7712	7.4604



SCOEPA00027519

REFERENCE TOXICANT DATA SHEET

Client QA/QC
Test Organism Pimephales promelas
Source Aquatic Bio-Systems
ID# FHM 865 Age 7 days
Size —
Loading —

Reference Toxicant NaCl
CID# 257 Stock Solution 20 g/L
Solvent distilled water
*Dilution Water Recon MH (FHM) ID# 1869
Total Hardness as CaCO3 90
Conductivity (µmhos/cm) / Salinity (ppt) 279

Test Begin Date 8-8-00 Time 1415
Test End Date 8-10-00 Time 1120
Total Alkalinity as CaCO3 68
Temperature 20 ± 1°C

Technician 0 hr KT 24 hr DW 48 hr DW 72 hr 96 hr
Time 0 hr 1415 24 hr 0930 48 hr 1120 72 hr 96 hr

Toxicant Concen. g/L	Test Chamber Number	Number Surviving 0	24	48	72	96	Dissolved Oxygen mg/l 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Cond. 0
Control		10	10	10			7.7	8.6	8.1			8.0	8.3	8.2			20	20	20			354
4		10	10	10			7.7	8.6	8.1			8.0	8.1	8.1			20	20	20			5480
6		10	9	8			7.7	8.7	8.1			8.0	8.0	8.0			20	20	20			7190
8		10	3	0			7.8	8.7	8.2			7.9	7.9	7.8			20	20	20			8630
10		10	0	—			7.9	8.8	—			7.9	7.8	—			20	20	—			9340
12		10	0	—			7.9	8.9	—			7.8	7.8	—			20	20	—			10330
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ± 1 °C					

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 6.5
Cusum Chart Limits 5.9 TO 9.2
Statistical Method Trimmed Spearman Karber

We verify this data is true and correct.
Task Manager Doug Winn
Project Manager Karin Jausse
QA Officer [signature]

SCOEPA00027520

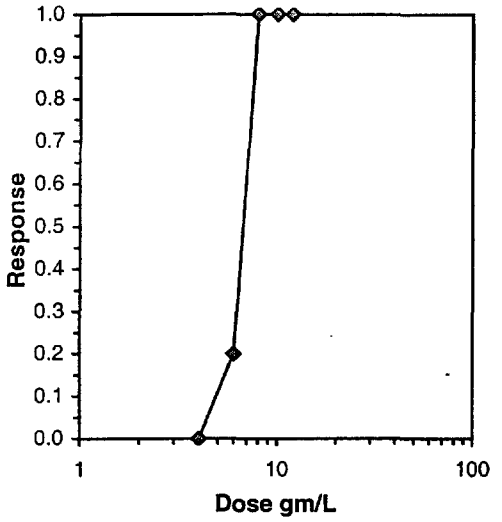
Acute Test-48 Hr Survival

Start Date:	08/08/2000 14:15	Test ID:	rppa865	Sample ID:	REF-Ref Toxicant
End Date:	08/10/2000 11:20	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	PP
Comments:	FHM865				

Conc-gm/L	1
LAB-Control	1.0000
4	1.0000
6	0.8000
8	0.0000
10	0.0000
12	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	6.4642	5.9216	7.0566
5.0%	6.5456	5.9178	7.2400
10.0%	6.6142	5.8375	7.4942
20.0%	6.6835	6.3141	7.0745
Auto-0.0%	6.4642	5.9216	7.0566



SCOEPA00027521

REFERENCE TOXICANT DATA SHEET

Client QA/QC | Reference Toxicant NaCl | Test Begin Date 7-26-00 Time 1045
Test Organism Ceriodaphnia dubia | CID# 257 | Stock Solution 20%c | Test End Date 7-28-00 Time 1145
Source In house | Solvent distilled
ID# Cd 1219 Age <24hrs | *Dilution Water Recon MH ID# 1860
Size – | Total Hardness as CaCO3 80 | Total Alkalinity as CaCO3 70
Loading – | Conductivity (µmhos/cm) / Salinity (ppt) 280 | Temperature 20±1°C
Technician 0 hr BM 24 hr BM 48 hr MS 72 hr 96 hr
Time 0 hr 1045 24 hr 1035 48 hr 1145 72 hr 96 hr

Toxicant Concen. %	Test Chamber Number	Number Surviving 0	24	48	72	96	Dissolved Oxygen mg/l 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Cond. 0
CONTROL	A	5	5	5			7.9	–	7.9			8.3	–	8.3			20	20	20			264
↓	B	5	5	5													20					
0.5	A	5	5	5			8.0	–	8.0			8.3	–	8.4			20	20	20			1021
↓	B	5	5	5													20					
1.0	A	5	5	5			8.0	–	8.0			8.2	–	8.4			20	20	20			1687
↓	B	5	5	5																		
1.5	A	5	5	5			8.0	–	8.0			8.2	–	8.4			20	20	20			2320
↓	B	5	5	5																		
2.0	A	5	5	3			8.0	–	8.0			8.2	–	8.0			20	20	20			4850
↓	B	5	5	4																		
3.0	A	5	2	0			8.1	–	8.1			8.1	–	8.1			20	20	20			3820
↓	B	5	2	0																		
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ±1 °C					

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 2.2
Cusum Chart Limits 1.4 TO 2.8
Statistical Method Trimmed Spearman Karber

We verify this data is true and correct.
Task Manager
Project Manager Doug Wynn
QA Officer

SCOEPA00027522

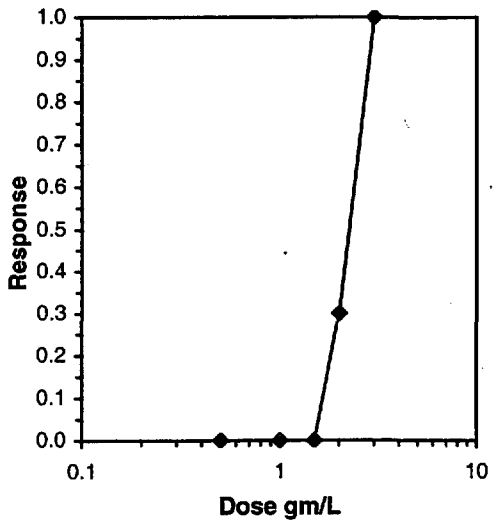
Acute Test-48 Hr Survival

Start Date:	07/26/2000 10:45	Test ID:	rcda1219	Sample ID:	REF-Ref Toxicant
End Date:	07/28/2000 11:45	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	CD
Comments:					

Conc-gm/L	1	2
LAB-Control	1.0000	1.0000
0.5	1.0000	1.0000
1	1.0000	1.0000
1.5	1.0000	1.0000
2	0.6000	0.8000
3	0.0000	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	2.2076	1.9966	2.4409
5.0%	2.2162	1.9803	2.4803
10.0%	2.2244	1.9536	2.5329
20.0%	2.2386	1.8506	2.7078
Auto-0.0%	2.2076	1.9966	2.4409



SCOEPA00027523

CHMHILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client Ref Tox - August | Date Initiated 7-25-00 | Time 1415
Sample Description NaCl Final 8.0 | Date Terminated 8-1-00 | Time 1230

Technician: Day 0 DW Day 1 MA Day 2 MA Day 3 [illegible] Day 4 [illegible] Day 5 [illegible] Day 6 KJ Day 7 KJ
Time: Day 0 1415 Day 1 1530 Day 2 1030 Day 3 1620 Day 4 1340 Day 5 1200 Day 6 1115 Day 7 1230

Concentration or Percent	Day	Number of Live Organisms A	B	C	D	Dissolved O_2 (mg/l) Pre	Post	pH Pre	Post	Temperature (°C)	Specific Conductivity (µmhos/cm)
Control	0	10	10	10	10		8.4		8.3	25	266
	1	10	10	10	10	7.4	7.5	8.3	8.4	25	280
	2	10	10	10	10	7.6	8.3	8.3	8.3	25	275
	3	10	10	10	10	7.7	8.3	8.2	8.3	25	281
	4	10	10	10	10	7.6	8.1	8.2	8.3	25	286
	5	10	10	10	9	7.7	8.2	8.3	8.2	25	290
	6	10	10	10	9	7.6	8.1	8.1	8.1	25	267
	7	9	10	10	9	7.6		8.1		25	
0.3	0	10	10	10*	10		8.4		8.2		
	1	10	10	9*	10	7.3	7.6	8.2	8.4		786
	2	10	9	9	9	7.6	8.3	8.2	8.4		754
	3	10	10	9	10	7.7	8.3	8.3	8.3		756
	4	10	10	9	10	7.7	8.1	8.1	8.3		764
	5	10	9	9	10	7.8	8.0	8.2	8.4	25	752
	6	10	9	9	10	7.6	8.1	8.0	8.2		745
	7	10	9	9	10	7.5		8.0			
1.0	0	10	10	10	10	—	8.4	—	8.2		
	1	10	10	10	10	7.3	7.5	8.2	8.3		1455
	2	6	10	10	10	7.5	8.3	8.2	8.3		1680
	3	10	10	10	10	7.7	8.3	8.1	8.0		1585
	4	10	10	10	10	7.8	8.2	8.1	8.3		1694
	5	10	10	10	10	7.0	8.3	8.0	8.3	25	1590
	6	10	10	10	10	7.7	8.1	7.9	8.1		1683
	7	10	10	10	9	7.5	—	8.0	—		
2.0	0	10	10	10	10		8.4		8.3		
	1	10	10	10	10	7.7	7.6	8.2	8.2		2720
	2	10	10	10	10	7.5	8.3	8.1	8.2		2730
	3	10	10	10	10	7.9	8.2	8.0	7.9		2700
	4	10	10	10	10	7.9	8.0	8.1	8.2		2760
	5	9	9	10	10	7.8	7.9	8.3	8.3	25	2765
	6	9	8	9	10	7.7	8.1	7.8	8.1		2780
	7	8	7	8	10	7.5		8.0			
4.0	0	10	10	10	10	—	8.4	—	8.2	25	4570
	1	8	9	10	8	7.2	7.7	8.1	8.1	25	4400
	2	8	8	10	10	7.5	8.3	8.0	8.2	25	4540
	3	8	8	10	10	7.7	8.3	8.0	8.1	25	4400
	4	8	8	10	10	7.8	8.1	8.0	8.0	25	4550
	5	1	1	2	4	8.1	8.2	8.3	8.3	25	4600
	6	1	1	2	3	7.6	8.1	7.7	8.0	25	4460
	7	1	1	2	3	7.4	—	8.0	—	25	
8.0	0	10	10	10	10		8.4		8.0	25	6980
	1	0	0	0	1	7.2	7.7	8.0	8.1		6770
	2	0	0	0	0	7.5	8.3	8.0	8.0		6540
	3					~~7.8~~					
	4										
	5										
	6										
	7										

* only 9 observed → start # reduced to 9 DW

Endpoint	IC25	Cusum Chart Limits	
Survival	2.3	2.1 to 5.4	
Growth	2.1	1.7 to 4.0	

Task Manager Doug Winn
Project Manager [signature]
QA Officer [signature]

SCOEPA00027524

FATHEAD MINNOW 7-DAY GROWTH DATA

Client _____ Ref Tox - August Species ID# FHM # 860

Sample Description NaCl (50g/L stock) Start Date 7-25-00

Concentration or Percent	Replicate	Tare Weight (gm)	Total Weight (gm)	No. of Fish
Control	A	1.05150	1.05559	9
	B	1.05063	1.05482	10
	C	1.05420	1.05848	10
	D	1.03321	1.03634	9
0.3	A	1.03491	1.04025	10
	B	1.04378	1.04840	9
	C	1.05533	1.05882	9
	D	1.04037	1.04409	10
1.0	A	1.05591	1.06010	10
	B	1.05089	1.05501	10
	C	1.04673	1.05187	10
	D	1.04124	1.04471	9
2.0	A	1.04823	1.05146	8
	B	1.05287	1.05574	7
	C	1.04388	1.04713	8
	D	1.04837	1.05222	10
4.0	A	1.03002	1.03070	1
	B	1.03037	1.03085	1
	C	1.04765	1.04847	2
	D	1.04048	1.04187	3
8.0	A	1.03361		—
	B	1.02795		—
	C	1.04120		—
	D	1.05272		—

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	07/25/2000 14:15	Test ID:	rppc860	Sample ID:	REF-Ref Toxicant
End Date:	08/01/2000 12:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

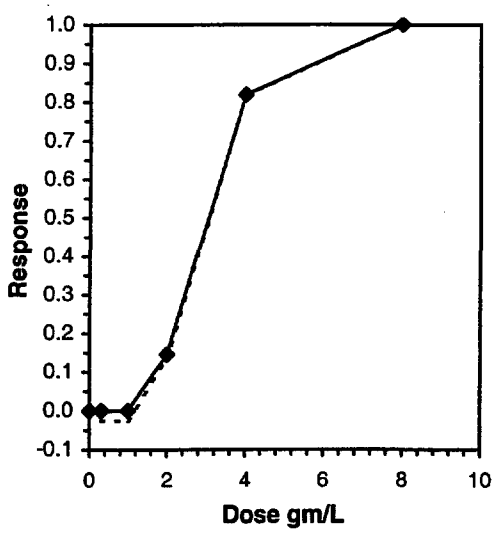
Conc-gm/L	1	2	3	4
LAB-Control	0.9000	1.0000	1.0000	0.9000
0.3	1.0000	0.9000	1.0000	1.0000
1	1.0000	1.0000	1.0000	0.9000
2	0.8000	0.7000	0.8000	1.0000
4	0.1000	0.1000	0.2000	0.3000
8	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	0.9500	1.0000	1.3305	1.2490	1.4120	7.072	4	0.9665	1.0000
0.3	0.9750	1.0263	1.3691	1.2490	1.4120	5.854	4	0.9665	1.0000
1	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	0.9665	1.0000
2	0.8250	0.8684	1.1544	0.9912	1.4120	15.615	4	0.8250	0.8536
4	0.1750	0.1842	0.4217	0.3218	0.5796	29.582	4	0.1750	0.1811
8	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93054	0.868	0.57443	0.35208
Bartlett's Test indicates equal variances (p = 0.60)	2.73601	13.2767		

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	1.3416	0.2659	0.7892	2.4562	0.1856
IC10	1.6832	0.2470	1.1974	2.4492	0.3341
IC15	2.0108	0.1984	1.3078	2.4505	-0.3340
IC20	2.1595	0.1556	1.6608	2.5593	-0.4083
IC25	2.3082	0.1392	1.9068	2.6697	-0.3124
IC40	2.7542	0.1145	2.3900	3.0547	-0.3338
IC50	3.0516	0.1044	2.7122	3.3251	-0.2405



SCOEPA00027526

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	07/25/2000 14:15	Test ID:	rppc860	Sample ID:	REF-Ref Toxicant
End Date:	08/01/2000 12:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

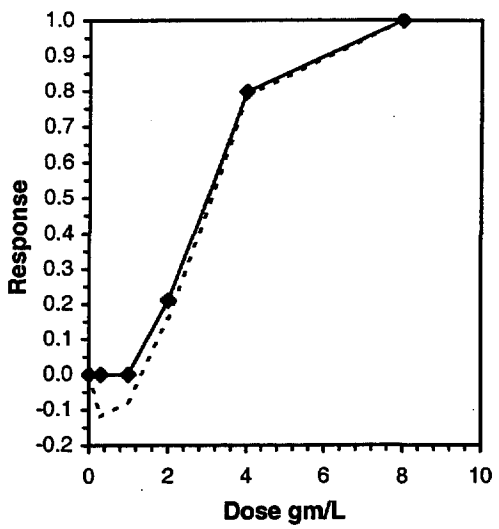
Conc-gm/L	1	2	3	4
LAB-Control	0.4090	0.4190	0.4280	0.3130
0.3	0.5340	0.4620	0.3878	0.3720
1	0.4190	0.4120	0.5140	0.3470
2	0.3230	0.2870	0.3250	0.3850
4	0.0680	0.0480	0.0820	0.1390
8	0.0000	0.0000	0.0000	0.0000

			Transform: Untransformed					Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
LAB-Control	0.3922	1.0000	0.3922	0.3130	0.4280	13.614	4	0.4181	1.0000
0.3	0.4389	1.1190	0.4389	0.3720	0.5340	16.981	4	0.4181	1.0000
1	0.4230	1.0784	0.4230	0.3470	0.5140	16.261	4	0.4181	1.0000
2	0.3300	0.8413	0.3300	0.2870	0.3850	12.307	4	0.3300	0.7894
4	0.0842	0.2148	0.0842	0.0480	0.1390	46.381	4	0.0842	0.2015
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	4	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96523	0.868	0.23292	-0.5364
Bartlett's Test indicates equal variances (p = 0.78)	1.78054	13.2767		

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	1.2374	0.2428	0.1343	1.5540	-1.4320
IC10	1.4747	0.2320	0.4697	2.1081	-0.5163
IC15	1.7121	0.2328	0.8970	2.3320	-0.3823
IC20	1.9494	0.1861	1.4000	2.4424	-0.1684
IC25	2.1339	0.1549	1.6498	2.5909	-0.1830
IC40	2.6442	0.1243	2.2535	3.0357	0.0342
IC50	2.9845	0.1126	2.6727	3.3618	0.2679



SCOEPA00027527

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Reference Toxicant Test Data Summary

Client: QA/QC – August
Test Start Date: 7-25-00
Sample Description: NaCl – 50 g/L
Sample ID#: ——
Ceriodaphnia Lot#: Cd 1218
Statistician: DW

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	30	27	31	37	27	30	28	18	32	28	10	288
0.25 g/L	27	25	23	25	29	25	32	28	30	27	10	271
0.5 g/L	26	23	28	24	26	28	24	30	19	28	10	256
1.0 g/L	17	19	17	10	16	12	6/AD	7	12	0/AD	8	116
1.5 g/L	2	2	0/AD	6	8	3	6	0	3	9	9	39
2.0 g/L	0/AD	0/AD	0/AD	0/AD	0	0	0	0/AD	0	0	5	0
4.0 g/L	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Endpoint	IC25	Cusum Chart Limits
Survival	1.64	0.78 to 2.53
Reproduction	0.64	0.06 to 1.18

Task Manager: Doug Winn
Project Manager: Karen Larsen
QA Officer:

* day 6 results | D.W.

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client QA/QC - August Test Beginning : Date 7-25-00 Time 1155

Sample Description NaCl - 50 g/L STOCK Test Ending : Date 7-31-00 Time 1010

Ceriodaphnia Lot# Cd 1218 Dilution Water Reconst (AM) ID# 1860

Technician Day 1 DW Day 2 DW Day 3 AD Day 4 MS Day 5 AD Day 6 DW Day 7 ____

Time Day 1 1110 Day 2 0945 Day 3 1320 Day 4 0910 Day 5 1120 Day 6 1010 Day 7 ____

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	5	6	11	4	6	0	0	4	0	10	40
	4	0	0	0	0	0	0	8	6	0	6	10	20
	5	11	10	9	12	12	11	10	12	13	10	10	110
	6	15	12	16	14	11	13	10	0	15	12	10	118
	7												
0.25 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	5	3	4	6	4	6	5	5	4	10	42
	4	5*	0	0	0	0	0	0	0	0	0	10	5
	5	6	7	8	6	9	10	11	11	10	10	10	88
	6	16	13	12	15	14	11	15	12	15	13	10	136
	7												
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	5	4	4	3	4	4	4	3	6	10	41
	4	0	0	0	0	0	0	0	0	0	0	10	0
	5	9	7	9	9	11	15	9	11	6	9	10	90
	6	13	11	15	11	12	14	11	15	10	13	10	125
	7												
1.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0/AD	9	0
	3	4	4	3	4	4	5	6	4	3	1	9	37
	4	0	0	0	0	0	0	0	0	0	1	9	0
	5	6	7	6	3	4	4	AD	0	3	1	8	33
	6	7	8	8	3	8	3	1	3	6	1	8	46
	7							↓			↓		
1.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	0	0	4	4	0	4	0	3	2	10	17
	5	2	0	AD	0	4	3	0	0	0	4	9	13
	6	0	2	1	2	0	0	2	0	0	3	9	9
	7			↓									
2.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	AD	AD	AD	AD	0	0	0	0	0	0	6	0
	3	1	1	1	1	0	0	0	0	0	0	6	0
	4	1	1	1	1	0	0	0	0	0	0	6	0
	5	1	1	1	1	0	0	0	0	0	0	6	0
	6	1	1	1	1	0	0	0	0/AD	0	0	5	0
	7	↓	↓	↓	↓				↓				
4.0 g/L	1	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	0	0
	2	1	1	1	1	1	1	1	1	1	1	1	1
	3	1	1	1	1	1	1	1	1	1	1	1	1

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client QA/QC - August | Initiated Date 7-25-00 Time 1155 | Adults Isolated Date 7-29-00 Time 1200

Sample Description NaCl - 50 g/L STOCK | Terminated Date 7-31-00 Time 1010 | Neo's Collected Date 7-29-00 Time 2200

Technician Day 0 [redacted] Day 1 DW Day 2 DW Day 3 [redacted] Day 4 MS Day 5 [redacted] Day 6 DW Day 7 ____

Time Day 0 1230 Day 1 1110 Day 2 0945 Day 3 1545 Day 4 1010 Day 5 1700 Day 6 1010 Day 7 ____

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.9	7.7 / 8.0	7.8 / 7.9	7.7 / 8.0	7.6 / 8.0	7.7 / 7.9	8.0 / –	
0.25 g/L	8.0	7.7 / 8.0	7.7 / 7.9	8.0 / 8.1	7.9 / 8.0	7.7 / 7.0	8.0 / –	
0.5 g/L	7.9	7.7 / 8.0	7.7 / 7.9	8.2 / 8.1	8.0 / 8.0	8.0 / 7.9	7.9 / –	
1.0 g/L	8.0	7.7 / 8.0	7.7 / 7.9	8.3 / 8.2	8.0 / 8.1	8.1 / 8.0	7.9 / –	
1.5 g/L	8.0	7.7 / 8.0	7.6 / 7.9	8.3 / 8.3	7.9 / 8.2	7.9 / 8.1	7.9 / –	
2.0 g/L	8.1	7.7 / 8.0	7.6 / 7.9	8.3 / 8.3	7.9 / [redacted]	7.9 / 8.1	7.9 / –	
4.0 g/L	8.1	7.7 / –						

Percent or Concentration	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	7.9	8.3 / 8.2	8.3 / 8.2	8.3 / 8.2	8.1 / 7.9	8.2 / 8.1	8.1 / –	
0.25 g/L	8.0	8.3 / 8.2	8.3 / 8.2	8.2 / 8.1	8.0 / 7.9	8.3 / 8.3	8.1 / –	
0.5 g/L	8.0	8.3 / 8.2	8.3 / 8.1	8.2 / 8.1	8.2 / 7.8	8.2 / 7.9	8.0 / –	
1.0 g/L	7.9	8.3 / 8.2	8.3 / 8.1	8.2 / 8.1	8.3 / 8.1	8.2 / 8.0	8.1 / –	
1.5 g/L	7.9	8.3 / 8.2	8.2 / 8.1	8.2 / 8.2	8.3 / [redacted]	8.2 / 8.0	8.1 / –	
2.0 g/L	7.9	8.3 / 8.1	8.2 / 8.0	8.1 / 8.0	8.4 / [redacted]	8.4 / 8.3	8.2 / –	
4.0 g/L	7.8	8.2 / –						

Percent or Concentration	Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	263	276	271	273	270			
0.25 g/L	664	675	658	650	695			
0.5 g/L	1020	1040	998	1006	1020			
1.0 g/L	1688	1690	1701	1669	1696			
1.5 g/L	2290	2300	2280	2270	2300			
2.0 g/L	2820	2830	2810	2800	2810			
4.0 g/L	4610							

COMMENTS: ____

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	07/25/2000 11:55	Test ID:	rcdc1218	Sample ID:	REF-Ref Toxicant
End Date:	07/31/2000 10:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

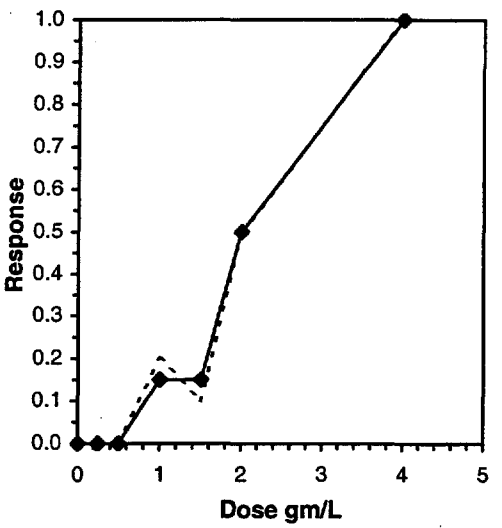
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	0.0000
1.5	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
LAB-Control	1.0000	1.0000	0	10	10	10			1.0000	1.0000
0.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
0.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
1	0.8000	0.8000	2	8	10	10	0.2368	0.0500	0.8500	0.8500
1.5	0.9000	0.9000	1	9	10	10	0.5000	0.0500	0.8500	0.8500
*2	0.5000	0.5000	5	5	10	10	0.0163	0.0500	0.5000	0.5000
*4	0.0000	0.0000	10	0	10	10	0.0000	0.0500	0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1.5	2	1.73205	

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	0.6667	0.2869	0.5833	1.5359	1.8536
IC10	0.8333	0.3721	0.6667	1.5833	-0.1752
IC15	1.5000	0.3342	0.7500	1.6254	-0.9145
IC20	1.5714	0.3005	0.8333	2.0000	-1.3277
IC25	1.6429	0.2777	0.9167	2.1250	-1.3520
IC40	1.8571	0.2285	1.6870	2.5000	0.9551
IC50	2.0000	0.3028	1.7688	2.7500	0.4559



SCOEPA00027531

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	07/25/2000 11:55	Test ID:	rcdc1218	Sample ID:	REF-Ref Toxicant
End Date:	07/31/2000 10:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	30.000	27.000	31.000	37.000	27.000	30.000	28.000	18.000	32.000	28.000
0.25	27.000	25.000	23.000	25.000	29.000	25.000	32.000	28.000	30.000	27.000
0.5	26.000	23.000	28.000	24.000	26.000	28.000	24.000	30.000	19.000	28.000
1	17.000	19.000	17.000	10.000	16.000	12.000	6.000	7.000	12.000	0.000
1.5	2.000	2.000	0.000	6.000	8.000	3.000	6.000	0.000	3.000	9.000
2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	28.800	1.0000	28.800	18.000	37.000	16.756	10				28.800	1.0000
0.25	27.100	0.9410	27.100	23.000	32.000	10.061	10	0.912	2.223	4.145	27.100	0.9410
0.5	25.600	0.8889	25.600	19.000	30.000	12.516	10	1.716	2.223	4.145	25.600	0.8889
*1	11.600	0.4028	11.600	0.000	19.000	51.596	10	9.225	2.223	4.145	11.600	0.4028
*1.5	3.900	0.1354	3.900	0.000	9.000	81.488	10	13.355	2.223	4.145	3.900	0.1354
2	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000
4	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

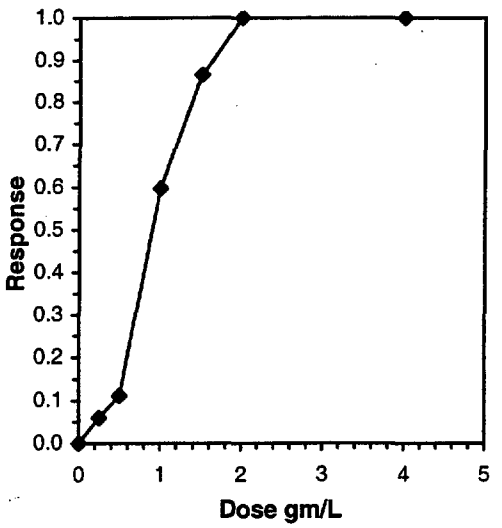
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96408	0.93	-0.5846	1.13594
Bartlett's Test indicates equal variances (p = 0.10)	7.78361	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	0.5	1	0.70711		4.14546	0.14394	1217.95	17.3822	9.6E-19	4, 45

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05*	0.2118	0.1425	0.0860	0.5439	0.7847
IC10	0.4467	0.1284	0.1720	0.5982	-0.3241
IC15	0.5400	0.0821	0.2727	0.6506	-1.4991
IC20	0.5914	0.0507	0.5090	0.7009	-0.0206
IC25	0.6429	0.0489	0.5662	0.7512	0.1996
IC40	0.7971	0.0498	0.7171	0.9171	0.5078
IC50	0.9000	0.0568	0.8111	1.0271	0.3855

* indicates IC estimate less than the lowest concentration



SCOEPA00027532

APPENDIX C
CHAIN OF CUSTODY

SUBCONTRACT ORDER

North Creek Analytical - Portland

P008136

SENDING LABORATORY:	**RECEIVING LABORATORY:**
North Creek Analytical - Portland	CH2M Hill - Corvallis
9405 SW Nimbus Ave.	2300 NW Walnut
Beaverton, OR 97008	Corvallis, OR 97330
Phone: (503) 906-9200	Phone :1-541-758-0235
Fax: (503) 906-9210	Fax: 1-541-752-0276
Project Manager: Howard Holmes	

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P008136-01	**Water**	**Sampled: 08/07/00 08:15**		
Subcontract Outside	08/14/00 17:00	08/08/00 08:15		BIOASSAY
Containers Supplied:				
Other (A)				

Wacker Siltronics

CD 2680-01

Released By	Date	Received By	Date
[signature]	8/7/00	[signature] BRATT Mucker	CH2M 8-8-00 1300

1 of 1

SCOEPA00027534

SUBCONTRACT ORDER

North Creek Analytical - Portland

P008136

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Howard Holmes

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P008136-01	**Water**	**Sampled: 08/07/00 08:15**		
Subcontract Outside	08/14/00 17:00	08/08/00 08:15		BIOASSAY
Containers Supplied:				
Other (A)				
Sample ID: P008136-02	**Water**	**Sampled: 08/09/00 08:00**		
Subcontract Outside	08/14/00 17:00	08/10/00 08:00		BIOASSAY
Containers Supplied:				
Other (A)				

Please fax confirmation for receipt of samples to: (NCA-PDX) 503-906-9210

C02680-02
Temp. upon arrival = 4°C

Released By	Date	Received By	Date
[signature]	8/9/00	Doug Winn	8-10-00 / 1130AM
Released By	Date	Received By	Date

SCOEPA00027535

SUBCONTRACT ORDER

North Creek Analytical - Portland

P008136

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Howard Holmes

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P008136-01	**Water**	**Sampled: 08/07/00 08:15**		
Subcontract Outside	08/14/00 17:00	08/08/00 08:15		BIOASSAY
Containers Supplied:				
Other (A)				
Sample ID: P008136-02	**Water**	**Sampled: 08/09/00 08:00**		
Subcontract Outside	08/14/00 17:00	08/10/00 08:00		BIOASSAY
Containers Supplied:				
Other (A)				
Sample ID: P008136-03	**Water**	**Sampled: 08/11/00 08:10**		
Subcontract Outside	08/14/00 17:00	08/12/00 08:10		BIOASSAY
Containers Supplied:				
Other (A)				

Temp. upon arrival = 5°C

C02680-03

Released By	Date	Received By	Date
[signature]	8/11/00	[signature]	8-12-00
Released By	Date	Received By	Date

SCOEPA00027536

NAME CHANGE

MO	DAY	YEAR	TIME	AM	PM	FORWARDING AGENCY No.
	7					

GREYHOUND LINES, INC.
15110 NORTH DALLAS PKWY.
DALLAS, TEXAS 75248

043

FORWARDING AGENT'S INITIALS	PICK-UP AGENT I.D.	DELIVERY AGENT I.D.	DESTINATION AGENCY NO.

DESTINATION STATION CITY & STATE: [illegible], OR
ZIP: 17330

127 281 895 4

1 To (Recipient's Name): [illegible]

Exact Street Address Cannot deliver to P.O. Box or Zip Code: 2360 NW [illegible]

City: [illegible] State: OR Zip: 17330

Recipient's Package Express Account No.:

Recipient's Phone Number (Very Important): (541) [illegible]

2 Shipper's Phone Number (Very Important): (503) 643 9200

Shipper's Package Express Account No.: 6 0 2 0 5 6 0

3 From (Shipper's Name): NORTH CREEK ANALYTICAL

Exact Street Address Cannot deliver to P.O. Box or Zip Code: 9405 S W NIMBUS AVE

City: BEAVERTON State: OR Zip: 97008

4 INTERLINE INFORMATION

Carrier Code	City	Schedule #

5 Routing: _____
If no routing specified, shipment will be routed via Greyhound direct to the extent possible.

6 SERVICE REQUIRED: NBO / SAME DAY / OVER-NIGHT / STD X

7 PAYMENT: BILL FKG EXP ACCT X / CASH / BILL 3RD PARTY / BILL CRDT CARD

X X = ÷ 200 =
DIMENSIONAL WEIGHT COMPUTATION DIMENSIONAL WGT. LBS.

NO. OF PIECES: 1 ACTUAL WEIGHT LBS.: [illegible]

CARTON DESCRIPTION

8

PREPAID	CHARGES	COLLECT
$ [illegible]	EXPRESS	$ [illegible]
	REFWD	
	VALUE	
	COLLECT / C.O.D. FEE	
	PICK-UP	
	DELIVERY	
	STORAGE	
	OTHER	
	C.O.D. AMOUNT	
$ [illegible]	TOTAL	$

9 RATE ZONE: A C.O.D.

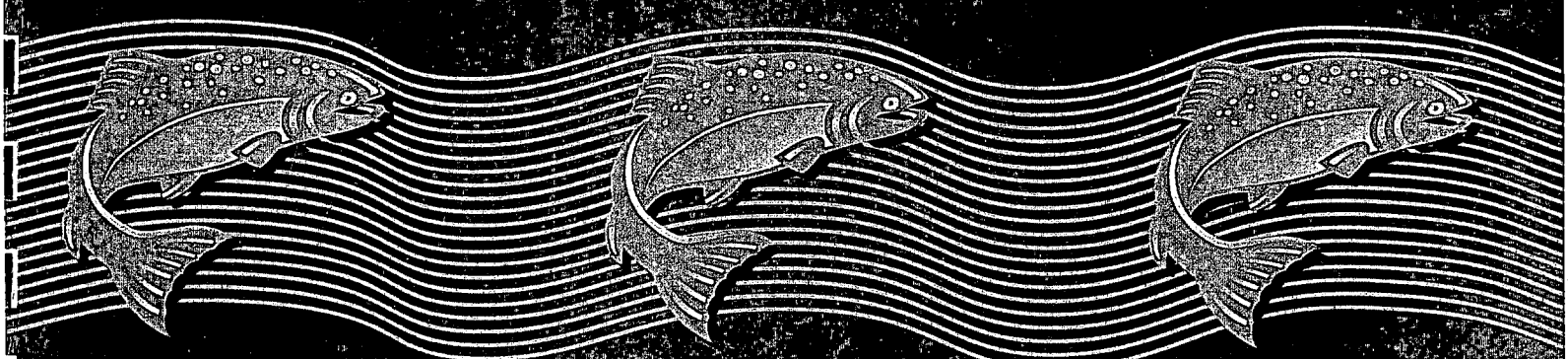
SUBJECT TO TARIFF REGULATIONS PRINTED ON REVERSE SIDE. LABEL - 5

X _____ SIGNATURE (RECEIVED IN GOOD ORDER UNLESS SPECIFIED ON BACK) DATE PRINT NAME

SCOEPA00027537

BIOMONITORING SERVICES

BIOASSAY REPORT
ACUTE AND CHRONIC BIOASSAYS
Conducted October 10 through 17, 2000



CH2MHILL

SCOEPA00027538

BIOASSAY REPORT
ACUTE AND CHRONIC BIOASSAYS
Conducted October 10 through 17, 2000

Prepared for

NORTH CREEK ANALYTICAL
WACKER SILTRONICS

Prepared by

CH2M HILL
2300 NW Walnut Boulevard
Corvallis, Oregon 97330

October, 2000
Lab ID No. C02751

SCOEPA00027539

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INTRODUCTION

CH2M HILL conducted acute and chronic definitive tests on samples provided by North Creek Analytical Beaverton, Oregon (Wacker Siltronics). The organisms tested were the water flea (*Ceriodaphnia dubia*) and the fathead minnow (*Pimephales promelas*). The tests were conducted from October 10 through 17, 2000.

METHODS AND MATERIALS

TEST METHODS

The acute tests were performed according to: *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms*, Weber C., et. al. (1993); EPA/600/4-90/027F and *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Weber, C. et al. (1994); EPA/600/4-91/002 and *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.

TEST ORGANISMS

The *Ceriodaphnia dubia* used in the tests were obtained from CH2M HILL's in-house cultures. The *Ceriodaphnia dubia* used in the chronic test were less than 24 hours old and within an 8-hour age range at test initiation. The *Ceriodaphnia dubia* used in the acute test were less than 24 hours old at test initiation. The fathead minnows used in the tests were obtained from Aquatic Bio-Systems, Fort Collins, Colorado. The fathead minnows used in the chronic test were less than 24 hours old at test initiation. The fathead minnows used in the acute test were 8 days old and acclimated to test conditions for less than 1 day prior to testing. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (1994). The test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used in the tests was moderately hard reconstituted water with a hardness of 96 and 92 mg/l as $CaCO_3$, alkalinity of 66 and 66 mg/l as $CaCO_3$, and pH of 8.0 and 8.2.

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TEST CONCENTRATIONS

The concentrations tested in both the acute and chronic tests were 3, 10, 17, 50, and 100 percent effluent with dilution water for the control. The concentrations for the *Ceriodaphnia dubia* acute test were run in quadruplicate with five organisms per replicate. The concentrations for the fathead minnow acute test were run in duplicate with ten organisms per replicate. For the chronic *Ceriodaphnia dubia* test, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel. For the fathead minnow chronic test, 10 organisms per chamber with four chambers per concentration for a total of 40 organisms per concentration were used.

SAMPLE COLLECTION

Samples were collected on October 9, 11, and 13, 2000 and transported to CH2M HILL's Corvallis Aquatic Toxicology Laboratory by Greyhound Bus. The samples were stored in the dark at 4°C until test solutions were prepared and tested. Chain of custody forms for sample collection are provided in Appendix C.

SAMPLE PREPARATION

Samples used during these tests were filtered through a 60 µm net upon arrival and temperature was adjusted prior to each daily renewal.

MONITORING OF BIOASSAYS

Samples were monitored on arrival for hardness, total residual chlorine, ammonia, and temperature.

The acute tests were monitored at initiation for pH, conductivity, and dissolved oxygen, and every 24 hours thereafter for dissolved oxygen, pH, and mortality. Conductivity was again measured at test termination. Temperature was monitored continuously throughout the 48 hour test periods.

For the chronic tests, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in the control and all concentrations tested. Conductivity was measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was monitored daily in the chronic test. According to EPA (1994), *Ceriodaphnia dubia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia dubia* in the controls have produced their third brood and at least 15 neonates per adult are produced. Fathead minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the test.

SCOEPA00027542

DATA ANALYSIS

The effects measured during the acute tests included survival over the exposure period. The effects measured during the *Ceriodaphnia dubia* chronic test included survival and reproduction over the exposure period. The effects measured during the fathead minnow chronic test included survival and growth over the exposure period. For the chronic tests, statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, using Toxcalc, version 5.0. Dunnett's Procedure, Bonferroni T-test, or Fisher's Exact Test was used to compare the survival data and Dunnett's Procedure or Bonferroni T-test was used to compare the reproduction or growth data between the control and each effluent treatment. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or Bonferroni T-test could not be met, Steel's Many-One Rank Test or Wilcoxon Many-One Rank Test with Bonferroni Adjustment was used to analyze the data.

RESULTS AND DISCUSSION

ACUTE BIOASSAYS

The raw data sheets are presented in Appendix A. The results of the *Ceriodaphnia dubia* acute test are summarized in Table 1.

Table 1
Summary of Acute Results
Ceriodaphnia dubia
Percent Survival

Concentration (%)	0 hr	24 hr	48 hr
Control	100	100	100
3	100	100	100
10	100	100	100
17	100	100	100
50	100	95	85
100	100	90	0 [a]

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Steel's Many-One Rank Test.

For the *Ceriodaphnia dubia* acute test, the no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 50 and 100 percent effluent. The LC_{50} was 61.9 percent effluent. Survival in the 100 percent effluent was 0 percent.

SCOEPA00027543

The results of the fathead minnow acute test are summarized in Table 2.

Table 2
Summary of Acute Results
Fathead minnow
Percent Survival

Concentration (%)	0 hr	24 hr	48 hr
Control	100	100	100
3	100	100	100
10	100	100	100
17	100	100	100
50	100	100	100
100	100	100	100

For the fathead minnow acute test, the no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 100 and greater than 100 percent effluent. The LC_{50} for the test was greater than 100 percent effluent.

Dissolved oxygen concentrations remained at 40 percent saturation or greater throughout the testing period. Acute test temperatures remained in the range of 20±1°C. The tests proceeded without interruption or incidence that could have affected test results.

SCOEPA00027544

CHRONIC BIOASSAYS

Table 3 summarizes the results of the *Ceriodaphnia dubia* chronic test.

Table 3
Ceriodaphnia dubia
Chronic Results

Concentration (%)	Percent Survival	No. Young Per Adult
Control	90	26.0
3	100	19.5[b]
10	40[a]	7.0
17	0[a]	0.6
50	0[a]	0.0
100	0[a]	0.0

[b] Indicates a statistically significant reduction from control at p less than 0.05 using Wilcoxon Two-Sample Test

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Fisher's Exact Test.

The test results indicated a statistically significant reduction in survival at the 10, 17, 50, and 100 percent effluent concentrations when compared to the control and a reduction in reproduction at the 3 percent effluent concentration. Control survival was 90 percent. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were <3 and 3 percent effluent.

The IC_{25} value (the concentration of effluent causing a 25 percent reduction in biological measurement, e.g. growth) was calculated on the *Ceriodaphnia dubia* reproduction. The IC_{25} value for reproduction was 3.0 percent effluent.

SCOEPA00027545

Table 4 summarizes the results of the fathead minnow chronic test.

Table 4 Fathead Minnow Chronic Results		
Sample Concentration (%)	**Percent Survival**	**Mean Dry Weight Per Fish (mg)**
Control	92.5	0.50
3	95.0	0.47
10	97.5	0.52
17	97.5	0.51
50	90.0	0.49
100	85.0	0.46

The results indicate no statistically significant reduction in survival or growth at any effluent concentration tested when compared to the control. The NOEC and LOEC were and 100 and greater than 100 percent effluent, respectively. Control survival was 92.5 percent.

The IC_{25} value was calculated on the fathead minnow growth. The IC_{25} value for growth was greater than 100 percent effluent.

SCOEPA00027546

SUMMARY OF TEST RESULTS

Table 5 summarizes the results of the acute testing performed.

Table 5 **Acute Test Results**		
Endpoint	*Ceriodaphnia dubia*	*Pimephales promelas*
	Survival (% effluent)	Survival (% effluent)
NOEC	50	100
LOEC	100	> 100
LC50	61.9	> 100

Table 6 summarizes the results of the chronic testing performed.

Table 6 **Chronic Test Results**				
Endpoint	*Ceriodaphnia dubia*		*Pimephales promelas*	
	Survival (% effluent)	Reproduction (% effluent)	Survival (% effluent)	Growth (% effluent)
NOEC	3	< 3	100	100
LOEC	10	3	>100	>100
IC25	NA	3.0	NA	>100

SCOEPA00027547

REFERENCE TOXICANT TESTS

The results of monthly reference toxicant tests conducted with sodium chloride indicate that the test organisms were within their respective sensitivity range based on EPA guidelines. The LC_{50} values, IC_{25} values, and Control Chart Limits are listed in the tables below. The data sheets for the reference toxicant tests are provided in Appendix B.

Table 7
Acute Reference Toxicant Tests (g/L)

Species	LC_{50}	Control Chart limits
Pimephales promelas (FHM 882)	7.9	6.4 to 8.1
Pimephales promelas (FHM 883)	7.7	6.1 to 8.8
Ceriodaphnia dubia	1.9	1.4 to 2.8

Table 8
Chronic Reference Toxicant Tests (g/L)

Species (test)	IC_{25}	Control Chart limits
Pimephales promelas (survival)	3.8	2.1 to 5.3
Pimephales promelas (growth)	3.8	1.7 to 4.1
Ceriodaphnia dubia (survival)	2.5	0.75 to 2.66
Ceriodaphnia dubia (reproduction)	0.69	0.06 to 1.21

SCOEPA00027548

APPENDIX A
RAW DATA SHEETS

CH2M HILL TOXICITY TEST ORGANISM AND WATER QUALITY DATA

Client Wacker Siltronics — Test Initiation: Date 10-10-00 Time 1615 — Test Termination: Date 10-17-00 Time 1145

Contact Howard Holmes — Technician Hansen, Mickey, Oldham, Ensor, Dalton-ATHA

Test Species/ID				
	Pimephales promelas / FHM 882		*Pimephales promelas* / FHM 883	
	Ceriodaphnia dubia / Cd 1254		*Ceriodaphnia dubia* / Cd 1256	

Sample Information							
Sample ID Number	Field ID	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Dechlor.	Ammonia NH_3-N mg/l	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
2751 -01	00-105	9 DW 10-10-00		0.00 / -	0.73	386	-
-02	00-106	10-11-00	0800	0.03 / -	1.01	320	-
-03	00-108	10-13-00	0810	0.00 / -	1.05	330	-
				/			
				/			
				/			
				/			
				/			
				/			
				/			
				/			
				/			

Test Species Information	ID# FHM 882	ID# Cd 1254	ID# FHM 883	ID# Cd 1256
(Age) or Size	< 24 hours —	< 24 hours within an 8 hour span	8 days —	< 24 hours —
Test Container Size	400 ml	30 ml	800 ml	30 ml
Test Volume	250 ml	15 ml	500 ml	25 ml
Feeding: Type	0.1 ml *Artemia*	0.1 ml Algae &	none	Algae & YCT
Amount	2 x daily	YCT daily	—	prior to test
Aeration: Began	None	None	None	None
Amount	—	—	—	—
Dilution Water ID#	1904 / 1911	1904 / 1511	1904	1904
Acclimation Period	< 24 hours	< 24 hours	< 1 days	< 24 hours
Test Location	# 4	# 6	# 7	# 7
Condition of Survivors				
Size (mm)	—	—	—	—
Loading Rate	—	—	—	—

Comments

Dilution Water Source	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	1904	96	66
Reon MH	1911	92	66

Water Quality Meters Used/ID#

Dissolved Oxygen #1 pH #1 Temperature _____

Conductivity #1 Refractometer _____ Other _____

SCOEPA00027550

CH2MHILL

48 or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Wacker Siltronics CH2M ID # 2751 -01

Sample Description

Test Species Ceriodaphnia dubia ID# cd 1256

Beginning, Date 10-10-00 Time 1630

Ending, Date 10-12-00 Time 1600

Technician 0 hr DW 24 hr DW 48 hr DW 72 hr ____ 96 hr ____

Time 0 hr 1630 24 hr 1440 48 hr 1600 72 hr ____ 96 hr ____

Conc or Percent	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
CONTROL	A	5	5	5			8.4	–	8.0			8.2	–	8.0			20	20	20			295	–	330		
	B	5	5	5																						
	C	5	5	5																						
↓	D	5	5	5																						
3%	A	5	5	5			8.4	–	8.0			8.2	–	8.0												
	B	5	5	5																						
	C	5	5	5																						
↓	D	5	5	5																						
10%	A	5	5	5			8.4	–	8.0			8.1	–	8.0												
	B	5	5	5																						
	C	5	5	5																						
↓	D	5	5	5																						

CH2MHILL

48 or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Wacker Siltronics CH2M ID # 2751-01

Sample Description

Test Species Ceriodaphnia dubia ID# Cd 1256

Beginning, Date 10-10-00 Time 1630

Ending, Date 10-12-00 Time 1600

Technician 0 hr DW 24 hr DW 48 hr DW 72 hr ____ 96 hr ____

Time 0 hr 1600 24 hr 1440 48 hr 1600 72 hr ____ 96 hr ____

Conc or Percent	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
17%	A	5	5	5			9.4	—	8.0			8.1	—	8.0												
	B	5	5	5																						
	C	5	5	5																						
	D	5	5	5																						
50%	A	5	5	5			9.8	—	8.0			7.9	—	7.9												
	B	5	5	4																						
	C	5	4	4																						
	D	5	5	4																						
100%	A	5	4	0			8.9	—	8.1			7.5	—	7.5			20	20	20			1290	—	1275		
	B	5	4	0																						
	C	5	5	0																						
	D	5	5	0																						

Acute Test-48 Hr Survival

Start Date:	10/10/2000 16:30	Test ID:	275101cda	Sample ID:	WACKER -Siltronics (via N.C. Anal.)
End Date:	10/12/2000 16:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	10/10/2000	Protocol:	EPAA 93	Test Species:	CD
Comments:					

Conc-%	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000
17	1.0000	1.0000	1.0000	1.0000
50	1.0000	0.8000	0.8000	0.8000
100	0.0000	0.0000	0.0000	0.0000

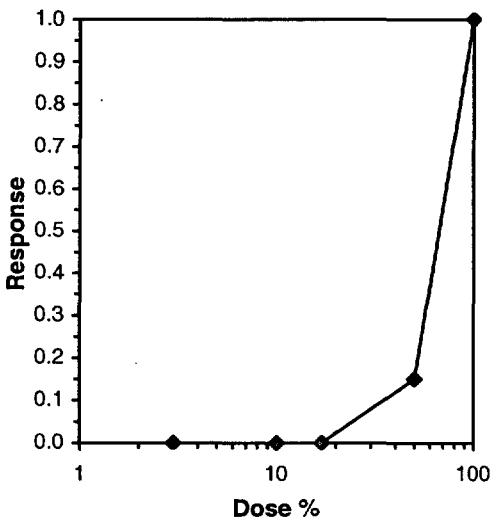
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
LAB-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
10	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
17	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
50	0.8500	0.8500	1.1667	1.1071	1.3453	10.206	4	12.00	10.00	3	20
*100	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.46508	0.884	3.02059	13.9892
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	2

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	61.911	53.743	71.320
5.0%	64.201	54.293	75.916
10.0%	65.856	52.653	82.370
20.0%	66.516	61.611	71.811
Auto-0.0%	61.911	53.743	71.320



SCOEPA00027553

CH2M HILL

48 or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Wacker Siltronics CH2M ID # 2751 -01

Sample Description

Test Species Pimephales promelas ID# FHM 882

Beginning, Date 10-10-00 Time 1630

Ending, Date 10-12-00 Time 1600

Technician 0 hr BM 24 hr DW 48 hr DW 72 hr ____ 96 hr ____

Time 0 hr 1630 24 hr 1445 48 hr 1600 72 hr ____ 96 hr ____

Conc or Percent	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
CONTROL	A	10	10	10			8.4	8.2	7.9			8.2	8.2	7.9			20	20	20			295	—	308		
↓	B	10	10	10																						
3	A	10	10	10			8.4	8.2	7.9			8.2	8.1	7.9												
↓	B	10	10	10																						
10	A	10	10	10			8.4	8.2	7.9			8.1	8.0	7.8												
↓	B	10	10	10																						
17	A	10	10	10			8.4	8.2	7.8			8.1	8.0	7.8												
↓	B	10	10	10																						
50	A	10	10	10			8.8	8.3	7.7			7.9	7.8	7.6												
↓	B	10	10	10																						
100%	A	10	10	10			8.9	8.4	7.6			7.5	7.4	7.2			20	20	20			1290	—	1267		
↓	B	10	10	10																						

Acute Test-48 Hr Survival

Start Date:	10/10/2000 16:30	Test ID:	275101ppa	Sample ID:	WACKER -Siltronics (via N.C. Anal.)
End Date:	10/12/2000 16:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	10/10/2000	Protocol:	EPAA 93	Test Species:	PP
Comments:					

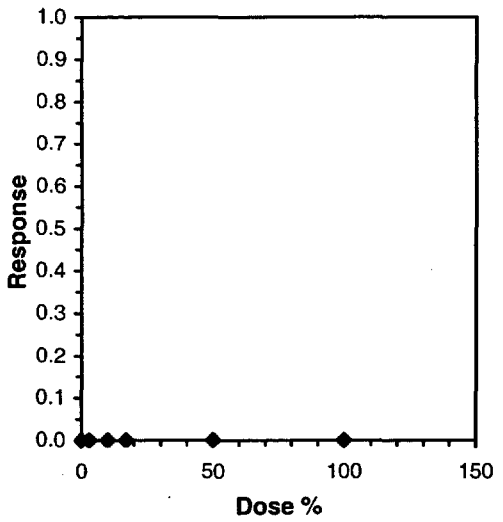
Conc-%	1	2
LAB-Control	1.0000	1.0000
3	1.0000	1.0000
10	1.0000	1.0000
17	1.0000	1.0000
50	1.0000	1.0000
100	1.0000	1.0000

Conc-%	Mean	N-Mean		Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
LAB-Control	1.0000	1.0000	1.41202	0	20	20	2			1.0000	1.0000
3	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000
10	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000
17	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000
50	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000
100	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Linear Interpolation (80 Resamples)

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



SCOEPA00027555

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client Wacker Siltronics — Test Start Date 10-10-00

Sample Description — Sample ID# C02751-01

Ceriodaphnia Lot# Cd 1254 — Statistician

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	28	32	25	29	0/AD	32	29	28	24	33	9	260
3	23	20	19	26	12	21	14	19	24	17	10	195
10	11	4/AD	6/AD	8	10	7/AD	6/AD	5/AD	6/AD	7	4	70
17	0/AD	3/AD	0/AD	0/AD	0/AD	2/AD	0/AD	0/AD	0/AD	1/AD	0	6
50	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0
100	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0/AD	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Wacker Siltronics — Test Beginning: Date 10-10-00 Time 1640

Sample Description 2751 -01 — Test Ending: Date 10-16-00 Time 1215

Ceriodaphnia Lot# Cd 1254 — Dilution Water Reconstituted ID# 1904

Technician — Day 1 DW Day 2 BM Day 3 BM Day 4 RW Day 5 RW Day 6 DW Day 7 ____

Time — Day 1 0945 Day 2 1330 Day 3 1000 Day 4 1030 Day 5 1015 Day 6 1215 Day 7 ____

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
CONTROL	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	6	4	6	0 AD	6	6	6	6	6	9	50
	4	0	0	0	0		0	0	0	0	0	9	0
	5	11	9	9	8		10	11	10	7	9	9	84
	6	13	17	12	15		16	12	12	11	18	9	126
	7												
3	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	5	3	4	0	6	5	5	6	5	10	39
	4	7	0	0	6	0	0	0	0	0	0	10	13
	5	6	6	5	6	6	5	0	4	5	5	10	43
	6	10	9	11	10	6	10	9	10	13	7	10	95
	7												
10	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	5	3	4	3	3	6	10	18
	4	4	4 AD	2	3	0	0	0	0	0	2	9	~~11~~ 15
	5	3	↓	4	3	3	4	2	2 AD	3	2	8	26
	6	4	↓	0 AD	2	2	0 AD	0 AD	↓	0 AD	3	4	11
	7		↓	↓			↓	↓	↓	↓			
17	1	AD	0	AD	AD	AD	0	AD	0	AD	0	4	0
	2	↓	0	↓	↓	↓	0	↓	0	↓	0	4	0
	3		3				0		0 AD		AD 1	2	DW 8 4
	4		AD				2		↓		↓	1	2
	5		↓				AD					0	0
	6						↓					C	
	7	↓	↓	↓	↓	↓		↓	↓	↓	↓		
50	1	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	0	0
	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	3												
	4												
	5												
	6												
	7	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
100%	1	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	0	0
	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	3												
	4												
	5												
	6												
	7	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client Wacker Siltronics — Initiated Date 10-10-00 Time 1640 — Adults Isolated Date 10-9-00 Time 0745

Sample Description — Terminated Date 10-16-00 Time 1215 — Neo's Collected Date 10-9-00 Time 1250

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	DW	DW	BM	BM	[illegible]	[illegible]	DW	
Time	1640	0945	1335	1010	1110	1045	1215	

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
CONTROL	8.1	7.8 / 8.0	7.5 / 7.5	7.8 / 7.5	7.9 / 7.6	7.6 / 7.5	8.0 / –	
3	8.1	7.8 / 8.0	7.6 / 7.7	7.8 / 7.5	7.9 / 7.5	7.6 / 7.7	8.0 / –	
10	8.1	7.8 / 8.0	7.6 / 7.7	7.8 / 7.5	7.9 / 7.4	7.6 / 7.5	8.1 / –	
17	8.2	7.8 / 7.8	7.6 / 7.8	7.8 / 7.5	7.9 / 7.4	7.6 / –		
50	8.2	7.8 / –	– / –	– / –	– / –	– / –	– / –	–
100%	8.2	7.8 / –	– / –	– / –	– / –	– / –	– / –	–

Percent or Concentration	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
CONTROL	8.0	8.1 / 7.8	8.2 / 7.6	8.3 / 7.9	8.2 / 8.1	8.3 / 7.1	8.2 / –	
3	7.9	8.1 / 7.8	8.2 / 7.7	8.3 / 7.9	8.2 / 8.1	8.3 / 7.9	8.3 / –	
10	7.9	8.1 / 7.7	8.2 / 7.7	8.2 / 7.8	8.2 / 7.9	8.2 / 7.8	8.3 / –	
17	7.9	8.1 / 7.6	8.1 / 7.7	8.2 / 7.8	8.1 / 7.9	8.1 / 7.9		
50	7.8	7.9 / –	– / –	– / –	– / –	– / –	– / –	–
100%	7.3	7.6 / –	– / –	– / –	– / –	– / –	– / –	–

Percent or Concentration	Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
CONTROL	332		308		323			
3								
10								
17			454 / 498		480			
50								
100%	1280							

COMMENTS:

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	10/10/2000 16:40	Test ID:	275101cdc	Sample ID:	WACKER -Siltronics (via N.C. Anal.)
End Date:	10/16/2000 12:15	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	10/10/2000	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	0.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
LAB-Control	0.9000	1.0000	1	9	10	10		
3	1.0000	1.1111	0	10	10	10	0.5000	0.0500
*10	0.4000	0.4444	6	4	10	10	0.0286	0.0500
*17	0.0000	0.0000	10	0	10	10	0.0001	0.0500
*50	0.0000	0.0000	10	0	10	10	0.0001	0.0500
*100	0.0000	0.0000	10	0	10	10	0.0001	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	3	10	5.47723	33.3333

SCOEPA00027559

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/10/2000 16:40	Test ID:	275101cdc	Sample ID:	WACKER -Siltronics (via N.C. Anal.)
End Date:	10/16/2000 12:15	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	10/10/2000	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	28.000	32.000	25.000	29.000	0.000	32.000	29.000	28.000	24.000	33.000
3	23.000	20.000	19.000	26.000	12.000	21.000	14.000	19.000	24.000	17.000
10	11.000	4.000	6.000	8.000	10.000	7.000	6.000	5.000	6.000	7.000
17	0.000	3.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	1.000
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					Rank	1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical		Mean	N-Mean
LAB-Control	26.000	1.0000	26.000	0.000	33.000	36.891	10				26.000	1.0000
*3	19.500	0.7500	19.500	12.000	26.000	22.321	10	67.50	82.00	5.77587	19.500	0.7500
10	7.000	0.2692	7.000	4.000	11.000	30.861	10				7.000	0.2692
17	0.600	0.0231	0.600	0.000	3.000	179.161	10				0.600	0.0231
50	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000
100	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.74147	0.868	-2.5991	8.71915
F-Test indicates equal variances (p = 0.03)	4.85631	6.54109		

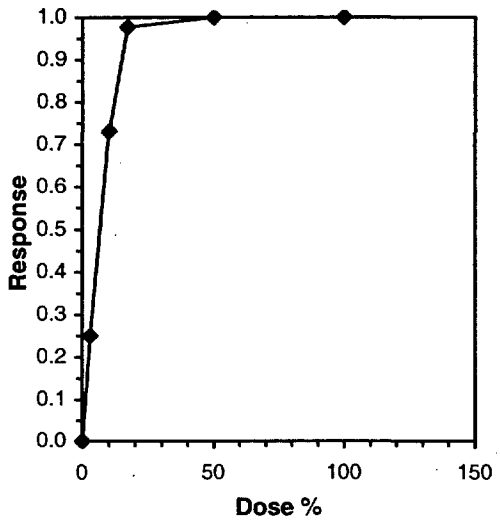
Hypothesis Test (1-tail, 0.05)

Wilcoxon Two-Sample Test indicates significant differences

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL		Skew
IC05*	0.6000	0.8332	0.3874	3.4023	2.3104
IC10*	1.2000	0.9307	0.7747	3.9842	1.5872
IC15*	1.8000	1.0077	1.1621	4.5661	1.2150
IC20*	2.4000	1.0642	1.5495	5.1029	1.0103
IC25	3.0000	1.1203	1.9368	5.6286	0.8592
IC40	5.1840	1.1416	3.2482	7.2463	0.2979
IC50	6.6400	0.9503	5.1463	8.3891	0.3180

* indicates IC estimate less than the lowest concentration



SCOEPA00027560

FATHEAD MINNOW 7-DAY GROWTH DATA

Client ~~Gresham~~ Wacker Species ID# FHM

Sample Description C02751 Start Date ~~9-26-00~~ 10-17-00

Concentration or Percent	Replicate	Tare Weight (gm)	Total Weight (gm)	No. of Fish
Control	A	1.02692	1.03274	9
	B	1.04592	1.05086	10
	C	1.05205	1.05660	9
	D	1.03984	1.04460	9
DW+3	A	1.05213	1.05664	9
	B	1.06601	1.07056	10
	C	1.02058	1.02587	10
	D	1.03827	1.04281	9
DW ~~1.9~~ 10	A	1.03233	1.03787	10
	B	1.04327	1.04802	10
	C	1.04642	1.05144	9
	D	1.05065	1.05594	10
DW ~~9~~ 17	A	1.02256	1.02804	10
	B	1.04089	1.04581	10
	C	1.02422	1.02940	9
	D	1.05565	1.06040	10
DW ~~32~~ 50	A	1.02186	1.02779	10
	B	1.03705	1.04196	9
	C	1.05714	1.06095	8
	D	1.02~~8~~193 KS	1.02688	9
100	A	1.05214	1.05645	8
	B	1.04512	1.04941	9
	C	1.04308	1.04755	8
	D	1.04828	1.05359	9
	A			
	B			
	C			
	D			

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client Wacker Siltronics — Date Initiated 10-10-00 — Time 1625

Sample Description 2751 -01 — Date Terminated 10-17-00 — Time 1145

Technician: Day 0 BW/AM Day 1 kle Day 2 kle Day 3 AM Day 4 KS Day 5 KS Day 6 Bm Day 7 kle

Time: Day 0 1625 Day 1 1535 Day 2 1410 Day 3 1455 Day 4 1400 Day 5 1300 Day 6 1335 Day 7 1145

Concentration or Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
CONTROL	0	10	10	10	10		8.4		8.2	25	295
	1	10	10	10	10	7.8	8.0	8.2	8.3	25	
	2	9	10	10	9	7.3	7.9	7.9	8.0	25	
	3	9	10	10	9	7.8	7.9	7.9	8.1	25	302
	4	9	10	9	9	7.5	8.0	8.0	8.1	25	
	5	9	10	9	9	7.3	7.9	7.9	8.0	25	306
	6	9	10	9	9	7.3	8.3	7.8	8.2	25	
	7	9	10	9	9	7.0		8.0		25	
3	0	10	10	10	10		8.4		8.2	25	
	1	10	10	10	9	7.8	8.1	8.1	8.3		
	2	10	10	10	9	7.5	8.2	7.8	8.0		
	3	10	10	10	9	7.3	8.0	7.9	8.2		
	4	10	10	10	9	7.4	8.1	7.9	8.1		
	5	9	10	10	9	7.5	8.2	7.8	8.3		
	6	9	10	10	9	7.3	8.3	7.8	8.2		
	7	9	10	10	9	7.1		8.0			
10	0	10	10	10	10		8.4		8.1	25	
	1	10	10	10	10	8.0	8.1	8.1	8.3		
	2	10	10	10	10	7.3	8.3	7.8	8.0		
	3	10	10	9	10	7.2	8.2	7.9	8.2		
	4	10	10	9	10	7.3	8.1	7.9	8.1		
	5	10	10	9	10	7.2	8.3	7.9	8.0		
	6	10	10	9	10	7.3	8.3	7.8	8.1		
	7	10	10	9	10	7.2		7.9			
17	0	10	10	10	10		8.4		8.1	25	
	1	10	10	10	10	7.9	8.2	8.1	8.2		
	2	10	10	10	10	7.3	8.3	7.7	8.0		
	3	10	10	10	10	7.3	8.2	7.8	8.1		
	4	10	~~10~~ 10	9	10	7.3	8.0	8.0	8.1		
	5	10	10	9	10	7.3	8.3	7.9	8.1		
	6	10	10	9	10	7.3	8.3	7.8	8.0		
	7	10	10	9	10	7.2		7.9			
50	0	10	10	10	10		8.4		7.9	25	
	1	10	9	8	10	8.0	8.3	7.9	8.0		
	2	10	9	8	10	7.2	8.3	7.5	7.8		
	3	10	9	8	10	7.0	8.1	7.7	8.0		
	4	10	9	8	9	7.1	8.0	7.9	8.1		
	5	10	9	8	9	7.0	8.3	7.7	8.0		
	6	10	9	8	9	7.6	8.3	7.8	7.9		
	7	10	9	8	9	7.0		7.6			
100%	0	10	10	10	10		8.4		7.5	25	1290
	1	10	9	9	9	8.0	8.3	7.5	7.5	25	
	2	8	9	8	9	7.5	8.3	7.1	7.5	25	
	3	8	9	8	9	7.2	8.2	7.4	7.8	25	1302
	4	8	9	8	9	7.1	8.0	7.6	8.0	25	
	5	8	9	8	9	7.5	8.2	7.4	7.8	25	1183
	6	8	9	8	9	~~8.4~~ 7.6	8.2	7.5	7.4	25	
	7	8	9	8	9	7.0		7.1		25	

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	10/10/2000 16:25	Test ID:	275101ppc	Sample ID:	WACKER -Siltronics (via N.C. Anal.)
End Date:	10/17/2000 11:45	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	10/10/2000	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

Conc-%	1	2	3	4
LAB-Control	0.9000	1.0000	0.9000	0.9000
3	0.9000	1.0000	1.0000	0.9000
10	1.0000	1.0000	0.9000	1.0000
17	1.0000	1.0000	0.9000	1.0000
50	1.0000	0.9000	0.8000	0.9000
100	0.8000	0.9000	0.8000	0.9000

			Transform: Arcsin Square Root					1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
LAB-Control	0.9250	1.0000	1.2898	1.2490	1.4120	6.318	4			
3	0.9500	1.0270	1.3305	1.2490	1.4120	7.072	4	-0.625	2.410	0.1571
10	0.9750	1.0541	1.3713	1.2490	1.4120	5.942	4	-1.250	2.410	0.1571
17	0.9750	1.0541	1.3713	1.2490	1.4120	5.942	4	-1.250	2.410	0.1571
50	0.9000	0.9730	1.2543	1.1071	1.4120	9.935	4	0.544	2.410	0.1571
100	0.8500	0.9189	1.1781	1.1071	1.2490	6.954	4	1.713	2.410	0.1571

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96008	0.884	-0.0777	-0.8082
Bartlett's Test indicates equal variances (p = 0.97)	0.89048	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.10308	0.11167	0.02251	0.0085	0.05793	5, 18

SCOEPA00027563

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	10/10/2000 16:25	Test ID:	275101ppc	Sample ID:	WACKER -Siltronics (via N.C. Anal.)
End Date:	10/17/2000 11:45	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	10/10/2000	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:					

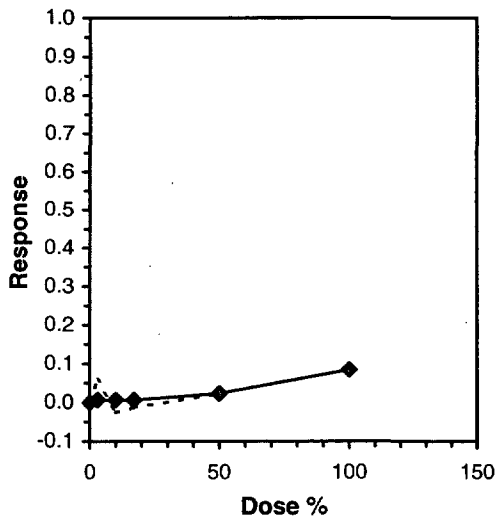
Conc-%	1	2	3	4
LAB-Control	0.5820	0.4940	0.4550	0.4760
3	0.4510	0.4550	0.5290	0.4540
10	0.5540	0.4750	0.5020	0.5290
17	0.5480	0.4920	0.5180	0.4750
50	0.5930	0.4910	0.3810	0.4950
100	0.4310	0.4290	0.4470	0.5310

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	0.5017	1.0000	0.5017	0.4550	0.5820	11.126	4				0.5017	1.0000
3	0.4722	0.9412	0.4722	0.4510	0.5290	8.019	4	0.794	2.410	0.0896	0.4985	0.9935
10	0.5150	1.0264	0.5150	0.4750	0.5540	6.619	4	-0.357	2.410	0.0896	0.4985	0.9935
17	0.5082	1.0130	0.5082	0.4750	0.5480	6.268	4	-0.175	2.410	0.0896	0.4985	0.9935
50	0.4900	0.9766	0.4900	0.3810	0.5930	17.680	4	0.316	2.410	0.0896	0.4900	0.9766
100	0.4595	0.9158	0.4595	0.4290	0.5310	10.521	4	1.137	2.410	0.0896	0.4595	0.9158

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.94168		0.884		0.32453	0.76683
Bartlett's Test indicates equal variances (p = 0.53)					4.16476		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	100	>100		1	0.08955	0.17848	0.00187	0.00276	0.64703	5, 18

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	71.865			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



SCOEPA00027564

APPENDIX B
REFERENCE TOXICANT DATA SHEETS

REFERENCE TOXICANT DATA SHEET

Client: QA/QC | Reference Toxicant: NaCl | Test Begin Date: 10-10-00 Time: 1330
Test Organism: *Pimephales promelas* | CID#: ~~188~~ 256 | Stock Solution: 20 g/L | Test End Date: 10-12-00 Time: 1155
Source: Aquatox Inc. | Solvent: Distilled water
ID#: FHM 882 | Age: < 24 hours | *Dilution Water: Recon MH | ID#: 1904
Size: NA | Total Hardness as CaCO3: 96 | Total Alkalinity as CaCO3: 66
Loading: NA | Conductivity (µmhos/cm) / Salinity (ppt): 278 | Temperature: 20 ± 1 °C

		0 hr	24 hr	48 hr	72 hr	96 hr
Technician		KS	BW	DW		
Time		1330	0945	1155		

Toxicant Concen. (g/L)	Test Chamber Number	Number Surviving 0	24	48	72	96	Dissolved Oxygen (mg/l) 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Cond 0
Control		10	10	10			8.5	8.0	8.1			8.2	7.9	8.1			20	20	20			2953
4		10	10	10			8.5	8.1	8.1			8.0	7.8	7.9			20	20	20			5210
6		10	10	10			8.6	8.2	8.1			8.0	7.7	7.8			20	20	20			6620
8		10	10	5			8.6	8.2	8.2			7.9	7.7	7.7			20	20	20			7850
10		10	0	–			8.6	8.2	–			7.8	7.6	–			20	20	–			8850
12		10	0	–			8.6	8.2	–			7.8	7.6	–			20	20	–			9790
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ±1 °C					

*Dilution Water Code

Recon.	- reconstituted water
VS	- very soft
S	- soft
MH	- moderately hard
H	- hard
VH	- very hard

48 h LC50 7.9

Cusum Chart Limits 6.4 TO 8.1

Statistical Method Trimmed Spearman Karber

We verify this data is true and correct.

Task Manager

Project Manager

QA Officer

SCOEPA00027566

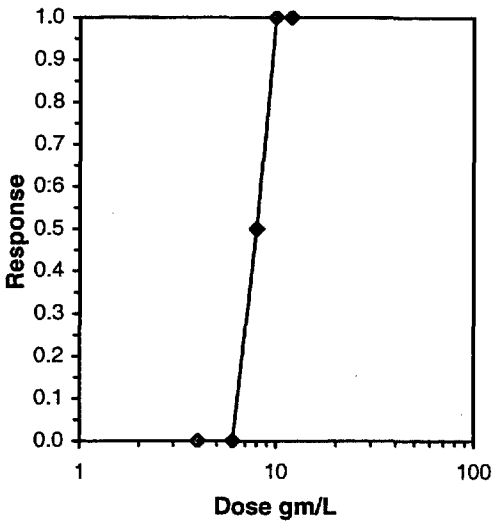
Acute Test-48 Hr Survival

Start Date:	10/10/2000 13:30	Test ID:	rppa882	Sample ID:	REF-Ref Toxicant
End Date:	10/12/2000 11:55	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	PP
Comments:	FHM 882				

Conc-gm/L	1
LAB-Control	1.0000
4	1.0000
6	1.0000
8	0.5000
10	0.0000
12	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	7.8720	7.2612	8.5341
5.0%	7.8847	7.2071	8.6260
10.0%	7.8974	7.1354	8.7408
20.0%	7.9229	6.9062	9.0893
Auto-0.0%	7.8720	7.2612	8.5341



SCOEPA00027567

REFERENCE TOXICANT DATA SHEET

Client QA/QC
Reference Toxicant NaCl
Test Begin Date 10-10-00 Time 1125
Test Organism *Pimephales promelas*
CID# ~~188~~ 256 Stock Solution 20 g/L
Test End Date 10-12-00 Time 1010
Source Aquatox Inc.
Solvent Distilled water
ID# FHM 883 Age ~~< 24 hours~~ 8 days BM
*Dilution Water Recon MH ID# 1904
Size NA
Total Hardness as CaCO3 96
Total Alkalinity as CaCO3 66
Loading NA
Conductivity (µmhos/cm) / Salinity (ppt) 278
Temperature 20 ± 1 °C
Technician 0 hr BM 24 hr BM 48 hr DW 72 hr 96 hr
Time 0 hr 1125 24 hr 0945 48 hr 1010 72 hr 96 hr

Toxicant Concen. (g/L)	Test Chamber Number	Number Surviving					Dissolved Oxygen (mg/l)					pH					Temperature °C					Cond
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0
Control		10	10	10			8.6	8.3	8.1			8.3	8.0	8.0			20	20	20			297
4		10	10	10			8.6	8.3	8.1			8.0	7.8	7.8			20	20	20			6210
6		10	10	10			8.6	8.3	8.1			7.9	7.8	7.7			20	20	20			6590
8		10	7	4			8.6	8.2	8.1			7.9	7.7	7.6			20	20	20			7860
10		10	~~2~~ 0	–			8.6	8.2	–			7.8	7.7	–			20	20	–			8810
12		10	0	–			8.6	8.2	–			7.8	7.6	–			20	20	–			9790
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ± 1 °C					

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 7.7
Cusum Chart Limits 6.1 TO 8.8
Statistical Method Trimmed Spearman Karber

We verify this data is true and correct.
Task Manager [signature]
Project Manager [signature]
QA Officer [signature]

SCOEPA00027568

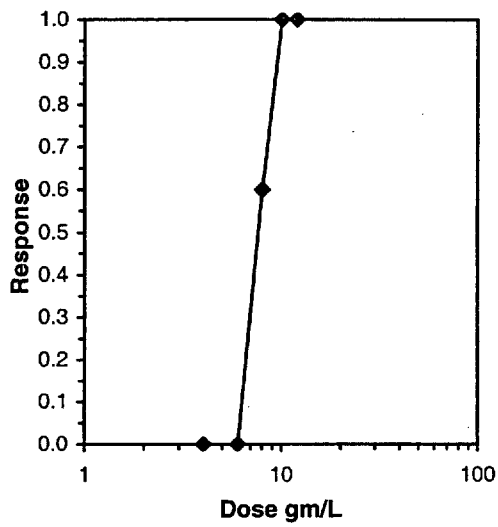
Acute Test-48 Hr Survival

Start Date:	10/10/2000 11:25	Test ID:	rppa883	Sample ID:	REF-Ref Toxicant
End Date:	10/12/2000 10:10	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	PP
Comments:	FHM 883				

Conc-gm/L	1
LAB-Control	1.0000
4	1.0000
6	1.0000
8	0.4000
10	0.0000
12	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	7.6734	7.0896	8.3054
5.0%	7.6663	7.0228	8.3687
10.0%	7.6592	6.9458	8.4458
20.0%	7.6454	6.7420	8.6698
Auto-0.0%	7.6734	7.0896	8.3054



SCOEPA00027569

REFERENCE TOXICANT DATA SHEET

Client QA/QC | Reference Toxicant NaCl | Test Begin Date 10-30-00 Time 1345
Test Organism Ceriodaphnia dubia | CID# 257 | Stock Solution 20 g/L | Test End Date 10-5-00 Time 1200
Source In house | Solvent distilled
ID# CD 1253 | Age <24 hrs | *Dilution Water Recon MH (FHM) | ID# 1900
Size — | Total Hardness as CaCO3 98 | Total Alkalinity as CaCO3 68
Loading — | Conductivity (µmhos/cm) / Salinity (ppt) 300 | Temperature 20±1°C

Technician	0 hr BM	24 hr BM	48 hr DW	72 hr	96 hr	
Time	0 hr 1345	24 hr 0840	48 hr 1200	72 hr	96 hr	

Toxicant Concen. (5%)	Test Chamber Number	Number Surviving 0	24	48	72	96	Dissolved Oxygen mg/l 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Cond. 0
CONTROL	A	5	5	5			8.6	—	8.6			8.1	—	8.3			20	—	20			299
"	B	5	5	5																		
0.5	A	5	5	5			8.7	—	8.6			8.1	—	8.3			20	—	20			1074
"	B	5	5	5																		
1.0	A	5	5	5			8.9	—	8.6			8.1	—	8.3			20	—	20			1761
"	B	5	5	5																		
1.5	A	5	5	5			8.3	—	8.6			8.1	—	8.3			20	—	20			2370
"	B	5	5	5																		
2.0	A	5	5	1			8.8	—	8.6			8.1	—	8.3			20	—	20			2930
"	B	5	5	1																		
3.0	A	5	3	0			8.7	—	8.6			8.0	—	8.2			20	—	20			3910
"	B	5	4	0																		
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ±1 °C					

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 1.9

Cusum Chart Limits 1.4 TO 2.8

Statistical Method Trimmed Spearman Karber

We verify this data is true and correct.

Task Manager

Project Manager

QA Officer

SCOEPA00027570

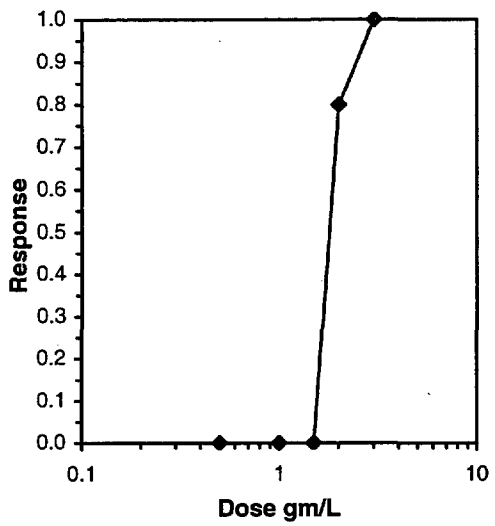
Acute Test-48 Hr Survival

Start Date:	10/03/2000 13:45	Test ID:	rcda1253	Sample ID:	REF-Ref Toxicant
End Date:	10/05/2000 12:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	CD
Comments:					

Conc-gm/L	1	2
LAB-Control	1.0000	1.0000
0.5	1.0000	1.0000
1	1.0000	1.0000
1.5	1.0000	1.0000
2	0.2000	0.2000
3	0.0000	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	1.8564	1.7005	2.0265
5.0%	1.8333	1.6688	2.0140
10.0%	1.8143	1.6510	1.9937
20.0%	1.7955	1.6962	1.9005
Auto-0.0%	1.8564	1.7005	2.0265



SCOEPA00027571

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client: Ref Tox - October FHM661 | Date Initiated: 10-3-00 | Time: 1130
Sample Description: NaCl - 50 g/L STOCK | Date Terminated: 10-10-00 | Time: 0955

Technician: Day 0 [illegible] Day 1 [illegible] Day 2 [illegible] Day 3 [illegible] Day 4 [illegible] Day 5 [illegible] Day 6 [illegible] Day 7 [illegible]
Time: Day 0 1130 Day 1 0900 Day 2 1015 Day 3 1305 Day 4 1055 Day 5 1000 Day 6 1255 Day 7 0955

Concentration or g/L Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
Control	0	10	10	10	10		8.2		8.2	25	298
	1	10	10	10	10	8.0	8.1	8.0	8.2	25	
	2	10	10	10	10	8.0	8.3	8.2	8.3	25	
	3	10	10	10	10	7.7	8.3	8.2	8.2	25	309
	4	10	10	10	10	8.2	8.3	8.1	8.2	25	295
	5	10	10	10	10	8.2	8.3	8.4	8.1	25	297
	6	10	10	10	10	7.3	8.0	8.1	8.2	25	
	7	10	10	10	10	7.4		8.3			
0.3	0	10	10	10	10		8.2		8.2		760
	1	10	10	10	10	7.4	8.1	8.0	8.2		
	2	10	10	10	10	8.0	8.3	8.2	8.3		
	3	10	10	10	10	7.8	8.3	8.3	8.5		816
	4	10	10	10	10	8.2	8.3	8.2	8.2		745
	5	10	10	10	10	8.2	8.3	8.3	8.2		757
	6	10	10	10	10	7.6	8.1	8.1	8.1		
	7	10	10	10	10	7.7		8.3			
1.0	0	10	10	10	10	—	8.3	—	8.2		1715
	1	10	10	10	10	7.4	8.2	8.1	8.2		
	2	10	10	10	10	8.1	8.3	8.1	8.2		
	3	10	10	10	10	8.0	8.3	8.3	8.4		1740
	4	10	10	10	10	8.1	8.3	8.4	8.1		1770
	5	10	10	10	10	8.0	8.3	8.4	8.2		1735
	6	10	10	10	10	7.7	8.3	8.0	8.1		
	7	10	10	9	10	7.8		8.2			
2.0	0	10	10	10	10		8.3		8.1		2870
	1	10	10	10	10	7.4	8.2	8.1	8.1		
	2	10	10	10	10	8.0	8.3	8.1	8.2		
	3	10	10	10	10	8.0	8.3	8.2	8.3		2820
	4	10	10	10	10	8.1	8.3	8.4	8.1		2880
	5	10	10	10	10	8.1	8.3	8.1	8.1		2920
	6	10	10	10	10	7.7	8.3	8.0	8.1		
	7	10	10	10	9	7.8		8.1			
4.0	0	10	10	10	10	—	8.3	—	8.0		4550
	1	10	10	10	10	7.6	8.2	8.0	8.0		
	2	10	10	10	10	8.1	8.3	8.0	8.1		
	3	10	9	8	10	8.2	8.3	8.1	8.2		4570
	4	10	8	8	10	8.1	8.3	8.0	8.0		4740
	5	10	8	8	10	8.2	8.3	8.0	8.0		4630
	6	4	7	8	10	7.6	8.1	8.0	8.0		
	7	4	7	8	10	7.8		8.0			
8.0	0	10	10	10	10		8.3		7.8	25	6900
	1	10	10	10	10	7.5	8.3	7.9	7.8	25	
	2	9	5	7	5	8.1	8.3	8.0	8.0	25	
	3	1	0	4	5	8.0	8.3	8.1	8.0	25	6900
	4	0	0	0	0	8.1	8.3	8.1	7.9	25	7120
	5	1	1	1	1		8			25	
	6	1	1	1	1						
	7	1	1	1	1						

Endpoint	IC25	Cusum Chart Limits	
Survival	3.8	2.1 to	5.3
Growth	3.8	1.7 to	4.1

Task Manager: Doug Winn
Project Manager: Karen Jansen
QA Officer:

FATHEAD MINNOW 7-DAY GROWTH DATA

Client _____ Ref Tox - October Species ID# FHM 881

Sample Description NaCl - 50 g/L STOCK Start Date 10-3-00

Concentration or Percent	Replicate	Tare Weight (gm)	Total Weight (gm)	No. of Fish
Control	A	1.06764	1.06982	10
	B	1.05841	1.06046	10
	C	1.04110	1.04373	10
	D	1.04131	~~1.06046~~ 1.04409	10
0.3	A	1.17610	1.02024	10
	B	1.03760	1.03996	10
	C	1.02637	1.02848	10
	D	1.04752	1.04991	10
1.0	A	1.04423	1.04734	10
	B	1.07696	1.07982	10
	C	1.05753	1.06006	9
	D	1.05164	1.05413	10
2.0	A	1.05426	1.05749	10
	B	1.05836	1.06128	10
	C	1.02181	1.02489	10
	D	1.03189	1.03445	9
4.0	A	1.03920	1.04050	4
	B	1.04074	1.04237	7
	C	1.03820	1.03997	8
	D	1.01397	1.01642	10
8.0	A	1.03923		0
	B	1.04884		0
	C	1.01427		0
	D	1.04071		0

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	10/03/2000 11:30	Test ID:	rppc881	Sample ID:	REF-Ref Toxicant
End Date:	10/10/2000 09:55	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:	October FHM Chronic Ref. Tox.				

Conc-gm/L	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
0.3	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	0.9000	1.0000
2	1.0000	1.0000	1.0000	0.9000
4	0.4000	0.7000	0.8000	1.0000
8	0.0000	0.0000	0.0000	0.0000

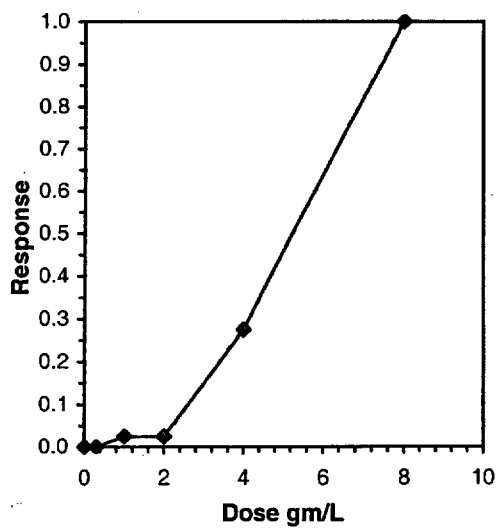
			Transform: Arcsin Square Root					Rank	1-Tailed	Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
LAB-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			1.0000	1.0000
0.3	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	1.0000	1.0000
1	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	0.9750	0.9750
2	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	0.9750	0.9750
4	0.7250	0.7250	1.0488	0.6847	1.4120	28.669	4	12.00	10.00	0.7250	0.7250
*8	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4	10.00	10.00	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.70446	0.884	-0.1071	7.51288
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	4	8	5.65685	

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	2.2000	0.3168	0.2800	2.7981	-1.6942
IC10	2.6000	0.4423	1.9947	4.8400	1.5525
IC15	3.0000	0.5469	2.1111	4.9556	0.9334
IC20	3.4000	0.5330	2.2267	5.0711	0.5599
IC25	3.8000	0.5126	2.4116	5.1867	0.2201
IC40	4.6897	0.4642	3.1524	5.7195	-0.3282
IC50	5.2414	0.4164	3.8224	6.0996	-0.6423



SCOEPA00027574

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	10/03/2000 11:30	Test ID:	rppc881	Sample ID:	REF-Ref Toxicant
End Date:	10/10/2000 09:55	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:	October FHM Chronic Ref. Tox.				

Conc-gm/L	1	2	3	4
LAB-Control	0.2180	0.2050	0.2630	0.2780
0.3	0.0000	0.2360	0.2110	0.2390
1	0.3110	0.2860	0.2530	0.2490
2	0.3230	0.2920	0.3080	0.2560
4	0.1300	0.1630	0.1770	0.2450
8	0.0000	0.0000	0.0000	0.0000

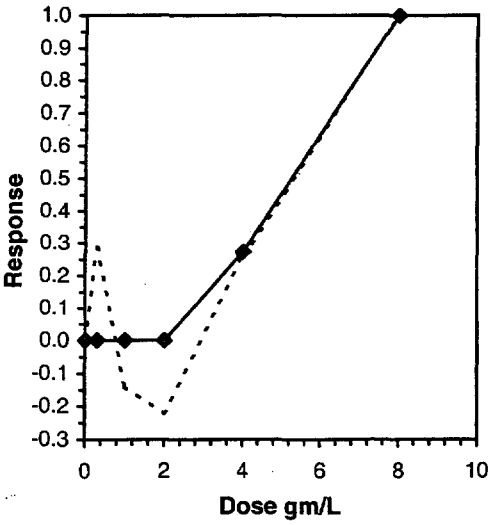
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	0.2410	1.0000	0.2410	0.2050	0.2780	14.529	4				0.2455	1.0000
0.3	0.1715	0.7116	0.1715	0.0000	0.2390	67.067	4	1.617	2.360	0.1015	0.2455	1.0000
1	0.2747	1.1400	0.2747	0.2490	0.3110	10.667	4	-0.785	2.360	0.1015	0.2455	1.0000
2	0.2948	1.2230	0.2948	0.2560	0.3230	9.760	4	-1.250	2.360	0.1015	0.2455	1.0000
4	0.1787	0.7417	0.1787	0.1300	0.2450	27.056	4	1.448	2.360	0.1015	0.1787	0.7281
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	4				0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.86809	0.868	-1.5748	4.43503
Bartlett's Test indicates equal variances (p = 0.07)	8.58169	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	4	8	5.65685		0.10146	0.42098	0.01234	0.0037	0.03821	4, 15

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	2.3678	1.0234	0.0000	3.0791	-0.8698
IC10	2.7356	1.0131	0.0000	4.3506	-1.1951
IC15	3.1034	0.8220	0.0000	4.7937	-1.6436
IC20	3.4712	0.6897	1.4643	4.9344	-1.8151
IC25	3.8390	0.5040	2.2964	5.0752	-0.1717
IC40	4.7038	0.4116	3.3351	5.6406	-0.1107
IC50	5.2531	0.3534	4.0929	6.0338	-0.2368



SCOEPA00027575

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client QA/QC - October Test Start Date 10-3-00

Sample Description NaCl Sample ID# Oct. Chronic Ref. Tox.

Ceriodaphnia Lot# Cd 1252 Statistician DW

Percent or g/L Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	26	28	21	34	31	28	DW 29	34	DW	30	10	285
0.25	26	25	29	32	24	24	33	26	32	* Adult lost in x-fer	9/9	251
0.5	23	24	28	25	25	22	28	26	26	26	10	253
1	18	15	16	14	16	18	11	11	10	22	10	151
1.5	6	7	12	13	13	8	6	7	10	6	10	88
2	0	0	0	0	1	2	0	0	1	5	10	9
4	%AD	%AD	%AD	%AD	%AD	%AD	%AD	%AD	%AD	%AD	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Endpoint	IC_{25}	Cusum chart Limits
Survival	2.50	0.75 TO 2.66
Reproduction	0.69	0.06 TO 1.21

Task Manager = Doug Winn
Proj. Manager =
QA officer =

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client QA/QC - October Test Beginning : Date 10-3-00 Time 0930

Sample Description NaCl - 50 g/L STOCK Test Ending : Date 10-10-00 Time 1000

Ceriodaphnia Lot# Cd 1252 Dilution Water Recon MH (EHM) ID# 1900/

Technician Day 1 DW Day 2 DW Day 3 MS Day 4 DW Day 5 DW Day 6 BW Day 7 DW

Time Day 1 1045 Day 2 0915 Day 3 1310 Day 4 0945 Day 5 1000 Day 6 1035 Day 7 1000

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	4	3	0	0	0	3	0	3	0	10	13
	4	5	0	0	6	5	4	0	6	0	5	10	31
	5	9	11	8	13	12	13	11	12	8	12	10	109
	6	0	13	0	0	0	0	15	0	13	0	10	41
	7	12	0	10	15	14	11	0	16	0	13	10	91
0.25 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	*	9/9	0
	4	4	0	5	4	2	2	5	5	5	↓	9/9	32
	5	10	12	11	13	10	9	13	11	11	↓	9/9	100
	6	0	13	0	0	12	13	0	0	0	↓	9/9	38
	7	12	0	13	15	0	0	15	10	16	↓	9/9	81
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	5	5	5	6	0	4	5	4	4	0	10	38
	5	11	10	11	11	12	10	10	10	12	14	10	111
	6	0	0	0	0	0	0	0	0	0	12	10	12
	7	7	9	12	8	13	8	13	12	10	0	10	92
1.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	4	0	0	0	10	4
	4	4	0	1	5	4	3	0	3	2	2	10	24
	5	7	6	8	7	7	12	5	8	8	9	10	77
	6	0	9	7	0	0	0	0	0	0	11	10	27
	7	7	0	0	2	5	3	2	0	0	0	10	19
1.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	2	2	3	3	2	1	1	2	2	10	18 DW
	5	4	0	3	5	3	3	4	2	3	2	10	29
	6	2	0	7	0	0	0	0	0	0	0	10	9
	7	0	5	0	5	7	3	1	4	5	2	10	32
2.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	0	0	0	0	0	0	0	0	0	10	0
	5	0	0	0	0	0	0	0	0	0	0	10	0
	6	0	0	0	0	1	0	0	0	0	5	10	6
	7	0	0	0	0	0	2	0	0	1	0	10	3
4.0 g/L	1	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	0	0
	2												
	3												

* NO adult Prob. lost in transf

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client QA/QC - October — Initiated Date 10-3-00 Time 0930 — Adults Isolated Date 10-2-00 Time 1100

Sample Description NaCl - 50 g/L STOCK — Terminated Date 10-10-00 Time 1000 — Neo's Collected Date 10-2-00 Time 1800

Technician Day 0 DW Day 1 DW Day 2 DW Day 3 MS Day 4 DW Day 5 DW Day 6 _____ Day 7 DW

Time Day 0 0930 Day 1 1045 Day 2 0915 Day 3 1515 Day 4 0945 Day 5 1000 Day 6 _____ Day 7 1000

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	8.0	8.1 / 7.9	8.1 / 8.0	7.8 / 7.6	8.0 / 7.8	7.9 / 7.8	7.7 / 7.7	8.0	7.9	8.3 / 8.2	8.3 / 8.1	8.4 / 8.0	8.3 / 8.1	8.2 / 8.1	8.0 / 7.8	8.2	307	305	309	319	310	306		
0.25 g/L	8.0	8.1 / 7.9	8.1 / 8.0	7.8 / 7.6	8.0 / 7.7	7.9 / 7.8	7.7 / 7.7	8.0	7.9	8.3 / 8.1	8.3 / 8.1	8.2 / 8.0	8.3 / 8.1	8.2 / 8.1	8.0 / 7.8	8.2								
0.5 g/L	8.0	8.0 / 7.9	8.1 / 8.0	7.8 / 7.6	8.0 / 7.7	7.9 / 7.8	7.7 / 7.6	8.0	7.9	8.3 / 8.1	8.3 / 8.1	8.2 / 8.0	8.2 / 8.1	8.2 / 8.1	8.0 / 7.7	8.2								
1.0 g/L	8.0	8.0 / 7.9	8.1 / 8.0	7.6 / 7.7	8.0 / 7.7	7.9 / 7.8	7.7 / 7.6	8.0	7.9	8.3 / 8.1	8.3 / 8.1	8.1 / 7.9	8.2 / 8.1	8.2 / 8.0	8.0 / 7.8	8.2								
1.5 g/L	8.0	7.9 / 7.9	8.1 / 7.9	7.9 / 7.8	8.0 / 7.7	8.0 / 7.8	7.7 / 7.7	8.0	7.8	8.3 / 8.0	8.3 / 8.1	8.2 / 7.9	8.2 / 8.0	8.2 / 8.0	8.0 / 7.8	8.2	2430	2390	2410	2390	2430	2410		
2.0 g/L	8.0	7.9 / 7.7	8.0 / 7.8	7.9 / 7.6	7.9 / 7.7	7.9 / 7.8	7.7 / 7.6	8.1	7.8	8.3 / 7.9	8.2 / 8.0	8.2 / 8.0	8.2 / 8.0	8.1 / 7.9	8.0 / 7.8	8.1	2980	2960	2950	2930	3000	2970		
4.0 g/L	8.0	7.9 / —	— / —	— / —	— / —	— / —	— / —		7.8	8.3 / —	— / —	— / —	— / —	— / —	— / —		4820							

COMMENTS: _____

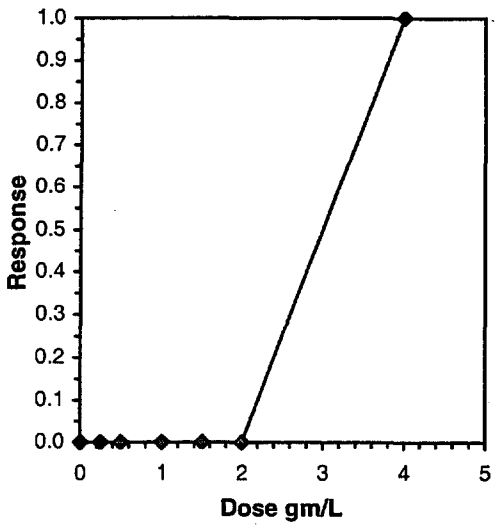
Ceriodaphnia Survival and Reproduction Test-7 Day survival

Start Date:	10/03/2000 09:30	Test ID:	rcdc1252	Sample ID:	REF-Ref Toxicant
End Date:	10/10/2000 10:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	October Cd Chronic Ref. Tox.				

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	2.1000	0.0000	2.1000	2.1000	1.0192
IC10	2.2000	0.0000	2.2000	2.2000	1.0192
IC15	2.3000	0.0000	2.3000	2.3000	-1.0192
IC20	2.4000	0.0000	2.4000	2.4000	-1.0192
IC25	2.5000	0.0000	2.5000	2.5000	#DIV/0!
IC40	2.8000	0.0000	2.8000	2.8000	-1.0192
IC50	3.0000	0.0000	3.0000	3.0000	#DIV/0!



SCOEPA00027579

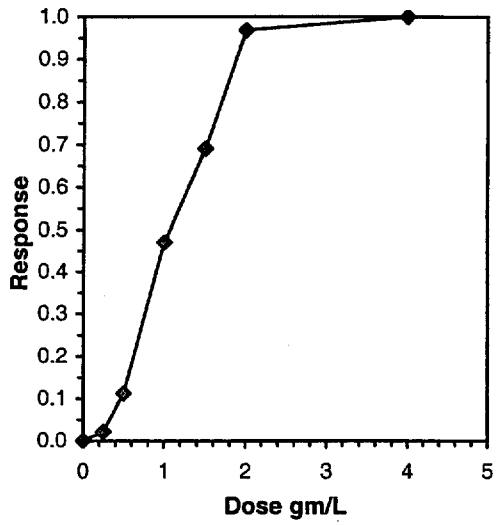
Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/03/2000 09:30	Test ID:	rcdc1252	Sample ID:	REF-Ref Toxicant
End Date:	10/10/2000 10:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	October Cd Chronic Ref. Tox.				

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	26.0000	28.0000	21.0000	34.0000	31.0000	28.0000	29.0000	34.0000	24.0000	30.0000
0.25	26.0000	25.0000	29.0000	32.0000	24.0000	24.0000	33.0000	26.0000	32.0000	
0.5	23.0000	24.0000	28.0000	25.0000	25.0000	22.0000	28.0000	26.0000	26.0000	26.0000
1	18.0000	15.0000	16.0000	14.0000	16.0000	18.0000	11.0000	11.0000	10.0000	22.0000
1.5	6.0000	7.0000	12.0000	13.0000	13.0000	8.0000	6.0000	7.0000	10.0000	6.0000
2	0.0000	0.0000	0.0000	0.0000	1.0000	2.0000	0.0000	0.0000	1.0000	5.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	0.3286	0.0996	0.1196	0.4691	-0.2064
IC10	0.4662	0.0868	0.2391	0.5589	-0.5692
IC15	0.5527	0.0513	0.4289	0.6255	-0.2964
IC20	0.6225	0.0458	0.5273	0.6993	0.1409
IC25	0.6924	0.0476	0.6003	0.7852	0.3279
IC40	0.9020	0.0605	0.7941	1.0163	0.6123
IC50	1.0675	0.0772	0.9154	1.1929	0.0809



SCOEPA00027580

APPENDIX C
CHAIN OF CUSTODY

SUBCONTRACT ORDER

North Creek Analytical - Portland

P010279

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Howard Holmes

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P010279-01	**Water**	**Sampled: 10/09/00 09:30**		
Subcontract Outside	10/16/00 17:00	10/10/00 09:30		Bioassay
Containers Supplied:				
Other (A)				

nca™ North Creek Analytical, Inc.
Environmental Laboratory Network
www.ncalabs.com

CLIENT Wacker
PROJECT Bioassay - Oct 2000
SAMPLE 00.105
DATE 10.9.00 TIME 0930
UNPRESERVED

Lab ID = CO2751-01

Temp. upon arrival = 5°C

FHM & cd Chronics!
FHM & cd Acutes!

Released By	Date	Received By	Date
[signature]	10/9/00	Doug Winn/LAB	10-10-00/1600
Released By	Date	Received By	Date

SCOEPA00027582

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client: Wacker Siltronic
Address: 7200 N.W Front Ave
Portland, OR 97210

Contact Person: Tom Rothschild
Phone: 503-219-7374

CH2M HILL Project #:

NPDES# 101132
Composite Sample Information:

Samples/Hour 2 hr Volume/Sample 4 gal
Total Hours 24 Total Volume 48 gal
Initiated: Date 10-10-00 Time 0500
Ended: Date 10-11-00 Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: P.O.# 210162

CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

Check Chlorine (Y/N)
Temp. Upon Arrival (°C) 3
Check Ammonia (Y/N) Dechlorinate (Y/N)

Analysis Required/Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
OO-106	10.11.00	~~15~~ 0810	X		1	02751-02	X	X	X	X														

Sampled By & Title (Please sign and print name): Dianne Irish CAR ITCH	Date/Time: 10/11/00 0810	Relinquished By (Please sign and print name): Dianne Irish	Date/Time: 10/11/00
Received By (Please sign and print name): Bob Fabel NOA	Date/Time: 10/11/00 @ 13:15	Relinquished By (Please sign and print name): Bob F NOA	Date/Time: 10/11/00 @ 14:30
Received By (Please sign and print name): Brett Mulvey	Date/Time: 10/12/00 1115	Relinquished By (Please sign and print name):	Date/Time:
Received By (Please sign and print name):	Date/Time:	Shipped Via: UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___ Bus	Shipping #
Work Authorized By (Please sign and print name):	Remarks:		

Rev. 10/97

SCOEPA00027583

SUBCONTRACT ORDER

North Creek Analytical - Portland

P010279

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Howard Holmes

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P010279-01	**Water**	**Sampled: 10/09/00 09:30**	[redacted]	
Subcontract Outside	10/16/00 17:00	10/10/00 09:30		Bioassay
Sample ID: P010279-02	**Water**	**Sampled: 10/11/00 08:10**	[redacted]	
Subcontract Outside	10/23/00 17:00	10/12/00 08:10		Bioassay

C02751-02

Released By	Date	Received By	Date
Howard B Holmes	10/11/00		10/12/00 11:15
Released By	Date	Received By	Date

SCOEPA00027584

SUBCONTRACT ORDER

North Creek Analytical - Portland

P010279

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Howard Holmes

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P010279-01	**Water**	**Sampled: 10/09/00 09:30**		
Subcontract Outside	10/16/00 17:00	10/10/00 09:30		Bioassay
Containers Supplied:				
Other (A)				
Sample ID: P010279-02	**Water**	**Sampled: 10/11/00 08:10**		
Subcontract Outside	10/23/00 17:00	10/12/00 08:10		Bioassay
Containers Supplied:				
Other (A)				
Sample ID: P010279-03	**Water**	**Sampled: 10/13/00 08:10**		
Subcontract Outside	10/23/00 17:00	10/14/00 08:10		Bioassay
Containers Supplied:				
Other (A)				

nca™ North Creek Analytical, Inc.
Environmental Laboratory Network
www.ncalabs.com

CLIENT Wacker Siltronic
PROJECT Bioassay · Oct. · 2000
SAMPLE 00·108
DATE 10·13·00 TIME 0810
UNPRESERVED

C02751-03
Temp upon arrival 4°C

Jessica Roberts 10/13/00

Released By	Date	Received By	Date
Released By	Date	Received By	Date

SCOEPA00027585

Greyhound Lines, Inc.
P.O. Box 660362, MS 410
Dallas, Texas 75266-0362

ORIGINATING CARRIER	ORIGINATING SCHEDULE	MO.	DAY	YEAR	TIME	AM	PM	FORWARDING AGENCY NO.

FORWARDING AGENT'S INITIALS	PICK-UP AGENT I.D.	DELIVERY AGENT	DESTINATION AGENCY NO.

DESTINATION STATION CITY & STATE | ZIP

154 777 051 0

1 To (Recipient's Name)

Exact Street Address Cannot deliver to P.O. Box or Zip Code

City | State | Zip

Recipient's Package Express Account No.

Recipient's Phone Number (Very Important) ( ) -

2

Shipper's Phone Number (Very Important) ( ) -

Shipper's Package Express Account No.

3 From (Shipper's Name)

Exact Street Address Cannot deliver to P.O. Box or Zip Code

City | State | Zip

4 **INTERLINE INFORMATION**

Carrier Code	City	Schedule #
Carrier Code	City	Schedule #

5 Routing: _____
If no routing specified, shipment will be routed via Greyhound direct to the extent possible.

6 **SERVICE REQUIRED** | 7 **PAYMENT**

PRIORITY	STD	BILL PKG. EXP. ACCT	CASH	BILL CRDT CARD
X		X		

NO. OF PIECES	ACTUAL WEIGHT LBS.	

CARTON DESCRIPTION

X X = ÷ 200 = 8 DIMENSIONAL WEIGHT COMPUTATION | DIMENSIONAL WGT. LBS.

9

	RATE ZONE	C.O.D.
PREPAID X	CHARGES	COLLECT
$	EXPRESS	$
	REFWD	
	VALUE	
	COLLECT/ C.O.D. FEE	
	PICK-UP	
	DELIVERY	
	STORAGE	
	OTHER	
	C.O.D. AMOUNT	
$	TOTAL	$

X _____ SIGNATURE (RECEIVED IN GOOD ORDER UNLESS SPECIFIED ON BACK) DATE PRINT NAME

SUBJECT TO TARIFF REGULATIONS PRINTED ON REVERSE SIDE. **LABEL - 5**

2751-01

Greyhound Lines, Inc.
P.O. Box 660362, MS 410
Dallas, Texas 75266-0362

ORIGINATING CARRIER	ORIGINATING SCHEDULE	MO.	DAY	YEAR	TIME	AM / PM	FORWARDING AGENCY NO.

FORWARDING AGENT'S INITIALS	PICK-UP AGENT I.D.	DELIVERY AGENT	DESTINATION AGENCY NO.

DESTINATION STATION CITY & STATE | ZIP

154 777 052 1

RATE ZONE | C.O.D. 9

1 To (Recipient's Name)

Exact Street Address Cannot deliver to P.O. Box or Zip Code

City | State | Zip

Recipient's Package Express Account No. | Recipient's Phone Number (Very Important) ( ) –

2 Shipper's Phone Number (Very Important) ( ) – | Shipper's Package Express Account No.

3 From (Shipper's Name)

Exact Street Address Cannot deliver to P.O. Box or Zip Code

City | State | Zip

4 **INTERLINE INFORMATION**

Carrier Code	City	Schedule #
Carrier Code	City	Schedule #

5 Routing: _____
If no routing specified, shipment will be routed via Greyhound direct to the extent possible.

6 ***SERVICE REQUIRED*** | 7 ***PAYMENT***

PRIORITY | STD (X) | BILL PKG EXP ACCT | CASH | BILL CRDT. CARD

NO. OF PIECES | ACTUAL WEIGHT LBS. | CARTON DESCRIPTION

X X = DIMENSIONAL WEIGHT COMPUTATION ÷ 200 = DIMENSIONAL WGT. LBS. 8

	PREPAID (X)	CHARGES	COLLECT
	$	EXPRESS	$
		REFWD	
		VALUE	
		COLLECT/ C.O.D. FEE	
		PICK-UP	
		DELIVERY	
		STORAGE	
		OTHER	
		C.O.D. AMOUNT	
	$	TOTAL	$

X _____ SIGNATURE (RECEIVED IN GOOD ORDER UNLESS SPECIFIED ON BACK) DATE PRINT NAME

SUBJECT TO TARIFF REGULATIONS PRINTED ON REVERSE SIDE. **LABEL - 5**

SCOEPA00027587

Greyhound Lines, Inc.
P.O. Box 660362, MS 410
Dallas, Texas 75266-0362

ORIGINATING CARRIER	ORIGINATING SCHEDULE	MO.	DAY	YEAR	TIME	AM	PM	FORWARDING AGENCY NO

FORWARDING AGENT'S INITIALS	PICK-UP AGENT I.D.	DELIVERY AGENT	DESTINATION AGENCY NO.

DESTINATION STATION CITY & STATE | ZIP

154 777 049 9

RATE ZONE | C.O.D.

1 To (Recipient's Name)

Exact Street Address Cannot deliver to P.O. Box or Zip Code

City | State | Zip

Recipient's Package Express Account No.

Recipient's Phone Number (Very Important) ( ) -

2 Shipper's Phone Number (Very Important) ( ) -

Shipper's Package Express Account No.

3 From (Shipper's Name)

Exact Street Address Cannot deliver to P.O. Box or Zip Code

City | State | Zip

4 **INTERLINE INFORMATION**

Carrier Code	City	Schedule #
Carrier Code	City	Schedule #

5 Routing: _____
If no routing specified, shipment will be routed via Greyhound direct to the extent possible.

6 ***SERVICE REQUIRED*** — PRIORITY [X] | STD [ ]

7 ***PAYMENT*** — BILL PKG EXP ACCT [X] | CASH [ ] | BILL CRDT CARD [ ]

NO. OF PIECES | ACTUAL WEIGHT LBS. | CARTON DESCRIPTION

X x X = ÷ 200 =
DIMENSIONAL WEIGHT COMPUTATION | DIMENSIONAL WGT. LBS.

8

	PREPAID [X]	CHARGES	COLLECT
	$ 5.20	EXPRESS	$
		REFWD	
		VALUE	
		COLLECT/ C.O.D. FEE	
		PICK-UP	
		DELIVERY	
		STORAGE	
		OTHER	
		C.O.D. AMOUNT	
	$ 5.20	TOTAL	$

X _____ SIGNATURE (RECEIVED IN GOOD ORDER UNLESS SPECIFIED ON BACK) DATE PRINT NAME

SUBJECT TO TARIFF REGULATIONS PRINTED ON REVERSE SIDE. **LABEL - 5**

C02751-03

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

P0102794 1 of 3

Client Wacker Siltronic NPDES# 101132

Address 7200 N.W. Front Ave Composite Sample Information

Portland, OR 97210

Samples/Hour 2 hr Volume/Sample 4 gal

Total Hours 24 Total Volume 48 gal

Contact Person: Tom Rothschild Initiated: Date 10.8.00 Time 0500

Phone: 503-219-7374 Ended: Date 10.9.00 Time 0500

Chilled During Collection Yes ☐ No ☒

CH2M HILL Project #

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

P. O.# 210162

Check Chlorine (Y/N)

Temp. Upon Arrival (°C)

Check Ammonia (Y/N) Dechlorinate (Y/N)

Analysis Required/Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
00.105	10/9/00	~~1030~~ 0930	X		1		X	X	X	X														

Sampled By & Title (Please sign and print name) Dianne Irish Dianne Irish LAB TECH	Date/Time 10.9.00 ~~1030~~ 0930	Relinquished By (Please sign and print name) Dianne Irish Dianne Irish	Date/Time 10.9.00 ~~1040~~ 0940
Received By (Please sign and print name) Nancy Spangler	Date/Time 10-9-00 0940	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Bob F NCA	Date/Time 10/9/00 @ 12:30	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

Rev. 10/97

SCOEPA00027589

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

PO 10279 B 2 of 3

Client Wacker Siltronic NPDES# 101132

Address 7200 N.W Front Ave Portland, OR 97210

Composite Sample Information

Samples/Hour 2 hr Volume/Sample 4 gal

Total Hours 24 Total Volume 48 gal

Contact Person: Tom Rothschild Initiated: Date 10.10.00 Time 0800

Phone: 503-219-7374 Ended: Date 10.11.00 Time 0800

Chilled During Collection Yes ☐ No ☒

CH2M HILL Project #

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

P.O.# 210162

Check Chlorine (Y/N) _____

Temp. Upon Arrival (°C) _____

Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

Analysis Required/Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
00.106	10.11.00	~~10.0810~~	X		1		X	X	X	X														

Sampled By & Title (Please sign and print name) Dianne Irish LAB TECH	Date/Time 10/11/00 0810	Relinquished By (Please sign and print name) Dianne Irish	Date/Time 10/11/00
Received By (Please sign and print name) Bob Fahrholz NCA	Date/Time 10/11/00 @ 13:15	Relinquished By (Please sign and print name) Bob F NCA	Date/Time 10/11/00 @ 14:30
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

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SCOEPA00027590

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

P010279 C 3 of 3

Client Wacker Siltronic
Address 7200 N.W. Front Ave.
Portland, OR 97210
Contact Person: Tom Rothschild
Phone: 503-219-7374

NPDES# 101132
Composite Sample Information
Samples/Hour 2 hr Volume/Sample 4 gal
Total Hours 24 Total Volume 48 gal
Initiated: Date 10.12.00 Time 0800
Ended: Date 10.13.00 Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
P.O.# 210162
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

Check Chlorine (Y/N) _____
Temp. Upon Arrival (°C) _____
Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

CH2M HILL Project # _____

Analysis Required/Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
00.108	10.13.00	0810	X		1		X	X	X	X														

Sampled By & Title (Please sign and print name) Dianne Irish LAB TECH	Date/Time 10/13/00 0810	Relinquished By (Please sign and print name) Dianne Irish	Date/Time 10/13/00 1115
Received By (Please sign and print name) Gary Spangler	Date/Time 10-13-00 1115	Relinquished By (Please sign and print name) Gary Spangler	Date/Time 10-13-00
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

Rev 10/97

SCOEPA00027591

BIOMONITORING SERVICES

BIOASSAY REPORT

ACUTE AND CHRONIC BIOASSAYS

Conducted September 12 through 19, 2000

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CH2MHILL

BIOASSAY REPORT
ACUTE AND CHRONIC BIOASSAYS
Conducted September 12 through 19, 2000

Prepared for

North Creek Analytical
Wacker Siltronics

Prepared by

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September, 2000
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SCOEPA00027593

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INTRODUCTION

CH2M HILL conducted acute and chronic definitive tests on samples provided by North Creek Analytical Beaverton, Oregon (Wacker Siltronics). The organisms tested were the water flea (*Ceriodaphnia dubia*) and the fathead minnow (*Pimephales promelas*). The tests were conducted from September 12 through 19, 2000.

METHODS AND MATERIALS

TEST METHODS

The acute tests were performed according to: *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms*, Weber C., et. al. (1993); EPA/600/4-90/027F and *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Weber, C. et al. (1994); EPA/600/4-91/002 and *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.

TEST ORGANISMS

The *Ceriodaphnia dubia* used in the tests were obtained from CH2M HILL's in-house cultures. The *Ceriodaphnia dubia* used in the chronic test were less than 24 hours old and within an 8-hour age range at test initiation. The *Ceriodaphnia dubia* used in the acute test were less than 24 hours old at test initiation. The fathead minnows used in the tests were obtained from Aquatox, Hot Springs, Arkansas. The fathead minnows used in the chronic tests were less than 24 hours old at test initiation. The fathead minnows used in the acute test were 8 days old and acclimated to test conditions for less than 1 day prior to testing. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (1994). The test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution waters used in the tests was moderately hard reconstituted water with a hardness of 88 and 88 mg/l as $CaCO_3$, alkalinity of 64 and 66 mg/l as $CaCO_3$, and pH of 8.0, and 8.2.

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TEST CONCENTRATIONS

The concentrations tested in both the acute and chronic tests were 3, 10, 17, 50, and 100 percent effluent with dilution water for the control. The concentrations for the *Ceriodaphnia dubia* acute test were run in quadruplicate with five organisms per replicate. The concentrations for the fathead minnow acute test were run in duplicate with ten organisms per replicate. For the chronic *Ceriodaphnia dubia* tests, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel. For the fathead minnow chronic tests, 10 organisms per chamber with four chambers per concentration for a total of 40 organisms per concentration were used.

SAMPLE COLLECTION

Two samples were collected on September 11 and 13, 2000 and transported to CH2M HILL's Corvallis Aquatic Toxicology Laboratory by Greyhound Bus. The samples were stored in the dark at 4°C until test solutions were prepared and tested. Chain of custody forms for sample collection are provided in Appendix C. The third sample was not received due to upset conditions at Wacker Siltronics, therefore the second sample was used for the remainder of the chronic tests.

SAMPLE PREPARATION

Samples used during these tests were filtered through a 60 µm net upon arrival and temperature was adjusted prior to each daily renewal.

MONITORING OF BIOASSAYS

Samples were monitored on arrival for hardness, total residual chlorine, ammonia, and temperature.

The acute tests were monitored at initiation for pH, conductivity, and dissolved oxygen, and every 24 hours thereafter for dissolved oxygen, pH, and mortality. Conductivity was again measured at test termination. Temperature was monitored continuously throughout the 48 hour test periods.

For the chronic tests, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in the control and all concentrations tested. Conductivity was measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was monitored daily in the chronic test. According to EPA (1994), *Ceriodaphnia dubia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia dubia* in the controls have produced their third brood and at least 15 neonates per adult are produced. Fathead minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the test.

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DATA ANALYSIS

The effects measured during the acute tests included survival over the exposure period. The effects measured during the *Ceriodaphnia dubia* chronic test included survival and reproduction over the exposure period. The effects measured during the fathead minnow chronic test included survival and growth over the exposure period. For the chronic tests, statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, using Toxcalc, version 5.0. Dunnett's Procedure, Bonferroni T-test, or Fisher's Exact Test was used to compare the survival data and Dunnett's Procedure or Bonferroni T-test was used to compare the reproduction or growth data between the control and each effluent treatment. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or Bonferroni T-test could not be met, Steel's Many-One Rank Test or Wilcoxon Many-One Rank Test with Bonferroni Adjustment was used to analyze the data.

RESULTS AND DISCUSSION

ACUTE BIOASSAYS

The raw data sheets are presented in Appendix A. The results of the *Ceriodaphnia dubia* acute test are summarized in Table 1.

Table 1
Summary of Acute Results
Ceriodaphnia dubia
Percent Survival

Concentration (%)	0 hr	24 hr	48 hr
Control	100	100	100
3	100	100	100
10	100	100	95
17	100	95	90
50	100	10	0[a]
100	100	0	0[a]

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Steel's Many-One Rank Test.

For the *Ceriodaphnia dubia* acute test, the no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 17 and 50 percent effluent. The LC_{50} was 23.6 percent effluent. Survival in the 100 percent effluent was 0 percent.

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The results of the fathead minnow acute test are summarized in Table 2.

Table 2
Summary of Acute Results
Fathead minnow
Percent Survival

Concentration (%)	0 hr	24 hr	48 hr
Control	100	100	100
3	100	100	100
10	100	100	100
17	100	100	100
50	100	100	100
100	100	100	100

For the fathead minnow acute test, the no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 100 and greater than 100 percent effluent. The LC_{50} for the test was greater than 100 percent effluent.

Dissolved oxygen concentrations remained at 40 percent saturation or greater throughout the testing periods. Acute test temperatures remained in the range of 20±1°C. The tests proceeded without interruption or incidence that could have affected test results.

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CHRONIC BIOASSAYS

Table 3 summarizes the results of the *Ceriodaphnia dubia* chronic test.

Table 3
Ceriodaphnia dubia
Chronic Results

Concentration (%)	Percent Survival	No. Young Per Adult
Control	100	22.9
3	100	21.6
10	60[a]	7.6
17	70	3.4[b]
50	0[a]	0.0
100	0[a]	0.0

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Fisher's Exact Test.

[b] Indicates a statistically significant reduction from control at p less than 0.05 using Steel's Many-One Rank Test.

The test results indicated a statistically significant reduction in survival at the 10, 50, and 100 percent effluent concentrations when compared to the control and a reduction in reproduction at the 17 percent effluent concentration. Control survival was 100 percent. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) were 3 and 10 percent effluent.

The IC_{25} value (the concentration of effluent causing a 25 percent reduction in biological measurement, e.g. growth) was calculated on the *Ceriodaphnia dubia* reproduction. The IC_{25} value for reproduction was 5.2 percent effluent.

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Table 4 summarizes the results of the fathead minnow chronic test.

Table 4 Fathead Minnow Chronic Results		
Sample Concentration (%)	**Percent Survival**	**Mean Dry Weight Per Fish (mg)**
Control	95.0	0.33
3	100	0.34
10	97.5	0.34
17	100	0.34
50	97.5	0.32
100	97.5	0.32

The results indicate no statistically significant reduction in survival or growth at any effluent concentration tested when compared to the control. The NOEC and LOEC were and 100 and greater than 100 percent effluent, respectively. Control survival was 95 percent.

The IC_{25} value was calculated on the fathead minnow growth. The IC_{25} value for growth was greater than 100 percent effluent.

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SUMMARY OF TEST RESULTS

Table 5 summarizes the results of the acute testing performed.

Table 5
Acute Test Results

Endpoint	*Ceriodaphnia dubia*	*Pimephales promelas*
	Survival (% effluent)	Survival (% effluent)
NOEC	17	100
LOEC	30	> 100
LC50	23.6	> 100

Table 6 summarizes the results of the chronic testing performed.

Table 6
Chronic Test Results

Endpoint	*Ceriodaphnia dubia*		*Pimephales promelas*	
	Survival (% effluent)	Reproduction (% effluent)	Survival (% effluent)	Growth (% effluent)
NOEC	17	10	>100	>100
LOEC	10	17	100	100
IC25	NA	5.2	NA	>100

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REFERENCE TOXICANT TESTS

The results of monthly reference toxicant tests with sodium chloride conducted in September indicate that the test organisms were within their respective sensitivity range based on EPA guidelines. The LC_{50} values, IC_{25} values, and Control Chart Limits are listed in the tables below. The data sheets for the reference toxicant tests are provided in Appendix B.

Table 7
Acute Reference Toxicant Tests (g/L)

Species	LC_{50}	Control Chart limits
Pimephales promelas (FHM 876)	7.3	6.1 to 8.7
Pimephales promelas (FHM 877	7.0	6.0 to 8.8
Ceriodaphnia dubia	2.1	1.4 to 2.8

Table 8
Chronic Reference Toxicant Tests (g/L)

Species (test)	IC_{25}	Control Chart limits
Pimephales promelas (survival)	4.1	2.1 to 5.3
Pimephales promelas (growth)	3.3	1.8 to 4.0
Ceriodaphnia dubia (survival)	1.79	0.79 to 2.54
Ceriodaphnia dubia (reproduction)	0.89	0.06 to 1.20

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APPENDIX A
RAW DATA SHEETS

CH2M HILL TOXICITY TEST ORGANISM AND WATER QUALITY DATA

Client Wacker Siltronics — Test Initiation: Date 9-12-00 Time 1130 — Test Termination: Date 9-19-00 Time 1200

Contact Howard Holmes @ N.C. Analytical — Technician Janssen, Winn, Muckey, Stanaway

Test Species/ID: *Pimephales promelas* / FHM 876 — *Pimephales promelas* / FHM 877

Ceriodaphnia dubia / Cd 1242 — *Ceriodaphnia dubia* / Cd 1243

Sample Information								Test Species Information	ID# FHM 876	ID# Cd 1242	ID# FHM 877	ID# Cd 1243
Sample ID Number	Field ID	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Dechlor.	Ammonia NH_3-N mg/l	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$	(Age) or Size	< 24 hours —	< 24 hours within an 8 hour span	8 days —	< 24 hours —
G27619-01	P009247-01	9/11/00	0850	0.01 / —	0.73	254	-	Test Container Size	400 ml	30 ml	800 ml	30 ml
-02		9/11-09/13	850	0.01 / -	0.54	360	-	Test Volume	250 ml	15 ml	500 ml	25 ml
* —	—	-	-	- / -	-	-	-	Feeding: Type	0.1 ml *Artemia*	0.1 ml Algae &	—	Algae & YCT
				/				Amount	2 x daily	YCT daily	—	prior to test
				/				Aeration: Began	None	None	—	
				/				Amount	—	—	—	—
				/				Dilution Water ID#	1887/1890	1887/1890	1887	1887
				/				Acclimation Period	< 24 hours	< 24 hours	<1 days	< 24 hours
				/				Test Location	# 4	# 5	# 7	# 7
				/				Condition of Survivors				
				/				Size (mm)	—	—	—	—
				/				Loading Rate	—	—	—	—
				/				Comments	* Received 01 & 02 Samples Only.			

Dilution Water Source	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	1887	88	64
Recon MH (FHM)	1890	88	66

Water Quality Meters Used/ID#

Dissolved Oxygen #1 pH #1 Temperature _____

Conductivity #1 Refractometer _____ Other _____

CH2MHILL

(48) or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Wacker Siltronics CH2M ID # 2719-01

Sample Description

Test Species Ceriodaphnia dubia ID# CDF# 1243

Beginning, Date 9-12-00 Time 1135

Ending, Date 9-14-00 Time 1135

Technician	0 hr BM	24 hr KS	48 hr BM	72 hr	96 hr	
Time	0 hr 1135	24 hr 1115	48 hr 1135	72 hr	96 hr	

Conc or (Percent)	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Control	A	5	5	5			8.6	-	8.3			8.2	-	8.2			20	20	20			288		370		
	B	5	5	5																						
	C	5	5	5																						
	D	5	5	5																						
3	A	5	5	5			8.6	-	8.4			8.2	-	8.2			20	20	20							
	B	5	5	5																						
	C	5	5	5																						
	D	5	5	5																						
10	A	5	5	4			8.7	-	8.4			8.1	-	8.2			20	20	20							
	B	5	5	5																						
	C	5	5	5																						
	D	5	5	5																						
17	A	5	5	5			8.7	-	8.4			8.1	-	8.2			20	20	20							
	B	5	5	5																						
	C	5	5	5																						
	D	5	4	3																						

CH2M HILL

(48) or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Wacker Solutions CH2M ID # 2719-01

Sample Description

Test Species Ceriodaphnia dubia ID# Cd# 1243

Beginning, Date 9-12-03 Time 1135

Ending, Date Time

Technician 0 hr BW 24 hr KS 48 hr ____ 72 hr ____ 96 hr ____

Time 0 hr 1135 24 hr 1115 48 hr ____ 72 hr ____ 96 hr ____

Conc or (Percent)	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
50	A	5	0	-			8.8	-	8.4			8.0	-	8.1			23	20						796		
	B	5	1	0																						
	C	5	1	1																						
	D	5	0	-																						
100	A	5	0	-			8.9	8.4	-			7.7	7.9	-			20	20				979				
	B	5	0	-																						
	C	5	0	-																						
	D	5	0	-																						

Acute Test-48 Hr Survival

Start Date:	09/12/2000 11:35	Test ID:	271901cda	Sample ID:	Wacker Siltronics via N. Creek Anyl.
End Date:	09/14/2000 11:35	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	09/11/2000 08:50	Protocol:	EPAA 93	Test Species:	CD
Comments:	Ceriodaphnia dubia acute.				

Conc-%	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000
10	0.8000	1.0000	1.0000	1.0000
17	1.0000	1.0000	1.0000	0.6000
50	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
LAB-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
10	0.9500	0.9500	1.2857	1.1071	1.3453	9.261	4	16.00	10.00	1	20
17	0.9000	0.9000	1.2305	0.8861	1.3453	18.660	4	16.00	10.00	2	20
*50	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20
*100	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	4	10.00	10.00	20	20

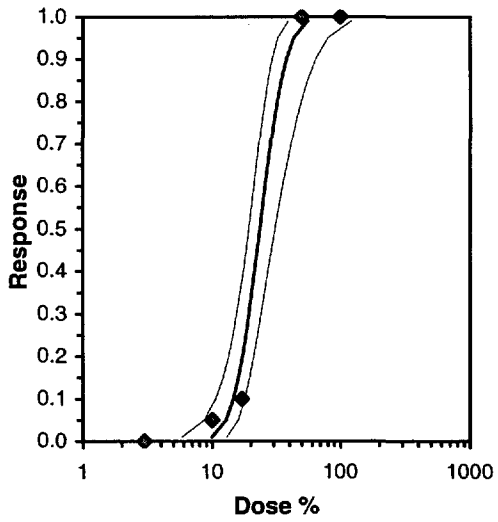
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.64245	0.884	-2.4079	8.16893
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	17	50	29.1548	5.88235

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.21142	1.30946	3.64488	8.77795	0	4.51441	7.81472	0.21	1.37202	0.16099	8
Intercept	-3.5222	1.71391	-6.8815	-0.1629							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	9.94239	5.78505	12.9203
EC05	3.355	12.7999	8.65559	15.8816
EC10	3.718	14.6452	10.6242	17.9043
EC15	3.964	16.0383	12.1209	19.5385
EC20	4.158	17.2394	13.3928	21.0473
EC25	4.326	18.3413	14.5293	22.5278
EC40	4.747	21.4403	17.5034	27.2496
EC50	5.000	23.5515	19.3309	30.9457
EC60	5.253	25.8706	21.1815	35.4213
EC75	5.674	30.2418	24.3481	44.9032
EC80	5.842	32.1747	25.6526	49.4885
EC85	6.036	34.5842	27.2186	55.5152
EC90	6.282	37.8739	29.2702	64.2725
EC95	6.645	43.3341	32.5073	80.0817
EC99	7.326	55.7887	39.3495	121.67



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CH2M HILL

48 or 96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Walker Electronics CH2M ID # 2719-01

Sample Description

Test Species Pimephales promelas ID# CHM #877

Beginning, Date 9-12-00 Time 1150

Ending, Date 9-14-00 Time 1155

Technician 0 hr BM 24 hr KT 48 hr BM 72 hr ____ 96 hr ____

Time 0 hr 1150 24 hr 1130 48 hr 1155 72 hr ____ 96 hr ____

Conc or Percent	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Control	A	10	10	10			8.6	8.6	8.4			8.2	8.1	8.1			20	20	20			289		342		
	B	10	10	10																						
3	A	10	10	10			8.6	8.6	8.4			8.2	8.1	8.1			20	20	20							
	B	10	10	10																						
10	A	10	10	10			8.7	8.5	8.4			8.1	8.1	8.1			20	20	20							
	B	10	10	10																						
17	A	10	10	10			8.7	8.5	8.4			8.1	8.0	8.0			20	20	20							
	B	10	10	10																						
~~100~~ 50	A	10	10	10			8.8	8.4	8.2			8.0	7.9	7.9			20	20	20							
	B	10	10	10																						
100	A	10	10	10			8.9	8.4	7.6			7.7	7.8	7.6			20	20	20			979		420		
	B	10	10	10																						

Acute Test-48 Hr Survival

Start Date:	09/12/2000 11:50	Test ID:	271901ppa	Sample ID:	Wacker Siltronics via N. Creek Anyl.
End Date:	09/14/2000 11:55	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	09/11/2000 08:50	Protocol:	EPAA 93	Test Species:	PP
Comments:	FHM acute.				

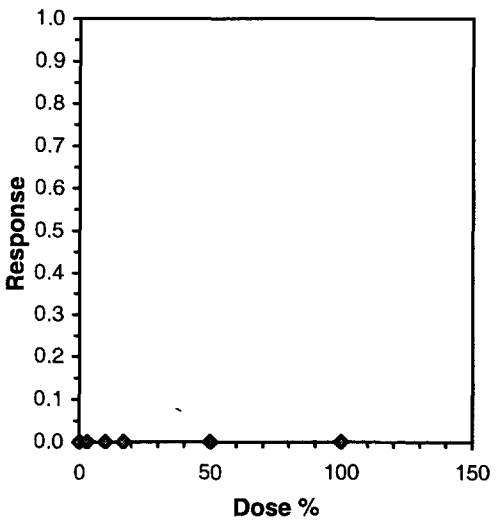
Conc-%	1	2
LAB-Control	1.0000	1.0000
3	1.0000	1.0000
10	1.0000	1.0000
17	1.0000	1.0000
50	1.0000	1.0000
100	1.0000	1.0000

Conc-%	Mean	N-Mean		Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
LAB-Control	1.0000	1.0000	1.41202	0	20	20	2			1.0000	1.0000
3	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000
10	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000
17	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000
50	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000
100	1.0000	1.0000	1.41202	0	20	20	2	1.0000	0.0500	1.0000	1.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Linear Interpolation (80 Resamples)

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



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CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client Wacker Siltronics via N. Creek Test Start Date 9-12-00

Sample Description _____ Sample ID# C02719

Ceriodaphnia Lot# Cd 1242 Statistician DW

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	24	26	27	24	28	10	23	26	15	26	10	229
3	13	23	23	22	4	24	23	35 27 DW	28	21	10	216
10	0 AD	13	16	10	13	0 AD	5	19	0 AD	0 AD	6	76
17	8	8	5	1	0 AD	5	4	3	0 AD	0 AD	7	34
50	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0	0
100	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Cd Test ended @ day 6 ! DW

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Wacker Polysilicones Test Beginning : Date 9-12-00 Time 1130

Sample Description _____ Test Ending : Date 9-18-00 Time 0930

Ceriodaphnia Lot# Cd 1242 Dilution Water Reconstituted Hard ID# 1887 #1890

Technician Day 1 BM Day 2 BM Day 3 BM Day 4 BM Day 5 DM Day 6 DW Day 7 ____

Time Day 1 0915 Day 2 1405 Day 3 1155 Day 4 1215 Day 5 1035 Day 6 0930 Day 7 ____

Percent or Concentration	Day	Replicate										No. Live Adults	Total Live Young
		A	B	C	D	E	F	G	H	I	J		
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	5	4	5	6	5	4	5	3	6	10	47
	4	9	11	11	9	9	5	0	9	0	0	10	63
	5	0	0	0	0	0	~~12~~	10	0	12	9	10	31
	6	11	10	12	10	13	0	9	12	0	11	10	88
	7												
3	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	5	6	6	4	2	4	3	3	6	6	10	45
	4	6	8	7	9	2	8	9	12	~~9~~	10	10	80
	5	0	0	0	0	0	0	0	8	0	0	10	8
	6	2	9	10	9	0	12	11	12	13	5	10	83
	7												
10	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0 AD	0	0	0	0	0 AD	0	0	0 AD	0	7	0
	3		0	2	1	2		1	3		0 AD	6	9
	4		0	0	0	0		0	7			6	7
	5		4	4	1	4		0	0			6	13
	6		9	10	8	7		4	9			6	47
	7												
17	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0 AD	9	0
	3	0	0	0	0	0	0	0	0	0 AD		8	0
	4	0	0	0	0	0	0	0	0			8	0
	5	2	2	2	0	0	2	0	0			8	8
	6	6	6	3	1	0 AD	3	4	3			7	26
	7												
50	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0 AD	0 AD	0 AD	0 AD	0	AD 0	AD 0	AD 0	0	AD 0	2	0
	3					0 AD				0 AD		0	0
	4												
	5												
	6												
	7												
100	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	0	0
	3												
	4												
	5												
	6												
	7												

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client Waters Solutions — Initiated Date 9-12-00 Time 1130 — Adults Isolated Date 9-11-00 Time 0900

Sample Description _____ — Terminated Date 9-18-00 Time 0930 — Neo's Collected Date 9-11-00 Time 1650

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	DW	BM	BM	BM	BM	BM	DW	
Time	1130	0920	1425	1315	1125	1415	0930	

Percent or Concentration	Dissolved Oxygen (mg/l)								pH								Conductivity (µmhos/cm)							
	Day								Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Control	8.2	8.0 / 7.7	8.1 / 7.3	7.9 / 7.6	7.8 / 6.9	7.7 / 7.7	7.5 / -		8.0	8.1 / 7.8	8.4 / 7.7	8.3 / 8.1	8.3 / 7.9	8.3 / 8.0	8.3 / -		302		320					
3	8.2	7.9 / 7.3	8.2 / 7.9	7.8 / 7.6	7.7 / 7.0	7.5 / 7.1	7.7 / -		8.0	8.2 / 7.8	8.4 / 7.9	8.3 / 8.0	8.3 / 7.8	8.4 / 8.0	8.2 / -									
10	8.2	8.0 / 7.8	8.1 / 7.9	7.9 / 7.6	7.7 / 7.1	8.0 / 7.5	7.7 / -		8.0	8.2 / 7.8	8.4 / 7.9	8.3 / 7.9	8.3 / 7.8	8.3 / 7.9	8.2 / -									
17	8.2	7.9 / 7.8	8.2 / 8.0	7.9 / 7.6	7.8 / 7.0	8.0 / 7.5	7.7 / -		8.0	8.2 / 7.8	8.4 / 7.9	8.3 / 7.9	8.3 / 7.8	8.3 / 7.9	8.3 / -									
50	8.2	8.0 / 7.9	8.2 / 8.1	8.2 / -					7.8	8.0 / 7.6	8.3 / 7.8	8.2 / -												
100	8.2	8.0 / 8.1	7.6 / 8.2						7.6	7.9 / 7.5	7.9 / 7.7						1017		1203					

COMMENTS: _____

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	09/12/2000 11:30	Test ID:	271901cdc	Sample ID:	WACKER SIL
End Date:	09/18/2000 09:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	09/11/2000 08:50	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	Cd chronic.				

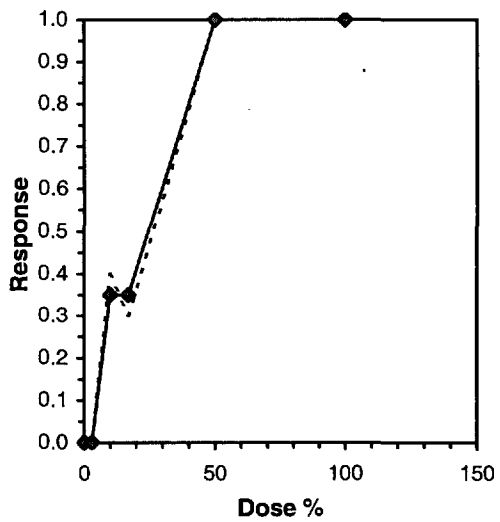
Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	0.0000	0.0000
17	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
LAB-Control	1.0000	1.0000	0	10	10	10			1.0000	1.0000
3	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
*10	0.6000	0.6000	4	6	10	10	0.0433	0.0500	0.6500	0.6500
17	0.7000	0.7000	3	7	10	10	0.1053	0.0500	0.6500	0.6500
*50	0.0000	0.0000	10	0	10	10	0.0000	0.0500	0.0000	0.0000
*100	0.0000	0.0000	10	0	10	10	0.0000	0.0500	0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	3	10	5.47723	33.3333

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL		Skew
IC05	4.000	0.580	3.583	6.500	2.4661
IC10	5.000	1.665	4.167	10.000	4.7838
IC15	6.000	2.348	4.750	13.588	3.3900
IC20	7.000	3.393	5.333	17.049	2.2442
IC25	8.000	4.332	5.917	19.108	1.3762
IC40	19.538	5.709	7.667	25.286	-0.3445
IC50	24.615	5.306	8.833	29.405	-0.8674



SCOEPA00027613

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	09/12/2000 11:30	Test ID:	271901cdc	Sample ID:	WACKER SIL
End Date:	09/18/2000 09:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	09/11/2000 08:50	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	Cd chronic.				

Conc-%	1	2	3	4	5	6	7	8	9	10
LAB-Control	24.000	26.000	27.000	24.000	28.000	10.000	23.000	26.000	15.000	26.000
3	13.000	23.000	23.000	22.000	4.000	24.000	23.000	35.000	28.000	21.000
10	0.000	13.000	16.000	10.000	13.000	0.000	5.000	19.000	0.000	0.000
17	8.000	8.000	5.000	1.000	0.000	5.000	4.000	3.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					Rank	1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical		Mean	N-Mean
LAB-Control	22.900	1.0000	22.900	10.000	28.000	25.333	10				22.900	1.0000
3	21.600	0.9432	21.600	4.000	35.000	38.314	10	91.00	79.00	5.46119	21.600	0.9432
10	7.600	0.3319	7.600	0.000	19.000	98.308	10				7.600	0.3319
*17	3.400	0.1485	3.400	0.000	8.000	92.178	10	55.00	79.00	5.46119	3.400	0.1485
50	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000
100	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

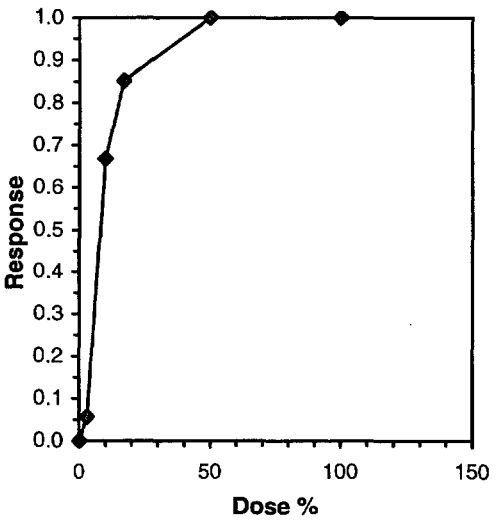
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.89929	0.9	-1.0232	2.61942
Bartlett's Test indicates equal variances (p = 0.58)	1.08315	9.21035		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	3	17	7.14143	33.3333

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL		Skew
IC05*	2.6423	1.1929	0.5307	3.7395	-0.6873
IC10	3.4950	1.0775	1.0614	4.4791	-1.0084
IC15	4.0675	1.0295	1.5921	5.2186	-1.0868
IC20	4.6400	1.0263	2.1228	5.9582	-1.0388
IC25	5.2125	1.0407	2.6536	6.6977	-0.9411
IC40	6.9300	1.0702	4.4976	8.9163	-0.2311
IC50	8.0750	1.1329	6.1058	10.6244	0.3533

* indicates IC estimate less than the lowest concentration



SCOEPA00027614

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client Wacker Siltronics — Date Initiated ~~KJ~~ 8-12-00 — Time 1415

Sample Description C027J9 — Date Terminated ~~KJ~~ 8-19-00 — Time 1200

Technician: Day 0 AAA/KJ Day 1 AAA Day 2 AAA Day 3 AAA Day 4 Mee Day 5 Mee Day 6 KJ Day 7 KJ

Time: Day 0 1415 Day 1 0940 Day 2 1610 Day 3 1455 Day 4 0850 Day 5 1150 Day 6 0830 Day 7 1200

Concentration or Percent	Day	Number of Live Organisms A	B	C	D	Dissolved O_2 (mg/l) Pre	Post	pH Pre	Post	Temperature (°C)	Specific Conductivity (µmhos/cm)
Control	0	10	10	10	10		8.3		8.1	25	303
	1	9	10	10	10	8.0	8.3	8.1	8.1	26	
	2	9	10	10	10	—	8.1	—	8.2	25	331
	3	8	10	10	10	7.9	8.3	8.1	8.0		
	4	8	10	10	10	8.0	7.7	8.1	8.2	25	
	5	8	10	10	10	7.7	8.3	8.1	8.1	25	
	6	8	10	10	10	7.4	8.2	8.1	8.3	25	
	7	8	10	10	10	7.5		8.0		25	
3	0	10	10	10	10		8.3		8.2		
	1	10	10	10	10	8.0	8.2	8.1	8.1		
	2	10	10	10	10	—	8.1		8.1		
	3	10	10	10	10	7.9	8.3	8.1	8.2		
	4	10	10	10	10	8.1	8.1	8.1	8.2		
	5	10	10	10	10	8.0	8.1	8.1	8.3		
	6	10	10	10	10	7.4	8.2	8.1	8.2		
	7	10	10	10	10	7.5		8.0			
10	0	10	10	10	10		8.3		8.1		
	1	10	10	10	10	7.8	8.1	8.0	8.1		
	2	10	10	10	10	—	8.1		8.1		
	3	10	10	10	10	7.9	8.3	8.1	8.2		
	4	10	9	10	10	7.9	8.1	8.1	8.2		
	5	10	9	10	10	8.0	8.2	8.1	8.2		
	6	10	9	10	10	7.5	8.2	8.1	8.2		
	7	10	9	10	10	7.5		8.0			
17	0	10	10	10	10		8.3		8.1		
	1	10	10	10	10	7.9	8.2	8.0	8.1		
	2	10	10	10	10	—	8.1		7.9		
	3	10	10	10	10	8.0	8.3	8.1	8.1		
	4	10	10	10	10	7.8	8.3	8.1	8.1		
	5	10	10	10	10	8.0	8.3	8.1	8.2		
	6	10	10	10	10	7.5	8.2	8.1	8.1		
	7	10	10	10	10	7.5		8.0			
50	0	10	10	10	10		8.3		7.9		
	1	10	10	10	10	7.9	8.3	7.9	7.9		
	2	10	10	10	10	—	8.1	—	7.9		
	3	10	10	10	10	7.6	8.3	8.0	8.0		
	4	10	10	10	10	7.9	8.3	8.0	8.0		
	5	10	9	10	10	8.0	8.3	8.0	8.0		
	6	10	9	10	10	7.4	8.3	8.0	8.0		
	7	10	9	10	10	7.4		7.9			
100	0	10	10	10	10		8.3		7.7	25	1020
	1	10	10	10	10	7.9	8.3	7.8	7.7	25	
	2	10	10	10	10	—	8.2	—	7.8	25	1210
	3	10	10	10	10	7.9	8.3	7.8	7.8		
	4	10	10	10	9	7.8	8.3	7.9	7.8	25	
	5	10	10	10	9	8.0	8.3	7.9	7.8	25	
	6	10	10	10	9	7.2	8.3	7.9	7.8	25	
	7	10	10	10	9	7.2		7.7		25	

FATHEAD MINNOW 7-DAY GROWTH DATA

Client Wacker Siltronics Species ID# FHM # 876

Sample Description C02719 Start Date 9-12-00

Concentration or Percent	Replicate	Tare Weight (gm)	Total Weight (gm)	No. of Fish
Control	A	1.04977	1.05296	DW ~~10~~ 8
	B	1.03840	1.04175	10
	C	1.04924	1.05272	10
	D	1.05894	1.06208	10
3	A	1.04232	1.04568	10
	B	1.04257	1.04611	10
	C	1.03708	1.04035	10
	D	1.06827	1.07156	10
10	A	1.04158	1.04522	10
	B	1.03428	1.03747	DW ~~10~~ 9
	C	1.05471	1.05811	10
	D	1.04115	1.04457	DW ~~8~~ 10
17	A	1.03037 17 [15]	1.03380	10
	B	1.04089	1.04419	10
	C	1.04983	1.05288	10
	D	1.05811	1.06159	DW ~~9~~ 10
50	A	1.07037	1.07341	10
	B	1.05099	1.05417	DW ~~10~~ 9
	C	1.08773	1.09100	DW ~~9~~ 10
	D	1.02487	1.02810	10
100	A	1.07867	1.08196	10
	B	1.04004	1.04348	10
	C	1.07123	1.07433	10
	D	1.06525	1.06830	DW ~~10~~ 9
	A			
	B			
	C			
	D			

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	09/12/2000 14:15	Test ID:	271901ppc	Sample ID:	Wacker Siltronics via N. Creek Anyl.
End Date:	09/19/2000 12:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	09/11/2000 08:50	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:	FHM chronic.				

Conc-%	1	2	3	4
LAB-Control	0.8000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000
10	1.0000	0.9000	1.0000	1.0000
17	1.0000	1.0000	1.0000	1.0000
50	1.0000	0.9000	1.0000	1.0000
100	1.0000	1.0000	1.0000	0.9000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
LAB-Control	0.9500	1.0000	1.3358	1.1071	1.4120	11.411	4		
3	1.0000	1.0526	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
10	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	18.50	10.00
17	1.0000	1.0526	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
50	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	18.50	10.00
100	0.9750	1.0263	1.3713	1.2490	1.4120	5.942	4	18.50	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.76061	0.884	-1.7403	2.85367
Equality of variance cannot be confirmed				

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

SCOEPA00027617

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	09/12/2000 14:15	Test ID:	271901ppc	Sample ID:	Wacker Siltronics via N. Creek Anyl.
End Date:	09/19/2000 12:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	09/11/2000 08:50	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:	FHM chronic.				

Conc-%	1	2	3	4
LAB-Control	0.3190	0.3350	0.3480	0.3140
3	0.3360	0.3540	0.3270	0.3290
10	0.3640	0.3190	0.3400	0.3420
17	0.3630	0.3300	0.3050	0.3480
50	0.3040	0.3180	0.3270	0.3230
100	0.3290	0.3440	0.3100	0.3050

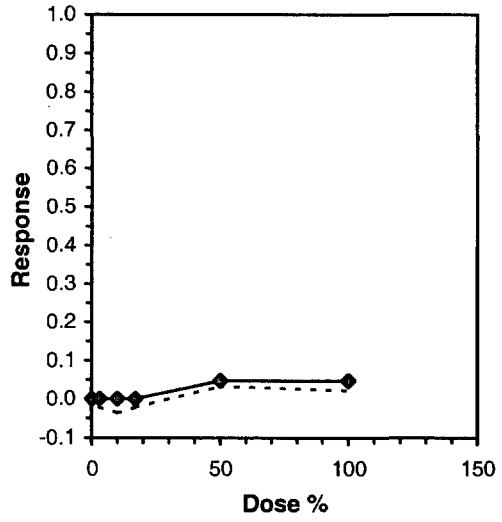
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
LAB-Control	0.3290	1.0000	0.3290	0.3140	0.3480	4.715	4				0.3358	1.0000
3	0.3365	1.0228	0.3365	0.3270	0.3540	3.652	4	-0.617	2.410	0.0293	0.3358	1.0000
10	0.3412	1.0372	0.3412	0.3190	0.3640	5.389	4	-1.007	2.410	0.0293	0.3358	1.0000
17	0.3365	1.0228	0.3365	0.3050	0.3630	7.418	4	-0.617	2.410	0.0293	0.3358	1.0000
50	0.3180	0.9666	0.3180	0.3040	0.3270	3.155	4	0.904	2.410	0.0293	0.3200	0.9529
100	0.3220	0.9787	0.3220	0.3050	0.3440	5.573	4	0.575	2.410	0.0293	0.3200	0.9529

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97945	0.884	-0.0189	-0.5992
Bartlett's Test indicates equal variances (p = 0.75)	2.64341	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.02932	0.0891	0.00033	0.0003	0.37979	5, 18

Linear Interpolation (80 Resamples)

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



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APPENDIX B
REFERENCE TOXICANT DATA SHEETS

REFERENCE TOXICANT DATA SHEET

Client: QA/QC | Reference Toxicant: NaCl | Test Begin Date: 9-12-00 Time: 1145
Test Organism: *Pimephales promelas* | CID#: KJ ~~188~~ 257 | Stock Solution: 20 g/L | Test End Date: 9-14-00 Time: 1120
Source: Aquatox Inc. | Solvent: Distilled water
ID#: FHM 876 | Age: < 24 hours | *Dilution Water: Recon MH | ID#: 1887
Size: NA | Total Hardness as CaCO3: 88 | Total Alkalinity as CaCO3: 64
Loading: NA | Conductivity (µmhos/cm) / Salinity (ppt): 269 | Temperature: 20 ± 1 °C
Technician: 0 hr KJ | 24 hr KJ | 48 hr BM | 72 hr | 96 hr
Time: 0 hr 1145 | 24 hr 1040 | 48 hr 1120 | 72 hr | 96 hr

Toxicant Concen. (g/L)	Test Chamber Number	Number Surviving					Dissolved Oxygen (mg/l)					pH					Temperature °C					Conc
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0
Control		10	10	10			8.5	8.6	8.6			8.1	8.1	8.3			20	20	20			350
4		10	10	10			8.6	8.7	8.7			8.0	8.0	8.0			20	20	20			4820
6		10	10	10			8.7	8.7	8.7			7.9	7.9	7.9			20	20	20			6400
8		10	8	2			8.7	8.7	8.7			7.9	7.8	7.7			20	20	20			9470
10		10	KR 1	-			8.7	8.7	8.6			7.8	7.8	7.7			20	20	20			8410
12		10	0	-			8.7	8.7	-			7.7	7.7	-			20	20	-			7330
																						9560
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ± 1 °C					

*Dilution Water Code

Recon.	- reconstituted water
VS	- very soft
S	- soft
MH	- moderately hard
H	- hard
VH	- very hard

48 h LC50 7.3

Cusum Chart Limits 6.1 TO 8.7

Statistical Method Trimmed Spearman Karber

We verify this data is true and correct.

Task Manager

Project Manager Doug Winn

QA Officer

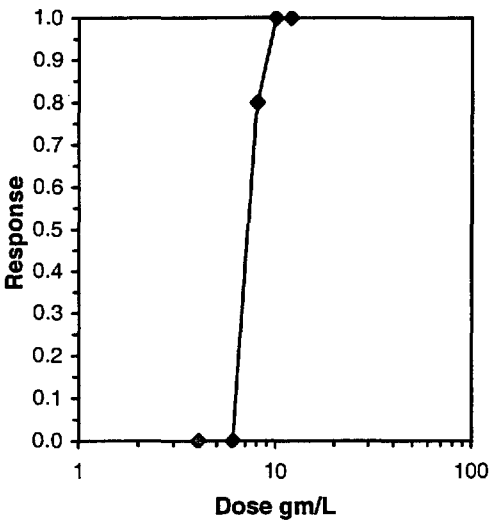
Acute Test-48 Hr Survival

Start Date:	09/12/2000 11:45	Test ID:	rppa876	Sample ID:	REF-Ref Toxicant
End Date:	09/14/2000 11:20	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	PP
Comments:	FHM 876				

Conc-gm/L	1
LAB-Control	1.0000
4	1.0000
6	1.0000
8	0.2000
10	0.0000
12	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	7.2913	6.8351	7.7780
5.0%	7.2501	6.7600	7.7757
10.0%	7.2159	6.7102	7.7597
20.0%	7.1819	6.7849	7.6021
Auto-0.0%	7.2913	6.8351	7.7780



SCOEPA00027621

REFERENCE TOXICANT DATA SHEET

Client QA/QC | Reference Toxicant NaCl | Test Begin Date 9-12-00 Time 0915
Test Organism Ceriodaphnia dubia | CID# 257 Stock Solution 20%c | Test End Date 9-14-00 Time 0840
Source In house | Solvent distilled
ID# Cd 1243 Age <24hrs | *Dilution Water Recon MH ID# 1287
Size - | Total Hardness as CaCO3 88 | Total Alkalinity as CaCO3 64
Loading - | Conductivity (µmhos/cm) / Salinity (ppt) 269 | Temperature 20±1°C
Technician 0 hr BM 24 hr KS 48 hr BM 72 hr ____ 96 hr ____
Time 0 hr 0915 24 hr 1056 48 hr 0840 72 hr ____ 96 hr ____

Toxicant Concen. 5/c	Test Chamber Number	Number Surviving 0	24	48	72	96	Dissolved Oxygen mg/l 0	24	48	72	96	pH 0	24	48	72	96	Temperature °C 0	24	48	72	96	Cond. 0
control	A	5	5	5			8.4	-	8.4			8.2	-	8.4			20	20	20			296
↓	B	5	5	5																		
0.5	A	5	5	5			8.4	-	8.5			8.1	-	8.3			20	20	20			1134
↓	B	5	5	5																		
1.0	A	5	5	5			8.5	-	8.5			8.1	-	8.2			20	20	20			1881
↓	B	5	5	5																		
1.5	A	5	5	5			8.6	-	8.4			8.1	-	8.2			20	20	20			2560
↓	B	5	5	5																		
2.0	A	5	5	2			8.7	-	8.4			8.1	-	8.1			20	20	20			3150
↓	B	5	5	4																		
3.0	A	5	0	-			8.7	-	8.6			8.0	-				20	20				4100
↓	B	5	1	0										8.1					20			
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ±1 °C					

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 2.1
Cusum Chart Limits 1.4 TO 2.8
Statistical Method Trimmed Spearman Karber

We verify this data is true and correct.
Task Manager ____
Project Manager Karen Jansen
QA Officer ____

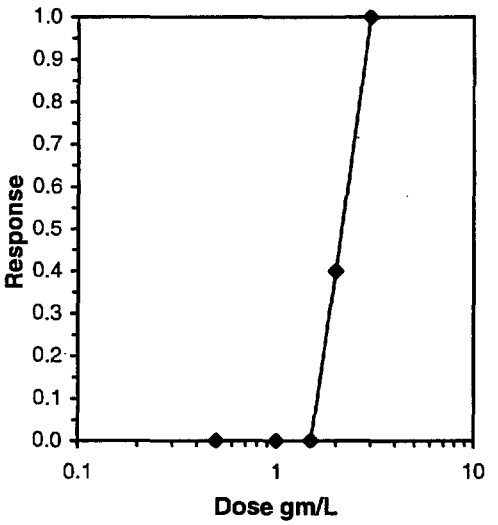
Acute Test-48 Hr Survival

Start Date:	09/12/2000 09:15	Test ID:	rcda1243	Sample ID:	REF-Ref Toxicant
End Date:	09/14/2000 08:40	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	CD
Comments:	Cd Acute Ref. Tox. for September				

Conc-gm/L	1	2
LAB-Control	1.0000	1.0000
0.5	1.0000	1.0000
1	1.0000	1.0000
1.5	1.0000	1.0000
2	0.4000	0.8000
3	0.0000	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	2.1324	1.9153	2.3741
5.0%	2.1335	1.8930	2.4046
10.0%	2.1346	1.8641	2.4444
20.0%	2.1367	1.7742	2.5733
Auto-0.0%	2.1324	1.9153	2.3741



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CH2MHILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client QA/QC September Test Start Date 8-31-00

Sample Description Chronic Ref. Tox – NaCl Sample ID# CID 257

Ceriodaphnia Lot# Cd 1239 Statistician DW

Percent or g/L Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	22	6	22	26	30	27	30	21	26	27	10	237
0.25	28	26	%AD	29	30	29	28	22	29	25	9	246
0.5	21	22	22	23	21	AD/25	25	24	25	24	9	232
1	15	16	17	13	17	15	18	20	18	18	10	167
1.5	4	9	5	6	6	3	6	6	3	2	10	50
2	%AD	0	0	DW %AD	1	%AD	0	0	%AD	1	6	3
4	0	0	0	0	0	0	0	0	0	0	0	0

Footnote: *Ceriodaphnia dubia* test should be terminated when 60% of the control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Day 6 Results!

Endpoint	IC_{25}	Cusum chart limits
Survival	1.79	0.79 TO 2.54
Reproduction	0.89	0.06 TO 1.20

Task Manager Doug Winn
Project Manager
QA Officer

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client QA/QC - September Test Beginning : Date 8-31-00 Time 1800

Sample Description NaCl - 50 g/L STOCK Test Ending : Date 9-6-00 Time 0900

Ceriodaphnia Lot# Cd 1239 Dilution Water Recon MH (FAM) ID# 1884

Technician Day 1 BW Day 2 BW Day 3 BW Day 4 BW Day 5 BW Day 6 DW Day 7 ____

Time Day 1 1050 Day 2 0830 Day 3 1705 Day 4 1410 Day 5 1045 Day 6 0900 Day 7 ____

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	0	4	5	5	4	5	4	5	3	10	39
	4	8	4	9	10	0	0	0	0	0	10	10	41
	5	0	2	0	0	11	10	13	9	10	0	10	55
	6	10	0	9	11	14	13	12	8	11	14	10	102
	7												
0.25 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	4	0 AD	5	5	4	5	5	5	3	9	40
	4	9	10	|	0	0	0	10	0	10	11	9	50
	5	0	0	|	11	13	10	0	8	0	0	9	42
	6	15	12	|	13	12	15	13	9	14	11	9	114
	7			|									
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	5	4	5	4	3	6	4	4	4	3	10	42
	4	0	0	0	0	0	0	0	0	10	0	10	10
	5	6	7	8	8	6	10	11	8	0	8	10	72
	6	10	11	9	11	12	9/AD	10	12	11	13	9	108
	7												
1.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	1	3	0	2	4	3	2	4	2	3	10	24
	4	0	0	1	0	0	0	0	0	5	0	10	6
	5	3	3	5	3	5	5	6	6	0	5	10	41
	6	11 Z DW	10 B DW	11 B DW	8 B DW	8 Z DW	7 0 DW	10 4 DW	10 B DW	11 Z DW	10 Z DW	10	24 DW 96
	7												
1.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	2	1	0	1	0	1	0	0	0	10	5
	4	0	0	1	0	0	0	0	3	0	0	10	4
	5	2	4	0	3	3	3	1	0	1	0	10	17
	6	2	3	3	3	2	0	4	3	2	2	10	24
	7												
2.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	0	0	1	0	0	0	0	0	0	10	1
	5	0	0	0	0	1	0	0	0	0	1	10	2
	6	0 AD	0	0	0 AD	0	0 AD	0	0	0 AD	0	6	0
	7												
4.0 g/L	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	|	|	|	|	|	|	|	|	|	|	|	|
	3	|		|	|	|	|	|	|	|	|	|	

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client QA/QC - September — Initiated Date 8-31-00 Time 1800 — Adults Isolated Date 8-30-00 Time 0900

Sample Description NaCl - 50 g/L STOCK — Terminated Date 9-6-00 Time 0900 — Neo's Collected Date 8-30-00 Time 1710

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Technician	DW	Bm	Bm	Bm	Bm	Bm	DW	
Time	1800	1120	0935	1730	1405	1058	0900	

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Conductivity (µmhos/cm) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	8.1	7.9 / 7.9	8.0 / 8.4	8.4 / 7.8	8.3 / 7.9	8.4 / 7.4	8.2 / –		7.9	8.3 / 8.1	8.2 / 8.0	8.6 / 7.7	8.3 / 7.8	8.2 / 7.5	8.3 / –		335	321	343	335	340	278		
0.25 g/L	8.1	7.8 / 8.0	8.0 / 8.5	8.4 / 8.0	8.3 / 8.0	8.2 / 7.6	8.2 / –		7.9	8.2 / 8.0	8.2 / 7.9	8.3 / 7.7	8.3 / 7.8	8.2 / 7.5	8.2 / –		810	777	836	813	833	692		
0.5 g/L	8.1	7.9 / 7.9	7.9 / 8.5	8.4 / 8.1	8.3 / 8.0	8.4 / 7.6	8.2 / –		7.9	8.2 / 8.0	8.2 / 8.0	8.3 / 7.9	8.3 / 7.8	8.2 / 7.5	8.2 / –		1245	1202	1271	1257	1276	1050		
1.0 g/L	8.1	7.7 / 7.9	7.9 / 8.4	8.2 / 8.1	8.3 / 8.0	8.4 / 7.6	8.2 / –		7.9	8.2 / 8.0	8.2 / 8.0	8.3 / 7.9	8.3 / 7.8	8.2 / 7.5	8.2 / –		2060	1918	2060	2050	2080	1720		
1.5 g/L	8.1	7.7 / 7.9	7.9 / 8.4	8.3 / 8.2	8.3 / 8.1	8.3 / 7.6	8.2 / –		7.8	8.2 / 7.9	8.2 / 8.0	8.3 / 7.9	8.3 / 7.8	8.2 / 7.5	8.1 / –		2770	2610	2750	2750	2800	2330		
2.0 g/L	8.1	7.9 / 8.0	8.0 / 8.4	8.4 / 8.2	8.3 / 8.0	8.3 / 7.6	8.3 / –		7.7	8.2 / 7.9	8.2 / 7.9	8.3 / 7.9	8.3 / 7.8	8.1 / 7.5	8.1 / –		3410	3360	3400	3380	3440	2870		
4.0 g/L	8.0	8.0 / –							7.6	8.1 / –							5490							

COMMENTS: Conductivity meter was recalibrated on Day 5. Bm

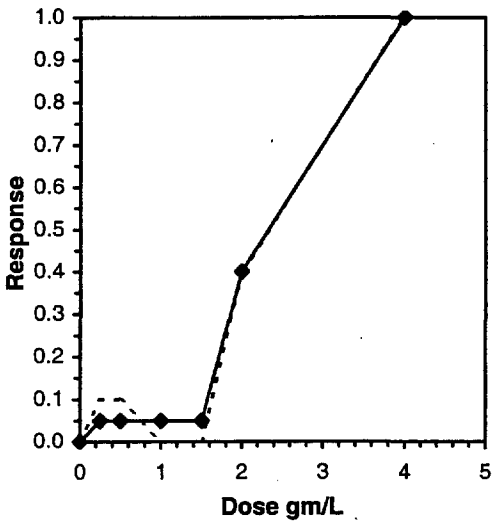
Ceriodaphnia Survival and Reproduction Test-6 Day Survival

Start Date:	08/31/2000 18:00	Test ID:	rcdc1239	Sample ID:	REF-Ref Toxicant
End Date:	09/06/2000 09:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	Ref. Tox. for September				

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.25	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.0000	1.0000	1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	0.0000	1.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	1.5000	0.6662	0.1000	1.6281	-0.6775
IC10	1.5714	0.4310	0.2000	2.0000	-2.3200
IC15	1.6429	0.1710	1.5415	2.1111	1.4886
IC20	1.7143	0.1960	1.5830	2.2222	1.1984
IC25	1.7857	0.2187	1.6424	2.3333	1.0655
IC40	2.0000	0.2968	1.7771	2.6667	0.6370
IC50	2.3333	0.3416	1.8514	2.8889	0.0579



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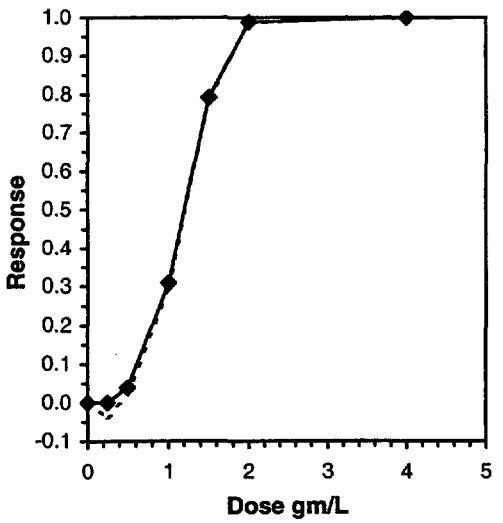
Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	08/31/2000 18:00	Test ID:	rcdc1239	Sample ID:	REF-Ref Toxicant
End Date:	09/06/2000 09:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD
Comments:	Ref. Tox. for September				

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
LAB-Control	22.0000	6.0000	22.0000	26.0000	30.0000	27.0000	30.0000	21.0000	26.0000	27.0000
0.25	28.0000	26.0000	0.0000	29.0000	30.0000	29.0000	28.0000	22.0000	29.0000	25.0000
0.5	21.0000	22.0000	22.0000	23.0000	21.0000	25.0000	25.0000	24.0000	25.0000	24.0000
1	15.0000	16.0000	17.0000	13.0000	17.0000	15.0000	18.0000	20.0000	18.0000	18.0000
1.5	4.0000	9.0000	5.0000	6.0000	6.0000	3.0000	6.0000	6.0000	3.0000	2.0000
2	0.0000	0.0000	0.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05	0.5198	0.1745	0.0832	0.6097	-0.2836
IC10	0.6127	0.1679	0.1665	0.7195	-0.8199
IC15	0.7056	0.1264	0.2509	0.8292	-1.1166
IC20	0.7985	0.1135	0.5384	0.9390	-1.0783
IC25	0.8913	0.0984	0.6489	1.0189	-0.2453
IC40	1.0944	0.0482	0.9641	1.1478	-0.5691
IC50	1.1976	0.0390	1.1008	1.2477	-0.2305



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CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Client Ref Tox FHM #875 Date Initiated 9/8-9-00 Time 1610

Sample Description NaCl Date Terminated 9-15-00 Time 1030

Technician: Day 0 MA Day 1 MA Day 2 MA Day 3 BW Day 4 KJ Day 5 MA Day 6 MA Day 7 KJ

Time Day 0 1610 Day 1 1700 Day 2 920 Day 3 1030 Day 4 1020 Day 5 1010 Day 6 1920 Day 7 1030

Concentration or Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
Control	0	10	10	10	10		8.3		8.3	25	285
	1	10	10	10	10	8.2	8.3	8.4	8.2	25	292
	2	10	10	10	10	8.1	8.3	8.3	8.1	25	276
	3	10	10	10	10	8.1	8.4	8.3	8.1	25	311
	4	10	10	10	10	7.7	8.3	8.0	8.3	25	323
	5	10	10	10	10	7.7	8.3	8.1	8.2	25	306
	6	10	10	10	10	8.0	8.0	8.1	8.0	25	305
	7	10	10	10	10	7.2		7.9		25	
0.3	0	10	10	10	10		8.3		8.3		262
	1	10	10	10	10	8.7	8.3	8.3	8.2		735
	2	10	10	10	10	8.1	8.2	8.2 8.3	8.1		517
	3	10	10	10	10	8.1	8.4	8.3	8.1		557
	4	10	10	10	10	7.7	8.3	8.1	8.3		795
	5	10	10	10	10	8.0	8.3	8.1	8.2		927
	6	10	10	10	10	7.8	8.1	8.0	8.0		817
	7	10	10	10	10	7.2		7.9			~~1620~~
1.0	0	10	10	10	10		8.3		8.2		1620
	1	10	10	10	10	8.3	8.3	8.3	8.2		1594
	2	10	10	10	10	8.0	8.1	8.1	8.0		1650
	3	10	10	10	10	8.1	8.4	8.2	8.0		1930
	4	10	10	10	10	7.7	8.3	8.0	8.2		1807
	5	10	10	10	10	7.9	8.3	8.0	8.1		1814
	6	10	10	10	10	7.8	8.2	8.0	8.0		1964
	7	10	10	10	10	7.2	—	7.8	—		
2.0	0	10	10	10	10		8.3		8.2		2810
	1	10	10	10	10	8.3	8.3	8.2	8.1		2810
	2	10	10	10	10	8.0	8.2	8.1	8.0		2830
	3	10	10	10	10	8.1	8.4	8.1	8.0		3130
	4	10	10	10	10	7.8	8.3	8.0	8.1		2950
	5	10	10	10	10	8.0	8.3	7.9	8.1		3160
	6	10	10	10	10	7.8	8.3	7.9	8.0		3150
	7	10	10	10	10	7.2		7.8			
4.0	0	10	10	10	10	—	8.3	—	8.1		4580
	1	10	10	10	10	8.2	8.3	8.1	8.1		4580
	2	10	10	10	10	8.1	8.2	8.0	8.0		4540
	3	10	10	10	10	8.0	8.4	8.0	7.9		5040
	4	10	10	10	10	7.8	8.3	7.9	8.1		5050
	5	8	10	9 10	9	8.2	8.3	7.9	8.0		5050
	6	8	10	10	8	8.0	8.3	7.9	7.9		5050
	7	7	9	8	7	7.4	—	7.8	—	25	
8.0	0	10	10	10	10		8.3		8.0	25	6580
	1	10	10	10	10	8.3	8.3	8.1	8.0	25	6720
	2	10	10	10	10	8.1	8.3	7.8	7.9	25	6850
	3	~~10~~	~~10~~	~~9 10~~	~~10~~ 10	8.0	8.4	7.9	7.9	25	7730
	4	5	5	5	7	7.9	8.2	7.9	8.0	25	7360
	5	0	0	0	0	8.1	8.3	7.7	7.9	25	7650
	6	↓	↓	↓	↓					25	
	7	↓	↓	↓	↓					7	

Endpoint	IC25	Cusum Chart Limits	
Survival	4.1	2.1 to 5.3	
Growth	3.3	1.8 to 4.0	

Task Manager BT

Project Manager Karen Jansen

QA Officer

FATHEAD MINNOW 7-DAY GROWTH DATA

Client Ref Tox - September Species ID# FHM #875

Sample Description NaCl Start Date 9-8-00

Concentration or Percent	Replicate	Tare Weight (gm)	Total Weight (gm)	No. of Fish
Control	A	1.03769	1.04142	10
	B	1.01418	1.01745	10
	C	1.03293	1.03618	10
	D	1.04393	1.04725	10
0.3	A	1.04345	1.04686	10
	B	1.04038	1.04362	10
	C	1.04326	1.04717	10
	D	1.05729	1.06158	10
1.0	A	1.04484	1.04910	10
	B	1.04616	1.04991	10
	C	1.06520	1.06845	10
	D	1.04620	1.05089	10
2.0	A	1.05203	1.05592	10
	B	1.03899	1.04261	10
	C	1.05999	1.06353	10
	D	1.04380	1.04707	10
4.0	A	1.05248	1.05388	7
	B	1.05627	1.05925	9
	C	1.03216638	1.03512	8
	D	1.04138	1.04358	7
8.0	A	1.03808		—
	B	1.04454		—
	C	1.03874		—
	D	1.05648		—
	A			
	B			
	C			
	D			

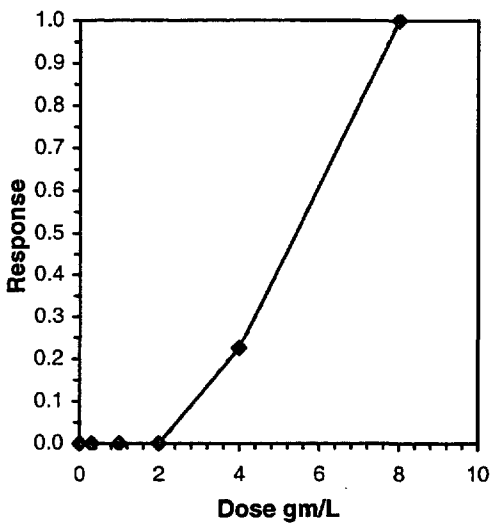
Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	09/08/2000 16:10	Test ID:	rppc875	Sample ID:	REF-Ref Toxicant
End Date:	09/15/2000 10:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:	FHM Chronic Ref. Tox. for September!				

Conc-gm/L	1	2	3	4
LAB-Control	1.0000	1.0000	1.0000	1.0000
0.3	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
2	1.0000	1.0000	1.0000	1.0000
4	0.7000	0.9000	0.8000	0.7000
8	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	2.4444	0.1027	2.2667	2.8000	2.2713
IC10	2.8889	0.2054	2.5333	3.6000	2.2713
IC15	3.3333	0.2657	2.8000	4.4000	1.1177
IC20	3.7778	0.2609	3.0667	4.5098	0.1855
IC25	4.1290	0.2167	3.3892	4.6755	-0.1956
IC40	4.9032	0.1625	4.3724	5.3404	-0.0117
IC50	5.4194	0.1354	4.9770	5.7837	-0.0117



SCOEPA00027631

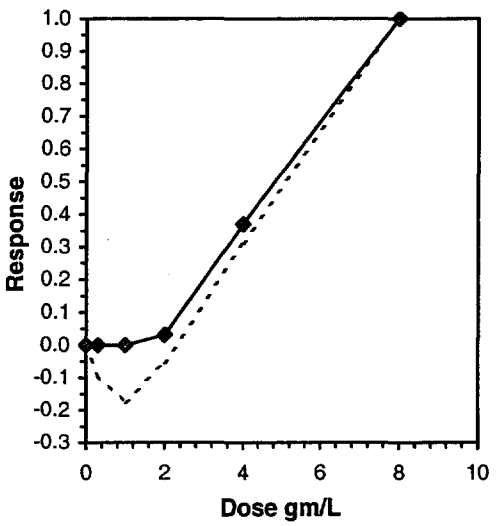
Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	09/08/2000 16:10	Test ID:	rppc875	Sample ID:	REF-Ref Toxicant
End Date:	09/15/2000 10:30	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP
Comments:	FHM Chronic Ref. Tox. for September!				

Conc-gm/L	1	2	3	4
LAB-Control	0.3730	0.3270	0.3250	0.3320
0.3	0.3410	0.3240	0.3910	0.4290
1	0.4260	0.3750	0.3250	0.4690
2	0.3890	0.3620	0.3540	0.3270
4	0.1400	0.2980	0.2740	0.2200
8	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	2.1078	0.2527	1.2310	2.5027	-0.4590
IC10	2.4036	0.1990	1.8598	2.8925	0.1263
IC15	2.6994	0.2342	2.1226	3.5892	0.7019
IC20	2.9952	0.2910	2.3287	4.3052	0.9559
IC25	3.2910	0.3334	2.5826	4.6971	0.6774
IC40	4.1914	0.4034	2.9874	5.3825	-0.1898
IC50	4.8262	0.4255	3.2930	5.8188	-0.6814



SCOEPA00027632

REFERENCE TOXICANT DATA SHEET

Client QA/QC
Reference Toxicant NaCl
Test Begin Date 9-12-00 Time 1200
Test Organism *Pimephales promelas*
CID# ~~188~~ 257 Stock Solution 20 g/L
Test End Date 9-14-00 Time 1120
Source Aquatox Inc.
Solvent Distilled water
ID# FHM 877 Age 8 days ~~24 hours~~ KT
*Dilution Water Recon MH ID# 1887
Size NA
Total Hardness as CaCO3 88
Total Alkalinity as CaCO3 64
Loading NA
Conductivity (µmhos/cm) / Salinity (ppt) 269
Temperature 20 ± 1 °C
Technician 0 hr Bm 24 hr KT 48 hr Bm 72 hr 96 hr
Time 0 hr 1200 24 hr 1040 48 hr 1120 72 hr 96 hr

Toxicant Concen. (g/L)	Test Chamber Number	Number Surviving					Dissolved Oxygen (mg/l)					pH					Temperature °C					Cond
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0
Control		10	10	10			8.5	8.5	8.6			8.1	8.1	8.3			20	20	20			300
4		10	10	10			8.6	8.5	8.6			8.0	7.9	7.9			20	20	20			5730
6		10	10	10			8.7	8.5	8.6			7.9	7.8	7.8			20	20	20			6410
8		10	0	-			8.7	8.5	-			7.9	7.7	-			20	20	-			7640
10		10	0	-			8.7	8.5	-			7.8	7.7	-			20	20	-			8760
12		10	0	-			8.7	8.6	-			7.7	7.6	-			20	20	-			9550
Test Acceptability Limits:		Survival in Controls: > or = 90%					For RBT: >6.0 and <10.8 All Others (at 20°C): > 4.0 and < 9.1					pH: > 6.0 and < 9.0					Temperature ± 1 °C					

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 7.0
Cusum Chart Limits 6.0 TO 8.8
Statistical Method Linear Interpolation

We verify this data is true and correct.
Task Manager [signature]
Project Manager [signature]
QA Officer [signature]

SCOEPA00027633

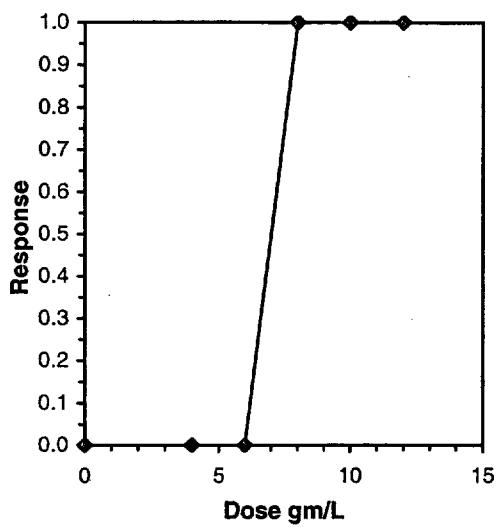
Acute Test-48 Hr Survival

Start Date:	09/12/2000 12:00	Test ID:	rppa877	Sample ID:	REF-Ref Toxicant
End Date:	09/14/2000 11:20	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 93	Test Species:	PP
Comments:	FHM 877				

Conc-gm/L	1
LAB-Control	1.0000
4	1.0000
6	1.0000
8	0.0000
10	0.0000
12	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SD	95% CL(Exp)	Skew
IC05	6.1000			
IC10	6.2000			
IC15	6.3000			
IC20	6.4000			
IC25	6.5000			
IC40	6.8000			
IC50	7.0000			



SCOEPA00027634

APPENDIX C
CHAIN OF CUSTODY

SUBCONTRACT ORDER

North Creek Analytical - Portland

P009247

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Howard Holmes

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P009247-01	**Water**	**Sampled: 09/11/00 08:50**		
Subcontract Outside	09/18/00 17:00	09/12/00 08:50		Bioassay
Containers Supplied:				
Other (A)				

2719-01

FAm f cb Acute & Chronic definitives

bill to Howard Holmes @ N.C. Analytical

Released By	Date	Received By	Date
[signature]	9/11/00	[signature]	9/12/00
Released By	Date	Received By	Date

SCOEPA00027636

SUBCONTRACT ORDER

North Creek Analytical - Portland

P009324

SENDING LABORATORY:

North Creek Analytical - Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Phone: (503) 906-9200
Fax: (503) 906-9210
Project Manager: Howard Holmes

RECEIVING LABORATORY:

CH2M Hill - Corvallis
2300 NW Walnut
Corvallis, OR 97330
Phone :1-541-758-0235
Fax: 1-541-752-0276

Analysis	Due	Expires	Laboratory ID	Comments
Sample ID: P009324-01	**Water**	**Sampled: 09/13/00 08:15**		
Subcontract Outside	09/20/00 17:00	09/14/00 08:15		Bioassay
Containers Supplied:				
Other (A)				

Lab ID → CO2719-02
Temp. upon arrival

* Conversation with Tom @ Wacker Siltronics: He said we will not be getting the 2719-03 Sample on Saturday because of "Sample Troubles". He wants bioassay continued out with the -02 Sample so he has data → See phone Conversation memo in my notebook. Doug Winn

Released By	Date	Received By	Date
Jessica Roberts	9/13/00	Doug Winn	9-14-00/1145
Released By	Date	Received By	Date

SCOEPA00027637

Greyhound Lines, Inc.
P.O. Box 660362, MS 410
Dallas, Texas 75266-0362

ORIGINATING CARRIER	ORIGINATING SCHEDULE	MO.	DAY	YEAR	TIME	AM	PM	FORWARDING AGENCY NO.

FORWARDING AGENT'S INITIALS	PICK-UP AGENT I.D.	DELIVERY AGENT	DESTINATION AGENCY NO.

DESTINATION STATION CITY & STATE | ZIP

154 777 054 3

RATE ZONE | C.O.D. 9

PREPAID | CHARGES | COLLECT

1 To (Recipient's Name)

Exact Street Address Cannot deliver to P.O. Box or Zip Code

City | State | Zip

Recipient's Package Express Account No.

Recipient's Phone Number (Very Important) ( ) -

2 **Shipper's Package Express Account No.**

Shipper's Phone Number (Very Important) ( ) -

3 From (Shipper's Name)

Exact Street Address Cannot deliver to P.O. Box or Zip Code

City | State | Zip

4 **INTERLINE INFORMATION**

Carrier Code	City	Schedule #
Carrier Code	City	Schedule #

5 Routing: _____
If no routing specified, shipment will be routed via Greyhound direct to the extent possible.

6 ***SERVICE REQUIRED*** — PRIORITY [X] | STD [ ]

7 ***PAYMENT*** — BILL PKG EXP ACCT [X] | CASH [ ] | BILL CRDT CARD [ ]

NO. OF PIECES | ACTUAL WEIGHT LBS. | CARTON DESCRIPTION

x | x = ÷ 200 = 8
DIMENSIONAL WEIGHT COMPUTATION | DIMENSIONAL WGT. LBS.

	EXPRESS	$
	REFWD	
	VALUE	
	COLLECT/ C.O.D. FEE	
	PICK-UP	
	DELIVERY	
	STORAGE	
	OTHER	
	C.O.D. AMOUNT	
$	TOTAL	$

X _____ _____ _____
SIGNATURE (RECEIVED IN GOOD ORDER UNLESS SPECIFIED ON BACK) | DATE | PRINT NAME

SUBJECT TO TARIFF REGULATIONS PRINTED ON REVERSE SIDE.

LABEL - 5

C02719-01

SCOEPA00027638

CH2MHILL TELEPHONE CONVERSATION RECORD

CALL TO Doug Winn

PHONE NO. 503 219-7374

DATE 9-14-00

CALL FROM Tom @ Walker Siltronics

TIME _____ ☐ AM ☐ PM

MESSAGE TAKEN BY DcW

PROJECT NO. _____

SUBJECT Bioassay.

We will not be getting the -03 sample! Tom said to run bioassays out on the -02 sample & put it in report.

Also Tom wants someone to get ahold of him on doing TIEs for Wacker Siltronics sample. ← [for 3 or 4 chemicals]

Get info. on TIEs & get back to him!

REV 10/96 FORM 4

SCOEPA00027639

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

3.3°C Poo 9 247

1 of 3

Client Wacker Siltronic

Address 7200 N.W. Front Ave
Portland, OR

Contact Person: Tom Rothschild

Phone: 503-219-7374

CH2M HILL Project #

NPDES# 101122

Composite Sample Information

Samples/Hour 2 hr Volume/Sample 2 gal

Total Hours 24 Total Volume ~~50~~ 48 gal

Initiated: Date 9/10/00 Time 0700

Ended: Date 9/11/00 Time 0700

Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

P.O.# 210162

Check Chlorine (Y/N)

Temp. Upon Arrival (°C)

Check Ammonia (Y/N) Dechlorinate (Y/N)

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
00.82	9/11/00	0850	X		1		X	X	X	X														

Sampled By & Title (Please sign and print name) Dianne Irish Dianne Irish LAB TECH	Date/Time 9/11/00 0850	Relinquished By (Please sign and print name) Dianne Irish Dianne Irish	Date/Time 9/11/00
Received By (Please sign and print name) [signature] Larry Spangler	Date/Time 9-11-00 1015	Relinquished By (Please sign and print name) [signature] Larry Spangler	Date/Time 9-11-00
Received By (Please sign and print name) [signature] NCA	Date/Time 9/11/00 @14:55	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

Rev. 10/97

SCOEPA00027640

P009247. 2 of 3
~~P009374~~

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic
Address 7200 N. W. Front Ave
Portland, OR 97283
Contact Person: Tom Rothschild
Phone: 503-219-~~7302~~ 7374
CH2M HILL Project #

NPDES# 101122
Composite Sample Information
Samples/Hour 24/DI Volume/Sample ~~48~~ 4gal/DI
Total Hours 24 Total Volume ~~48~~ 4gal
Initiated: Date 9/12/00 Time 0800
Ended: Date 9/12/00 Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
P. O.#
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (541) 752-4271 Ext. 3160
Message: (541) 758-0235 Ext. 3160

Check Chlorine (Y/N) _____
Temp. Upon Arrival (°C) _____
Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
00.83	9/13/00	0815	X		1		X	X	X	X														

Sampled By & Title (Please sign and print name) Dianne Irish LAB TECH	Date/Time 9/13/00 0815	Relinquished By (Please sign and print name) Dianne Irish Dianne Irish	Date/Time 9/13/00
Received By (Please sign and print name) Bob Fahrholz	Date/Time 9/13/00 @ 10:50	Relinquished By (Please sign and print name) Bob Fahrholz	Date/Time 9/13/00 @ 14:25
Received By (Please sign and print name) Monica Roberts JROBERTS	Date/Time 9/13 1425	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

RECEIVED DEC 2 2 2000
SJR

AQUATIC TOXICOLOGY REPORT:

CHRONIC DEFINITIVE BIOASSAYS CONDUCTED

December 5 through December 12, 2000
MXA01204Q

Ceriodaphnia dubia
Pimephales promelas

Prepared for:

WACKER SILTRONIC
7200 NW Front Avenue
Portland, OR 97210

Prepared by:

COFFEY LABORATORIES, INC.
12423 NE Whitaker Way
Portland, OR 97230

December 15, 2000

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SCOEPA00027643

ANALYTICAL NARRATIVE

Mr. Thomas J. Rothschild
Wacker Siltronic
7200 NW Front Avenue
Portland, OR 97210

December 15, 2000
Job #: MXA01204Q

Re: Statistical Analysis - Toxicity Tests

Coffey Laboratories, Inc. has completed the statistical analysis of the data collected from dual endpoint toxicity tests which were conducted from 12/5/00 through 12/12/00 on effluent provided by Wacker Siltronic. The enclosed report includes a summary of the *Ceriodaphnia dubia* and Fathead Minnow tests and results, along with the raw data and statistical summaries for the effluent and reference toxicant.

In summary of the statistical analyses, the *Ceriodaphnia dubia* chronic test showed a significant reduction in survival at the 12.5 percent effluent concentration, and a significant reduction in reproduction at the 12.5 percent effluent concentration. Therefore, the chronic No-Observable-Effect-Concentration (NOEC) values for *Ceriodaphnia dubia* survival and reproduction were both 6.25 percent effluent respectively. The chronic Lowest-Observable-Effect-Concentration (LOEC) values for *Ceriodaphnia dubia* survival and reproduction were both 12.5 percent effluent. The chronic LC_{50} value for *Ceriodaphnia dubia* survival was 9.23 percent effluent. The chronic IC_{25} value (an estimate of the effluent concentration causing a 25 percent reduction in biological growth) for *Ceriodaphnia dubia* reproduction was <6.25 percent effluent. The Fathead Minnow chronic test showed no significant difference in survival at any effluent concentration when compared to survival in the controls. The chronic NOEC values for Fathead Minnow survival and growth were 100 percent effluent. The chronic LC_{50} value for Fathead Minnow survival was >100 percent effluent, and the chronic IC_{25} value for Fathead Minnow growth was >100 percent effluent.

Acute data was derived from the chronic test data in the *Ceriodaphnia dubia* and Fathead Minnow tests. Data from the *Ceriodaphnia dubia* 48-hour acute tests showed toxicity at the 100 percent effluent concentrations. Thus, the acute NOEC values for *Ceriodaphnia dubia* survival were 50 percent effluent. Data from the Fathead Minnow 96-hour acute tests showed no toxicity at the 100 percent effluent concentrations. Thus, the acute NOEC values for Fathead Minnow survival were 100 percent effluent.

Coffey Laboratories' Aquatic Toxicology Department is accredited by the Washington State Department of Ecology which demonstrates the high priority we place on Quality Assurance. It is our goal to meet all of your needs by offering the highest quality services in the most efficient manner possible. If you would like further assistance, or should you have other questions regarding Aquatic testing, please feel free to contact me at (503) 254-1794, ext. 215. We look forward to working with you in the future to ensure the health of our Northwest waterways.

Sincerely,
COFFEY LABORATORIES, INC.

Brian Boling
Aquatic Biologist

Approved by,

Ragheda Kaady
Quality Assurance Director

INTRODUCTION

Coffey Laboratories, Inc. conducted two chronic definitive bioassay tests using the water flea (*Ceriodaphnia dubia*) and the Fathead Minnow (*Pimephales promelas*) on samples provided by Wacker Siltronic. The tests were conducted from December 5 through December 12, 2000.

METHODS AND MATERIALS

Test Methods: The chronic test methods were performed according to *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* Lewis, P.A. *et al.*; EPA/600/4-91/002 (1994). The acute test results were derived from the chronic data and were analyzed according to *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* Weber, C.I. *et al.*; EPA/600/4-90/027F (1993).

Test Organisms: The *Ceriodaphnia dubia* used in the chronic test were obtained from Coffey Laboratories, Inc. in-house cultures and were less than 24 hours old and within an 8-hour age range at test initiation. The Fathead Minnows used in the chronic test were obtained from Aquatic Biosystems, Inc., Ft. Collins, CO (See Appendix D) and were 24 - 36 hours old at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA/600/4-91/002 (1994). The test organisms appeared vigorous and in good condition prior to testing.

Dilution Water: The dilution water used for the Fathead Minnow and *Ceriodaphnia dubia* tests was reconstituted moderately hard water (EPA/600/4-91/002) with a total hardness and alkalinity of 100 and 60 mg/L as $CaCO_3$, respectively.

Test Concentrations: The concentrations tested in the chronic tests were 6.25, 12.5, 25, 50, and 100 percent effluent and dilution water alone for the control. Ten fish were placed in each of four replicates per concentration for the Fathead Minnow chronic test. For the chronic *Ceriodaphnia* test, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel.

Sample Collection: Samples were collected by Wacker Siltronic personnel on December 3, 5 and 12. (See Chains-of-Custody). The samples were picked up by Coffey Laboratories personnel and transported to the laboratory. Samples were stored in the dark at 4°C until test solutions were prepared.

Sample Preparation: The samples used during these tests were diluted and temperature adjusted prior to each daily renewal.

Monitoring of Bioassays: Pre- and post-renewal solutions were monitored for conductivity and dissolved oxygen daily in each concentration, as well as for pH in the control and 100 percent effluent concentration. Additionally, the pH was measured in all the post-renewal solutions of every concentration. Alkalinity and hardness were measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was monitored daily in the chronic test. According to EPA/600/4-91/002 (1994), *Ceriodaphnia dubia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia* in the controls have produced their third brood and at least 15 neonates per adult. In addition, control organism survival must be equal to or greater than 80 percent. Fathead Minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the Fathead Minnow chronic test. Temperature was monitored continuously throughout the 7-day period.

Data Analysis: All statistical analyses were performed using WEST, Inc. computer package, Toxstat, Version 3.5. This program utilizes, among others, Dunnett's, Steel's Many One Rank Sum, and Wilcoxon's Rank Sum Analyses for the hypothesis endpoint estimates, and Probit, Spearman-Karber, and Linear Interpolation methods for point estimates.

The effect measured for acute tests is survival over the exposure period. The effects measured for *Ceriodaphnia dubia* chronic

METHODS AND MATERIALS (CONT.)

tests are survival and reproduction over the 7-day exposure period. The effects measured for Fathead Minnow chronic tests are survival and growth over the 7-day exposure period. The statistical analyses performed are those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* EPA/600/4-91/002, and *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms,* EPA/600/4-90/027F. Dunnett's, T-test with Bonferroni Adjustment, Steel's Many-One Rank Sum, or Wilcoxon Rank Sum Tests are used to determine the No-Observed-Effect-Concentration (NOEC) and the Lowest-Observed-Effect-Concentration (LOEC) when analyzing the survival and growth data of the Fathead Minnow, as well as the reproduction data of the *Ceriodaphnia dubia*. Fisher's Exact Test is used to analyze the survival data of the *Ceriodaphnia dubia* tests. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test with Bonferroni Adjustment cannot be met, Steel's Many-One Rank Sum Test or Wilcoxon Rank Sum with Bonferroni Adjustment is used to analyze the data. In addition, the Linear Interpolation method is used to determine the chronic IC_{25} values (the concentration of effluent causing a 25 percent reduction in biological growth) for the Fathead Minnow growth data and the *Ceriodaphnia dubia* reproduction data.

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RESULTS AND DISCUSSION

Table 1 summarizes the chronic bioassay results.

Table 1
Chronic Bioassay Results

	Ceriodaphnia dubia		Fathead Minnow	
Evaluation	Survival (% effluent)	Reproduction (% effluent)	Survival (% effluent)	Growth (% effluent)
NOEC	6.25	6.25	100	100
LOEC	12.5	12.5	--	--
Point Estimate	9.23 (LC_{50})	<6.25 (IC_{25})	>100 (LC_{50})	>100 (IC_{25})

Table 2 summarizes the acute bioassay results.

Table 2
48-Hour Acute Bioassay Results

	Survival (% effluent)	
Evaluation	*Ceriodaphnia dubia*	Fathead Minnow
NOEC	50	100
LOEC	100	>100
LC_{50}	54.15	>100

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RESULTS AND DISCUSSION (Cont.)

Chronic Bioassays:

Table 3 summarizes the survival and growth data for the Fathead Minnow test conducted.

Table 3
Fathead Minnow Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight per Fish (mg)
Control	100	0.667
6.25	100	0.531
12.5	100	0.707
25	95.0	0.753
50	100	0.712
100	92.5	0.580

* Indicates a statistically significant reduction from control at $p \leq$ to 0.05 using Steel's Many-One Rank Test or Dunnett's Test.

Results using Steel's Many-One Rank Test showed no significant reduction in survival when compared to the control at any effluent concentration. Dunnett's Test showed no reduction in growth when compared to the control at any effluent concentration. Therefore, the NOEC values for survival and growth were both 100 percent effluent. Control survival was 100 percent.

The chronic LC_{50} value (an estimate of the effluent concentration which is lethal to 50 percent of the test organisms) for Fathead Minnow survival was >100 percent effluent. The chronic IC_{25} value for Fathead Minnow growth was >100 percent effluent. The EPA has indicated that the IC_{25} is the approximate analogue of the NOEC (Technical Support Document for Water Quality Based Toxics Control EPA/505/2-90-001, March 1991), making it a valuable indicator of chronic aquatic toxicity.

The dissolved oxygen levels remained above 40 percent saturation throughout the tests. Test temperatures were steady at $25 \pm 1\,^{\circ}C$. The tests proceeded without interruption or incident that could have affected test results.

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RESULTS AND DISCUSSION (Cont.)

Chronic Bioassays (Cont.):

Table 4 summarizes the survival and reproduction data for the *Ceriodaphnia dubia* test.

Table 4
***Ceriodaphnia dubia* Results**

Concentration (%)	Percent Survival	Number of Young per Adult
Control	80	21.8
6.25	77	8.2
12.5	20 *	0.1 *
25	0 *	0.8 *
50	0 *	0 *
100	0 *	0 *

* Indicates a statistically significant reduction from control at $p \leq$ to 0.05 using Fisher's Exact Test or Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment.

Results using Fisher's Exact Test showed a statistically significant reduction in survival when compared to the control at the 12.5, 25, 50, and 100 percent effluent concentrations. In addition, Wilcoxon's Rank Sum Test w/ Bonferroni adjustment showed a reduction in reproduction when compared to the control at the 12.5, 25, 50 and 100 percent effluent concentrations. Therefore, the NOEC value for survival and reproduction were both 6.25 percent effluent. The LOEC values for survival and reproduction were both 25 percent effluent. Control survival was 80 percent.

The chronic LC_{50} value for *Ceriodaphnia dubia* survival was 9.23 percent effluent. The chronic IC_{25} value for *Ceriodaphnia dubia* reproduction was <6.25 percent effluent.

The dissolved oxygen levels in the tests remained above 40 percent saturation throughout the test. Test temperatures were steady at $25 \pm 1\,^{\circ}C$. The tests proceeded without interruption or incident that could have affected test results.

RESULTS AND DISCUSSION (Cont.)

Acute Results:

Table 5 summarizes the survival data for the acute screening tests using the Fathead Minnow and the *Ceriodaphnia dubia*.

Table 5
Summary of 48/96-Hour Acute Results

Species	Concentration (%)	Percent Survival		
		0 Hour	24 Hours	48/96 Hours
Fathead Minnow	Control	100	100	100
	100	100	100	95.0
Ceriodaphnia dubia	Control	100	100	100
	100	100	0*	0*

* Indicates a statistically significant reduction from the control at $p \leq 0.05$ using the Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment.

Dual-endpoint testing allows the acute test results to be derived from the chronic test data. In the Fathead Minnow 96-hour acute test, the Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment showed no statistically significant reduction in survival between the control organisms and those in the 100 percent effluent concentration. In addition, Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment showed significant difference in survival between the control organisms and those in the 100 percent effluent concentration in the *Ceriodaphnia dubia* 48-hour acute test. Therefore, the acute NOEC values for Fathead Minnow and *Ceriodaphnia dubia* survival were 100 and 50 percent effluent, respectively.

RESULTS AND DISCUSSION (Cont.)

Reference Toxicant Tests:

Tables 6 & 7 summarize the results from the *Ceriodaphnia dubia* and the Fathead Minnow chronic and acute reference toxicant tests conducted in November.

Table 6
Chronic Reference Toxicant Tests with Sodium Chloride

Species (test)	Point Estimates	95% C.I.
Pimephales promelas (survival - LC_{50})	4.06 g/L	3.59 - 4.53 g/L
Pimephales promelas (growth - IC_{25})	1.84 g/L	1.25 - 2.88 g/L
Ceriodaphnia dubia (survival - LC_{50})	1.90 g/L	1.71 - 2.09 g/L
Ceriodaphnia dubia (reproduction - IC_{25})	<0.5 g/L	--- - --- g/L

Table 7
Acute Reference Toxicant Tests

Species	LC_{50}	95% C.I.
Pimephales promelas	6.55 g/L	6.31 - 6.79 g/L
Ceriodaphnia dubia	1.98 g/L	1.76 - 2.19 g/L

The reference toxicant tests with sodium chloride conducted in November showed that test organisms were within their respective sensitivity range based on EPA guidelines (EPA/600/4-91/002, 1994).

The chronic IC_{25} values, as well as the LC_{50} values and the respective 95 percent confidence intervals are listed in the Tables above. The data sheets for the reference toxicant tests are provided in Appendix B.

WATER QUALITY PARAMETERS

Lab Sample ID: A01204Q-1
Field ID: 00-131
Date/Time: 12/04/00 0920
Matrix: Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Conductivity	EPA 120.1	0.5	1200.	µmhos/cm
pH	EPA 150.1	----	7.08	S.U.
Alkalinity	EPA 310.1	0.5	14.	mg/L
Biochemical Oxygen Demand	EPA 405.1	1.5	5.	mg/L
MBAS (Surfactants)	EPA 425.1	0.01	0.05	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Ammonia Nitrogen	SM4500-NH3-B/C	0.2	0.9	mg/L
Hydrogen Peroxide	Dip Stick	0.5	<0.5	mg/L

ND means none detected at or above the detection limit listed.

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Calcium	SM 3111B	1.	120.	mg/L
Magnesium	SM 3111B	0.1	2.2	mg/L
Total Hardness	SM 2340-B	0.5	310.	mg/L

Extractable Organics
CLISolventScan; Solvent Scan.
Analysis Date: 12/12/00
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Propylene glycol	5.	ND	ND

Results expressed as mg/l unless otherwise noted.
ND means none detected at or above the detection limit listed.

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WATER QUALITY PARAMETERS (cont.)

Lab Sample ID: A01204Q-3
Field ID: 00-132
Date/Time: 12/06/00 0730
Matrix: Waste Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Conductivity	EPA 120.1	0.5	1200.	µmhos/cm
Alkalinity	EPA 310.1	0.5	14.	mg/L
Biochemical Oxygen Demand	EPA 405.1	1.5	5.	mg/L
MBAS (Surfactants)	EPA 425.1	0.05	0.06	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Ammonia Nitrogen	SM4500-NH3-B/C	0.2	0.8	mg/L
Hydrogen Peroxide	Dip Stick	0.5	1.0	mg/L

ND means none detected at or above the detection limit listed.

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Total Hardness	SM 2340-B	0.5	310.	mg/L
Calcium	EPA 200.7	1.	120.	mg/L
Magnesium	EPA 200.7	0.5	1.9	mg/L

Extractable Organics
CLISolventScan; Solvent Scan.
Analysis Date: 12/12/00
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Propylene glycol	5.	ND	14.

Results expressed as mg/l unless otherwise noted.

WATER QUALITY PARAMETERS (cont.)

Lab Sample ID: A01204Q-4
Field ID: 00-134
Date/Time: 12/08/00 0830
Matrix: Waste Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Conductivity	EPA 120.1	0.5	1400.	μmhos/cm
Alkalinity	EPA 310.1	0.5	17.	mg/L
Biochemical Oxygen Demand	EPA 405.1	1.5	9.	mg/L
MBAS (Surfactants)	EPA 425.1	0.05	0.06	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Ammonia Nitrogen	SM4500-NH3-B/C	0.2	1.	mg/L
Hydrogen Peroxide	Dip Stick	0.5	1.0	mg/L

ND means none detected at or above the detection limit listed.

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Total Hardness	SM 2340-B	0.5	260.	mg/L
Calcium	EPA 200.7	1.	100.	mg/L
Magnesium	EPA 200.7	0.5	1.9	mg/L

Extractable Organics
CLISolventScan; Solvent Scan.
Analysis Date: 12/12/00
Analyst: MKM

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Propylene glycol	5.	ND	6.

Results expressed as mg/l unless otherwise noted.

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APPENDIX A

RAW DATA SHEETS

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

Lab Number: A01204Q
Lab Abbr: _____
Sample/Source Name: _____

Test Organism: FHM
Dates Delivered: _____
Dates Collected: _____

Test Initiation: 12-05-00
Test Conclusion: _____
Dechlorination: _____

Analyst(s): HT
Reviewed by: _____

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
50	0	12/5	HT			8.4		795					
	1	12/6	HT		7.76	8.4	7.0	806	813				
	2	12/7	HT		7.78	8.4	7.3	801	856				
	3	12/8	HT		7.44	8.5	5.8	812	862				
	4	12/9	RS		7.50	8.1	5.2	700	860				
	5	12/10	HT		7.37	8.5	6.0	925	963				
	6	12/11	HT		7.72	8.5	6.9	904	966				
	7												
100	0	12/5	HT	7.93		8.4		1231					
	1	12/6	HT	7.39	7.38	8.4	7.1	1236	1255				
	2	12/7	HT	7.62	7.64	8.5	7.8	1235	1296				
	3	12/8	HT	7.41	7.38	8.5	6.5	1248	1330				
	4	12/9	RS	7.30	7.49	8.3	5.0	1200	1190				
	5	12/10	HT	7.36	7.24	8.5	6.5	1245	1531				
	6	12/11	HT	7.62	7.62	8.5	7.1	1468	1543				
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												

Notes: _____

SCOEPA00027656

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

Number: A01204Q
stabbr: Wackenhut
n[illegible]/Source Name: Eff

Test Organism: F.H.M.
Dates Delivered: 12-4, 12-6, 12-8
Dates Collected: 12-3, 12-5, 12-7

Test Initiation: 12-05-00
Test Conclusion: 12-12-00
Dechlorination:

Analyst(s): HT
Reviewed by:

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
0	0	12/5/00	HT	9.09		8.4		513					
	1	12/6	HT	9.08	8.20	7.7	6.9	398	400				
	2	12/7	HT	7.76	7.89	7.7	6.8	500	412				
	3	12/8	NT	7.58	7.69	8.2	5.3	508	390				
	4	12/9	BD	7.89	7.53	8.1	5.2	499	400				
	5	12/10	NT	734	7.45	85	5.2	429	390				
	6	12/11	NT	7.79	787	8.5	6.3	386	397				
	7												
6.25	0	12/5	NT			8.1		429					
	1	12/6	NT		8.03	7.8	6.8	428	436				
	2	12/7	NT		8.01	7.9	7.1	397	429				
	3	12/8	NT		7.61	8.4	5.1	408	420				
	4	12/9	BD		7.49	8.4	5.0	400	421				
	5	12/10	NT		7.43	8.2	5.5	422	448				
	6	12/11	NT		7.63	8.5	5.7	431	443				
	7												
12.5	0	12/5	NT			8.0		494					
	1	12/6	NT		7.95	7.8	6.6	486	491				
	2	12/7	NT		7.94	8.0	7.0	468	505				
	3	12/8	NT		7.57	8.5	5.3	470	446				
	4	12/9	BD		7.40	8.3	5.0	480	476				
	5	12/10	NT		7.44	8.2	5.6	501	535				
	6	12/11	NT		7.79	8.5	5.7	499	523				
	7												
25	0	12/5	NT			8.1		586					
	1	12/6	NT		7.86	8.1	7.0	589	590				
	2	12/7	NT		7.87	8.4	7.2	573	609				
	3	12/8	NT		7.53	8.5	5.8	584	609				
	4	12/9	BD		7.42	8.3	5.2	574	550				
	5	12/10	NT		7.45	8.5	5.9	645	686				
	6	12/11	NT		7.83	8.5	6.4	650	678				
	7												

notes:

Doc ID: [illegible]
Revision #: [illegible]
Revision Date: 11/26/97

CHRONIC RENEWAL LARVAE TOXICITY TEST

Number: A01204Q
Abbr: Wackersilt
Source Name: eff

Test Organism: FHM
Dates Delivered: 12-4, 12-6, 12-8
Dates Collected: 12-3, 12-5, 12-9

Test Initiation: 12-05-00
Test Conclusion: 12-12-00
H_2O Batch #:
Feeding Regime:

Analyst(s):
Reviewed by:
Randomization Chart #:

Conc.	Rep.	Number Organisms/ Container	Immobile/Mortality 0	24	48	72	96	120	144	168	Total Mort.	Temperature (°C) 0	24	48	72	96	120	144	168
	1	10	0	0	0	0	0	0	0	0	0	26			25		26	25	26
	2	10	↓	↓	↓	↓	↓	↓	↓	0	0	26				25			
	3	10	↓	↓	↓	↓	↓	↓	↓	0	0			25					
	4	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	1	10	0	0	0	0	0	0	0	0	0	26			25		26	25	26
	2	10	↓	↓	↓	↓	↓	↓	↓	0	0		26			25			
	3	10	↓	↓	↓	↓	↓	↓	↓	0	0			25					
	4	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	1	10	0	0	0	0	0	0	0	0	0	26			25		26	25	26
	2	10	↓	↓	↓	↓	↓	↓	↓	0	0		26			25			
	3	10	↓	↓	↓	↓	↓	↓	↓	0	0			25					
	4	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	1	10	0	0	0	0	0	0	1	0	1	26			25		26	25	26
	2	10	↓	↓	0	0	0	↓	0	0	0		26			25			
	3	10	↓	↓	0	1	0	↓	0	0	1			25					
	4	10	↓	↓	1	0	0	↓	0	0	1								
	1	10	0	0	0	0	0	0	0	0	0	26			25		26	25	26
	2	10	↓	↓	↓	↓	↓	↓	2	0	2		26			25			
	3	10	↓	↓	↓	↓	↓	↓	0	0	0			25					
	4	10	↓	↓	↓	↓	↓	↓	0	0	0								
	1	10	0	0	0	0	0	0	0	0	0	26			25		26	25	26
	2	10	↓	↓	↓	↓	↓	↓	↓	0	0		26			25			
	3	10	↓	↓	↓	↓	↓	↓	↓	0	0			25					
	4	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	1																		
	2																		
	3																		
	4																		
		ANALYST:	HT	HT	HT	HT	RH	HT	HT	HT									

Comments:

Doc ID: O:\CLOM\Port.BRN\LifeSci.SEC\Forms\ChrncRnw.FOR
Revision #: 1.00
Revision Date: 11/18/93

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: ~~Walter~~ A01204Q
Test Dates: 12-5-00 / 12-12-00
Weighing Date: 12-12-00
Analyst: HT

Custabbr: Wackersilt
Drying Temp. (°C):
Drying Time (h): 12 hrs
Reviewed by:

Conc.	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (g)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (g)	Remarks
Control	1	0.93260	0.94036				
0	2	0.93162	0.93792				
	3	0.92952	0.93560				
	4	0.93136	0.93818				
Conc.	1	0.92854	0.93371				
6.25	2	0.93176	0.93683				
	3	0.92927	0.93482				
	4	0.92640	0.93184				
Conc.	1	0.92527	0.93347				
12.5	2	0.92711	0.93388				
	3	0.92430	0.93031				
	4	0.91947	0.92677				
Conc.	1	0.92660	0.92994				
25	2	0.91874	0.92488				
	3	0.91940	0.92629				
	4	0.92244	0.93017				
Conc.	1	0.92359	0.93107				
50	2	0.92230	0.93197				
	3	0.92458	0.92905				
	4	0.92317	0.93071				
Conc.	1	0.92276	0.92850				
100	2	0.92171	0.92845				
	3	0.92215	0.92731				
	4	0.92028	0.92583				

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: A01204Q
Test Dates: 12-5-00/12-12-00
Weighing Date: 12-12-00
Analyst: HT

Custabbr: Wackersilt
Drying Temp.: 101°C
Drying Time (h): 12
Reviewed by: _____

Conc.	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (mg)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (mg)	Average wt. per conc. (~mg)
Control	1	0.93260	0.94036	7.760	10	0.776	
	2	0.93162	0.93792	6.300	10	0.630	
0 %	3	0.92982	0.93560	5.780	10	0.578	
	4	0.93136	0.93818	6.820	10	0.682	0.667
Conc.	1	0.92854	0.93371	5.170	10	0.517	
	2	0.93176	0.93683	5.070	10	0.507	
6.25 %	3	0.92927	0.93482	5.550	10	0.555	
	4	0.92640	0.93184	5.440	10	0.544	0.531
Conc.	1	0.92527	0.93347	8.200	10	0.820	
	2	0.92711	0.93388	6.770	10	0.677	
12.5 %	3	0.92430	0.93031	6.010	10	0.601	
	4	0.91947	0.92677	7.300	10	0.730	0.707
Conc.	1	0.92060	0.92994	9.340	10	0.934	
	2	0.91874	0.92488	6.140	10	0.614	
25 %	3	0.91940	0.92629	6.890	10	0.689	
	4	0.92244	0.93017	7.730	10	0.773	0.753
Conc.	1	0.92359	0.93067	7.080	10	0.708	
	2	0.92230	0.93197	9.670	10	0.967	
50 %	3	0.92458	0.92905	4.470	10	0.447	
	4	0.92347	0.93071	7.240	10	0.724	0.712
Conc.	1	0.92276	0.92850	5.740	10	0.574	
	2	0.92171	0.92845	6.740	10	0.674	
100 %	3	0.92215	0.92731	5.160	10	0.516	
	4	0.92028	0.92583	5.550	10	0.555	0.580

Walker

Doc ID: [illegible]
Revision #: 1.01
Revision Date: 11/18/93

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Number: A01204Q
Sustabbr: Wackersh
Sample/Source Name: eff

Test Organism: C.d
Dates Delivered: 12-4, 12-6, 12-8
Dates Collected: 12-3, 12-5, 12-7

Test Initiation: 12-5-00
Test Conclusion: 12-12-10
Dechlorination:

Analyst(s): HT
Reviewed by:

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
	0	12/5	HT	26	833		8.3		443					
	1	12/6	HT	26	802	8.10	8.1	8.2	~~385~~	~~412~~	468/421			
	2	12/7	HT	25	798	8.22	8.0	8.0	427	417				
	3	12/8	HT	26	785	7.94	8.5	8.5	420	416				
	4	12/9	BD	25	7.75	7.82	8.3	8.0	410	415				
	5	12/10	HT	26	806	806	8.5	8.5	468	426				
	6	12/11	HT	25	813	821	8.5	8.5	572	444				
	7													
	8													
	0	12/5	HT	26			8.2		431					
	1	12/6	HT	26		—	8.1	—	427	—				
	2	12/7	HT	25		821	8.2	8.2	413	471				
	3	12/8	HT	26		7.94	8.5	8.5	406	461				
	4	12/9	BD	25		7.91	8.0	8.3	400	452				
	5	12/10	HT	26		806	8.5	8.5	433	480				
	6	12/11	HT	25		825	8.5	8.5	447	486				
	7													
	8													
	0	12/5	HT	26			8.2		482					
	1	12/6	HT	26		803	8.1	8.2	488	525				
	2	12/7	HT	25		821	8.4	8.4	431	536				
	3	12/8	HT	25		802	8.5	8.5	432	530				
	4	12/9	BD	25		8.1	8.1	8.3	421	520				
	5	12/10	HT	26		808	8.5	8.5	507	554				
	6	12/11	HT	25		820	8.5	8.5	511	569				
	7													
	8													
	0	12/5	HT	26	~~[illegible]~~		8.3		572					
	1	12/6	HT	26		8.03	8.1	8.2	593	635				
	2	12/7	HT	25		8.16	8.4	8.4	582	652				
	3	12/8	HT	26		7.97	8.5	8.5	579	676				
	4	12/9	BD	25		7.86	8.2	8.3	590	671				
	5	12/10	HT	26		802	8.5	8.5	644	730				
	6	12/11	HT	25		816	8.5	8.5	644	735				
	7													
	8													

Doc ID: [illegible]
Revision #: 1.01
Revision Date: 11/18/93

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Job Number: A01204Q
Custabbr:
Sample/Source Name:

Test Organism: C. d.
Dates Delivered:
Dates Collected:

Test Initiation: 12-5-00
Test Conclusion:
Dechlorination:

Analyst(s): HT
Reviewed by:

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
	0	12/5	HT	26			8.4		801					
	1	12/6	HT	26		7.92	8.2	8.1	797	881				
	2	12/7	HT	25		8.09	8.5	8.5	783	875				
	3	12/8	HT	26		7.92	8.5	8.5	800	878				
	4	12/9	BB	26	7.90	7.80	8.3	8.3	810	900				
	5													
	6													
	7													
	8													
	0	12/5	HT	26	7.98		8.5		1221					
	1	12/6	HT	26	7.66	7.71	8.4	8.1	1279	1340				
	2	12/7	HT				~~8.5~~	~~8.5~~	1262	—				
	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													

CHRONIC RENEWAL CERIODAPHNIA TOXICITY TEST: SURVIVAL AND REPRODUCTION DATA

Number: AC1204Q
Abbr: WackerSite
Source Name: EFF

Test Organism: C. dub
Dates Delivered:
Dates Collected:

Test Initiation: 12-5-00
Test Conclusion: 12-12-00
H_2O Batch #:
Feeding Regime:

Analyst(s): NT
Reviewed by:
Randomization Chart #:

Conc. µg/L	Rep.	Number Organisms @ Start	0	1	2	3	4	5	6	7	8	Total Mort.	0	1	2	3	4	5	6	7	8	Total Offspring
	1	1	C	C	C	C	C	C	C	C		C	C	C	C	C	4	C	7	5		16
	2	1										1					4	4	C	4		12
	3	1										C					2	C	8	C		10
	4	1										C					5	4	C	6		15
	5	1										2					C	C	C	2		2
	6	1										C					3	C	2	1		6
	7	1				Spilled						C				V						C
	8	1				2						1				1	5	C	5			16
	9	1										C				C	3	C	4	4		11
	10	1	V	V	V	V						1	V	V	V	C	4	C				4
	1	1	C	C	C	C	C	C	21			1	C	C	C	C	C	C	C			C
	2	1						1				1					C	C				C
	3	1						C	13			1					2	C	C			2
	4	1						C	12			1					1	C	C			1
	5	1						C	1			C					C	C	C			C
	6	1						1				1					1					1
	7	1						C	1			1					2	C	1			2
	8	1						C	C			1					1	C	C			1
	9	1						1				1										1
	10	1	V	V	V	V	C	C	1				V	V	1	V	C	C	C			C
	1	1	C	1								1	C	C								1
	2	1										1										C
	3	1										1										C
	4	1										1										C
	5	1										1										C
	6	1										1										C
	7	1										1										C
	8	1										1										C
	9	1										1										C
	10	1	V	V								1	V	V								C
	1	1	C	C	C	C	C	C	C	C		C	C	C	C	4	C	8	13	14		39
	2	1										C				2	C	9	9	11		31
	3	1										C				3	C	11	14	14		42
	4	1										C				3	C	9	13	10		34
	5	1							V	V	V	C				C	5	6	C	12		23
	6	1										C				C	4	6	C	15		27
	7	1						1				1					C	C				C
	8	1				1		C	C	C		C				1	C	C	3	3		9
	9	1				C			C	C		1				V	C	3	3	12		12
	10	1	V	V	V	1						1	V	V	V	C						C
	1	1	C	C	C	1						1	C	C	C	C						C
	2	1			1							1										C
	3	1			C	C	1					1				C	C					C
	4	1			1																	C
	5	1			C	C	1					1				C	C					C
	6	1																				C
	7	1			V	C	C					1				V	C					C
	8	1			1																	C
	9	1			C	C	C					1										C
	10	1	V	V	V	C	C					1	V	V	V	V						C
	1	1	C	C	C	C	1					1	C	C	C	C	C	C	1			C
	2	1										1										C
	3	1				C	C	1				1						1				C
	4	1							C	C		C								C		C
	5	1					C	C	C			C								C		C
	6	1										1										C
	7	1			V	V	C	C	1			1						V				C
	8	1			1							1										C
	9	1			C	C	C	1				1						1				C
	10	1	V	V	C	C	C	1				1	V	V	V	V	1	C	V			C
ANALYST:			HT	HT	HT	NT	NT	HT	HT	HT												

Comments:

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
6.25 %	7	2	9
TOTAL	15	4	19

Critical Fisher's value (10,9,8) (alpha=0.05) is 2.0. b value is 7.
Since b is greater than 2.0 there is no significant difference
between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
12.5 %	2	8	10
TOTAL	10	10	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 2.
Since b is less than or equal to 3.0 there is a significant difference
between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
25 %	0	10	10
TOTAL	8	12	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 0.
Since b is less than or equal to 3.0 there is a significant difference
between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
50 %	0	10	10
TOTAL	8	12	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 0.
Since b is less than or equal to 3.0 there is a significant difference
between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
100 %	0	10	10
TOTAL	8	12	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 0.
Since b is less than or equal to 3.0 there is a significant difference
between CONTROL and TREATMENT at the 0.05 level.

Summary of Fisher's Exact Tests

GROUP	IDENTIFICATION	NUMBER EXPOSED	NUMBER DEAD	SIG 0.05
	CONTROL	10	2	
1	6.25 %	9	2	
2	12.5 %	10	8	*
3	25 %	10	10	*
4	50 %	10	10	*
5	100 %	10	10	*

Title: Wackersilt C. Dubia Chronic Reproduction 12/4/00
File: 01204QCR. Transform: NO TRANSFORMATION

Shapiro - Wilk's Test for Normality

******** Shapiro - Wilk's Test is aborted ********

This test can not be performed because total number of replicates is greater than 50.

Total number of replicates = 60

Title: Wackersilt C. Dubia Chronic Reproduction 12/4/00
File: 01204QCR. Transform: NO TRANSFORMATION

Hartley's Test for Homogeneity of Variance
Bartlett's Test for Homogeneity of Variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Title: Wackersilt C. Dubia Chronic Reproduction 12/4/00
File: 01204QCR. Transform: NO TRANSFORMATION

Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment Ho: Control<Treatment

GROUP	IDENTIFICATION	MEAN IN ORIGINAL UNITS	RANK SUM	CRIT. VALUE	REPS	SIG 0.05
1	0 CONTROL	21.8000				
2	6.25 %	8.2000	82.50	74	10	
3	12.5 %	0.1000	66.00	74	10	*
4	25 %	0.8000	71.00	74	10	*
5	50 %	0.0000	65.00	74	10	*
6	100 %	0.0000	65.00	74	10	*

Critical values are 1 tailed (k = 5)

Title: Wackersilt C. Dubia Chronic Reproduction 12/4/00
File: 01204QCR. Transform: NO TRANSFORMATION

GRP	IDENTIFICATION	MEAN	SMOOTHED MEAN	CONCENTRATION
1	0 CONTROL	21.8000	21.8000	0.0000
2	6.25 %	8.2000	8.2000	6.2500
3	12.5 %	0.1000	0.4500	12.5000
4	25 %	0.8000	0.4500	25.0000
5	50 %	0.0000	0.0000	50.0000
6	100 %	0.0000	0.0000	100.0000

ICp estimate with p = 25 is < 6.2500

Title: Wackersilt C.Dubia 48-Hour Acute 12/04/00
File: 01204QCA. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

******** Shapiro - Wilk's Test is aborted ********

This test can not be performed because total number of replicates is greater than 50.

Total number of replicates = 60

Title: Wackersilt C.Dubia 48-Hour Acute 12/04/00
File: 01204QCA. Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's Test for Homogeneity of Variance
Bartlett's Test for Homogeneity of Variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Title: Wackersilt C.Dubia 48-Hour Acute 12/04/00
File: 01204QCA. Transform: ARC SINE(SQUARE ROOT(Y))

Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment Ho: Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	REPS	SIG 0.05
1	0 CONTROL	1.0472				
2	6.25 %	1.0472	105.00	74	10	
3	12.5 %	0.9948	100.00	74	10	
4	25 %	1.0472	105.00	74	10	
5	50 %	0.8378	85.00	74	10	
6	100 %	0.5236	55.00	74	10	*

Critical values are 1 tailed (k = 5)

Title: WackerSilt C.Dubia Survival LC50 12/4/00
File: 01204QC5. Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.2060	4.3560	6.8760	4.3560	1.2060
OBSERVED	0	9	3	6	0

Chi-Square = 10.1684 (p-value = 0.0377)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: WackerSilt C.Dubia Survival LC50 12/4/00
File: 01204QC5. Transform: NO TRANSFORMATION

Probit Analysis - not Using Smoothed Proportions

DOSE	NUMBER SUBJECTS	NUMBER OBSERVED	OBSERVED PROPORTION	PREDICTED PROPORTION
6.25	9	2	0.2222	0.2221
12.50	10	8	0.8000	0.8002
25.00	10	10	1.0000	1.0000
50.00	10	10	1.0000	1.0000
100.00	10	10	1.0000	1.0000

Est. Mu = 9.2251 Est. Sigma = 3.8882
sd = 1.2642 sd = 1.5603

Chi-Square lack of fit = 0.0003 Likelihood lack of fit = 0.0005
Table Chi-square = 11.3449 (alpha = 0.01, df = 3)
Table Chi-square = 7.8147 (alpha = 0.05, df = 3)

Title: WackerSilt C.Dubia Survival LC50 12/4/00
File: 01204QC5. Transform: NO TRANSFORMATION

Probit LC Estimates
WITHOUT CONTROL DATA

POINT	EST. END POINT	95% CONFIDENCE LIMITS	
LC 1	0.1799	-7.5362	7.8960
LC 5	2.8297	-2.9507	8.6100
LC10	4.2422	-0.5571	9.0416
LC20	5.9528	2.2417	9.6638
LC25	6.6026	3.2556	9.9495
LC30	7.1862	4.1301	10.2422
LC40	8.2401	5.5861	10.8940
LC50	9.2251	6.7473	11.7029
LC60	10.2102	7.6732	12.7472
LC70	11.2641	8.4209	14.1072
LC75	11.8476	8.7514	14.9438
LC80	12.4975	9.0688	15.9261
LC90	14.2080	9.7398	18.6761
LC95	15.6206	10.1917	21.0494
LC99	18.2703	10.9242	25.6164

Title: Wackersilt C.Dubia 48-Hour LC50 12/4/00
File: 01204QCP. Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.2060	4.3560	6.8760	4.3560	1.2060
OBSERVED	0	8	4	6	0

Chi-Square = 7.2838 (p-value = 0.1216)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: Wackersilt C.Dubia 48-Hour LC50 12/4/00
File: 01204QCP. Transform: NO TRANSFORMATION

Probit Analysis - not Using Smoothed Proportions

DOSE	NUMBER SUBJECTS	NUMBER OBSERVED	OBSERVED PROPORTION	PREDICTED PROPORTION
6.25	10	0	0.0000	0.0106
12.50	10	1	0.1000	0.0225
25.00	10	0	0.0000	0.0803
50.00	10	4	0.4000	0.4208
100.00	10	10	1.0000	0.9863

Est. Mu = 54.1513 Est. Sigma = 20.7808
sd = 7.0543 sd = 5.4631

Chi-Square lack of fit = 3.8645 Likelihood lack of fit = 3.6763
Table Chi-square = 11.3449 (alpha = 0.01, df = 3)
Table Chi-square = 7.8147 (alpha = 0.05, df = 3)

Title: Wackersilt C.Dubia 48-Hour LC50 12/4/00
File: 01204QCP. Transform: NO TRANSFORMATION

Probit LC Estimates
WITHOUT CONTROL DATA

POINT	EST. END POINT	95% CONFIDENCE LIMITS	
LC 1	5.8080	-15.2498	26.8658
LC 5	19.9699	4.4455	35.4944
LC10	27.5196	14.2299	40.8094
LC20	36.6617	24.8651	48.4584
LC25	40.1349	28.4488	51.8209
LC30	43.2538	31.4348	55.0729
LC40	48.8865	36.2998	61.4732
LC50	54.1513	40.3249	67.9776
LC60	59.4160	43.9684	74.8637
LC70	65.0487	47.5643	82.5332
LC75	68.1677	49.4569	86.8785
LC80	71.6408	51.5013	91.7804
LC90	80.7829	56.6514	104.9145
LC95	88.3326	60.7331	115.9322
LC99	102.4946	68.1448	136.8444

Title: Wackersilt FHM Chronic Survival 12/04/00
File: 01204QFS. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

D = 0.0896
W = 0.6909

Critical W = 0.8840 (alpha = 0.01 , N = 24)
W = 0.9160 (alpha = 0.05 , N = 24)

Data FAIL normality test (alpha = 0.01). Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normality and should not be performed with this data as is.

Title: Wackersilt FHM Chronic Survival 12/04/00
File: 01204QFS. Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's Test for Homogeneity of Variance
Bartlett's Test for Homogeneity of Variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Title: Wackersilt FHM Chronic Survival 12/04/00
File: 01204QFS. Transform: ARC SINE(SQUARE ROOT(Y))

Steel's Many-One Rank Test - Ho: Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	DF	SIG 0.05
1	0 CONTROL	1.4120				
2	6.25 %	1.4120	18.00	10.00	4.00	
3	12.5 %	1.4120	18.00	10.00	4.00	
4	25 %	1.3358	16.00	10.00	4.00	
5	50 %	1.4120	18.00	10.00	4.00	
6	100 %	1.2898	12.00	10.00	4.00	

Critical values are 1 tailed (k = 5)

Title: Wackersilt FHM Chronic Growth 12/04/00
File: 01204QFG. Transform: NO TRANSFORMATION

Shapiro - Wilk's Test for Normality

D = 0.2539
W = 0.9509

Critical W = 0.8840 (alpha = 0.01 , N = 24)
W = 0.9160 (alpha = 0.05 , N = 24)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: Wackersilt FHM Chronic Growth 12/04/00
File: 01204QFG. Transform: NO TRANSFORMATION

Bartlett's Test for Homogeneity of Variance

Calculated B1 statistic = 11.1605 (p-value = 0.0483)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

Critical B = 15.0863 (alpha = 0.01, df = 5)
= 11.0705 (alpha = 0.05, df = 5)

Title: Wackersilt FHM Chronic Growth 12/04/00
File: 01204QFG. Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	0.1463	0.0293	2.0745
Within (Error)	18	0.2539	0.0141	
Total	23	0.4002		

(p-value = 0.1162)

Critical F = 4.2479 (alpha = 0.01, df = 5,18)
= 2.7729 (alpha = 0.05, df = 5,18)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Title: Wackersilt FHM Chronic Growth 12/04/00
File: 01204QFG. Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG 0.05
1	0 CONTROL	0.6665	0.6665		
2	6.25 %	0.5307	0.5307	1.6164	
3	12.5 %	0.7070	0.7070	-0.4822	
4	25.0 %	0.7525	0.7525	-1.0240	
5	50.0 %	0.7115	0.7115	-0.5358	
6	100.0 %	0.5797	0.5797	1.0329	

Dunnett critical value = 2.4100 (1 Tailed, alpha = 0.05, df = 5,18)

Title: Wackersilt FHM Chronic Growth 12/04/00
File: 01204QFG. Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	0 CONTROL	4			
2	6.25 %	4	0.2024	30.4	0.1358
3	12.5 %	4	0.2024	30.4	-0.0405
4	25.0 %	4	0.2024	30.4	-0.0860
5	50.0 %	4	0.2024	30.4	-0.0450
6	100.0 %	4	0.2024	30.4	0.0868

Title: Wackersilt FHM Chronic Growth 12/04/00
File: 01204QFG. Transform: NO TRANSFORMATION

GRP	IDENTIFICATION	MEAN	SMOOTHED MEAN	CONCENTRATION
1	0 CONTROL	0.6665	0.6737	0.0000
2	6.25 %	0.5307	0.6737	6.2500
3	12.5 %	0.7070	0.6737	12.5000
4	25.0 %	0.7525	0.6737	25.0000
5	50.0 %	0.7115	0.6737	50.0000
6	100.0 %	0.5797	0.5797	100.0000

ICp estimate with p = 25 is > 100.0000

Title: Wackersilt 96-Hour FHM Acute 12/04/00
File: 01204QFA. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

D = 0.0199
W = 0.7064

Critical W = 0.7490 (alpha = 0.01 , N = 8)
W = 0.8180 (alpha = 0.05 , N = 8)

Data FAIL normality test (alpha = 0.01). Try another transformation.

Warning - The F-test of homogeneity is sensitive to non-normality and should not be performed with this data as is.

Title: Wackersilt 96-Hour FHM Acute 12/04/00
File: 01204QFA. Transform: ARC SINE(SQUARE ROOT(Y))

Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment Ho: Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	REPS	SIG 0.05
1	0 CONTROL	1.4120				
2	100 %	1.2898	12.00	11	4	

Critical values are 1 tailed (k = 1)

APPENDIX B

REFERENCE TOXICANT DATA SHEETS

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

Number: NovRefTox Test Organism: F.H.M. Test Initiation: 11-7-00 Analyst(s): HRT
stabbr: Dates Delivered: ~~11-7-00~~ Test Conclusion: 11-14-00 Reviewed by:
Source Name: NaCl Dates Collected: Dechlorination:

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
[redacted]	0	11/7	HT	7.76		8.4		329					
	1	11/8	HT	7.74	7.77	8.4	8.4	335	314				
	2	11/9	HT	7.97	7.81	8.4	6.8	325	317				
	3	11/10	HT	8.03	7.79	8.3	6.1	301	291				
	*	11/11	HT			8.5	7.0	320	289				
	*	11/12	HT			8.3	7.2						
	6												
	7												
	0	11/7	HT			8.3		777					
	1	11/8	HT		7.82	8.5	8.5	772	2000				
	2	11/9	HT		7.75	8.2	6.7	2054	2040				
Pink	3	11/10	HT		7.77	8.3	6.8	1890	1990				
	*	11/11	HT			8.5	7.8	1806	1970				
	*	11/12	HT			8.2	7.5						
	6												
	7												
	0	11/7	HT			8.3		3930					
[redacted]	1	11/8	HT		7.82	8.5	8.5	3910	4040				
	2	11/9	HT		7.75	8.3	7.0	4450	4760				
	3	11/10	HT		7.76	8.3	6.9	4320	4550				
	*	11/11	HT			8.5	7.4	4240	4490				
	*	11/12	HT			8.3	7.4						
	6												
	7												
	0	11/7	HT			8.3		6520					
	1	11/8	HT		7.81	8.5	8.4	6570	7110				
Yellow	2	11/9	HT		7.78	8.4	7.3	7140	7180				
	3	11/10	HT		7.97	8.3	7.0	6770	6980				
	*	11/11	HT			8.5	7.7	6500	6910				
	*	11/12	HT			8.2	7.5						
	6												
	7												

ions: * Ph meter broken

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

Number: Nov RefTox Test Organism: F.H.M Test Initiation: 11-7-00 Analyst(s): HRT
stabbr: Dates Delivered: Test Conclusion: 11-14-00 Reviewed by:
nple/Source Name: NaCl Dates Collected: Dechlorination:

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0	11/7	HT			8.3		9400					
	1	11/8	HT		7.80	8.4	8.5	9030	9450				
	2	11/9	HT		7.77	8.4	7.4	9170	9480				
	3	11/10	NT		7.75	8.4	6.9	9180	9020				
	*	11/11	NT			8.5	7.8	8720	9100				
	*	11/12	NT			8.2	7.2						
	6												
	7												
	0	11/7	HT	7.80		8.3							
	1	11/8	HT	7.86	7.78	8.3	8.5	1249	1256				
	2	11/9	HT	7.92	7.80	8.5	7.7	1252	1322				
	3	11/10	NT	7.88	7.73	8.4	7.3	1272	1323				
	*	11/11	HT			8.5	8.1	1252	1285				
	*	11/12	NT			8.3	7.1						
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												

Blue

nents:

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Revision #: [illegible]
Revision Date: 11/26/97

CHRONIC RENEWAL LARVAE TOXICITY TEST

Number: Nov Ref Tox
Test Organism: F.H.M.
Test Initiation: 11-7-00
Analyst(s): HRT
Test Conclusion: 11-14-00
Reviewed by:
Dates Delivered: [illegible]
Dates Collected:
H_2O Batch #:
Randomization Chart #:
Feeding Regime: daily
Source Name: NaCl

Conc.	Rep.	Number Organisms/ Container	Immobile/Mortality 0	24	48	72	96	120	144	168	Total Mort.	Temperature (°C) 0	24	48	72	96	120	144	168
	1	10	0	0	0	0	0	1	3	2	6								
	2	10	↓	↓	↓	↓	↓	6*	0	0	6*								
	3	10	↓	↓	↓	↓	↓	1	3	2	6								
	4	10	↓	↓	↓	↓	↓	0	4	1	5								
	1	10	0	0	0	0	0	0	0	0	0								
	2	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	3	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	4	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	1	10	0	0	0	0	0	1	0	2	3								
	2	10	↓	↓	↓	↓	↓	0	3	1	4								
	3	10	↓	↓	↓	↓	↓	↓	0	3	3								
	4	10	↓	↓	↓	↓	↓	↓	4	2	6								
	1	10	0	0	0	1	2	1	1	2	7								
	2	10	↓	↓	↓	0	1	2	1	1	5								
	3	10	↓	↓	↓	1	1	2	1	0	5								
	4	10	↓	↓	↓	0	1	0	4	0	5								
	1	10	0	0	0	0	0	0	0	0	0								
	2	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	3	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	4	10	↓	↓	↓	↓	↓	↓	↓	0	0								
	1	10	0	0	1	7	1	1	—	—	10								
	2	10	↓	↓	1	4	5	—	—	—	10								
	3	10	↓	↓	1	6	2	1	—	—	10								
	4	10	↓	↓	0	10	—	—	—	—	10								
	1																		
	2																		
	3																		
	4																		
		ANALYST:	HT	HT	HT	HT	HT	HT	HT	HT									

Comments: * beaker spilled - rescued fish (fine - 9 hr)

SCOEPA00027690

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: Nov Ref Tox
Test Dates: 11-7-00/11-14-00
Weighing Date: 11/22/00
Analyst: BRB

Custabbr: QA/QC
Drying Temp.: 102°C
Drying Time (h): 12
Reviewed by: _____

Conc.	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (mg)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (mg)	Average wt. per conc. (mg)
Control	1	0.91638	0.92070	4.320	10	0.432	
	2	0.92471	0.92877	4.060	10	0.406	
0 g/L	3	0.91844	0.92134	2.900	10	0.290	
	4	0.92186	0.93269	10.830	10	1.083	0.553
Conc.	1	0.92137	0.92622	4.850	10	0.485	
	2	0.92432	0.92921	4.890	10	0.489	
1.0 g/L	3	0.92326	0.93353	10.270	10	1.027	
	4	0.92151	0.92599	4.480	10	0.448	0.612
Conc.	1	0.92381	0.92531	1.500	10	0.150	
	2	0.92532	0.92698	1.660	10	0.166	
2.5 g/L	3	0.92595	0.93057	4.620	10	0.462	
	4	0.92690	0.93198	5.080	10	0.508	0.321
Conc.	1	0.92712	0.92813	1.010	10	0.101	
	2	0.92584	0.92634	0.500	10	0.050	
4.0 g/l	3	0.92407	0.92498	0.910	10	0.091	
	4	0.92729	0.92931	2.020	10	0.202	0.111
Conc.	1	0.92502	0.92557	0.550	10	0.055	
	2	0.92668	0.92810	1.420	10	0.142	
5.5 g/L	3	0.93660	0.93785	1.250	10	0.125	
	4	0.93465	0.93506	0.410	10	0.041	0.091
Conc.	1			0.000			
	2			0.000			
8.0 g/L	3			0.000			
	4			0.000			0.000

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Revision #: 1.00
Revision Date: 11/18/93

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: Nov Ref Tox
Test Dates: 11-7-00/11-14-00
Weighing Date:
Analyst: WRT

Custabbr: Nov Ref Tox
Drying Temp. (°C): 121 °C.
Drying Time (h):
Reviewed by:

Conc.	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (g)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (g)	Remarks
Control	1	0.91638	0.92070				
0	2	0.92471	0.92877				
	3	0.91844	0.92134				
	4	0.92186	0.93269				
Conc.	1	0.92137	0.92622				
12.5	2	0.92432	0.92921				
	3	0.92329	0.93353				
	4	0.92151	0.92599				
Conc.	1	0.92381	0.92531				
12.5	2	0.92532	0.92698				
	3	0.92595	0.93057				
	4	0.92690	0.93198				
Conc.	1	0.92712	0.92813				
25	2	0.92584	0.92634				
	3	0.92407	0.92498				
	4	0.92729	0.92931				
Conc.	1	0.92502	0.92557				
50	2	0.92668	0.92810				
	3	0.93660	0.93785				
	4	0.93465	0.93506				
Conc.							
100							

SCOEPA00027692

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Number: Nov Ref Tox
stabbr:
nple/Source Name: NaCl

Test Organism: C dub.
Dates Delivered:
Dates Collected: X

Test Initiation: 11-7-00
Test Conclusion: 11-14-00
Dechlorination:

Analyst(s): HRT
Reviewed by:

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS									
					pH		DO		Sp. Cond.		(mg/L)			
					New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0	11/7	HT	25	7.88		8.4		533					
	1	11/8	HT	25	7.81	7.80	8.4	8.3	460	366				
	2	11/9	HT	25	7.92	8.09	8.1	8.4	578	437				
	3	11/10	NT	25	7.95	7.99	8.4	8.4	578	446				
Pink	*	11/11	NT	25			8.5	8.5	667	392				
	*	11/12	NT	25			8.2	8.5						
	6													
	7													
	8													
	0	11/7	HT	25			8.2		1236					
	1	11/8	HT	25		7.73	8.2	8.2	1166	1341				
	2	11/9	NT	25		8.06	8.2	8.3	1198	1328				
[redacted]	3	11/10	NT	25		7.96	8.2	8.3	1215	1291				
	*	11/11	NT	25			8.5	8.2	1115	1281				
	*	11/12	NT	25			8.0	8.3						
	6													
	7													
	8													
	0	11/7	HT	25			8.2		2080					
	1	11/8	HT	25		7.79	8.2	8.2	2080	2210				
[redacted]	2	11/9	NT	25		8.05	7.9	8.2	1950	2190				
	3	11/10	NT	25		7.99	8.0	8.2	1950	2130				
	*	11/11	NT	25			8.1	8.4	1913	2070				
	*	11/12	NT	25			8.0	8.3						
	6													
	7													
	8													
	0	11/7	HT	25			8.1		2990					
	1	11/8	HT	25		7.79	8.1	8.3	2980	3150				
[redacted]	2	11/9	NT	25		8.03	7.9	8.1	2880	3080				
Green	3	11/10	NT	25		7.99	8.0	8.1	2710	3040				
	*	11/11	NT	25			8.1	8.3	2700	3030				
	*	11/12	NT	25			7.8	8.2						
	6													
	7													
	8													

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Number: NovRefTox Test Organism: C dub Test Initiation: 11-7-00 Analyst(s): HRT
ustabbr: Dates Delivered: X Test Conclusion: 11-14-00 Reviewed by:
ample/Source Name: NaCl Dates Collected: Dechlorination:

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS									
					pH		DO		Sp. Cond.		(mg/L)			
					New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
	0	11/7	HT	25			8.1		4020					
	1	11/8	HT	25		7.79	8.1	8.3	3820	4020				
	2	11/9	HT	25		801	8.0	8.1	3720	4090				
	3	11/10	HT	25		7.96	8.0	8.1	3610	3970				
Blank	*	11/11	HT	25			8.0	8.2	3530	3680				
	*	11/12	HT	25			8.0	8.2						
	6													
	7													
	8													
	0	11/7	HT	25	7.82		8.1		5760					
	1	11/8	HT	25	7.75	7.78	8.1	8.4	5440	5820				
	2	~~11/10~~	~~HT~~	~~25~~										
Yellow	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													

SCOEPA00027694

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Revision #: 1.02
Revision Date: 11/26/97

CHRONIC RENEWAL CERIODAPHNIA TOXICITY TEST: SURVIVAL AND REPRODUCTION DATA

Number: Nov Ref Tox
abbr:
Source Name: NaCl

Test Organism: C. dub.
Dates Delivered:
Dates Collected:

Test Initiation: 11-7-00
Test Conclusion: 11-14-00
H_2O Batch #:
Feeding Regime: 1a1M

Analyst(s): HRT
Reviewed by:
Randomization Chart #:

nc. g/L	Rep.	Number Organisms @ Start	0	1	2	3	4	5	6	7	8	Total Mort.	0	1	2	3	4	5	6	7	8	Total Offspring
	1	1	0	0	0	0	0	0	0	0		1	0	0	0	0	3	0	*	7		
	2	1	|	|	|	|	|	|	|	|		|	|	|	|	0	3	*	8		4
	3	1	|	|	|	|	|	|	|	|		|	|	|	|	2	0	*	0		
	4	1	|	|	|	|	|	|	|	|		|	|	|	|	0	3	*	10		
	5	1	|	|	|	|	|	|	|	|		|	|	|	|	3	0	*	10		
	6	1	|	|	|	|	|	|	|	|		|	|	|	|	4	1	7	1		12
	7	1	|	|	|	|	|	|	|	|		|	|	|	|	3	1	6	2		11
	8	1	|	|	|	|	|	|	|	|		|	|	|	|	3	1	5	7		15
	9	1	|	|	|	|	|	|	|	|		|	|	|	|	0	1	7	7		14
	10	1	↓	↓	↓	↓	↓	↓	↓	↓		✓	↓	↓	↓	↓	2	↓	7	7		16
	1	1	0	0	0	0	0	0	0	0		5	0	0	0	0	0	2	2	6		8
	2	1	|	|	|	|	|	|	|	|		|	|	|	|	1	0	0	0		0
	3	1	|	|	|	|	|	|	|	|		|	|	|	|	1	3	6	2		11
	4	1	|	|	|	|	|	|	|	|		|	|	|	|	1	2	0	10		13
	5	1	|	|	|	|	|	|	|	|		|	|	|	|	2	0	4	2		8
	6	1	|	|	|	|	|	|	|	|		|	|	|	|	0	1	5	5		10
	7	1	|	|	|	|	|	|	|	|		|	|	|	|	2	1	4	4		10
	8	1	|	|	|	|	|	|	|	|		|	|	|	|	0	1	3	10		3
	9	1	|	|	|	|	|	|	|	|		|	|	|	|	1	1	4	6		11
	10	1	↓	↓	↓	↓	↓	↓	↓	↓		✓	↓	↓	↓	↓	1	N	4	5		10
	1	1	0	0	0	0	0	0	0	0		6	0	0	0	0	4	0	9	6		19
	2	1	|	|	|	|	|	|	|	|		|	|	|	|	4	1	6	11		21
	3	1	|	|	|	|	|	|	|	|		|	|	|	|	3	1	7	10		20
	4	1	|	|	|	|	|	|	|	|		|	|	|	|	4	↓	0	10		14
	5	1	|	|	|	|	|	|	|	|		|	|	|	|	5	10	8	9		32
	6	1	|	|	|	|	|	|	|	|		|	|	|	|	3	0	4	5		12
	7	1	|	|	|	|	|	|	|	|		|	|	|	|	4	1	6	9		14
	8	1	|	|	|	|	|	|	|	|		|	|	|	|	0	1	6	10		16
	9	1	|	|	|	|	|	|	|	|		|	|	|	|	4	↓	4	8		16
	10	1	↓	↓	↓	↓	↓	↓	↓	↓		✓	↓	↓	↓	↓	3	3	3	5		14
	1	1	^	0	1	—	—	—	—	—	—	F	0	0	0	—	—	—	—	—	—	0
	2	1	|	|	|	—	—	—	—	—	—	—	|	|	|	—	—	—	—	—	—	0
	3	1	|	|	0	0	0	0	0	0		0	|	|	|	0	0	1	0	2		3
	4	1	|	|	|	—	—	—	—	—	—	—	|	|	|	—	—	—	—	—	—	0
	5	1	|	|	|	—	—	—	—	—	—	—	|	|	|	—	—	—	—	—	—	0
	6	1	|	|	0	0	—	—	—	—	—	—	|	|	|	0	0	—	—	—	—	—	0
	7	1	|	|	0	0	0	0	0	0		0	|	|	|	0	0	0	0	0		0
	8	1	|	|	|	—	—	—	—	—	—	—	|	|	|	—	—	—	—	—	—	0
	9	1	|	|	|	—	—	—	—	—	—	—	|	|	|	—	—	—	—	—	—	0
	10	1	✓	✓	|	—	—	—	—	—	—	—	↓	↓	↓	—	—	—	—	—	—	0
	1	1	0	0	0	0	0	0	0	0		0	0	0	0	0	5	5	0	12		22
	2	1	|	|	|	|	|	|	|	|		|	|	|	|	6	0	10	14		30
	3	1	|	|	|	|	|	|	|	|		|	|	|	|	4	1	9	14		27
	4	1	|	|	|	|	|	|	|	|		|	|	|	|	5	↓	14	10		29
	5	1	|	|	|	|	|	|	|	|		|	|	|	|	4	7	10	10		31
	6	1	|	|	|	|	|	|	|	|		|	|	|	|	2	6	9	9		24
	7	1	|	|	|	|	|	|	|	|		|	|	|	|	5	7	0	13		25
	8	1	|	|	|	|	|	|	|	|		|	|	|	|	5	5	9	13		33
	9	1	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	3	7	0	10		20
	10	1	|	|	|	|	|	|	|	|		|	|	|	|	6	0	12	11		29
	1	1	^	1	—	—	—	—	—	—	—	—	0	0	—	—	—	—	—	—	—	0
	2	1	|	|	—	—	—	—	—	—	—	—	|	|	—	—	—	—	—	—	—	0
	3	1	|	|	—	—	—	—	—	—	—	—	|	|	—	—	—	—	—	—	—	0
	4	1	|	|	—	—	—	—	—	—	—	—	|	|	—	—	—	—	—	—	—	0
	5	1	|	|	—	—	—	—	—	—	—	—	|	|	—	—	—	—	—	—	—	0
	6	1	|	|	—	—	—	—	—	—	—	—	|	|	—	—	—	—	—	—	—	1
	7	1	|	|	—	—	—	—	—	—	—	—	|	|	—	—	—	—	—	—	—	1
	8	1	|	|	—	—	—	—	—	—	—	—	|	|	—	—	—	—	—	—	—	0
	9	1	|	|	—	—	—	—	—	—	—	—	|	|	—	—	—	—	—	—	—	0
	10	1	✓	✓	—	—	—	—	—	—	—	—	✓	✓	—	—	—	—	—	—	—	0
ANALYST:			HT	HT	HT	HT	HT	HT	HT	HT												

Comments:

* Spilled before neonates counted

SCOEPA00027695

APPENDIX C

CHAINS-OF-CUSTODY

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

COFFEY LABORATORIES, INC.

CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Jom Rothschild
Company Name: Wacker Siltronic
Mailing Address: 7200 NW Front Ave
Portland, Or
Phone: (503) 219-7374 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):

PO Number: 4500075102
Project Number:
Project Name: December 2000 - Bioassay
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- [x] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Initials: DJ

Reporting Request
- [x] State Compliance Format
- [x] FAX Results - Preliminary
- [x] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page ___ of ___
Job Number: MX401209Q
Custabbr: WackerSilt ☐NEW

☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date / Time	Media	Analysis Requested	Test/ Profile
00-131	T5	1a		12-4-00 0920 ~~1020~~	Water	Bioassay, Chronic & Accute/BOD	
	B5A	1f				Surfactants, pH, peroxides	
	009	1j				# Ammonia, Glycol	
	T5	1k	2				
	B1	1x	cube				
	B2C	1y					
	B2C	2y					

Sampled By: AUTHORIZED CUSTOMER SIGNATURE DATE:

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Dianne Irish	12-4-00	1135			
				LAB	12/4/00	1243

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Tom Rothschild
Company Name: Wacker Siltronic
Mailing Address: 7200 N. W. Front Ave
Portland, Oregon
Phone: (503) 219-7374 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):

PO Number: 45000 75102
Project Number:
Project Name: Bioassay - December 2000
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- [x] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Initials:

Reporting Request
- [x] State Compliance Format
- [ ] FAX Results - Preliminary
- [x] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page ___ of ___
Job Number: MXA012042 -
Custabbr: Wackersilt ☐NEW
☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
00-132	S5	3a		12-6-00	0730	Water	Bioassay - Acute / Chronic / BOD's	
	B5A	3f						
	009	3i						
	S5	3r						
	B1	3X	cube					
	B2C	3y						
	S5	3z						

Sampled By: Dianne Irish
AUTHORIZED CUSTOMER SIGNATURE Dianne Irish DATE: 12-06-00

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Dianne Irish	12-6-00	0	[signature]	12-6-00	1550
				LAB [signature]	12/6/00	1835

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Tom Rothschild
Company Name: Wacker Siltronic
Mailing Address: 7200 N.W. Front Ave
Portland, Oregon
Phone: (503) 219-7374 FAX: ( )

Report Instructions (Special - Additional- Job Specific):

PO Number: 4500075102
Project Number:
Project Name: Bioassay - December - 2000
EPA Protocol Containers: (Y)N Other:

Sample Turnaround
- [X] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Initials: Di

Reporting Request
- [X] State Compliance Format
- [ ] FAX Results - Preliminary
- [X] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page ___ of ___
Job Number: MXA012047Q
Custabbr: Wackersil ☐NEW

☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Time	Media	Analysis Requested	Test/ Profile
00-134	SY	4Q		12-8-00	0830	water	Bioassay-Chronic/Accute / BOD	
	BIA	4f						
	009	4j						
	SY	4r	2					
	BI	4x	cube					
	B[illegible]	4y						

Sampled By: Dianne Irish
AUTHORIZED CUSTOMER SIGNATURE Dianne Irish DATE: 12-8-00

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Dianne Irish	12-8-00			12-8-00	1407
				LAB	12/8/00	1629

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

APPENDIX D

ORGANISM HISTORY

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

Environmental Consulting & Testing

1423 N. 8th St. Suite 118 • Superior, WI 54880
(715) 392-6635 • Fax (715) 394-7414
www.ectesting.com

SHIPPING DATE: 12-04-00

FROM: ECT SUPERIOR, WI.

TO: COFFEY LAB
12423 N.E. WHITAKER
PORTLAND OR 97230
503 254-1794

SPECIES: FATHEAD MINNOW (PIMEPHALES PROMELAS)
DATE OF HATCH: 12-04-00 10:45 TO 11:30 AM CENTRAL TIME

NUMBER: 300 +
TEMP. AT SHIPPING: 24.3

P.O.#: JOB # verbal BRIAN

SHIPPED BY: FEDERAL EX. 1058-1543-3

WATER CHEMISTRY RECORDS

TEMPERATURE	24 to 26	AS Co
CONDUCTIVITY	90 to 120	AS UMHOS/CM
T.HARDNESS	50 to 80	AS CACO3
T.ALKALINITY	40 to 60	AS CACO3
pH	6.9 to 7.3	

RECENT REF. TESTS WITH NACL
(Overall mean (s.d.) = 2.47 (1.03) g/l n=42 *4.73 (1.02) g/l
n=75 (0.41 g/l to 4.53 g/l) (2.69 g/l to 6.77 g/l)

2000

JAN.	CHRONIC IC25 = 2.56 g/l	ACUTE (01 DAY OLD) LC50 = 4.05 g/l
FEB.	CHRONIC IC25 = 2.35 g/l	ACUTE (01 DAY OLD) LC50 = 4.87 g/l
MAR.	CHRONIC IC25 = 2.27 g/l	ACUTE (01 DAY OLD) LC50 = 4.05 g/l
APR.	CHRONIC IC25 = 2.33 g/l	ACUTE (01 DAY OLD) LC50 = 4.24 g/l
MAY	CHRONIC IC25 = 2.34 g/l	ACUTE (01 DAY OLD) LC50 = 5.35 g/l
JUNE	CHRONIC IC25 = 2.00 g/l	ACUTE (01 DAY OLD) LC50 = 4.87 g/l
JULY	CHRONIC IC25 = 2.41 g/l	ACUTE (01 DAY OLD) LC50 = 4.87 g/l
AUG.	CHRONIC IC25 = 2.54 g/l	ACUTE (01 DAY OLD) LC50 = 6.43 g/l
SEP.	CHRONIC IC25 = 2.73 g/l	ACUTE (01 DAY OLD) LC50 = 6.26 g/l
OCT.	CHRONIC IC25 = 2.17 g/l	ACUTE (01 DAY OLD) LC50 = 4.50 g/l
NOV.	CHRONIC IC25 = 2.34 g/l	ACUTE (01 DAY OLD) LC50 = 6.73 g/l
DEC.	CHRONIC IC25 = g/l	ACUTE (01 DAY OLD) LC50 = g/l

*Acute Toxicity Data extrapolated from Chronic Data

WACKER

Wacker Siltronic Corpora

April 11, 2001

Dr. Elliot Zais
Water Quality Source Control
Dept. of Environmental Quality
State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

ER:014TM

RE: Annual Bioassay Results

Dear Dr. Zais:

Previously reported evaluations of bioassay test results submitted in our October 2000 DMR were over-reported and did not take into account the correct dilution data to describe the effluent concentration within the zone of immediate dilution and the dilution at the edge of the mixing zone. This effected the test results and the percent of effluent used to determine the no observable effect concentration (NOEC). Using actual dilution data from three mixing zone studies, Wacker Siltronic Corporation is currently in compliance with all NPDES permit conditions in Schedule D, Section 6, Bioassay requirements.

The error occurred when we failed to take into account the effluent dilution data produced by the mixing zone studies when conducting the bioassay testing. Data used for effluent dilution determination up to this point were early estimated dilution values suggested in 1994 before the ZID was established in the permit.

A total of three mixing zone studies have been performed at the outfall in the years 1994, 1995, and 1999. These studies have been submitted to DEQ in the past. Each of these studies model the dilution conditions within the mixing zone and at the edge of the mixing zone. This data is used to define the pass/fail criteria for bioassay tests.

All mixing zone data that is valid for the existing permit has been used to calculate the average dilution a 5 foot radius for the ZID and at a 50 foot radius for the edge of the mixing zone. All dilution data points are based on 7Q10 worst case low flow conditions at 0.1 feet per second current velocity during both average and maximum permitted discharge volumes. Under these conditions the NOEC test criteria is:

Acute: NOEC $\geq$13.4% effluent (10-17.5% based on ZID dilutions of 5.7-10)

Chronic: NOEC $\geq$1.8% effluent (1.5-3.0% based on mixing zone dilutions of 33-72)

Test results have been re-evaluated based on the above average effluent dilutions:

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

Test Date (2000)	Test	Ceriodaphnia dubia Survival (% Effluent)	Pimephales promelas Survival (% Effluent)
Aug 8-15	Acute NOEC	17%	100%
	Chronic NOEC	<3%	<3%
Oct 10-17	Acute NOEC	50%	100%
	Chronic NOEC	3%	100%
Dec 5-12	Acute NOEC	50%	100%
	Chronic NOEC	<6.25	100%

The bioassay tests conducted in October and December pass under all mixing zone conditions. The August bioassay test appears to pass but a lack of data at the lower concentration make the results questionable. Future bioassay tests will be conducted at lower effluent concentrations to bracket the test criteria.

A Toxicity Identification Evaluation study has been conducted on the total effluent and upstream from the discharge point to determine the cause for periodic test failures. Testing is ongoing and it is hoped that it will assist in the design of long term solutions.

If you have any questions, please contact me at 503-219-7532

Very truly yours,

Wacker Siltronic Corporation;

Thomas C McCue

Thomas C. McCue
Environmental Manager

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

October 13, 1999

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER145:TM

Dear Dr. Zais,

Below are the results of the annual bioassay test performed August 31 through September 8, 1999 as required in our NPDES permit number 101128. The results of the bioassay are in compliance with the conditions of our permit with the exception of the chronic results of the Ceriodaphnia dubia. Bioassay testing was conducted by Coffey Laboratories, Inc.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	100%	100%
ZID Pass Criteria[1]	≥50%	≥50%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	12.5%	50%
Mixing Zone Pass Criteria[1]	≥ 17%	≥ 17%

Below are the results of the annual bioassay test performed September 8 through September 13, 1999 as required in our NPDES permit number 101128. The results of the bioassay are in compliance with the conditions of our permit. Bioassay testing was conducted by Parametrix Environmental Toxicology Laboratory.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	50%	50%
ZID Pass Criteria[1]	≥50%	≥50%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	50%	50%
Mixing Zone Pass Criteria[1]	≥ 17%	≥ 17%

If you have any questions please contact me at 219-7532.

Very truly yours,

WACKER SILTRONIC CORPORATION

Thomas C. McCue

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
NPDES DMR File

[1] Raymond, Richard/CH2MHILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution study identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC >/= 50% effluent and the chronic test NOEC >/= 17% effluent.

RECEIVED OCT 1 1 1999
SJR

Final Report

Toxicity Evaluation of Effluent to *Ceriodaphnia dubia* and *Pimephales promelas*

Prepared for:
Wacker Siltronic/North Creek Analytical

September 1999

Parametrix, Inc.

SCOEPA00027707

TOXICITY EVALUATION OF EFFLUENT

TO *Ceriodaphnia dubia* AND *Pimephales promelas*

Prepared for

WACKER SILTRONIC
c/o NORTH CREEK ANALYTICAL
9405 SW Nimbus Ave.
Beaverton, Oregon 97008

Prepared by

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

SEPTEMBER 1999

SIGNATURE PAGE

Submitted by: Parametrix, Inc.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

Prepared by: Gretchen Mitchell — 9-30-99
Gretchen Mitchell
Project Manager
Date

Approved by: [signature] — 10/1/99
Jim Laughlin
Manager, Toxicology Laboratory
Date

Approved by: [signature] — 10/4/99
Doug Henderson
QA/QC Officer
Date

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SCOEPA00027710

1. INTRODUCTION

This report summarizes the procedures and results of biological testing conducted for North Creek Analytical–Portland. All testing was conducted by Parametrix's Environmental Toxicology Laboratory in Kirkland, Washington.

Table 1. Introductory information.

Client name	Wacker Siltronic/North Creek Analytical
Parametrix job number	55-1945-12 (01)
Toxicity testing requirements	Dual endpoint *Ceriodaphnia dubia* and *Pimephales promelas* bioassays
Plant location	9405 SW Nimbus Ave., Beaverton, Oregon 97008
Test sponsor	Sara McClurg
Name of receiving waterbody	Willamette River

2. SAMPLE SOURCE AND HANDLING

Table 2. Source information for effluent and sample handling.

Sampling point	Final effluent
Collection dates and time	1) 9/8/99; 0810 2) 9/10/99; not reported 3) 9/13/99; not reported
Sample collection method	Composite
Time lapsed from sample collection to receipt by laboratory	<36 hours
Sample collected by	Wacker-Siltronic personnel

SCOEPA00027711

Table 3. Initial chemical and physical determinations.

	Collection Dates:		
Parameter Measured	**9/8/99**	**9/10/99**	**9/13/99**
Temperature (°C)	2	1	1
Salinity (ppt)	0.2	0.1	0.2
Dissolved Oxygen (mg/L)	8.2	7.6	8.6
pH	6.8	7.0	7.0
Conductivity (µS)	910	812	905
Total Hardness (mg/L as $CaCO_3$)	136	138	200
Total Alkalinity (mg/L as $CaCO_3$)	22	92	36
Total Residual Chlorine (mg/L)	<0.01	<0.01	0.02
Ammonia (mg/L)	<1	<1	1

SCOEPA00027712

3. TEST CONDITIONS

Table 4. Summary of test conditions for the dual endpoint *Ceriodaphnia dubia* bioassay.

Test Dates	9-16 September 1999
Test Protocol	*Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* EPA/600/4-91/002, July 1994 [see USEPA, 1999. Errata for the Effluent and Receiving Water Toxicity Testing Manuals. EPA-600/R-98/182]; *Whole Effluent Toxicity Testing Guidance Document.* ODEQ. January 1993
Test Material	Whole effluent
Test Organisms/Age	*Ceriodaphnia dubia* (water flea); ≤ 24 hours at initiation
Source of Organisms	In-house cultures
Acclimation Period	None
Number/Test Chamber	1
Volume/Test Chamber	15 mL
Test Concentrations	0, 6.25, 12.5, 25, 50 and 100% effluent
Replicates	Ten
Reference Toxicant	Sodium chloride
Test Duration	7 days
Control/Dilution Media	Natural spring water collected from Gold Creek Trout Farm; Woodinville, WA
Control/Dilution Water Collection Date	9/7/99
Pretreatment of Dilution Water	1 µm filtration
Test Chambers	30 ml polystyrene cups
Lighting	Fluorescent bulbs (50-100 foot candles)
Photoperiod	16 hours light; 8 hours dark
Aeration	None
Feeding	Daily: 100 µL *Selenastrum* suspension; 100 µL yeast/Cerophyl/trout chow (YCT)
Renewal	Daily
Temperature	25 ± 1°C
Chemical Data	pH and dissolved oxygen for each test concentration and the control (both initial and final solutions); temperature and specific conductivity at test initiation and every 24 hours; hardness, alkalinity, ammonia, and residual chlorine for each new sample
Effect Measured	Mortality (defined as immobility) and reproduction
Test Acceptability	Control survival ≥80%; ≥60% of control organisms produce three broods, an average total of 15 or more offspring for the first three broods must be produced
Endpoints reported	Median lethal concentration (LC50) Lowest observed effect concentration (LOEC) No observed effect concentration (NOEC)

SCOEPA00027713

Table 5. Summary of test conditions for the dual endpoint *Pimephales promelas* bioassay.

Test Dates	9-16 September 1999
Test Protocol	*Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* EPA/600/4-91/002, July 1994 [see USEPA, 1999. Errata for the Effluent and Receiving Water Toxicity Testing Manuals. EPA-600/R-98/182]; *Whole Effluent Toxicity Testing Guidance Document.* ODEQ. January 1993
Test Material	Whole effluent
Test Organisms/Age	*Pimephales promelas* (fathead minnow); ≤24 hours old
Source of Organisms	Aquatic Biosystems; Fort Collins, Colorado
Acclimation Period	None
Number/Test Chamber	10
Volume/Test Chamber	400 mL
Test Concentrations	0, 6.25, 12.5, 25, 50 and 100% effluent
Replicates	Four
Reference Toxicant	Potassium chloride
Test Duration	7 days
Control/Dilution Media	Laboratory-prepared synthetic water (80-100 mg/L hardness as $CaCO_3$)
Control/Dilution Water Preparation Date	9/9/99
Pretreatment of Dilution Water	None
Test Chambers	1,000 ml HDPE beakers
Lighting	Fluorescent bulbs (50-100 foot candles)
Photoperiod	16 hours light; 8 hours dark
Aeration	None
Feeding	0.15 mL newly hatched brine shrimp nauplii twice daily
Renewal	Daily
Temperature	25 ± 1°C
Chemical Data	Dissolved oxygen, and pH for each test concentration and the control (both initial and final solutions); temperature and specific conductivity at test initiation and every 24 hours; hardness, alkalinity, ammonia, and residual chlorine for 100% effluent
Effect Measured	Mortality and growth
Test Acceptability	Control survival ≥80%; average mean control weight ≥0.25 mg
Endpoints reported	Median lethal concentration (LC50) Lowest observed effect concentration (LOEC) No observed effect concentration (NOEC)

SCOEPA00027714

4. RESULTS

Records of biological and chemical data collected during testing and the statistical analyses (ToxCalc™ 1994-1996) used for reporting are included in the appendices of this report.

Bioassay results are summarized in Table 6 below. In summary, toxicity was observed in the *C. dubia* bioassay at the 48-hour and 7-day exposures, with NOECs of 50% effluent for both survival and reproduction endpoints. In addition, the *P. promelas* bioassay also exhibited toxicity during acute and chronic exposures, with NOECs of 50% effluent for survival and growth.

Control responses were within acceptable ranges, and reference toxicant test results were within the 95 percent confidence limits of the mean effect level.

Table 6. Summary of bioassay results.

Summary of 48-hour acute results:

	Survival (% effluent)	
Evaluation	***C. dubia***	***P. promelas***
NOEC	50	50
LOEC	100	100
LC50	70.7	>100
Reference Toxicant	Acceptable	Acceptable

Summary of chronic results:

	C. dubia		*P. promelas*	
Evaluation	**Survival (% effluent)**	**Reproduction (% effluent)**	**Survival (% effluent)**	**Growth % effluent)**
NOEC	50	50	50	50
LOEC	100	>50	100	>50
LC50	70.7	N/A	99.6	N/A
Reference Toxicant	Acceptable		Acceptable	

N/A = Not applicable

SCOEPA00027715

5. REFERENCES

ToxCalc™ Version 5.0. 1994-1996. McKinleyville, California: Tidepool Scientific Software.

U.S. EPA. 1994. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. EPA/600/4-91/002, July 1994. U.S. Environmental Protection Agency, Cincinnati, Ohio.

ODEQ. 1993. Whole effluent toxicity testing guidance document. January 1993. Oregon Department of Environmental Quality, Portland, Oregon.

SCOEPA00027716

SCOEPA00027717

APPENDIX A

DUAL ENDPOINT *Ceriodaphnia dubia* BIOASSAY DATA

Parametrix, Inc.
Environmental Toxicology Laboratory

Ceriodaphnia dubia
Chronic Daily Survival and Offspring

9/7/99 - 9/16/99

Client: NCA - Portland Client Number: Test Dates: ~~9/8/99~~ gm pc

Sample I.D./Source: Effluent Sample Collection Dates: 9/8, 9/10, 9/13 Dilution Media: ~~Well~~ Natural Spring

Temperature (°C) 0 25 24 25 48 25 72 25 96 25 120 25 144 24 168 25

Conc.	Rep.	Survival (hours) 0	24	48	72	96	120	144	168	Offspring (hours) 72	96	120	144	168	Total
CON	A	1	1	1	1	1	1	1	1	4	0	9	12	13	38
	B	1	1	1	1	1	1	1	1	6	0	8	12	0	26
	C	1	1	1	1	1	1	1	1	2	3	6	15	0	26
	D	1	1	1	1	1	1	1	1	0	2	5	~~11~~ (1)	7	14
	E	1	1	1	1	1	1	1	1	0	10	0	8	7	25
	F	1	1	1	1	1	1	1	1	0	5	4	12	0	21
	G	1	1	1	1	1	1	1	1	0	2	6	0	2	10
	H	1	1	1	1	1	1	1	1	0	3	4	7	0	14
	I	1	1	1	1	1	1	1	1	0	4	4	0	0	8
	J	1	1	1	1	1	1	1	1	0	0	5	10	0	15
6.25	A	1	1	1	1	1	1	1	1	7	0	6	10	0	23
	B	1	1	1	1	1	1	1	1	4	0	7	10	0	21
	C	1	1	1	1	1	1	1	1	5	0	8	12	0	25
	D	1	1	1	1	1	1	1	1	6	0	9	17	0	32
	E	1	1	1	1	1	1	1	1	0	4	4	0	0	8
	F	1	1	1	1	1	1	1	1	4	0	3	12	0	~~23~~ 19 JL
	G	1	1	1	1	1	1	1	1	5	0	6	9	11	31
	H	1	1	1	1	1	1	1	1	6	0	7	10	10	33
	I	1	1	1	1	1	1	1	1	3	0	6	13	11	33
	J	1	1	1	1	1	1	1	1	0	4	8	7	0	19
12.5	A	1	1	1	1	1	1	1	1	3	0	8	11	0	22
	B	1	1	1	1	1	1	1	1	0	3	7	11	0	21
	C	1	1	1	1	1	1	1	1	4	0	9	17	11	41 gm
	D	1	1	1	1	1	1	1	1	3	0	0	13	10	~~16~~ 26
	E	1	1	1	1	1	1	1	1	0	3	4	10	1	18
	F	1	1	1	1	1	1	1	1	5	0	9	13	0	27
	G	1	1	1	1	1	1	1	1	5	0	1	13	15	34
	H	1	1	1	1	1	1	1	1	3	0	9	14	0	26
	I	1	1	1	1	1	1	1	1	0	4	6	12	1	23 gm
	J	1	1	1	1	1	1	1	1	4	0	7	11	0 (2)	22

Revised 8/26/99

(1) DOC gm 9/15 should read: 0

9/21/99

(2) DOC, HF should read 0 4/16

Ceriodaphnia dubia
Chronic Daily Survival and Offspring

Conc.	Rep.	Survival (hours) 0	24	48	72	96	120	144	168	Offspring (hours) 72	96	120	144	168	Total
25	A	1	1	1	1	1	1	1	1	4	0	7	8	0	19
	B	1	1	1	1	1	1	1	1	0	4	6	10	0	20
	C	1	1	1	1	1	1	1	1	0	1	0	0	4	5
	D	1	1	1	1	1	1	1	1	0	4	5	10	0	19
	E	1	1	1	1	1	1	1	1	0	4	2	0	14	20
	F	1	1	1	1	1	1	1	1	0	2	3	7	0	12
	G	1	1	1	1	1	1	1	1	3	0	8	11	0	22
	H	1	1	1	1	1	1	1	1	3	0	7	9	0	19
	I	1	1	1	1	1	1	1	1	4	0	0	12	15	31
	J	1	1	1	1	1	1	1	1	0	5	8	14	0	27
50	A	1	1	1	1	1	1	1	1	0	3	6	5	0	14
	B	1	1	1	1	1	1	1	1	0	1	4	0	10	15
	C	1	1	1	1	1	1	1	1	2	0	9	6	5	22
	D	1	1	1	1	1	1	1	1	0	3	5	7	0	15
	E	1	1	1	1	1	1	1	1	0	3	4	0	8	15
	F	1	1	1	1	1	1	1	1	0	3	6	0	10	19
	G	1	1	1	1	1	1	1	1	4	0	5	4	0	13
	H	1	1	1	1	1	1	1	1	3	0	5	5	8	21
	I	1	1	1	1	1	1	1	1	0	4	5	5	0	14
	J	1	1	1	1	1	1	1	1	0	4	4	1	5	14
100	A	1	1	0-1	–	+	0	0	0			0	0	0	0
	B	1	1	0-1	–	+									0
	C	1	1	0-1	–	+									0
	D	1	1	0-1	–	–									0
	E	1	1	0-1	–	–									0
	F	1	1	0-1	–	–									0
	G	1	1	0-1	–	–									0
	H	1	0-1	–	–	–									0
	I	1	0-1	–	–	–									0
	J	1	1	0-1	–	–									0
	Initials	AC	AC	Zn	Zn	HR	HR	gm	HR	Zn	HR	HR	gm	HR	gm
	QC	gm													Cat
	Samp #	1	1	#2	#2	#2	#3	3	NA	#2	#2	#3	3	NA	
	Time	1400	1430	1500	1600	1310	1250	1500	1500	1600	1315	1250	1500	1445	
	Date	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16 1445	9/12	9/13	9/14	9/15	9/16 1445	

9/20/99

Revised 8/26/99

Ceriodaphnia dubia
Daily Water Quality Parameters

pH Solution

Date	9/9/99	9/10/99	9/10	9/11	9/11	9/12	9/12	9/13	9/13	9/14	9/14	9/15	9/15	9/16	9/16	
Day	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8
Conc	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control	8.1	8.1	8.1	8.3	8.3	8.3	8.3	8.0	~~8.0~~ ①	~~8.9~~ ②	7.9	8.2	7.9		7.9	
6.25	8.1	8.1	8.1	8.3	8.3	8.2	8.3	8.1	8.0	8.1	8.0	8.2	7.9		8.1	
12.5	8.0	8.0	8.1	8.2	8.3	8.2	8.3	8.1	8.0	8.1	7.9	8.1	7.9		8.1	
25	8.0	7.9	8.1	8.1	8.2	8.2	8.3	8.0	7.9	8.0	7.9	8.1	7.9		8.1	
50	7.8	7.8	7.9	8.0	8.1	8.0	8.2	7.9	7.8	7.9	7.7	7.9	7.8		8.1	
100	7.6	7.5	7.5	7.6	7.8	—		—	—	—	—	—			—	
Initials	AC	RS	RS	RS	RS	RS	RS	HR	HR	HR	HR	gm	gm		HR	

Dissolved Oxygen (mg/L) Solution

Conc.	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control	8.3	8.3	8.3	8.3	8.4	8.3	8.4	8.3	8.3	8.3	8.3	8.3	8.1		8.3	
6.25	8.3	8.3	8.3	8.3	8.4	8.3	8.4	8.3	8.3	8.3	8.3	8.3	8.1		8.3	
12.5	8.3	8.3	8.3	8.3	8.4	8.3	8.4	8.3	8.3	8.3	8.3	8.3	8.1		8.3	
25	8.3	8.3	8.3	8.3	8.4	8.3	8.4	8.3	8.3	8.3	8.3	8.3	8.2		8.3	
50	8.3	8.3	8.3	8.3	8.4	8.3	8.4	8.3	8.3	8.3	8.3	8.3	8.2		8.3	
100	8.3	8.3	8.3	8.3	8.4	8.3	8.4	—	—	—	—				—	
Initials	AC	RS	RS	RS	RS	RS	RS	HR	HR	HR	HR	gm	gm		HR	

Conductivity (μMHOS)

Conc.	0 Hour	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	168 Hours
Cont.	212	213	215	217	~~221~~ ①	378	522	608
100%	883	883	789	—	—	—	—	—
Samp #	1	1	#2	#2	#2	#3	3	NA
Initials	AC	RS	RS	RS	HR	HR	gm	HR

Comments:
① DC, HR, 9/13 Should read 217
② DC, HR, 9/13 Should read 7.9
③ DC, HR, 9/14 Should read 7.9

9/20/99

SCOEPA00027721

Test: CD-Ceriodaphnia Survival and Reproduction Test — Test ID: 2657
Species: CD-Ceriodaphnia dubia — Protocol: EPAF 94-EPA Freshwater
Sample ID: N/AP-Not applicable — Sample Type: EFF2-Industrial
Start Date: 9/9/99 End Date: 9/16/99 — Lab ID: WAPTL-Parametrix Tox Lab

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Sex	Number of Young	Notes
	1	1	D-Control	1	1	1	1	1	1	1	1	F	38	
	2	2	D-Control	1	1	1	1	1	1	1	1	F	26	
	3	3	D-Control	1	1	1	1	1	1	1	1	F	26	
	4	4	D-Control	1	1	1	1	1	1	1	1	F	14	
	5	5	D-Control	1	1	1	1	1	1	1	1	F	25	
	6	6	D-Control	1	1	1	1	1	1	1	1	F	21	
	7	7	D-Control	1	1	1	1	1	1	1	1	F	10	
	8	8	D-Control	1	1	1	1	1	1	1	1	F	14	
	9	9	D-Control	1	1	1	1	1	1	1	1	F	8	
	10	10	D-Control	1	1	1	1	1	1	1	1	F	15	
	11	1	6.250	1	1	1	1	1	1	1	1	F	23	
	12	2	6.250	1	1	1	1	1	1	1	1	F	21	
	13	3	6.250	1	1	1	1	1	1	1	1	F	25	
	14	4	6.250	1	1	1	1	1	1	1	1	F	32	
	15	5	6.250	1	1	1	1	1	1	1	1	F	8	
	16	6	6.250	1	1	1	1	1	1	1	1	F	19	
	17	7	6.250	1	1	1	1	1	1	1	1	F	31	
	18	8	6.250	1	1	1	1	1	1	1	1	F	33	
	19	9	6.250	1	1	1	1	1	1	1	1	F	33	
	20	10	6.250	1	1	1	1	1	1	1	1	F	19	
	21	1	12.500	1	1	1	1	1	1	1	1	F	22	
	22	2	12.500	1	1	1	1	1	1	1	1	F	21	
	23	3	12.500	1	1	1	1	1	1	1	1	F	41	
	24	4	12.500	1	1	1	1	1	1	1	1	F	26	
	25	5	12.500	1	1	1	1	1	1	1	1	F	18	
	26	6	12.500	1	1	1	1	1	1	1	1	F	27	
	27	7	12.500	1	1	1	1	1	1	1	1	F	34	
	28	8	12.500	1	1	1	1	1	1	1	1	F	26	
	29	9	12.500	1	1	1	1	1	1	1	1	F	23	
	30	10	12.500	1	1	1	1	1	1	1	1	F	22	
	31	1	25.000	1	1	1	1	1	1	1	1	F	19	
	32	2	25.000	1	1	1	1	1	1	1	1	F	20	
	33	3	25.000	1	1	1	1	1	1	1	1	F	5	
	34	4	25.000	1	1	1	1	1	1	1	1	F	19	
	35	5	25.000	1	1	1	1	1	1	1	1	F	20	
	36	6	25.000	1	1	1	1	1	1	1	1	F	12	
	37	7	25.000	1	1	1	1	1	1	1	1	F	22	
	38	8	25.000	1	1	1	1	1	1	1	1	F	19	
	39	9	25.000	1	1	1	1	1	1	1	1	F	31	
	40	10	25.000	1	1	1	1	1	1	1	1	F	27	
	41	1	50.000	1	1	1	1	1	1	1	1	F	14	
	42	2	50.000	1	1	1	1	1	1	1	1	F	15	
	43	3	50.000	1	1	1	1	1	1	1	1	F	22	
	44	4	50.000	1	1	1	1	1	1	1	1	F	15	
	45	5	50.000	1	1	1	1	1	1	1	1	F	15	
	46	6	50.000	1	1	1	1	1	1	1	1	F	19	
	47	7	50.000	1	1	1	1	1	1	1	1	F	13	

SCOEPA00027722

Test: CD-Ceriodaphnia Survival and Reproduction Test												Test ID: 2657		
Species: CD-Ceriodaphnia dubia												Protocol: EPAF 94-EPA Freshwater		
Sample ID: N/AP-Not applicable												Sample Type: EFF2-Industrial		
Start Date: 9/9/99		End Date: 9/16/99										Lab ID: WAPTL-Parametrix Tox Lab		
	48	8	50.000	1	1	1	1	1	1	1	1	F	21	
	49	9	50.000	1	1	1	1	1	1	1	1	F	14	
	50	10	50.000	1	1	1	1	1	1	1	1	F	14	
	51	1	100.000	1	1	0	0	0	0	0	0	F	0	
	52	2	100.000	1	1	0	0	0	0	0	0	F	0	
	53	3	100.000	1	1	0	0	0	0	0	0	F	0	
	54	4	100.000	1	1	0	0	0	0	0	0	F	0	
	55	5	100.000	1	1	0	0	0	0	0	0	F	0	
	56	6	100.000	1	1	0	0	0	0	0	0	F	0	
	57	7	100.000	1	1	0	0	0	0	0	0	F	0	
	58	8	100.000	1	0	0	0	0	0	0	0	F	0	
	59	9	100.000	1	0	0	0	0	0	0	0	F	0	
	60	10	100.000	1	1	0	0	0	0	0	0	F	0	

Comments: North Creek Analytical - Portland

SCOEPA00027723

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	9/9/99	Test ID:	2657	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	North Creek Analytical - Portland				

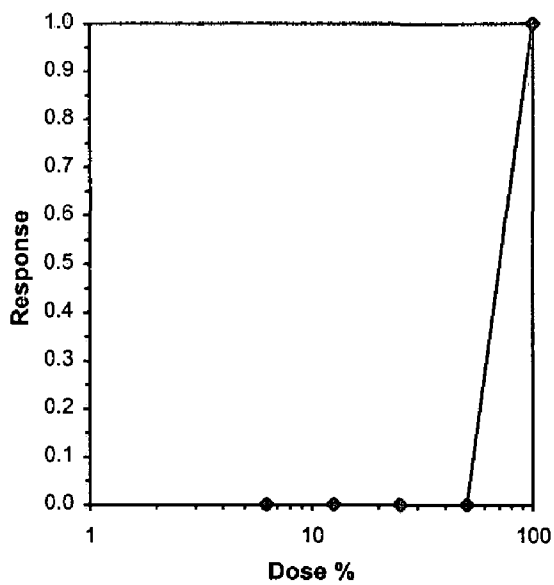
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
6.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
100	0.0000	0.0000	10	0	10	10			10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	50	100	70.7107	2

Graphical Method

Trim Level	EC50
0.0%	70.711
	70.711



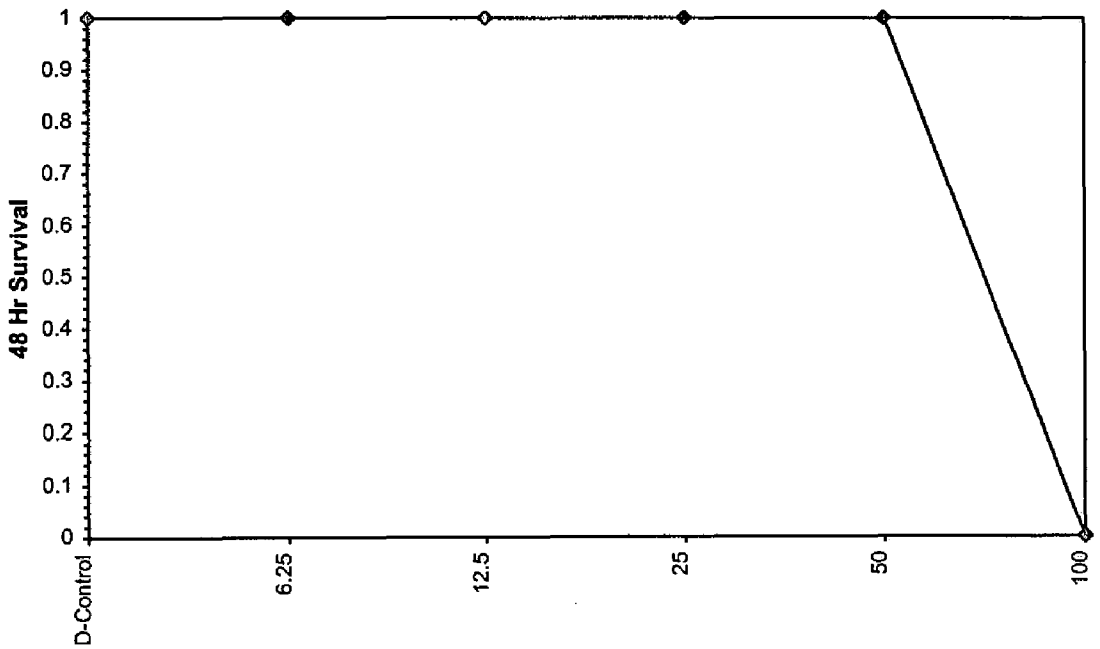
ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	9/9/99	Test ID:	2657	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	North Creek Analytical - Portland				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	9/9/99	Test ID:	2657	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	North Creek Analytical - Portland				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

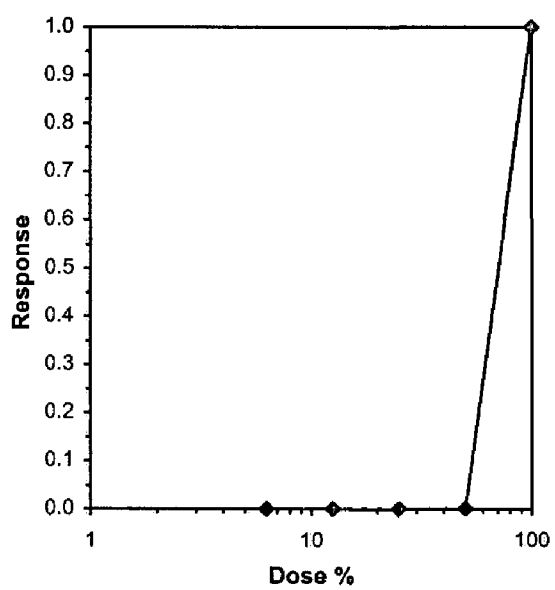
Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
6.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
100	0.0000	0.0000	10	0	10	10			10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	50	100	70.7107	2

Graphical Method

Trim Level	EC50
0.0%	70.711

70.711



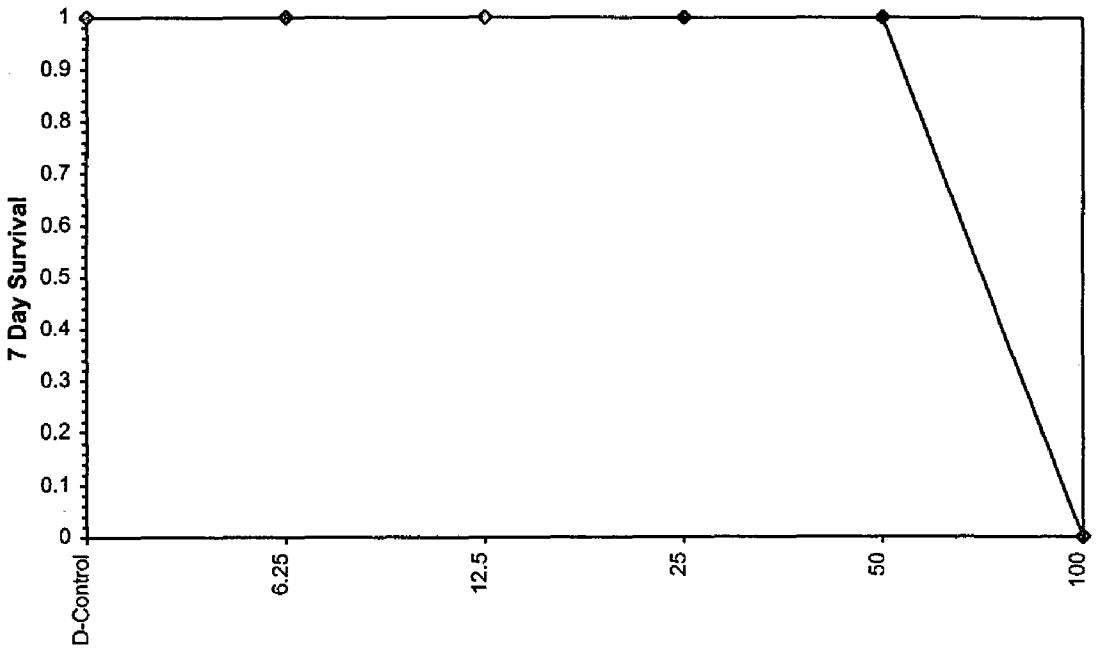
ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	9/9/99	Test ID:	2657	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	North Creek Analytical - Portland				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	9/9/99	Test ID:	2657	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	North Creek Analytical - Portland				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	38.000	26.000	26.000	14.000	25.000	21.000	10.000	14.000	8.000	15.000
6.25	23.000	21.000	25.000	32.000	8.000	19.000	31.000	33.000	33.000	19.000
12.5	22.000	21.000	41.000	26.000	18.000	27.000	34.000	26.000	23.000	22.000
25	19.000	20.000	5.000	19.000	20.000	12.000	22.000	19.000	31.000	27.000
50	14.000	15.000	22.000	15.000	15.000	19.000	13.000	21.000	14.000	14.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

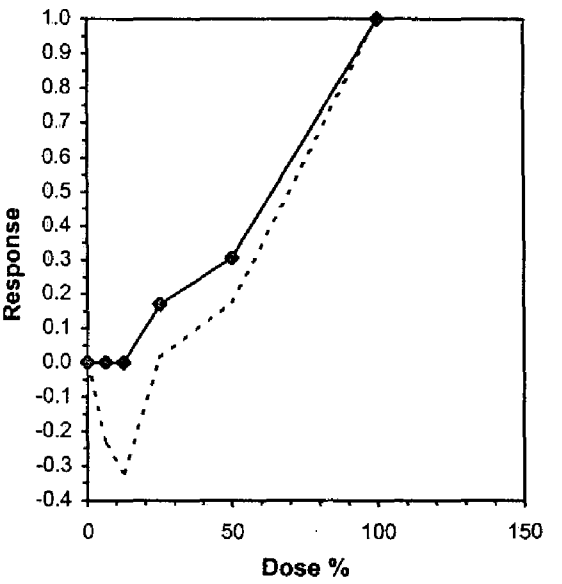
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	19.700	1.0000	19.700	8.000	38.000	46.711	10				23.367	1.0000
6.25	24.400	1.2386	24.400	8.000	33.000	33.194	10	-1.461	2.223	7.152	23.367	1.0000
12.5	26.000	1.3198	26.000	18.000	41.000	26.274	10	-1.958	2.223	7.152	23.367	1.0000
25	19.400	0.9848	19.400	5.000	31.000	36.948	10	0.093	2.223	7.152	19.400	0.8302
50	16.200	0.8223	16.200	13.000	22.000	19.907	10	1.088	2.223	7.152	16.200	0.6933
100	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98148	0.93	0.19483	0.54657
Bartlett's Test indicates equal variances (p = 0.08)	8.48876	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.7107	2	7.15239	0.36307	159.38	51.7444	0.0252	4, 45

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05	16.182	4.500	13.882	29.621	1.2973
IC10	19.863	5.622	15.837	34.905	0.9715
IC15	23.545	7.015	17.575	40.026	0.6896
IC20	30.521	8.949	19.594	50.535	0.3544
IC25	39.648	10.131	21.367	53.626	-0.2871
IC40	56.728	4.294	48.020	62.901	-2.4921
IC50	63.940	2.951	57.192	69.084	-0.4840



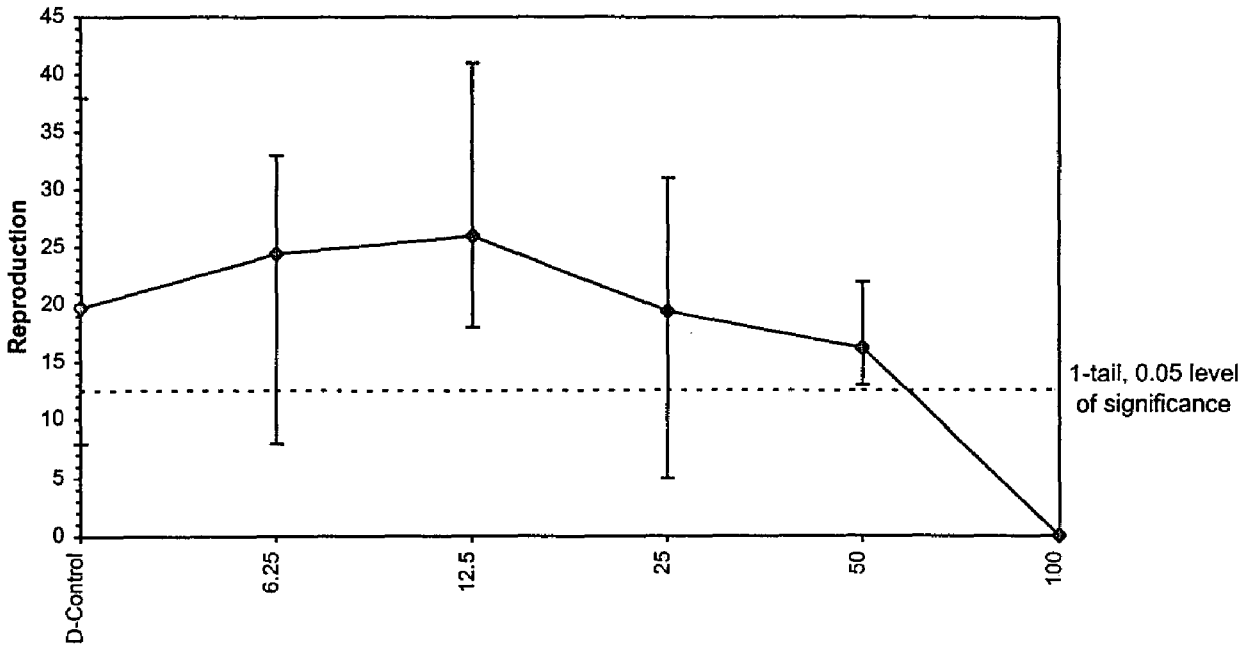
ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	9/9/99	Test ID:	2657	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:	North Creek Analytical - Portland				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: JC

SCOEPA00027730

APPENDIX B

DUAL ENDPOINT *Pimephales promelas* BIOASSAY DATA

Parametrix, Inc.
Environmental Toxicology Laboratory

Pimephales promelas
CHRONIC DAILY MONITORING

Client: NCA - Portland
Collection Dates: 9/8/99, 9/10, 9/13
Sample: Effluent
Test Dates: 9/9/99 - 9/16/99

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Temp (°C)	25	25	25	25	25	25	25	25

pH

% Conc.	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial (4)	Final	Final
Control	8.1	8.0	6.9	8.1	7.8	8.1	7.1	7.6	7.6	7.8	7.8	7.8	7.5	7.7
6.25	8.0	8.1	6.9	8.0	7.8	8.0	7.6	7.6	7.6	7.8	7.8	7.8	7.5	7.7
12.5	8.0	8.1	6.9	8.0	7.7	8.0	7.7	7.6	7.6	7.8	7.7	7.9	7.5	7.7
25	8.0	8.0	7.0	8.0	7.7	7.9	7.6	7.6	7.5	7.7	7.7	7.7	7.5	7.7
50	7.9	7.8	6.4	7.8	7.5	7.8	7.4	7.5	7.5	7.6	7.5	7.7	7.5	7.5
100	7.6 (1)	7.3	6.1 (2)	7.3	7.2	7.3	7.2	7.3	7.3	7.2	7.0	7.6	7.0	7.0

Dissolved Oxygen (mg/L)

	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial (4)	Final	Final
Control	8.1	8.2	6.9	7.8	7.1	8.0	7.3	8.2	7.6	8.1	7.5	7.8	7.0	7.6
6.25	8.1	8.3	6.9	7.9	7.4	7.6	5.8	8.0	7.6	8.0	7.5	7.8	7.0	7.6
12.5	8.2	8.3	6.9	7.8	7.0	7.7	6.8	8.0	7.6	7.8	7.4	7.8	7.0	7.6
25	8.2	8.3	7.0	7.8	7.1	7.8	6.4	8.0	7.5	8.0	7.2	7.8	6.9	7.7
50	8.2	8.3	6.4	7.8	6.6	7.7	6.3	8.1	7.5	7.5	6.7	7.6	6.9	7.2
100	8.3	8.3	6.1	7.8	6.9	7.7	6.8	8.1	7.3 (3)	7.5	6.3	7.3	6.3	7.2

Specific Conductivity (µS)

	Initial	1	2	3	4	5	6	Final
Control	310	325	328	328	347	327	333	336
100%	882	886	823	809	874	869	901	912
Sample #	1	1	#2	2	2	#3	3	
Initials	AC	QB	QB	[illegible]	[illegible]	[illegible]	[illegible]	JH
Date	9/9	9/10	9/10	9/11	9/11	9/12	9/12	9/13	9/13	9/14	9/14	9/15	9/15	9/16

NT = Not Taken
Shading indicates areas where data collection is not required.

Comments:
(1) DC, should read 7.3, AC
(2) should read: 7.8, 7.8, 8.0, 7.6, 7.6, 7.3 QB
(3) DC, should read: 7.6, 7.3, 7.1, 7.3, 6.9, 6.9 [illegible] 9/13/99
(4) DC [illegible] 9/15 Initial readings for Day 6 inverted columns. pH is in DO column and vice versa.

9/20/99

SCOEPA00027732

Parametrix, Inc.
Environmental Toxicology Laboratory

Parametrix, Inc.
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033

Pimephales promelas
Chronic Daily Survival

Client: NCA-Portland
Sample I.D./Source: Effluent
Dilution Media: 90H
Test Initiation Time: 1400 (*)
Organism Source/Age: ABS ≤ ≥ 24 hr
Test Dates: 9/9/99 – 9/16/99

Conc.	Rep.	No. of Survivors 0	24	48	72	96	120	144	168
Control	A 11	10	10	10	10	10	10	10	10
	B 18	10	10	10	10	10	10	10	10
	C 13	10	10	10	10	10	10	10	10
	D 6	10	10	10	10	10	10	10	10
6.25	A 2	10	10	10	10	~~8-2~~ (1)	9	9	9
	B 5	10	10	10	10	10	10	10	10
	C 8	10	10	10	10	10	10	10	10
	D 24	10	10	10	10	10	10	10	10
12.5	A 14	10	10	10	10	10	10	10	10
	B 1	10	10	10	10	10	10	10	10
	C 21	10	10	10	10	9-1	9	9	8-1
	D 17	10	10	10	9-1	9	9	9	9
25	A 3	10	10	10	10	10	10	10	10
	B 12	10	10	10	10	10	10	10	10
	C 4	10	10	9-1	9	8-1	8	8	8
	D 22	10	10	10	10	10	10	9-1	9
50	A 20	10	10	8-2	8	8	8	8	8
	B 15	10	10	10	10	10	10	10	10
	C 10	10	10	10	10	10	10	9-1	9
	D 7	10	10	10	10	10	9-1	9	9
100	A 16	10	4-6	3-1	3	3	3	3	3
	B 9	10	7-3	5-2	4-1	3-1	3	3	3
	C 19	10	9-1	6-3	4-2	~~4-1~~ (2)	3	3	3
	D 23	10	9-1	9	9	8-1	7-1	5-2	5
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								
Initials		AC	JB	[illegible]	[illegible]	[illegible]	HR	[illegible]	JU
Date		9/9/99	9/10/99	9/11	9/12	9/13	9/14	9/15	9/16

Comments
(1) DC: Should read 9-1, [illegible], 9/13/99
(2) DC: Should read 3-1, [illegible], 9/13/99
(*) DC should read ≤ 24 hr, cat, 10/5/99

Parametrix, Inc.
Environmental Toxicology Laboratory

7-DAY CHRONIC *Pimephales promelas* BIOMASS DATA

Client: NCA-Portland Client No.: 55-1945-12

Conc./Rep.	Pan No.	Foil weight (mg)	Foil & Organism weight (mg)	Organism weight (mg)
Con A	1	10.66	13.97	
Con B	2	9.33	13.56	
Con C	3	9.21	12.45	
Con D	4	9.62	12.88	
6.25 A	5	9.70	12.96	
B	6	8.60	12.71	
C	7	8.90	12.45	
D	8	9.60	13.58	
12.5 A	9	10.01	13.91	
B	10	8.69	11.96	
C	11	8.57	12.18	
D	12	9.12	13.33	
25 A	13	11.02	14.64	
B	14	9.73	13.53	
C	15	9.51	13.06	
D	16	10.67	14.33	
50 A	17	9.11	11.33	
B	18	8.13	11.45	
C	19	8.04	11.79	
D	20	9.05	11.87	
100 A	21	9.13	9.53	
B	22	8.64	8.96	
C	23	8.09	8.66	
D	24	9.40	9.78	

Comments: Calibration = 0.0101

Rev. 1/30/97

Client Name:				
Date:				
random #	test chambers			
19	11			
2	18			
18	13			
3	6			
5	2			
23	5			
21	8			
16	24			
20	14			
17	1			
12	21			
19	17			
3	3			
4	12			
17	4			
6	22			
24	20			
20	15			
23	10			
10	7			
12	16			
11	9			
23	19			
12	23			

Test: LF-Larval Fish Growth and Survival Test												Test ID: 2658		
Species: PP-Pimephales promelas												Protocol: EPAF 94-EPA Freshwater		
Sample ID: N/AP-Not applicable												Sample Type: EFF2-Industrial		
Start Date: 9/9/99			End Date: 9/16/99									Lab ID: WAPTL-Parametrix Tox Lab		
Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt(mg)	Tare Wgt(mg)	Wgt Count
	1	1	D-Control	10	10	10	10	10	10	10	10	13.97	10.66	
	2	2	D-Control	10	10	10	10	10	10	10	10	13.56	9.33	
	3	3	D-Control	10	10	10	10	10	10	10	10	12.45	9.21	
	4	4	D-Control	10	10	10	10	10	10	10	10	12.88	9.62	
	5	1	6.250	10	10	10	10	9	9	9	9	12.96	9.7	
	6	2	6.250	10	10	10	10	10	10	10	10	12.71	8.6	
	7	3	6.250	10	10	10	10	10	10	10	10	12.45	8.9	
	8	4	6.250	10	10	10	10	10	10	10	10	13.58	9.6	
	9	1	12.500	10	10	10	10	10	10	10	10	13.91	10.01	
	10	2	12.500	10	10	10	10	10	10	10	10	11.96	8.69	
	11	3	12.500	10	10	10	10	9	9	9	8	12.18	8.57	
	12	4	12.500	10	10	10	9	9	9	9	9	13.33	9.12	
	13	1	25.000	10	10	10	10	10	10	10	10	14.64	11.02	
	14	2	25.000	10	10	10	10	10	10	10	10	13.53	9.73	
	15	3	25.000	10	10	9	9	8	8	8	8	13.06	9.51	
	16	4	25.000	10	10	10	10	10	10	9	9	14.33	10.67	
	17	1	50.000	10	10	8	8	8	8	8	8	11.33	9.11	
	18	2	50.000	10	10	10	10	10	10	10	10	11.45	8.13	
	19	3	50.000	10	10	10	10	10	10	9	9	11.79	8.04	
	20	4	50.000	10	10	10	10	10	9	9	9	11.87	9.05	
	21	1	100.000	10	4	3	3	3	3	3	3	9.53	9.13	
	22	2	100.000	10	7	5	4	3	3	3	3	8.96	8.64	
	23	3	100.000	10	9	6	4	3	3	3	3	8.66	8.09	
	24	4	100.000	10	9	9	9	8	7	5	5	9.78	9.4	

Comments: North Creek Analytical - Portland

Larval Fish Growth and Survival Test-48 Hr Survival

Start Date:	9/9/99	Test ID:	2658	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	North Creek Analytical - Portland				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	0.9000	1.0000
50	0.8000	1.0000	1.0000	1.0000
100	0.3000	0.5000	0.6000	0.9000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
6.25	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
12.5	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
25	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
50	0.9500	0.9500	1.3358	1.1071	1.4120	11.411	4	16.00	10.00	2	40
*100	0.5750	0.5750	0.8750	0.5796	1.2490	32.005	4	10.00	10.00	17	40

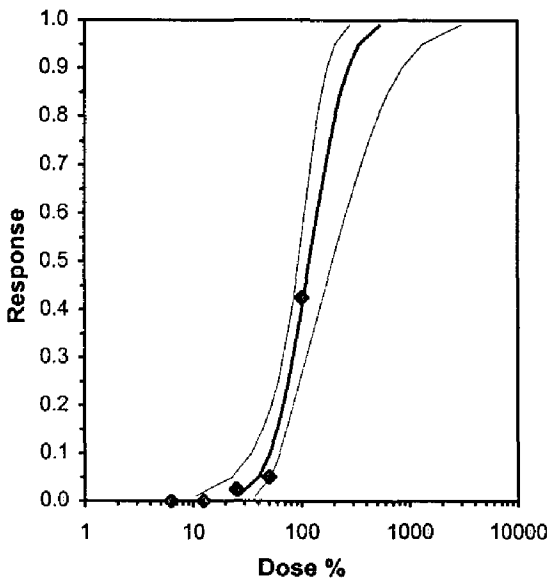
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.773	0.884	0.38334	5.14075
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	2

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.52544	0.82349	1.9114	5.13948	0	2.26935	7.81472	0.52	2.07289	0.28365	4
Intercept	-2.3079	1.54054	-5.3273	0.7116							
TSCR											

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	25.8831	10.395	37.289
EC05	3.355	40.3947	22.9978	51.9826
EC10	3.718	51.2124	34.4821	63.199
EC15	3.964	60.1041	44.4885	73.4497
EC20	4.158	68.2595	53.4416	84.3694
EC25	4.326	76.1325	61.4286	96.7501
EC40	4.747	100.237	81.4735	146.312
EC50	5.000	118.274	93.7736	193.222
EC60	5.253	139.558	106.83	257.799
EC75	5.674	183.743	131.19	421.066
EC80	5.842	204.936	142.021	512.691
EC85	6.036	232.744	155.63	645.567
EC90	6.282	273.153	174.433	863.653
EC95	6.645	346.304	206.248	1331.49
EC99	7.326	540.462	281.578	3007.96



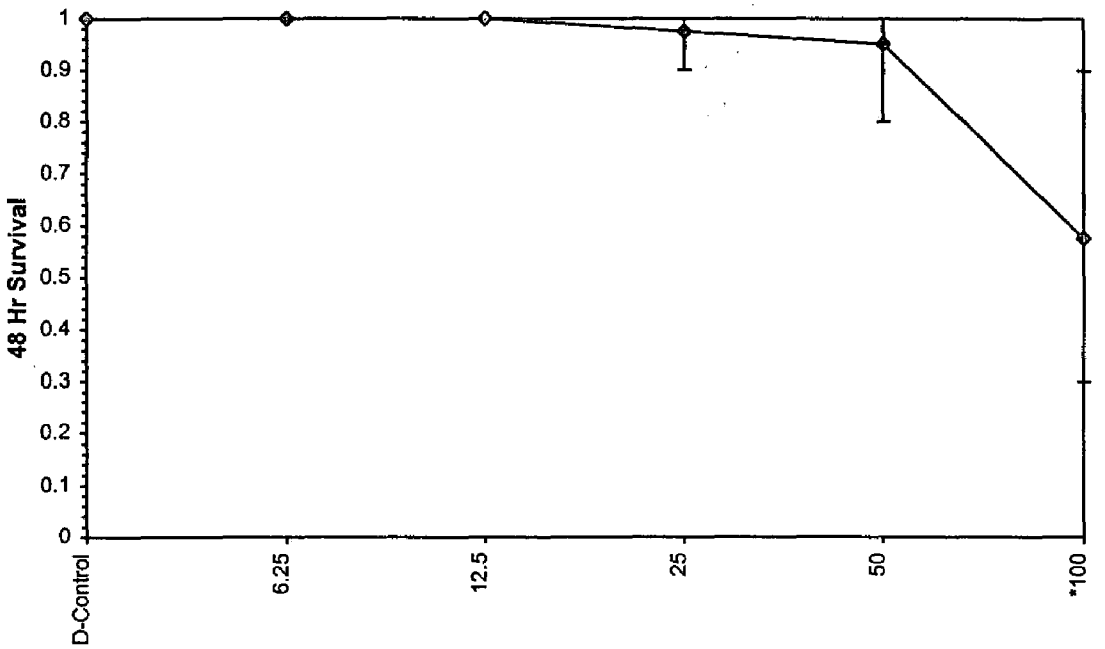
ToxCalc v5.0.23

Reviewed by: _____

Larval Fish Growth and Survival Test-48 Hr Survival

Start Date:	9/9/99	Test ID:	2658	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	North Creek Analytical - Portland				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	9/9/99	Test ID:	2658	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	North Creek Analytical - Portland				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
6.25	0.9000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	0.8000	0.9000
25	1.0000	1.0000	0.8000	0.9000
50	0.8000	1.0000	0.9000	0.9000
100	0.3000	0.3000	0.3000	0.5000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
6.25	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
12.5	0.9250	0.9250	1.2951	1.1071	1.4120	11.347	4	14.00	10.00	3	40
25	0.9250	0.9250	1.2951	1.1071	1.4120	11.347	4	14.00	10.00	3	40
50	0.9000	0.9000	1.2543	1.1071	1.4120	9.935	4	12.00	10.00	4	40
*100	0.3500	0.3500	0.6311	0.5796	0.7854	16.302	4	10.00	10.00	26	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94161	0.884	-0.2255	-0.4667
Equality of variance cannot be confirmed				

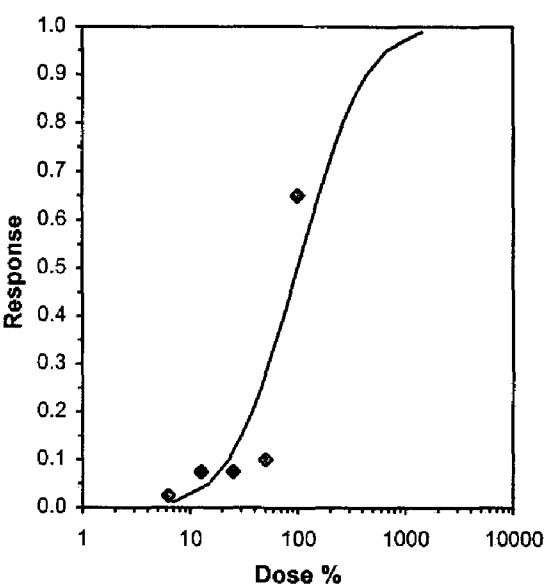
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	2

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	1.99338	0.74156	-0.3666	4.35336	0	13.4362	7.81472	3.8E-03	1.99812	0.50166	4
Intercept	1.01699	1.24995	-2.9609	4.9949							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	6.77769	
EC05	3.355	14.8922	
EC10	3.718	22.6576	
EC15	3.964	30.0733	
EC20	4.158	37.6626	
EC25	4.326	45.6828	
EC40	4.747	74.3059	
EC50	5.000	99.5675	
EC60	5.253	133.417	
EC75	5.674	217.011	
EC80	5.842	263.224	
EC85	6.036	329.651	
EC90	6.282	437.543	
EC95	6.645	665.694	
EC99	7.326	1462.69	

Significant heterogeneity detected (p = 3.78E-03)

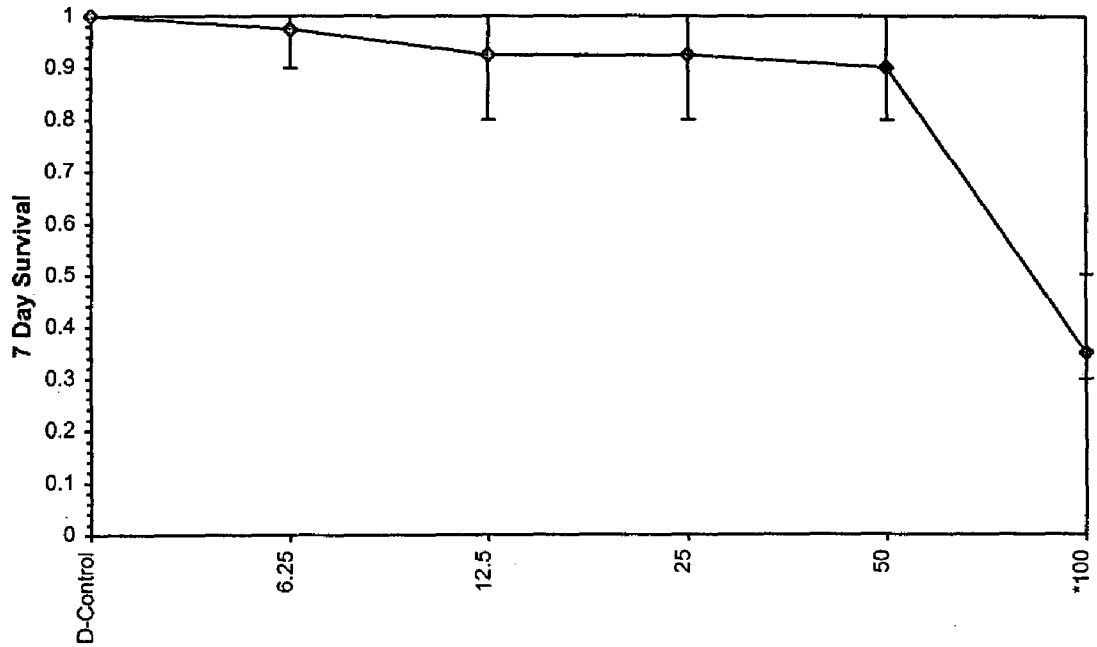


SCOEPA00027739

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	9/9/99	Test ID:	2658	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	North Creek Analytical - Portland				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	9/9/99	Test ID:	2658	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	North Creek Analytical - Portland				

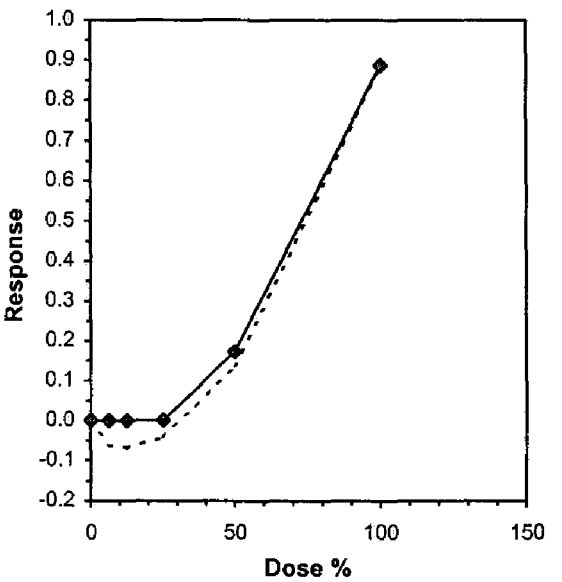
Conc-%	1	2	3	4
D-Control	0.3310	0.4230	0.3240	0.3260
6.25	0.3260	0.4110	0.3550	0.3980
12.5	0.3900	0.3270	0.3610	0.4210
25	0.3620	0.3800	0.3550	0.3660
50	0.2220	0.3320	0.3750	0.2820
100	0.0400	0.0320	0.0570	0.0380

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.3510	1.0000	0.3510	0.3240	0.4230	13.701	4				0.3661	1.0000
6.25	0.3725	1.0613	0.3725	0.3260	0.4110	10.513	4	-0.744	2.410	0.0697	0.3661	1.0000
12.5	0.3748	1.0677	0.3748	0.3270	0.4210	10.719	4	-0.822	2.410	0.0697	0.3661	1.0000
25	0.3658	1.0420	0.3658	0.3550	0.3800	2.879	4	-0.510	2.410	0.0697	0.3658	0.9991
50	0.3028	0.8625	0.3028	0.2220	0.3750	21.766	4	1.669	2.410	0.0697	0.3028	0.8270
*100	0.0418	0.1189	0.0418	0.0320	0.0570	25.676	4	10.698	2.410	0.0697	0.0418	0.1140

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97219		0.884		0.15998	0.39377
Bartlett's Test indicates equal variances (p = 0.05)					11.2373		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	50	100	70.7107	2	0.06967	0.19848	0.06757	0.00167	3.6E-09	5, 18

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	32.131	9.556	0.000	62.450	-0.5032
IC10	39.395	8.074	19.988	62.784	-0.1237
IC15	46.658	7.338	25.527	63.119	-0.6406
IC20	51.893	6.066	29.919	64.670	-0.5755
IC25	55.400	5.315	35.702	67.267	-0.6438
IC40	65.920	4.085	51.206	74.951	-0.6867
IC50	72.933	3.283	61.022	80.075	-0.6684

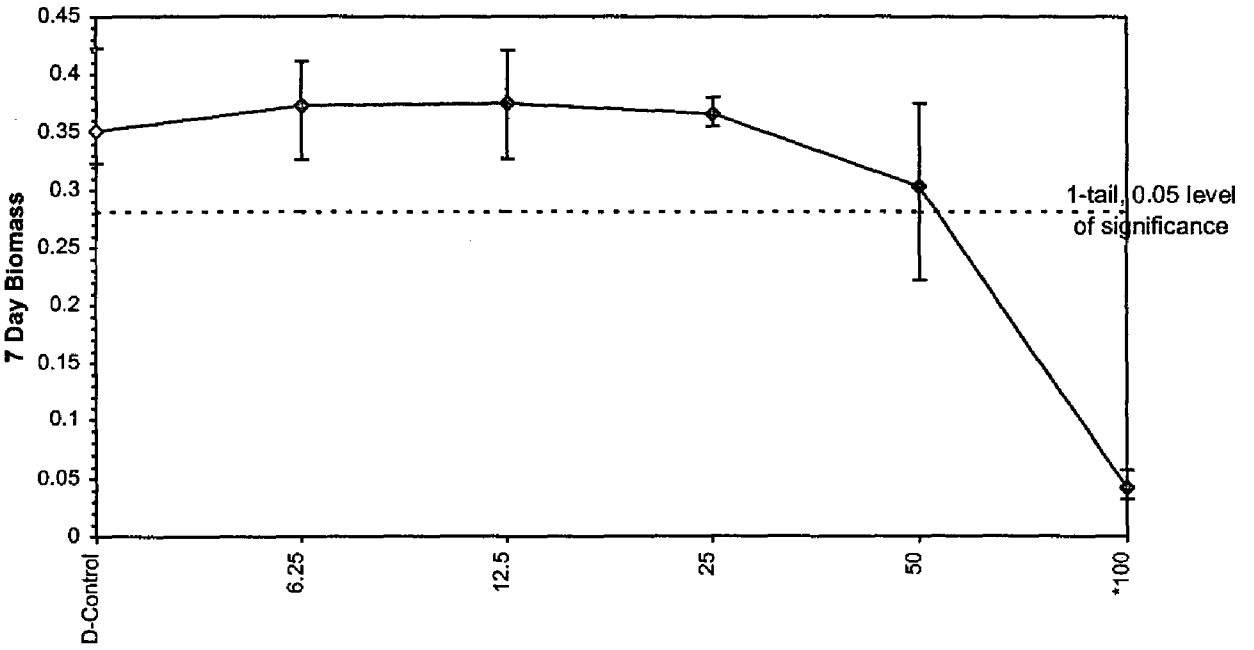


SCOEPA00027741

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	9/9/99	Test ID:	2658	Sample ID:	N/AP-Not applicable
End Date:	9/16/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	EFF2-Industrial
Sample Date:	9/8/99	Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	North Creek Analytical - Portland				

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: _____

SCOEPA00027743

APPENDIX C

REFERENCE TOXICANT DATA

Parametrix, Inc.
Environmental Toxicology Laboratory *Ceriodaphnia dubia* Page 1 of 3

IN-HOUSE
Chronic Daily Survival and Offspring

Client: Reftox Client Number: na Test Dates: 8/31/99 - 9/7/99

Sample I.D./Source: NaCl Sample Collection Dates: na Dilution Media: ~~96 hr~~ Trout Water

Temperature (°C) 0 25 24 25 48 25 72 25 96 25 120 25 144 25 168 25

Conc.	Rep.	Survival (hours)									Offspring (hours)						
		0	24	48	72	96	120	144	168		72	96	120	144	168		Total
CON	A	1	1	1	1	1	1	1	1		0	5	6	5	1		17
	B	1	1	1	1	1	1	1	1		0	05	6	6	0		17
	C	1	1	1	1	1	1	1	1		4	0	7	10	0		21
	D	1	1	1	1	1	1	1	1		2	5	5	5	0		17
	E	1	1	1	1	1	1	1	1		0	4	6	0	7		17
	F	1	1	1	1	1	1	1	1		0	6	7	6	0		19
	G	1	1	1	1	1	1	1	1		0	5	10	7	0		22
	H	1	1	1	1	1	1	1	1		0	86*	7	7	0		20
	I	1	1	1	1	1	1	1	1		0	8	7	6	0		21
	J	1	1	1	1	1	1	1	1		0	6	6	5	0		17
0.3125 g/L	A	1	1	1	1	1	1	1	1		0	5	0	0	0		5
	B	1	1	1	1	1	1	1	1		4	0	5	7	0		16
	C	1	1	1	1	1	1	1	1		0	3	6	5	0		14
	D	1	1	1	1	1	1	1	1		4	1	8	4	0		17
	E	1	1	1	1	1	1	1	1		0	5	9	6	0		20
	F	1	1	1	1	1	1	1	1		0	5	5	9	0		19
	G	1	1	1	1	1	1	1	1		4	0	9	9	0		21
	H	1	1	1	1	1	1	1	1		0	3	8	8	0		19
	I	1	1	1	1	1	1	1	1		2	0	8	7	0		17
	J	1	1	1	1	1	1	1	1		6	0	7	6	0		19
0.625 g/L	A	1	1	1	1	1	1	1	1		5	0	8	5	0		18
	B	1	1	1	1	1	1	1	1		0	6	10	6	0		22
	C	1	1	1	1	1	1	1	1		0	4	6	7	0		17
	D	1	1	1	1	1	1	1	1		0	7	7	5	0		19
	E	1	1	1	1	1	1	1	1		0	6	5	7	0		18
	F	1	1	1	1	1	1	1	1		5	0	5	8	0		18
	G	1	1	1	1	1	1	1	1		4	0	6	9	0		19
	H	1	1	1	1	1	1	1	1		0	5	6	5	0		16
	I	1	1	1	1	1	1	1	1		0	7	6	7	0		20
	J	1	1	1	1	1	1	1	1		0	5	7	8	0		20

Revised 8/26/99

9/8/99

Ceriodaphnia dubia
Chronic Daily Survival and Offspring

Conc.	Rep.	Survival (hours) 0	24	48	72	96	120	144	168	Offspring (hours) 72	96	120	144	168	Total
1.25 g/L	A	1	1	1	1	1	1	1	1	0	5	5	6	0	16
	B	1	1	1	1	1	1	1	1	0	2	4	4	0	10
	C	1	1	1	1	1	1	1	1	0	4	3	4	0	11 cat
	D	1	1	1	1	1	1	1	1	0	5	8	3	0	~~17~~ 16
	E	1	1	1	1	1	1	1	1	0	4	7	5	0	16
	F	1	1	1	1	1	1	1	1	0	5	6	6	0	17
	G	1	1	1	1	1	1	1	1	0	3	7	6	0	16
	H	1	1	1	1	1	1	1	1	0	4	5	6	0	15
	I	1	1	1	1	1	1	1	1	0	5	5	3	0	13
	J	1	1	1	1	1	1	1	1	0	4	7	7	0	18
2.5 g/L	A	1	1	0-1	0	0	0	0	0	0	0	0	0	0	
	B	1	1	0-1	0					0					
	C	1	1	1	0-1					0					
	D	1	1	0-1	0					0					
	E	1	1	0-1	0					0					
	F	1	1	0-1	0					0					
	G	1	1	0-1	0					0					
	H	1	1	0-1	0					0					
	I	1	1	0-1	0					0					
	J	1	1	0-1	0					0					
5.0	A	1	0	0	0					0					
	B	1	0	0	0					0					
	C	1	0	0	0					0					
	D	1	0	0	0					0					
	E	1	0	0	0					0					
	F	1	0	0	0					0					
	G	1	0	0	0					0					
	H	1	0	0	0					0					
	I	1	0	0	0					0					
	J	1	0	0	0	0	0	0	0	0	0	0	0	0	
	Initials	Rm	JB	RS	gm	Rm	AC	AC	RS	gm	Rm	AC	AC	RS	RS
	QC	RS													cat
	Samp #	NA	NA	NA	NA	NA	NA	NA	NA	na	NA	NA	NA	NA	NA
	Time	1600	1700	1730	1530	1700	1500	1530	1650	1600	1700	1500	1830	1650	1700
	Date	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/3	9/4	9/4 9/5 AC	9/6	9/7	9/7

#2 9/8/99

Revised 8/26/99

Ceriodaphnia dubia
Daily Water Quality Parameters

pH Solution																
Date	8/31	9/1	9/1	9/2	9/2	9/3	9/3	9/4	9/4	9/5	9/5	9/6	9/6		9/7	
Day	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8
Conc	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control	7.6	7.6	8.2	7.6	8.1	7.6	7.7	8.2	8.2	8.2	8.2	8.1	8.2		8.0	
0.3125	7.8	8.0	8.2	7.6	8.1	7.6	7.7	8.2	8.1	8.2	8.2	8.1	8.2		8.2	
0.625	7.8	7.9	8.1	7.7	8.1	7.6	7.7	8.2	8.1	8.2	8.2	8.1	8.2		8.2	
1.25	7.8	7.9	8.1	7.6	8.1	7.6	7.7	8.2	8.1	8.2	8.2	8.1	8.2		8.2	
2.5	7.7	7.9	8.1	7.6	8.1	7.6	7.7	—		—	—	—				
5.0	7.6	7.8	8.1	7.6	—	—	—	—		—	—	—				
Initials	JV	AC	JB	gm	AC	JB	JB	R	R	AC	AC	AC	AC		RS	

Dissolved Oxygen (mg/L) Solution																
Conc.	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control	8.3	8.3	8.3	8.3	8.3	8.2	8.2	8.2	8.0	8.3	8.3	8.3	8.3		8.2	
0.3125	8.3	8.3	8.3	8.3	8.2	8.2	8.1	8.1	7.9	8.3	8.3	8.3	8.3		8.2	
0.625	8.3	8.3	8.3	8.2	8.2	8.3	8.1	8.3	7.9	8.3	8.3	8.3	8.3		8.2	
1.25	8.3	8.3	8.3	8.2	8.2	8.3	8.2	8.2	8.0	8.3	8.3	8.3	8.2		8.2	
2.5	8.3	8.3	8.3	8.3	8.3	8.3	8.2	—		—	—	—	—			
5.0	8.3	8.3	8.3	8.3	—	—	—	—		—	—	—	—			
Initials	R	AC	JB	gm	AC	JB	JB	R	R	AC	AC	AC	AC		RS	

Conductivity (μMHOS)								
Conc.	0 Hour	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	168 Hours
Cont.	594	596	595	592	572	577	588	615
100%	9600	9360	—	—	—	—	—	
Samp #	NA	NA	na	NA	NA	NA	NA	NA
Initials	R	AC	gm	JB	R	AC	AC	RS

Comments: ODC, 9/7, RS pH Final should read = 8.0, 8.0, 8.0, 8.0

JC 9/8/99

SCOEPA00027747

Test: CD-Ceriodaphnia Survival and Reproduction Test | Test ID: REFTOX1029
Species: CD-Ceriodaphnia dubia | Protocol: EPAF 94-EPA Freshwater
Sample ID: REF-Ref Toxicant | Sample Type: NACL-Sodium chloride
Start Date: 8/31/99 End Date: 9/7/99 | Lab ID: WAPTL-Parametrix Tox Lab

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Sex	Number of Young	Notes
	1	1	D-Control	1	1	1	1	1	1	1	1	F	17	
	2	2	D-Control	1	1	1	1	1	1	1	1	F	17	
	3	3	D-Control	1	1	1	1	1	1	1	1	F	21	
	4	4	D-Control	1	1	1	1	1	1	1	1	F	17	
	5	5	D-Control	1	1	1	1	1	1	1	1	F	17	
	6	6	D-Control	1	1	1	1	1	1	1	1	F	19	
	7	7	D-Control	1	1	1	1	1	1	1	1	F	22	
	8	8	D-Control	1	1	1	1	1	1	1	1	F	20	
	9	9	D-Control	1	1	1	1	1	1	1	1	F	21	
	10	10	D-Control	1	1	1	1	1	1	1	1	F	17	
	11	1	0.313	1	1	1	1	1	1	1	1	F	5	
	12	2	0.313	1	1	1	1	1	1	1	1	F	16	
	13	3	0.313	1	1	1	1	1	1	1	1	F	14	
	14	4	0.313	1	1	1	1	1	1	1	1	F	17	
	15	5	0.313	1	1	1	1	1	1	1	1	F	20	
	16	6	0.313	1	1	1	1	1	1	1	1	F	19	
	17	7	0.313	1	1	1	1	1	1	1	1	F	21	
	18	8	0.313	1	1	1	1	1	1	1	1	F	19	
	19	9	0.313	1	1	1	1	1	1	1	1	F	17	
	20	10	0.313	1	1	1	1	1	1	1	1	F	19	
	21	1	0.625	1	1	1	1	1	1	1	1	F	18	
	22	2	0.625	1	1	1	1	1	1	1	1	F	22	
	23	3	0.625	1	1	1	1	1	1	1	1	F	17	
	24	4	0.625	1	1	1	1	1	1	1	1	F	19	
	25	5	0.625	1	1	1	1	1	1	1	1	F	18	
	26	6	0.625	1	1	1	1	1	1	1	1	F	18	
	27	7	0.625	1	1	1	1	1	1	1	1	F	19	
	28	8	0.625	1	1	1	1	1	1	1	1	F	16	
	29	9	0.625	1	1	1	1	1	1	1	1	F	20	
	30	10	0.625	1	1	1	1	1	1	1	1	F	20	
	31	1	1.250	1	1	1	1	1	1	1	1	F	16	
	32	2	1.250	1	1	1	1	1	1	1	1	F	10	
	33	3	1.250	1	1	1	1	1	1	1	1	F	11	
	34	4	1.250	1	1	1	1	1	1	1	1	F	16	
	35	5	1.250	1	1	1	1	1	1	1	1	F	16	
	36	6	1.250	1	1	1	1	1	1	1	1	F	17	
	37	7	1.250	1	1	1	1	1	1	1	1	F	16	
	38	8	1.250	1	1	1	1	1	1	1	1	F	15	
	39	9	1.250	1	1	1	1	1	1	1	1	F	13	
	40	10	1.250	1	1	1	1	1	1	1	1	F	18	
	41	1	2.500	1	1	0	0	0	0	0	0	F	0	
	42	2	2.500	1	1	0	0	0	0	0	0	F	0	
	43	3	2.500	1	1	1	0	0	0	0	0	F	0	
	44	4	2.500	1	1	0	0	0	0	0	0	F	0	
	45	5	2.500	1	1	0	0	0	0	0	0	F	0	
	46	6	2.500	1	1	0	0	0	0	0	0	F	0	
	47	7	2.500	1	1	0	0	0	0	0	0	F	0	

Reviewed by: JL

Test: CD-Ceriodaphnia Survival and Reproduction Test												Test ID: REFTOX1029		
Species: CD-Ceriodaphnia dubia												Protocol: EPAF 94-EPA Freshwater		
Sample ID: REF-Ref Toxicant												Sample Type: NACL-Sodium chloride		
Start Date: 8/31/99		End Date: 9/7/99										Lab ID: WAPTL-Parametrix Tox Lab		
	48	8	2.500	1	1	0	0	0	0	0	0	F	0	
	49	9	2.500	1	1	0	0	0	0	0	0	F	0	
	50	10	2.500	1	1	0	0	0	0	0	0	F	0	
	51	1	5.000	1	0	0	0	0	0	0	0	F	0	
	52	2	5.000	1	0	0	0	0	0	0	0	F	0	
	53	3	5.000	1	0	0	0	0	0	0	0	F	0	
	54	4	5.000	1	0	0	0	0	0	0	0	F	0	
	55	5	5.000	1	0	0	0	0	0	0	0	F	0	
	56	6	5.000	1	0	0	0	0	0	0	0	F	0	
	57	7	5.000	1	0	0	0	0	0	0	0	F	0	
	58	8	5.000	1	0	0	0	0	0	0	0	F	0	
	59	9	5.000	1	0	0	0	0	0	0	0	F	0	
	60	10	5.000	1	0	0	0	0	0	0	0	F	0	

Comments:

SCOEPA00027749

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	8/31/99	Test ID:	REFTOX1029	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

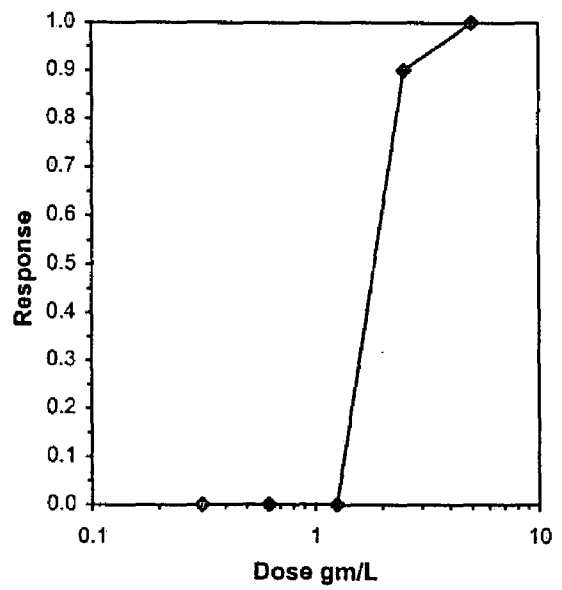
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.3125	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.625	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2.5	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
0.3125	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
0.625	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
1.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
*2.5	0.1000	0.1000	9	1	10	10	0.0001	0.0500	9	10
5	0.0000	0.0000	10	0	10	10			10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1.25	2.5	1.76777	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	1.8946	1.6612	2.1609
5.0%	1.8530	1.6302	2.1062
10.0%	1.8372	1.6939	1.9925
20.0%	1.8372	1.6939	1.9925
Auto-0.0%	1.8946	1.6612	2.1609



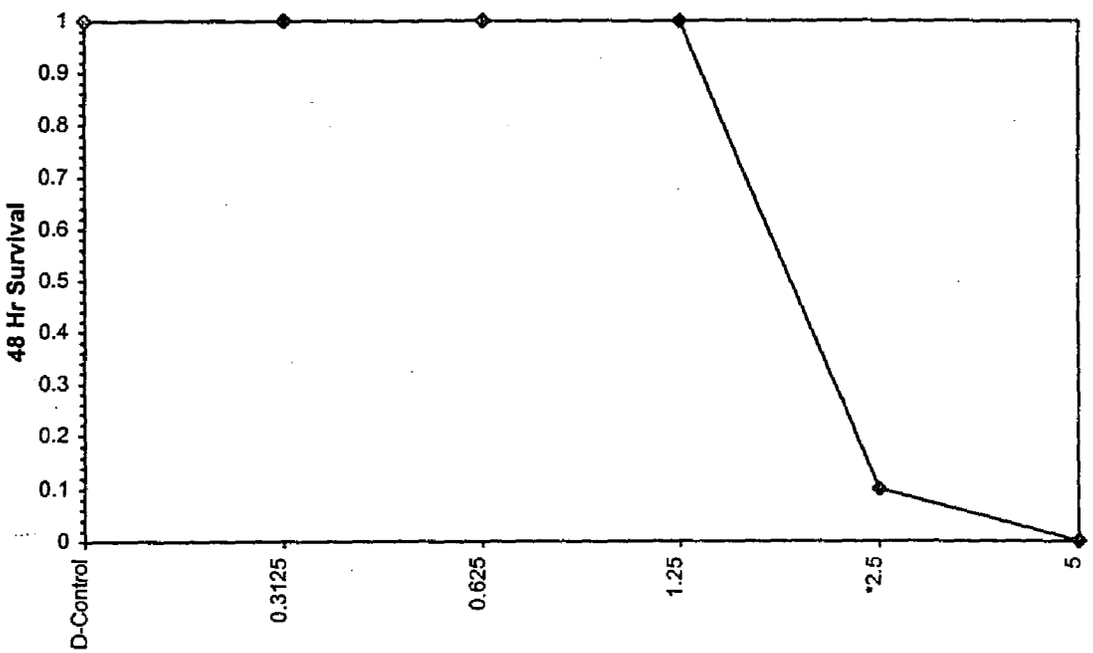
ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	8/31/99	Test ID:	REFTOX1029	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	8/31/99	Test ID:	REFTOX1029	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

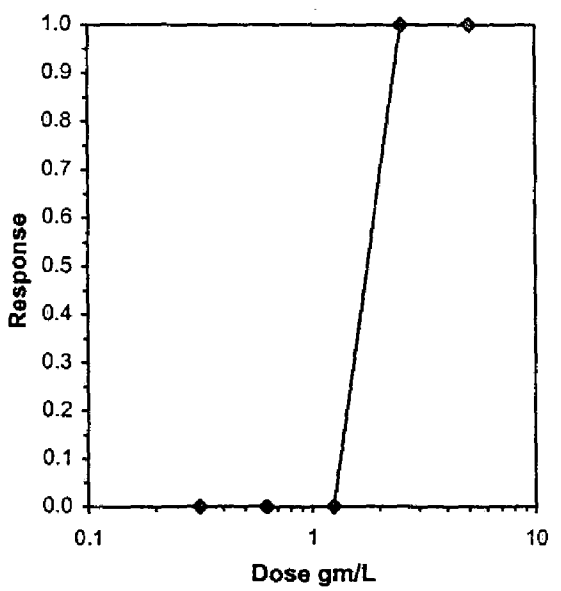
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.3125	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.625	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2.5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	0	10	10	10			0	10
0.3125	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
0.625	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
1.25	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
2.5	0.0000	0.0000	10	0	10	10			10	10
5	0.0000	0.0000	10	0	10	10			10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1.25	2.5	1.76777	

Graphical Method

Trim Level	EC50
0.0%	1.7678
	1.7678



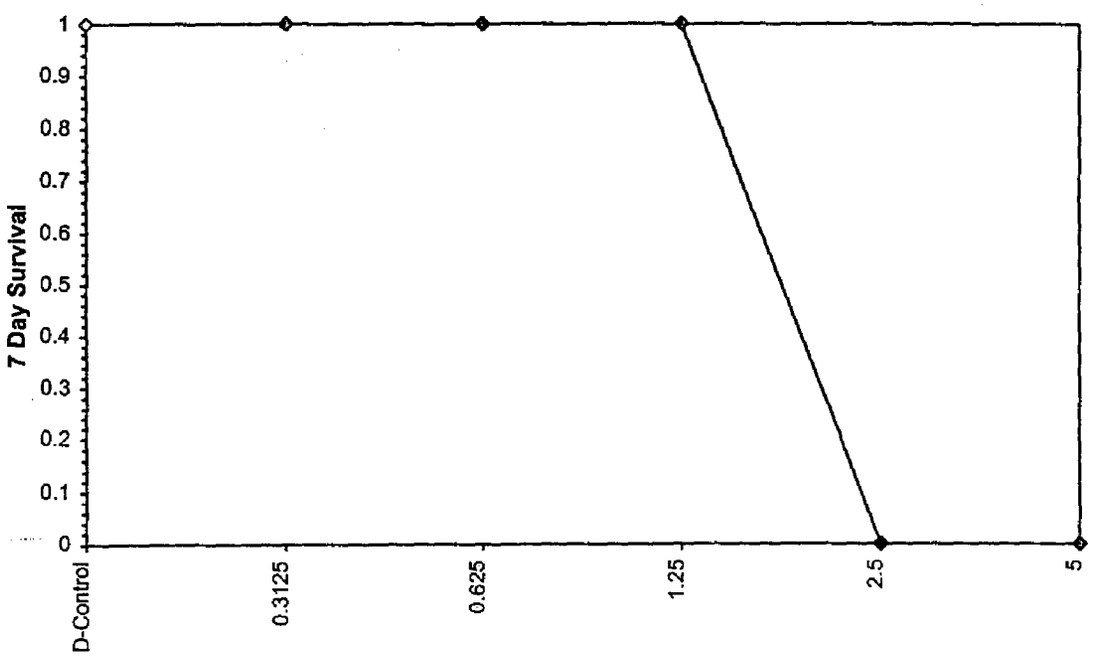
ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	8/31/99	Test ID:	REFTOX1029	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	8/31/99	Test ID:	REFTOX1029	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	17.000	17.000	21.000	17.000	17.000	19.000	22.000	20.000	21.000	17.000
0.3125	5.000	16.000	14.000	17.000	20.000	19.000	21.000	19.000	17.000	19.000
0.625	18.000	22.000	17.000	19.000	18.000	18.000	19.000	16.000	20.000	20.000
1.25	16.000	10.000	11.000	16.000	16.000	17.000	16.000	15.000	13.000	18.000
2.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	18.800	1.0000	18.800	17.000	22.000	10.872	10			18.800	1.0000
0.3125	16.700	0.8883	16.700	5.000	21.000	27.520	10	91.00	77.00	17.700	0.9415
0.625	18.700	0.9947	18.700	16.000	22.000	9.107	10	106.00	77.00	17.700	0.9415
*1.25	14.800	0.7872	14.800	10.000	18.000	17.677	10	62.50	77.00	14.800	0.7872
2.5	0.000	0.0000	0.000	0.000	0.000	0.000	10			0.000	0.0000
5	0.000	0.0000	0.000	0.000	0.000	0.000	10			0.000	0.0000

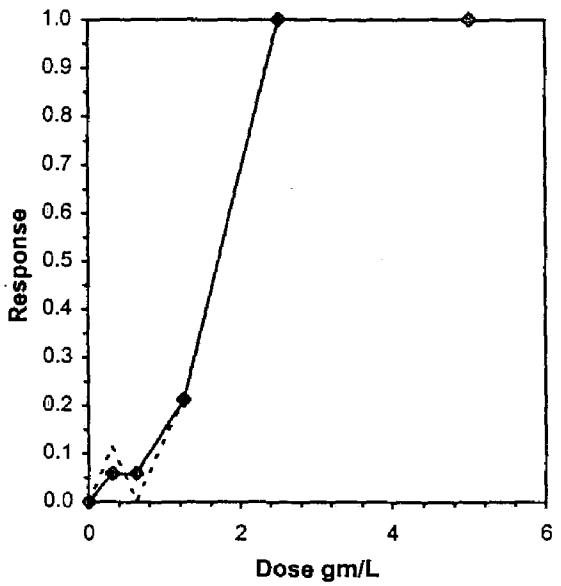
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.87214	0.919	-1.8181	6.18226
Bartlett's Test indicates equal variances (p = 0.02)	10.4343	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	0.625	1.25	0.88388	

Linear Interpolation (200 Resamples)

Point	gm/L	SD	95% CL		Skew
IC05*	0.2670	0.2723	0.0982	0.8212	0.2762
IC10	0.7931	0.2484	0.1965	1.0392	-1.0237
IC15	0.9957	0.1911	0.2947	1.2715	-1.4711
IC20	1.1983	0.1353	0.9446	1.3438	-1.9470
IC25	1.3091	0.0892	1.1049	1.4160	-2.1407
IC40	1.5473	0.0552	1.4290	1.6328	-0.5515
IC50	1.7061	0.0460	1.6075	1.7774	-0.5515

* indicates IC estimate less than the lowest concentration

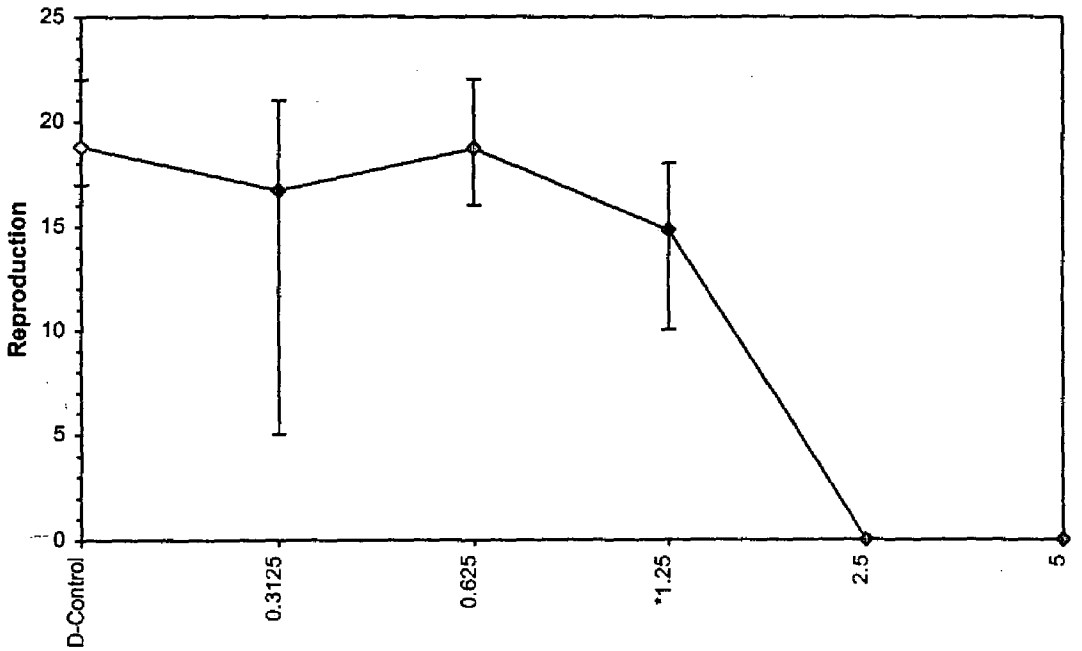


SCOEPA00027754

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	8/31/99	Test ID:	REFTOX1029	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

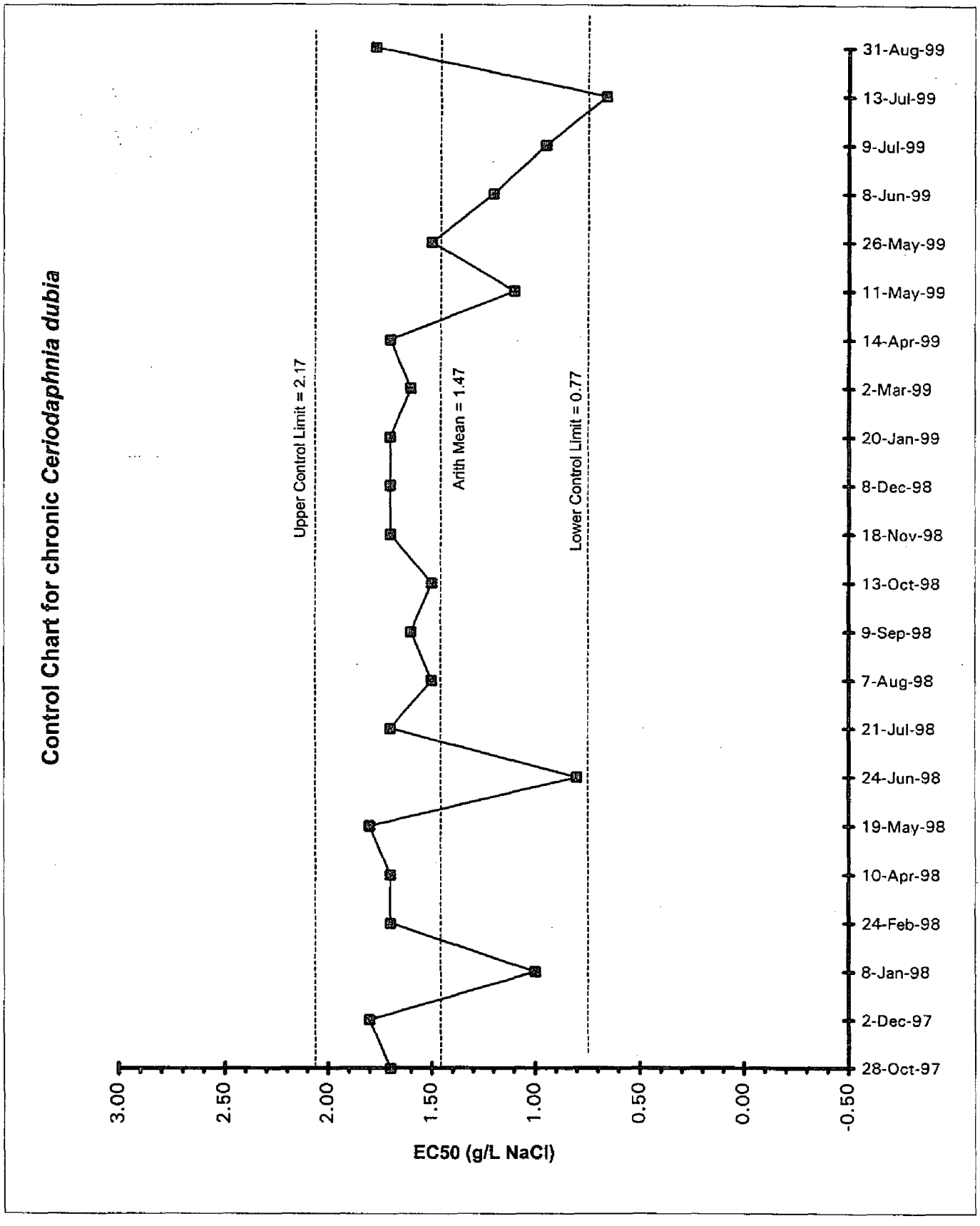
Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

SCOEPA00027756



Parametrix, Inc.
Environmental Toxicology Laboratory

Pimephales promelas
CHRONIC DAILY MONITORING

Client: In house Ref Tox Collection Dates: NA

Sample: A KCl Test Dates: 8/31 - 9/7/99

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Temp (°C)	25	25	24	25	25	25	25	25

9/6

pH

Conc.	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control	8.4	8.2	8.1	8.0	7.8	8.1	7.6	7.7	7.7	8.1	7.9	7.9	7.7	7.8
.125	8.4	8.2	8.1	8.0	7.9	8.0	7.8	7.7	7.7	8.0	7.8	8.0	7.8	7.8
.25	8.4	8.2	8.1	7.9	7.8	8.0	7.8	7.8	7.7	8.0	7.7	7.9	7.7	7.8
.5	8.5	8.2	8.1	7.9	7.9	8.0	7.8	7.8	7.7	8.0	7.8	8.0	7.7	7.9
1	8.5	8.2	8.2	8.0	8.0	8.0	7.7	7.8	7.7	8.0	7.8	8.0	7.7	7.8
2	8.5	8.2	8.2	—	8.0	—	—	—	—	—	—	—	—	—

Dissolved Oxygen (mg/L)

	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control	8.3	8.3	7.9	8.1	6.6	7.9	6.7	7.7	6.8	8.2	7.6	8.0	7.8	7.4
.125	8.3	8.3	7.9	8.0	6.6	7.8	6.7	7.7	6.9	8.0	7.1	8.3	7.7	7.5
.25	8.3	8.3	7.8	8.1	6.3	7.8	7.0	7.5	6.9	7.8	6.8	7.9	7.3	7.6
.5	8.3	8.3	7.8	8.1	6.7	7.8	6.8	7.6	6.9	8.0	7.3	8.0	7.1	7.9
1	8.3	8.3	8.0	8.1	6.9	7.8	6.7	7.6	6.8	8.0	7.4	7.9	7.2	7.0
2	8.3	8.3	8.0	—	6.8	—	—	—	—	—	—	—	—	—

Specific Conductivity (µS)

	Initial	1	2	3	4	5	6	Final
Control	374	401	334	296	297	304	317	319
100%	3930	3960	—	—	—	—	—	

Sample #	NA	NA		na		na		na		NA		NA		
Initials	HR	AC	CS	gm	gm	gm	gm	gm	gm	gm	gm	gm	gm	AC
Date	8/31	9/1	9/01	9/2	9/2	9/3	9/3	9/4	9/4	9/5	9/5	9/6	9/6	9/7

NT = Not Taken
Shading indicates areas where data collection is not required.

Comments: ① Should Read 8.2, gm 9/6/99

9/14/99 A.C.

Parametrix, Inc.
Environmental Toxicology Laboratory

Parametrix, Inc.
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033

Pimephales promelas
Chronic Daily Survival

Client: In house Ref Tox — Test Initiation Time: 1530
Sample I.D./Source: KCl — Organism Source/Age: ABS less than 24 hrs old
Dilution Media: 90# — Test Dates: 8/31/99 - 9/7/99

9/L Conc.	Rep.	No. of Survivors							
		0	24	48	72	96	120	144	168
Control	18 A	10	10	10	10	10	10	10	10
	6 B	10	10	10	10	10	9-1	9	9
	3 C	10	10	10	10	10	10	10	10
	12 D	10	10	10	10	10	10	10	10
.125	2 A	10	9-1	9	9	9	9	8-1	8
	22 B	10	10	10	10	10	10	10	10
	7 C	10	10	9-1	9	9	9	9	9
	9 D	10	10	10	10	10	10	10	10
.25	21 A	10	10	10	10	10	10	10	10
	16 B	10	10	10	10	10	10	10	10
	23 C	10	10	10	10	10	10	10	10
	24 D	10	10	9-1	9	9	9	8-1	8
.5	1 A	10	9-1	9	9	9	9	7-2	7
	4 B	10	10	10	10	10	9-1	9	9
	13 C	10	10	10	10	9-1	9	9	9
	11 D	10	10	10	10	10	10	10	10
1	17 A	10	3-7	1-2	1	1	0-1	0	0
	14 B	10	4-6	3-1	3	3	1-2	0-1	0
	15 C	10	4-6	2-2	0-2	0	—	-	0
~~2~~	8 D	10	5-5	4-1	4	4	3-1	2-1	2
2	5 A	10	0-10	0	0	0	—	-	—
	10 B	10	1-9	0-1	0	0	—	-	—
	19 C	10	0-10	0	0	0	—	-	—
	20 D	10	0-10	0	0	0	—	-	—
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								
Initials		RS	RS	JPM	JPM	JPM	PR	JPM	AC
Date		8/31	9/01	9/2①	9/3	9/4	9/5	9/6	9/7

Comments: DC: ①Should read 9/2, JPM

JPM 9/14/99

SCOEPA00027758

Parametrix, Inc.
Environmental Toxicology Laboratory

7-DAY CHRONIC *Pimephales promelas* BIOMASS DATA

Client: In House Ref Tox Client No.: N/A

Conc./Rep.	Pan No.	Foil weight (mg)	Foil & Organism weight (mg)	Organism weight (mg)
CON A	1	12.41	17.57	
B	2	9.64	14.75 15.16	
C	3	9.88	13.92	
D	4	11.49	16.54	
0.125 A	5	9.38	13.71	
B	6	~~A~~ 5 12.50	17.27	
C	7	12.14	17.47	
D	8	8.34	13.54	
0.25 A	9	11.01	16.33	
B	10	9.38	14.18	
C	11	11.08	16.98	
D	12	12.47	16.88	
0.5 A	13	10.11	13.36	
B	14	9.27	14.13	
C	15	10.77	16.11	
D	16	10.83	16.50	
1 A	17	—		
B	18	—		
C	19	—		
D	20	9.38	11.00	
2 A	21	—		
B	22	—		
C	23	—		
D	24	—		

Comments:

9/14/99

Rev. 1/30/97

Client Name:	In Houx	Ref Tox		
Date: 8/31/99				
random #	test chambers			
7	18			
19	6			
1	3			
14	12			
10	2			
1	22			
12	7			
0	9			
0	21			
7	16			
12	23			
21	24			
8	1			
13	4			
19	13			
13	11			
20	17			
21	14			
13	15			
17	8			
15	5			
22	10			
9	19			
23	20			

SCOEPA00027760

Test: LF-Larval Fish Growth and Survival Test
Test ID: REFTOX1033
Species: PP-Pimephales promelas
Protocol: EPAF 94-EPA Freshwater
Sample ID: REF-Ref Toxicant
Sample Type: KCL-Potassium chloride
Start Date: 8/31/99 15:30 End Date: 9/7/99
Lab ID: WAPTL-Parametrix Tox Lab

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total Wgt(mg)	Tare Wgt(mg)	Wgt Count	Notes
	1	1	D-Control	10	10	10	10	10	10	10	10	17.57	12.41		
	2	2	D-Control	10	10	10	10	10	9	9	9	15.16	9.64		
	3	3	D-Control	10	10	10	10	10	10	10	10	13.92	9.88		
	4	4	D-Control	10	10	10	10	10	10	10	10	16.54	11.49		
	5	1	0.125	10	9	9	9	9	9	8	8	13.71	9.38		
	6	2	0.125	10	10	10	10	10	10	10	10	17.27	12.5		
	7	3	0.125	10	10	9	9	9	9	9	9	17.47	12.14		
	8	4	0.125	10	10	10	10	10	10	10	10	13.54	8.34		
	9	1	0.250	10	10	10	10	10	10	10	10	16.33	11.01		
	10	2	0.250	10	10	10	10	10	10	10	10	14.18	9.38		
	11	3	0.250	10	10	10	10	10	10	10	10	16.98	11.08		
	12	4	0.250	10	10	9	9	9	9	8	8	16.88	12.47		
	13	1	0.500	10	9	9	9	9	9	7	7	13.36	10.11		
	14	2	0.500	10	10	10	10	10	9	9	9	14.13	9.27		
	15	3	0.500	10	10	10	10	9	9	9	9	16.11	10.77		
	16	4	0.500	10	10	10	10	10	10	10	10	16.5	10.83		
	17	1	1.000	10	3	1	1	1	0	0	0	NA	NA		
	18	2	1.000	10	4	3	3	3	1	0	0	NA	NA		
	19	3	1.000	10	4	2	0	0	0	0	0	NA	NA		
	20	4	1.000	10	5	4	4	4	3	2	2	11	9.38		
	21	1	2.000	10	0	0	0	0	0	0	0	NA	NA		
	22	2	2.000	10	1	0	0	0	0	0	0	NA	NA		
	23	3	2.000	10	0	0	0	0	0	0	0	NA	NA		
	24	4	2.000	10	0	0	0	0	0	0	0	NA	NA		

Comments:

SCOEPA00027761

Larval Fish Growth and Survival Test-48 Hr Survival

Start Date:	8/31/99 15:30	Test ID:	REFTOX1033	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
0.125	0.9000	1.0000	0.9000	1.0000
0.25	1.0000	1.0000	1.0000	0.9000
0.5	0.9000	1.0000	1.0000	1.0000
1	0.1000	0.3000	0.2000	0.4000
2	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
0.125	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00	2	40
0.25	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
0.5	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
*1	0.2500	0.2500	0.5124	0.3218	0.6847	30.428	4	10.00	10.00	30	40
2	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4			40	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94235	0.868	-0.4544	0.31375
Equality of variance cannot be confirmed				

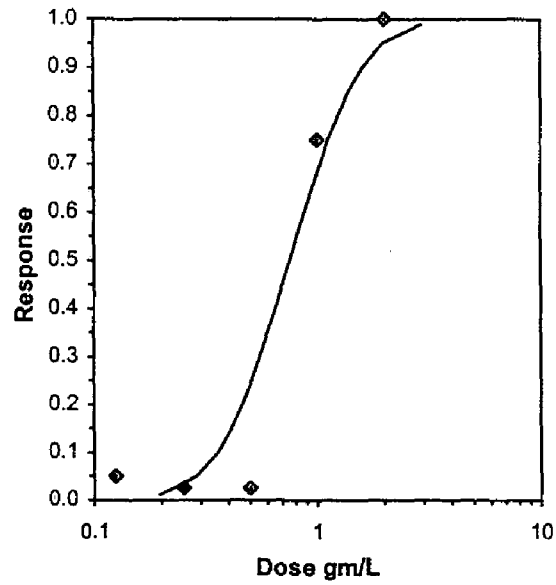
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	0.5	1	0.70711	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.93501	2.82989	-5.071	12.941	0	103.811	7.81472	2.4E-22	-0.1219	0.25413	5
Intercept	5.47957	0.84634	2.78613	8.173							
TSCR											

Point	Probits	gm/L	95% Fiducial Limits
EC01	2.674	0.19361	
EC05	3.355	0.28849	
EC10	3.718	0.35682	
EC15	3.964	0.41185	
EC20	4.158	0.46158	
EC25	4.326	0.509	
EC40	4.747	0.65125	
EC50	5.000	0.75532	
EC60	5.253	0.87601	
EC75	5.674	1.12082	
EC80	5.842	1.23597	
EC85	6.036	1.38521	
EC90	6.282	1.59885	
EC95	6.645	1.97757	
EC99	7.326	2.94659	

Significant heterogeneity detected (p = 2.35E-22)

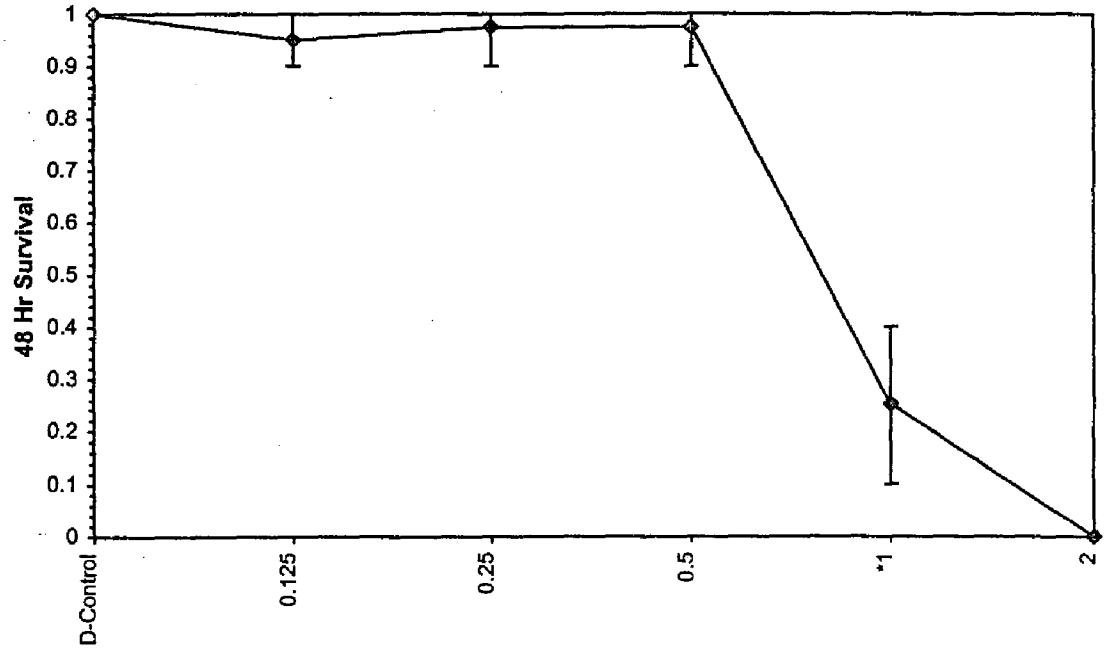


SCOEPA00027762

Larval Fish Growth and Survival Test-48 Hr Survival

Start Date:	8/31/99 15:30	Test ID:	REFTOX1033	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by: JE

SCOEPA00027763

Larval Fish Growth and Survival Test-96 Hr Survival

Start Date:	8/31/99 15:30	Test ID:	REFTOX1033	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
0.125	0.9000	1.0000	0.9000	1.0000
0.25	1.0000	1.0000	1.0000	0.9000
0.5	0.9000	1.0000	0.9000	1.0000
1	0.1000	0.3000	0.0000	0.4000
2	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
0.125	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00	2	40
0.25	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
0.5	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00	2	40
*1	0.2000	0.2000	0.4362	0.1588	0.6847	54.954	4	10.00	10.00	32	40
2	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4			40	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95735	0.868	-0.2463	1.18701
Equality of variance cannot be confirmed				

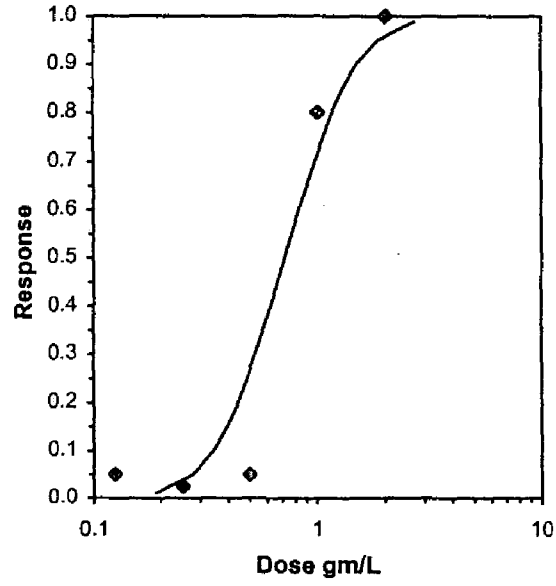
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	0.5	1	0.70711	

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	4.00294	2.69665	-4.579	12.5849	0	92.0251	7.81472	8.1E-20	-0.1446	0.24982	4
Intercept	5.57875	0.82713	2.94644	8.21105							
TSCR											

Point	Probits	gm/L	95% Fiducial Limits
EC01	2.674	0.18804	
EC05	3.355	0.2783	
EC10	3.718	0.34298	
EC15	3.964	0.39491	
EC20	4.158	0.44174	
EC25	4.326	0.48632	
EC40	4.747	0.61963	
EC50	5.000	0.71684	
EC60	5.253	0.8293	
EC75	5.674	1.05662	
EC80	5.842	1.16324	
EC85	6.036	1.30118	
EC90	6.282	1.49821	
EC95	6.645	1.84642	
EC99	7.326	2.73262	

Significant heterogeneity detected (p = 8.05E-20)

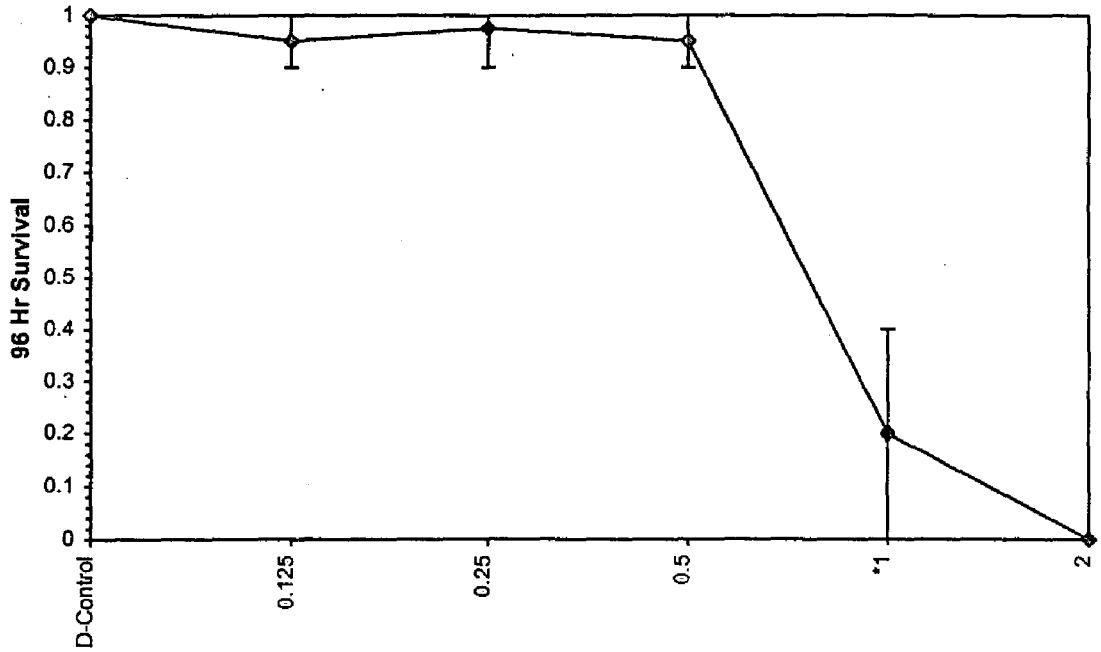


SCOEPA00027764

Larval Fish Growth and Survival Test-96 Hr Survival

Start Date:	8/31/99 15:30	Test ID:	REFTOX1033	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/31/99 15:30	Test ID:	REFTOX1033	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	1.0000	0.9000	1.0000	1.0000
0.125	0.8000	1.0000	0.9000	1.0000
0.25	1.0000	1.0000	1.0000	0.8000
0.5	0.7000	0.9000	0.9000	1.0000
1	0.0000	0.0000	0.0000	0.2000
2	0.0000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root						1-Tailed		Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Resp	Number
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4				1	40
0.125	0.9250	0.9487	1.2951	1.1071	1.4120	11.347	4	0.744	2.360	0.2418	3	40
0.25	0.9500	0.9744	1.3358	1.1071	1.4120	11.411	4	0.346	2.360	0.2418	2	40
0.5	0.8750	0.8974	1.2253	0.9912	1.4120	14.199	4	1.425	2.360	0.2418	5	40
*1	0.0500	0.0513	0.2350	0.1588	0.4636	64.866	4	11.090	2.360	0.2418	38	40
2	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4				40	40

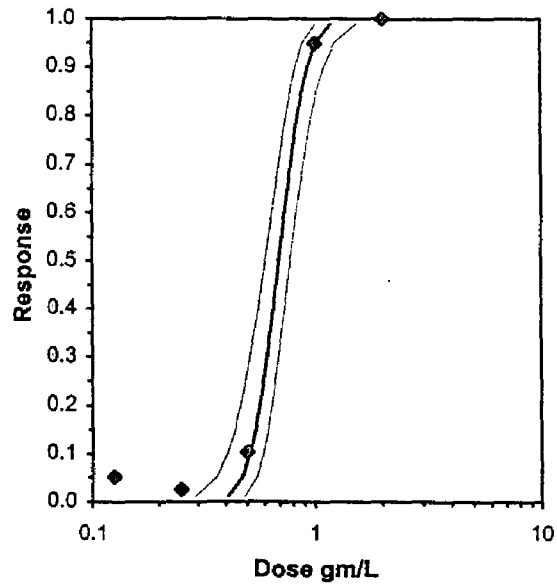
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95749	0.868	-0.314	-0.4503
Bartlett's Test indicates equal variances (p = 0.83)	1.46757	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	0.5	1	0.70711		0.14316	0.14902	0.93089	0.021	3.9E-08	4, 15

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	10.0726	1.72065	6.70012	13.4451	0.025	0.52642	7.81472	0.91	-0.1608	0.09928	6
Intercept	6.61993	0.34791	5.93802	7.30183							
TSCR	0.05	0.0199	0.011	0.089							

Point	Probits	gm/L	95% Fiducial Limits	
EC01	2.674	0.40571	0.28927	0.48766
EC05	3.355	0.47411	0.36243	0.55283
EC10	3.718	0.51516	0.40787	0.5923
EC15	3.964	0.54485	0.44115	0.62128
EC20	4.158	0.56966	0.46909	0.64594
EC25	4.326	0.59185	0.49405	0.66842
EC40	4.747	0.65166	0.56055	0.73179
EC50	5.000	0.69052	0.60245	0.77577
EC60	5.253	0.73169	0.64519	0.82531
EC75	5.674	0.80563	0.71697	0.92254
EC80	5.842	0.83701	0.74552	0.96696
EC85	6.036	0.87513	0.77884	1.02325
EC90	6.282	0.92556	0.82096	1.10135
EC95	6.645	1.00571	0.88426	1.23285
EC99	7.326	1.17526	1.0084	1.53553



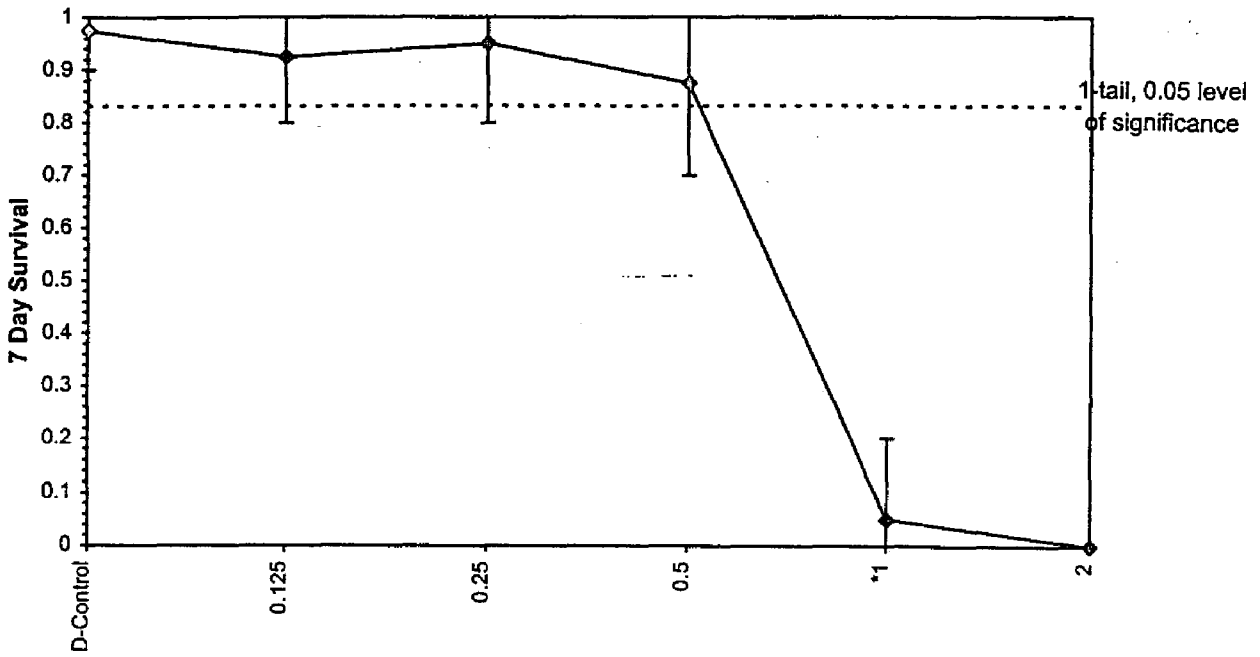
ToxCalc v5.0.23

Reviewed by:

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/31/99 15:30	Test ID:	REFTOX1033	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



SCOEPA00027767

Larval Fish Growth and Survival Test-7 Day Biomass

Start Date:	8/31/99 15:30	Test ID:	REFTOX1033	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	0.5160	0.5520	0.4040	0.5050
0.125	0.4330	0.4770	0.5330	0.5200
0.25	0.5320	0.4800	0.5900	0.4410
0.5	0.3250	0.4860	0.5340	0.5670
1	0.1620			

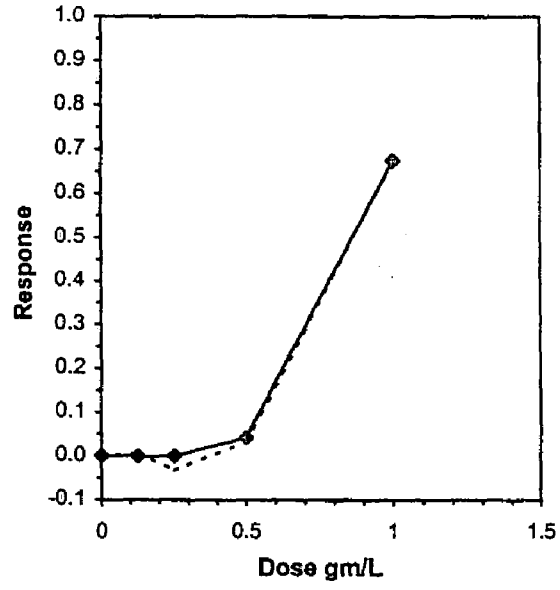
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.4943	1.0000	0.4943	0.4040	0.5520	12.833	4				0.4986	1.0000
0.125	0.4908	0.9929	0.4908	0.4330	0.5330	9.237	4	0.067	2.290	0.1195	0.4986	1.0000
0.25	0.5108	1.0334	0.5108	0.4410	0.5900	12.660	4	-0.316	2.290	0.1195	0.4986	1.0000
0.5	0.4780	0.9671	0.4780	0.3250	0.5670	22.444	4	0.312	2.290	0.1195	0.4780	0.9587
1	0.1620	0.3278	0.1620	0.1620	0.1620	0.000	1				0.1620	0.3249

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94349	0.844	-0.8453	0.37825
Bartlett's Test indicates equal variances (p = 0.56)	2.08291	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	0.5	>0.5			0.11946	0.24169	0.00073	0.00544	0.93806	3, 12

Linear Interpolation (200 Resamples)

Point	gm/L	SD	95% CL(Exp)		Skew
IC05	0.5069	0.1570	0.0000	0.5710	-0.6349
IC10	0.5463	0.0901	0.0221	0.6062	-0.9901
IC15	0.5858	0.0710	0.1490	0.6415	-1.1888
IC20	0.6252	0.0608	0.2262	0.6767	-1.2301
IC25	0.6647	0.0551	0.2940	0.7121	-1.2878
IC40	0.7830	0.0375	0.5423	0.8209	-1.3363
IC50	0.8619	0.0255	0.7033	0.8922	-1.2678



ToxCalc v5.0.23

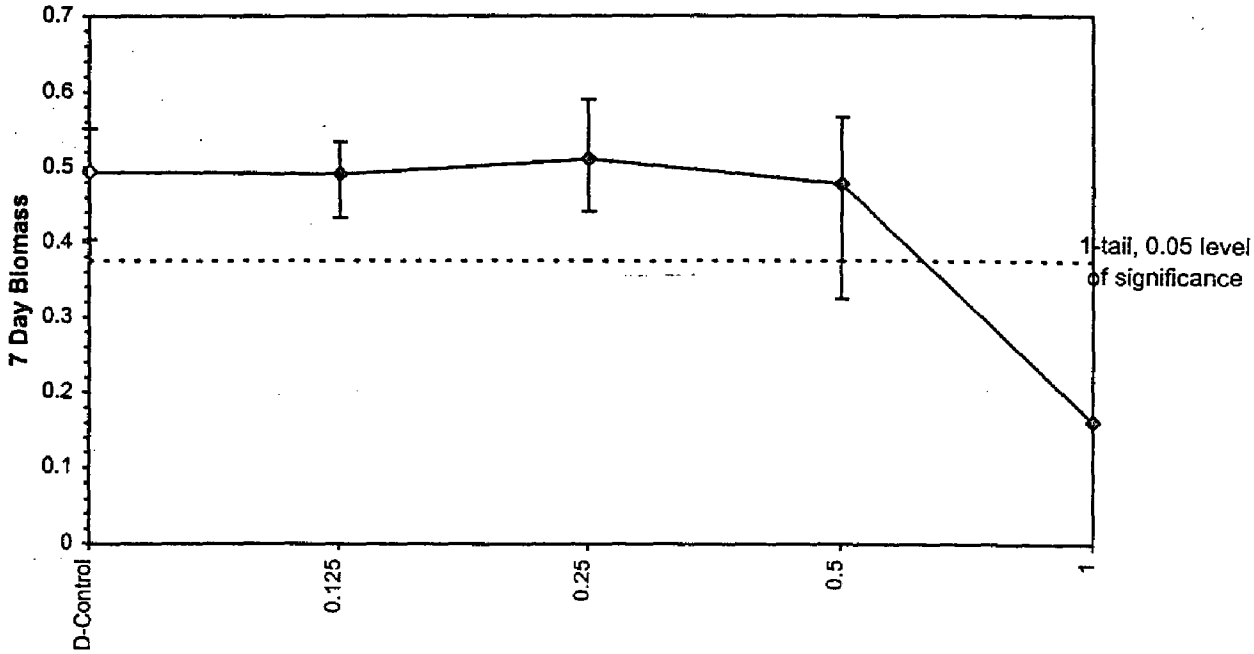
Reviewed by:

SCOEPA00027768

Larval Fish Growth and Survival Test-7 Day Biomass

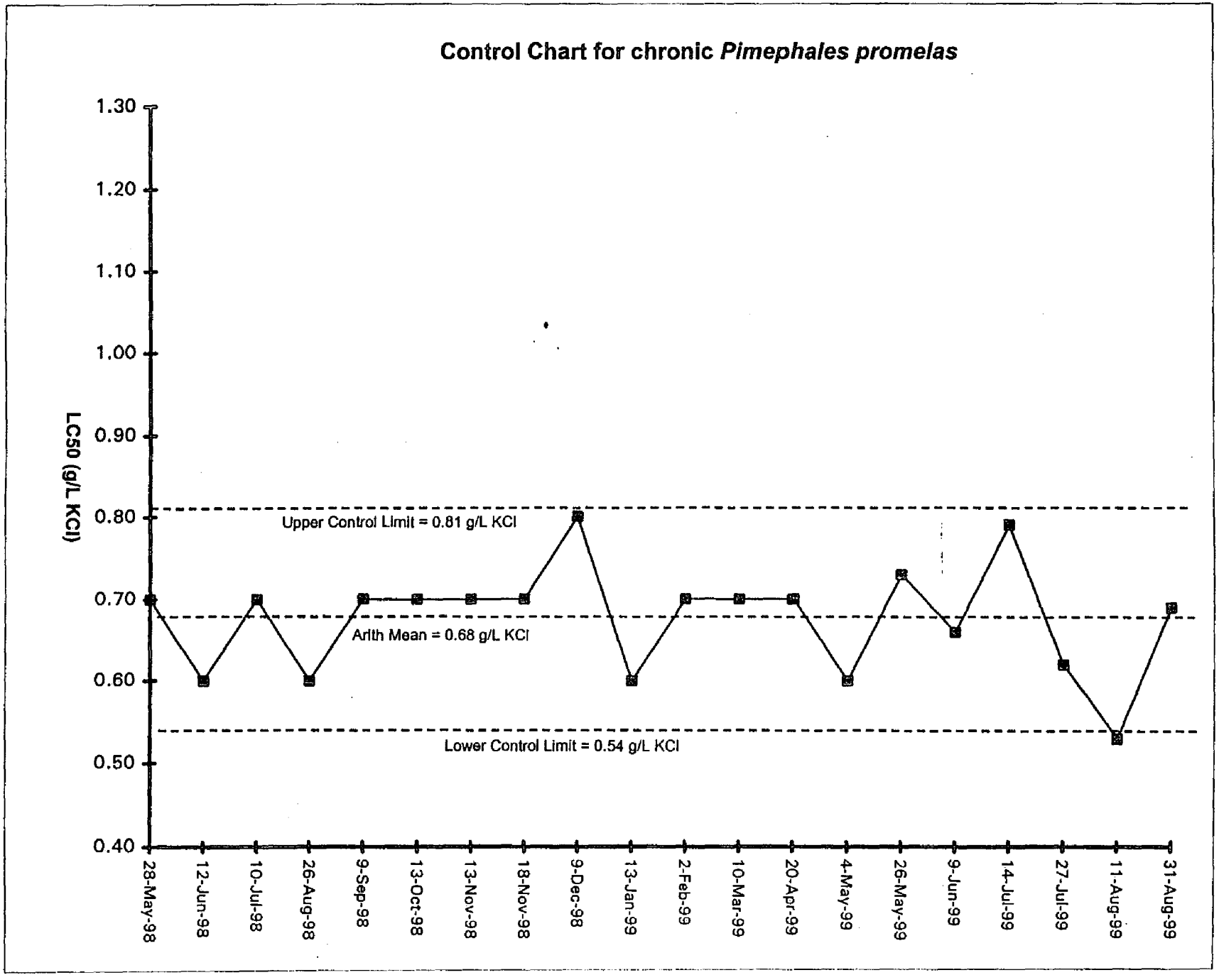
Start Date:	8/31/99 15:30	Test ID:	REFTOX1033	Sample ID:	REF-Ref Toxicant
End Date:	9/7/99	Lab ID:	WAPTL-Parametrix Tox Lab	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Dose-Response Plot



ToxCalc v5.0.23

Reviewed by:


Control Chart for chronic *Pimephales promelas*
LC50 (g/L KCl)
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
Upper Control Limit = 0.81 g/L KCl
Arith Mean = 0.68 g/L KCl
Lower Control Limit = 0.54 g/L KCl
28-May-98
12-Jun-98
10-Jul-98
26-Aug-98
9-Sep-98
13-Oct-98
13-Nov-98
18-Nov-98
9-Dec-98
13-Jan-99
2-Feb-99
10-Mar-99
20-Apr-99
4-May-99
26-May-99
9-Jun-99
14-Jul-99
27-Jul-99
11-Aug-99
31-Aug-99

SCOEPA00027771

APPENDIX D

CHAIN-OF-CUSTODY FORMS AND INITIAL WATER QUALITY PARAMETERS

North Creek Analytical - Portland Subcontract Order
P909143

Sending Laboratory	Receiving Laboratory
h Creek Analytical - Portland 05 SW Nimbus Ave. Beaverton, OR 97008 hone: 503/906-9200 Fax: 503/906-9210 roject Manager: Sara McClurg	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 425-822-8880 Fax: 425-889-8808

Subcontract Order Comments

/8/99 16:50

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
							Collected @ 0810
P909143-01	Water	9/8/99				A	
		9/9/99	Subcontract Outside	9/15/99			Bioassay

1 5 gallon cube of effluent

no tamper-evident seal.
Receiving Temp: 2 °C

Released By J. Roberts Date 9/8/99 Received By G. Mitchell Date 9/9/99

Released By _____ Date _____ Received By _____ Date _____ Page 1 of 1

North Creek Analytical - Portland Subcontract Order
P909143

Sending Laboratory	Receiving Laboratory
orth Creek Analytical - Portland 05 SW Nimbus Ave. Beaverton, OR 97008 one: 503/906-9200 Fax: 503/906-9210 oject Manager: Sara McClurg	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 425-822-8880 Fax: 425-889-8808

Subcontract Order Comments

9/8/99 16:50

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
P909143-01	Water	9/8/99				A	
		~~9/9/99~~	~~Subcontract Outside~~	~~9/20/99~~			~~Bioassay~~ Sent 9/8/99
P 9143-05	Water	9/9/99				A	
		9/10/99	Subcontract Outside	9/20/99			Bioassay

15 gall cube of effluent

No tamper evident seal intact

Receiving temp: 1°

Released By Bob Fa[illegible] Date 9/10/99 Received By [illegible] Date 9/11/99

Released By _____ Date _____ Received By _____ Date _____

North Creek Analytical - Portland Subcontract Order
P909143

Sending Laboratory	Receiving Laboratory
rth Creek Analytical - Portland 9 .)5 SW Nimbus Ave. Beaverton, OR 97008 P.)ne: 503/906-9200 Fax: 503/906-9210 P ject Manager: Sara McClurg	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 425-822-8880 Fax: 425-889-8808

Subcontract Order Comments

9. '99 16:50

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
~~P909143-01~~	~~Water~~	9/8/99				A	
		~~9/9/99~~	~~Subcontract Outside~~	~~9/20/99~~			~~Bioassay~~
~~P909143-05~~	~~Water~~	9/10/99				A	
		~~9/11/99~~	~~Subcontract Outside~~	~~9/20/99~~			~~Bioassay~~
P909143-06	Water	9/13/99				A	
		9/14/99	Subcontract Outside	9/20/99			Bioassay

Released By [signature] Date 9/13 Received By [signature] Date 9/14/99 Temp=10 °C

Released By _____ Date _____ Received By _____ Date _____ Page 1 of 1

Parametrix Environmental Toxicology Laboratory
5808 Lake Washington Boulevard NE, Suite 200
Kirkland, WA 98033

INITIAL WATER QUALITY PARAMETERS

SOURCE: Wacker **CLIENT:** NCA - Portland **CLIENT NO:** 55-1945-12

	SAMPLE #1	SAMPLE #2	SAMPLE #3
Date Sample Collected:	9/8/99	9/10/99	9/13/99
Date Sample Received:	9/9/99	9/11/99	9/14/99
Temperature (°C):	2	1°	1°
Salinity (ppt):	0.2	0.1	0.2
Dissolved Oxygen (mg/L):	8.2	7.6	8.6
pH:	6.8	7.0	7.0
Conductivity (µS):	910	812	905
Hardness (mg/L $CaCO_3$):	136	138	200
Alkalinity (mg/L $CaCO_3$):	22	92	36
Residual Chlorine (mg/L):	AC < 0.01	< 0.01	0.02
Ammonia (mg/L):	AC < 1.0	< 1.0	1.0
Initials:	AC	R	JU

NT= Not Taken

Rev. 2/20/96

RECEIVED OCT 5 1999
TJR
COPY

AQUATIC TOXICOLOGY REPORT:

Prepared for: WACKER SILTRONIC
7200 NW Front Avenue
Portland, OR 97210

Prepared by: COFFEY LABORATORIES, INC.
Portland, OR 97230

COPY

AQUATIC TOXICOLOGY REPORT:

CHRONIC DEFINITIVE
BIOASSAYS CONDUCTED
August 31 through September 8, 1999
MX990830T

Ceriodaphnia dubia
Pimephales promelas

Prepared for:

WACKER SILTRONIC
7200 NW Front Avenue
Portland, OR 97210

Prepared by:

COFFEY LABORATORIES, INC.
12423 NE Whitaker Way
Portland, OR 97230

September 30, 1999

SCOEPA00027778

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SCOEPA00027779

ANALYTICAL NARRATIVE

Mr. Thomas J. Rothschild
Wacker Siltronic
7200 NW Front Avenue
Portland, OR 97210

September 30, 1999
Job #: MX990830T

COPY

Re: Statistical Analysis - Toxicity Tests

Coffey Laboratories, Inc. has completed the statistical analysis of the data collected from dual endpoint toxicity tests which were conducted from 8/31/99 through 9/8/99 on effluent provided by Wacker Siltronic. The enclosed report includes a summary of the *Ceriodaphnia dubia* and Fathead Minnow tests and results, along with the raw data and statistical summaries for the effluent and reference toxicant.

In summary of the statistical analyses, the *Ceriodaphnia dubia* chronic test showed a significant reduction in survival and reproduction at the 25 and 6.25 percent effluent concentrations when compared to survival and reproduction in the controls. Therefore, the chronic No-Observable-Effect-Concentration (NOEC) values for *Ceriodaphnia dubia* survival and reproduction were 12.5 and < 6.25 percent effluent respectively. The chronic Lowest-Observable-Effect-Concentration (LOEC) values for *Ceriodaphnia dubia* survival and reproduction were 25 and 6.25 percent effluent, respectively. The chronic LC_{50} value for *Ceriodaphnia dubia* survival was 11.74 percent effluent. The chronic IC_{25} value (an estimate of the effluent concentration causing a 25 percent reduction in biological growth) for *Ceriodaphnia dubia* reproduction was < 6.25 percent effluent. The Fathead Minnow chronic test showed a significant difference in survival at the 100 percent effluent concentration when compared to survival in the controls. The chronic NOEC values for Fathead Minnow survival and growth were 50 percent effluent. The LOEC value for Fathead Minnow survival was 100 percent. The chronic LC_{50} value for Fathead Minnow survival was > 100 percent effluent, and the chronic IC_{25} value for Fathead Minnow growth was 63.49 percent effluent.

Acute data was derived from the chronic test data in the *Ceriodaphnia dubia* and Fathead Minnow tests. Data from both the *Ceriodaphnia dubia* and Fathead Minnow 48-hour acute tests showed no toxicity at the 100 percent effluent concentrations. Thus, the acute NOEC values for *Ceriodaphnia dubia* and Fathead Minnow survival were both 100 percent effluent.

Coffey Laboratories' Aquatic Toxicology Department is accredited by the Washington State Department of Ecology which demonstrates the high priority we place on Quality Assurance. It is our goal to meet all of your needs by offering the highest quality services in the most efficient manner possible. If you would like further assistance, or should you have other questions regarding Aquatic testing, please feel free to contact me at (503) 254-1794, ext. 241. We look forward to working with you in the future to ensure the health of our Northwest waterways.

Sincerely,
COFFEY LABORATORIES, INC.

Jason Cowley
Aquatic Biologist

Approved by,

Sue Coffey
President

COFFEY LABORATORIES, INC.
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INTRODUCTION

Coffey Laboratories, Inc. conducted two chronic definitive bioassay tests using the water flea (*Ceriodaphnia dubia*) and the Fathead Minnow (*Pimephales promelas*) on samples provided by Wacker Siltronic. The tests were conducted from August 31 through September 8, 1999.

METHODS AND MATERIALS

Test Methods: The chronic test methods were performed according to *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* Lewis, P.A. *et al.*; EPA/600/4-91/002 (1994). The acute test results were derived from the chronic data and were analyzed according to *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* Weber, C.I. *et al.*; EPA/600/4-90/027F (1993).

Test Organisms: The *Ceriodaphnia dubia* used in the chronic test were obtained from Coffey Laboratories, Inc. in-house cultures and were less than 24 hours old and within an 8-hour age range at test initiation. The Fathead Minnows used in the chronic test were obtained from Aquatic Biosystems, Inc., Ft. Collins, CO (See Appendix D) and were 24 - 36 hours old at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA/600/4-91/002 (1994). The test organisms appeared vigorous and in good condition prior to testing.

Dilution Water: The dilution water used for the Fathead Minnow and *Ceriodaphnia dubia* tests was reconstituted moderately hard water (EPA/600/4-91/002) with a total hardness and alkalinity of 100 and 60 mg/L as $CaCO_3$, respectively.

Test Concentrations: The concentrations tested in the chronic tests were 6.25, 12.5, 25, 50, and 100 percent effluent and dilution water alone for the control. Ten fish were placed in each of four replicates per concentration for the Fathead Minnow chronic test. For the chronic *Ceriodaphnia* test, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel.

Sample Collection: Samples were collected by Wacker Siltronic personnel on August 30, and September 1, and 3 (See Chains-of-Custody). The samples were picked up by Coffey Laboratories personnel and transported to the laboratory. Samples were stored in the dark at 4°C until test solutions were prepared.

Sample Preparation: The samples used during these tests were diluted and temperature adjusted prior to each daily renewal.

Monitoring of Bioassays: Pre- and post-renewal solutions were monitored for conductivity and dissolved oxygen daily in each concentration, as well as for pH in the control and 100 percent effluent concentration. Additionally, the pH was measured in all the post-renewal solutions of every concentration. Alkalinity and hardness were measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was monitored daily in the chronic test. According to EPA/600/4-91/002 (1994), *Ceriodaphnia dubia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia* in the controls have produced their third brood and at least 15 neonates per adult. In addition, control organism survival must be equal to or greater than 80 percent. Fathead Minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the Fathead Minnow chronic test. Temperature was monitored continuously throughout the 7-day period.

Data Analysis: All statistical analyses were performed using WEST, Inc. computer package, Toxstat, Version 3.5. This program utilizes, among others, Dunnett's, Steel's Many One Rank Sum, and Wilcoxon's Rank Sum Analyses for the hypothesis endpoint estimates, and Probit, Spearman-Karber, and Linear Interpolation methods for point estimates.

The effect measured for acute tests is survival over the exposure period. The effects measured for *Ceriodaphnia dubia* chronic tests are survival and reproduction over the 7-day exposure period. The effects measured for Fathead Minnow chronic tests are survival and growth over the 7-day exposure period. The statistical analyses performed are those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* EPA/600/4-91/002, and *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms,* EPA/600/4-90/027F. Dunnett's, T-test with Bonferroni Adjustment, Steel's Many-One Rank Sum, or Wilcoxon Rank Sum Tests are used to determine the No-Observed-Effect-Concentration (NOEC) and the Lowest-Observed-Effect-Concentration (LOEC) when analyzing the survival and growth data of the Fathead Minnow, as well as the reproduction data of the *Ceriodaphnia dubia*. Fisher's Exact Test is used to analyze the survival data of the *Ceriodaphnia dubia* tests. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test with Bonferroni Adjustment cannot be met, Steel's Many-One Rank Sum Test or Wilcoxon Rank Sum with Bonferroni Adjustment is used to analyze the data. In addition, the Linear Interpolation method is used to determine the chronic IC_{25} values (the concentration of effluent causing a 25 percent reduction in biological growth) for the Fathead Minnow growth data and the *Ceriodaphnia dubia* reproduction data.

RESULTS AND DISCUSSION

Table 1 summarizes the chronic bioassay results.

Table 1
Chronic Bioassay Results

	Ceriodaphnia dubia		Fathead Minnow	
Evaluation	Survival (% effluent)	Reproduction (% effluent)	Survival (% effluent)	Growth (% effluent)
NOEC	12.5	<6.25	50	50
LOEC	25	6.25	100	--
Point Estimate	11.74 (LC_{50})	<6.25 (IC_{25})	>100 (LC_{50})	63.49 (IC_{25})

Table 2 summarizes the acute bioassay results.

Table 2
48-Hour Acute Bioassay Results

	Survival (% effluent)	
Evaluation	*Ceriodaphnia dubia*	Fathead Minnow
NOEC	100	100
LOEC	>100	>100
LC_{50}	>100	>100

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RESULTS AND DISCUSSION (Cont.)

Chronic Bioassays:

Table 3 summarizes the survival and growth data for the Fathead Minnow test conducted.

Table 3
Fathead Minnow Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight per Fish (mg)
Control	97.5	0.594
6.25	90	0.472
12.5	100	0.633
25	92.5	0.574
50	92.5	0.500
100	70 *	--

* Indicates a statistically significant reduction from control at $p \leq$ to 0.05 using Steel's Many-One Rank Test or Dunnett's Test.

Results using Steel's Many-One Rank Test showed a statistically significant reduction in survival when compared to the control at the 100 percent effluent concentration. Dunnett's Test showed no further reduction in growth when compared to the control at any effluent concentration. Therefore, the NOEC values for survival and growth were both 50 percent effluent. The LOEC value for survival was 100 percent effluent. Control survival was 97.5 percent.

The chronic LC_{50} value (an estimate of the effluent concentration which is lethal to 50 percent of the test organisms) for Fathead Minnow survival was >100 percent effluent. The chronic IC_{25} value for Fathead Minnow growth was 63.49 percent effluent. The EPA has indicated that the IC_{25} is the approximate analogue of the NOEC (Technical Support Document for Water Quality Based Toxics Control EPA/505/2-90-001, March 1991), making it a valuable indicator of chronic aquatic toxicity.

The dissolved oxygen levels remained above 40 percent saturation throughout the tests. Test temperatures were steady at $25 \pm 1°C$. The tests proceeded without interruption or incident that could have affected test results.

RESULTS AND DISCUSSION (Cont.)

Chronic Bioassays (Cont.):

Table 4 summarizes the survival and reproduction data for the *Ceriodaphnia dubia* test.

Table 4
***Ceriodaphnia dubia* Results**

Concentration (%)	Percent Survival	Number of Young per Adult
Control	80	15.6
6.25	70	6.9 *
12.5	40	1.7 *
25	20 *	0.7 *
50	0 *	0 *
100	0 *	0 *

* Indicates a statistically significant reduction from control at $p \leq$ to 0.05 using Fisher's Exact Test or Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment.

Results using Fisher's Exact Test showed a statistically significant reduction in survival when compared to the control at the 25, 50, and 100 percent effluent concentrations. In addition, Wilcoxon's Rank Sum Test w/ Bonferroni adjustment showed a reduction in reproduction when compared to the control at the 6.25 and 12.5 percent effluent concentrations. Therefore, the NOEC values for survival and reproduction were 12.5 and <6.25 percent effluent, respectively. The LOEC values for survival and reproduction were 25 and 6.25 percent effluent, respectively. Control survival was 80 percent.

The chronic LC_{50} value for *Ceriodaphnia dubia* survival was 11.74 percent effluent. The chronic IC_{25} value for *Ceriodaphnia dubia* reproduction was <6.25 percent effluent.

The dissolved oxygen levels in the tests remained above 40 percent saturation throughout the test. Test temperatures were steady at $25 \pm 1°C$. The tests proceeded without interruption or incident that could have affected test results.

RESULTS AND DISCUSSION (Cont.)

Acute Results:

Table 5 summarizes the survival data for the acute screening tests using the Fathead Minnow and the *Ceriodaphnia dubia*.

Table 5
Summary of 48-Hour Acute Results

Species	Concentration (%)	Percent Survival		
		0 Hour	24 Hours	48 Hours
Fathead Minnow	Control	100	100	100
	100	100	97.5	95
Ceriodaphnia dubia	Control	100	100	100
	100	100	90	60

* Indicates a statistically significant reduction from the control at $p \leq 0.05$ using the Modified t-Test or Steel's Many-One Rank Test.

Dual-endpoint testing allows the acute test results to be derived from the chronic test data. In the Fathead Minnow 48-hour acute test, the Modified t-Test showed no statistically significant reduction in survival between the control organisms and those in the 100 percent effluent concentration. In addition, Steel's Many-One Rank Test showed no significant difference in survival between the control organisms and those in the effluent concentrations in the *Ceriodaphnia dubia* 48-hour acute test. Therefore, the acute NOEC values for Fathead Minnow and *Ceriodaphnia dubia* survival were both 100 percent effluent.

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RESULTS AND DISCUSSION (Cont.)

Reference Toxicant Tests:

Tables 6 & 7 summarize the results from the *Ceriodaphnia dubia* and the Fathead Minnow chronic and acute reference toxicant tests conducted in August.

Table 6
Chronic Reference Toxicant Tests with Sodium Chloride

Species (test)	Point Estimates	95% C.I.
Pimephales promelas (survival - LC_{50})	3.82 g/L	3.44 - 4.19 g/L
Pimephales promelas (growth - IC_{25})	1.50 g/L	1.47 - 1.53 g/L
Ceriodaphnia dubia (survival - LC_{50})	1.39 g/L	1.17 - 1.60 g/L
Ceriodaphnia dubia (reproduction - IC_{25})	0.61 g/L	0.51 - 0.65 g/L

Table 7
Acute Reference Toxicant Tests

Species	LC_{50}	95% C.I.
Pimephales promelas	5.04 g/L	4.65 - 5.43 g/L
Ceriodaphnia dubia	1.75 g/L	1.75 - 1.75 g/L

The reference toxicant tests with sodium chloride conducted in August showed that test organisms were within their respective sensitivity range based on EPA guidelines (EPA/600/4-91/002, 1994).

The chronic IC_{25} values, as well as the LC_{50} values and the respective 95 percent confidence intervals are listed in the Tables above. The data sheets for the reference toxicant tests are provided in Appendix B.

WATER QUALITY PARAMETERS

Lab Sample ID: 990830T-1
Field ID: 99-85
Date/Time: 08/30/99 0800
Matrix: Waste Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Conductivity	EPA 120.1	0.5	920.	µmhos/cm
Alkalinity	EPA 310.1	0.5	16.	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Ammonia Nitrogen	SM4500-NH3-B/C	0.2	ND	mg/L

ND means none detected at or above the detection limit listed.

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Total Hardness	SM 2340-B	0.5	210.	mg/L
Calcium	EPA 200.7	0.3	78.	mg/L
Magnesium	EPA 200.7	0.05	3.6	mg/L

WATER QUALITY PARAMETERS (cont.)

Lab Sample ID: 990830T-2
Field ID: 99-86
Date/Time: 09/01/99 0800
Matrix: Waste Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Conductivity	EPA 120.1	0.5	2300.	μmhos/cm
Alkalinity	EPA 310.1	1.	13.	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Ammonia Nitrogen	SM4500-NH3-B/C	0.2	0.8	mg/L

ND means none detected at or above the detection limit listed.

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Total Hardness	SM 2340-B	0.5	1000.	mg/L
Calcium	EPA 200.7	3.	400.	mg/L
Magnesium	EPA 200.7	0.25	9.	mg/L

WATER QUALITY PARAMETERS (cont.)

Lab Sample ID: 990830T-3
Field ID: 99-86
Date/Time: 09/03/99 0745
Matrix: Waste Water

EPA Category: Conventional Parameters

Parameter	Method	Detection Limit	Analytical Result	Units
Conductivity	EPA 120.1	0.5	840.	µmhos/cm
Alkalinity	EPA 310.1	0.5	12.	mg/L
Residual Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Total Chlorine	SM 4500-Cl-G	0.05	ND	mg/L
Chloramine	SM 4500-Cl-G	0.05	ND	mg/L
Ammonia Nitrogen	SM4500-NH3-B/C	0.2	0.4	mg/L

ND means none detected at or above the detection limit listed.

EPA Category: Metals

Parameter	Method	Detection Limit	Analytical Result	Units
Total Hardness	SM 2340-B	0.5	165.	mg/L
Calcium	EPA 200.8	0.05	64.	mg/L
Magnesium	EPA 200.8	0.05	1.2	mg/L

APPENDIX A

RAW DATA SHEETS

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CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

) Number: NY9908307 | Test Organism: FHM | Test Initiation: 8-31-99 | Analyst(s):
Custabbr: Wackersdorf | Dates Delivered: 8/31, 9/1, 9/3 | Test Conclusion: 9/7/99 | Reviewed by:
Sample/Source Name: EE | Dates Collected: " " " | Dechlorination:

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
0%	0	8/31		7.71	—	8.4	—	347	—				
	1	9/1		7.65	7.64	8.4	8.1	363	357				
	2	9/2		7.61	7.69	8.2	7.9	352	370				
	3	9/3		7.71	7.66	8.3	7.5	333	361				
	4	9/4		7.59	7.70	8.3	7.2	341	340				
	5	9/5		7.48	7.61	8.4	7.0	339	343				
	6	9/6		7.38	7.37	8.4	6.6	319	322				
	7	9/7		—	7.39	—	6.4	—	326				
6.25%	0	8/31		—	—	8.3	—	398	—				
	1	9/1		—	7.59	8.4	7.9	393	390				
	2	9/2		—	7.64	8.2	7.8	451	396				
	3	9/3		—	7.62	8.4	7.5	460	472				
	4	9/4		—	7.62	8.3	7.3	351	468				
	5	9/5		—	7.60	8.3	6.8	350	362				
	6	9/6		—	7.33	8.3	6.5	347	340				
	7	9/7		—	7.40	—	6.4	—	371				
12.5%	0	8/31		—	—	8.3	—	416	—				
	1	9/1		—	7.58	8.4	7.8	428	426				
	2	9/2		—	7.62	8.2	7.8	540	431				
	3	9/3		—	7.60	8.4	7.5	539	552				
	4	9/4		—	7.60	8.2	7.4	~~541~~ 543	513				
	5	9/5		—	7.55	8.2	6.8	387	399				
	6	9/6		—	~~7.46~~ 7.33	8.4	6.5	380	391				
	7	9/7		—	7.42	—	6.5	—	398				
25%	0	8/31		—	—	8.3	—	471	—				
	1	9/1		—	7.55	8.4	7.6	489	495				
	2	9/2		—	7.60	8.2	7.8	815	499				
	3	9/3		—	7.58	8.4	7.4	821	837				
	4	9/4		—	7.60	8.2	7.4	451	859				
	5	9/5		—	7.51	8.2	6.8	448	462				
	6	9/6		—	7.43	8.4	6.5	442	459				
	7	9/7		—	7.50	—	6.5	—	463				

ents:

SCOEPA00027792

CHRONIC RENEWAL LARVAE TOXICITY TEST - QUALITY ASSURANCE PARAMETERS

ob Number: MX990830T
.ustabbr: Wackersitt
ple/Source Name: Eff.

Test Organism: FHM
Dates Delivered:
Dates Collected:

Test Initiation: 8/31/99
Test Conclusion: 9/7/99
Dechlorination:

Analyst(s):
Reviewed by:

Conc.	Day	Date	Initials	MEASUREMENTS									
				pH		DO		Sp. Cond.		(mg/L)			
				New	Old	New	Old	New	Old	Alkalinity	Hardness	Ammonia	Chlorine
50%	0	8/31		—	—	8.3	—	619	—				
	1	9/1		—	7.50	8.4	7.5	625	634				
	2	9/2		—	7.52	8.2	7.6	1210	640				
	3	9/3		—	7.49	8.4	7.4	1237	1292				
	4	9/4		—	7.56	8.2	7.4	570 1244	1241				
	5	9/5		—	7.42	8.2	6.8	581	591				
	6	9/6		—	7.39	8.4	6.5	568	596				
	7	9/7		—	7.66	—	6.5	—	602				
100%	0	8/31		7.39	—	8.3	—	910	—				
	1	9/1		7.41	7.47	8.4	7.4	904	917				
	2	9/2		7.24	7.37	8.3	7.6	2200	910				
	3	9/3		7.19	7.31	8.4	7.4	2190	2310				
	4	9/4		7.41	7.24	8.2	7.3	830	2240				
	5	9/5		7.40	7.46	8.2	6.8	823	854				
	6	9/6		7.39	7.36	8.4	6.5	819	869				
	7	9/7		—	7.40	—	4.5	—	878				
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	0												
	1												
	2												
	3												
	4												
	5												
	6												
	7												

nts:

CHRONIC RENEWAL LARVAE TOXICITY TEST

Job Number: ~~Nark~~ MX990830T
Custabbr: Wackersilt
Sample/Source Name: Eff

Test Organism: FHM
Dates Delivered: 8/31, 9/1, 9/3
Dates Collected: " " "

Test Initiation: 8/31/99 ~ 14:00
Test Conclusion: 9/7/99 ~ 14:30
H_2O Batch #: 990831
Feeding Regime: 0.1 ml Artemia, 3x/daily

Analyst(s): [signature]
Reviewed by:
Randomization Chart #:

Conc.	Rep.	Number Organisms/ Container	Immobile/Mortality 0	24	48	72	96	120	144	168	Total Mort.	Temperature (°C) 0	24	48	72	96	120	144	168
Pink	1	10	0	0	0	0	0	0	0	0	0	25						25	
	2	10	0	0	0	0	0	0	0	0	0		25				25		
	3	10	0	0	0	0	0	0	0	0	0			25		25			
	4	10	0	0	0	0	0	0	0	0	0				24.5				
Green	1	10	0	1	0	~~1~~ 2	0	0	0	0	3	25						25	
	2	10	0	0	0	1	1	1	0	0	3		25				25		
	3	10	0	0	1	0	1	0	0	1	3			25		25			
	4	10	0	0	0	1	1	1	0	0	3				25				
Red	1	10	0	0	0	0	0	0	0	1	1	25						25	
	2	10	0	0	0	0	0	1	0	0	1		25				25		
	3	10	0	0	0	0	0	0	0	0	0			25		25			
	4	10	0	0	0	0	0	2	0	0	2				24.5				
Orange	1	10	0	0	0	0	0	0	0	0	0	25						25	
	2	10	0	0	0	0	0	0	0	0	0		25				25		
	3	10	0	0	0	0	1	0	0	0	1			25		25			
	4	10	0	0	0	0	0	0	0	0	0				25				
Yellow	1	10	0	0	0	0	0	0	0	0	0	25						25	
	2	10	0	~~0~~ 1	0	0	0	0	0	0	1		25				25		
	3	10	0	0	0	0	2	0	0	0	2			25		25			
	4	10	0	0	0	0	0	0	0	0	0				25				
Blue	1	10	0	0	0	0	0	0	0	0	0	25						25	
	2	10	0	0	0	0	0	0	0	0	0		25				25		
	3	10	0	0	0	~~0~~ 1	1	0	0	0	2			25		25			
	4	10	0	0	0	0	0	0	0	1	1				25				
	1																		
	2																		
	3																		
	4																		

ANALYST: [signature]

Comments:

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: MX990830T
Test Dates: 8/31/99 - 9/7/99
Weighing Date: 9/9/99
Analyst: JC

Custabbr: WACKERSILT
Drying Temp.: 102°C
Drying Time (h): 24 hrs.
Reviewed by: _____

Conc.	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (mg)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (mg)	Average wt. per conc. (mg)
Control	1	1.08343	1.08969	6.260	10	0.626	
	2	1.06849	1.07610	7.610	10	0.761	
0 %	3	1.07940	1.08544	6.040	10	0.604	
	4	1.08094	1.08477	3.830	10	0.383	0.594
Conc.	1	1.08256	1.08688	4.320	10	0.432	
	2	1.08442	1.08990	5.480	10	0.548	
6.25 %	3	1.07344	1.07841	4.970	10	0.497	
	4	1.09227	1.09637	4.100	10	0.410	0.472
Conc.	1	1.07717	1.08282	5.650	10	0.565	
	2	1.08959	1.09616	6.570	10	0.657	
12.5 %	3	1.08880	1.09558	6.780	10	0.678	
	4	1.07695	1.08328	6.330	10	0.633	0.633
Conc.	1	1.09626	1.10283	6.570	10	0.657	
	2	1.08907	1.09310	4.030	10	0.403	
25 %	3	1.07624	1.08241	6.170	10	0.617	
	4	1.08065	1.08685	6.200	10	0.620	0.574
Conc.	1	1.07978	1.08355	3.770	10	0.377	
	2	1.08098	1.08694	5.960	10	0.596	
50 %	3	1.07909	1.08312	4.030	10	0.403	
	4	1.09668	1.10293	6.250	10	0.625	0.500
Conc.	1	1.08075	1.08448	3.730	10	0.373	
	2	1.08357	1.08587	2.300	10	0.230	
100 %	3	1.08365	1.08709	3.440	10	0.344	
	4	1.08298	1.08535	2.370	10	0.237	0.296

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Revision #: 1.00
Revision Date: 11/18/93

CHRONIC RENEWAL LARVAE GROWTH DATA

Job Number: MX990830T
Test Dates: 8/31/99, 9/7/99
Weighing Date: 9/9/99
Analyst:

Custabbr: Wickersilt
Drying Temp. (°C): 102° C
Drying Time (h): 24 hrs.
Reviewed by:

Conc.	Rep. No.	A Wt. of dry boat (g)	B Dry wt. boat & larvae (g)	B-A Total dry wt. of larvae (g)	C No. of larvae	(B-A)/C Mean dry wt. of larvae (g)	Remarks
Control	1	1.08343	1.08969				
	2	1.06849	1.07610				
0%	3	1.07940	1.08544				
	4	1.08094	1.08477				
Conc.	1	1.08256	1.08688				
	2	1.08442	1.08990				
6.25%	3	1.07344	1.07841				
	4	1.09227	1.09637				
Conc.	1	1.07717	1.08282				
	2	1.08959	1.09616				
12.5%	3	1.08880	1.09558				
	4	1.07695	1.08328				
Conc.	1	1.09626	1.10283				
	2	1.08907	1.09310				
25%	3	1.07624	1.08241				
	4	1.08065	1.08685				
Conc.	1	1.07978	1.08355				
	2	1.08098	1.08694				
50%	3	1.07909	1.08312				
	4	1.09668	1.10293				
Conc.	1	1.08075	1.08448				
	2	1.08357	1.08587				
100%	3	1.08365	1.08709				
	4	1.08298	1.08535				

Title: WACKER FATHEAD CHRONIC - SURVIVAL, 8/31/99
File: 0830tfs Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

D = 0.1961
W = 0.9056

Critical W = 0.8840 (alpha = 0.01 , N = 24)
W = 0.9160 (alpha = 0.05 , N = 24)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: WACKER FATHEAD CHRONIC - SURVIVAL, 8/31/99
File: 0830TFS . Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's Test for Homogeneity of Variance
Bartlett's Test for Homogeneity of Variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Title: WACKER FATHEAD CHRONIC - SURVIVAL, 8/31/99
File: 0830TFS . Transform: ARC SINE(SQUARE ROOT(Y))

Steel's Many-One Rank Test - Ho: Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	DF	SIG 0.05
1	0 CONTROL	1.3713				
2	6.25 %	1.2543	13.50	10.00	4.00	
3	12.5 %	1.4120	20.00	10.00	4.00	
4	25 %	1.2951	15.50	10.00	4.00	
5	50 %	1.2951	15.50	10.00	4.00	
6	100 %	0.9912	10.00	10.00	4.00	*

Critical values are 1 tailed (k = 5)

Title: WACKER FATHEAD CHRONIC - SURVIVAL, 8/31/99
File: 0830TF5 Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.2060	4.3560	6.8760	4.3560	1.2060
OBSERVED	0	8	4	6	0

Chi-Square = 7.2838 (p-value = 0.1216)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: WACKER FATHEAD CHRONIC - SURVIVAL, 8/31/99
File: 0830TF5 Transform: NO TRANSFORMATION

Probit Analysis - not Using Smoothed Proportions

DOSE	NUMBER SUBJECTS	NUMBER OBSERVED	OBSERVED PROPORTION	PREDICTED PROPORTION
6.25	40	4	0.1000	0.0423
12.50	40	0	0.0000	0.0495
25.00	40	3	0.0750	0.0670
50.00	40	3	0.0750	0.1156
100.00	40	12	0.3000	0.2761

Est. Mu = 149.3029 Est. Sigma = 82.9419
sd = 28.4296 sd = 22.6634

Chi-Square lack of fit = 6.1747 Likelihood lack of fit = 7.3523
Table Chi-square = 11.3449 (alpha = 0.01, df = 3)
Table Chi-square = 7.8147 (alpha = 0.05, df = 3)

Title: WACKER FATHEAD CHRONIC - SURVIVAL, 8/31/99
File: 0830TF5 Transform: NO TRANSFORMATION

Probit LC Estimates
WITHOUT CONTROL DATA

POINT	EST. END POINT	95% CONFIDENCE LIMITS	
LC 1	-43.6488	-98.8742	11.5765
LC 5	12.8756	-16.3503	42.1015
LC10	43.0086	22.2093	63.8079
LC20	79.4973	54.6095	104.3850
LC25	93.3595	63.5173	123.2016
LC30	105.8081	70.7652	140.8511
LC40	128.2898	82.8732	173.7064
LC50	149.3029	93.5809	205.0250
LC60	170.3160	103.9796	236.6525
LC70	192.7977	114.9061	270.6894
LC75	205.2464	120.8979	289.5949
LC80	219.1086	127.5347	310.6825
LC90	255.5973	144.8787	366.3159
LC95	285.7303	159.1101	412.3504
LC99	342.2547	185.6753	498.8341

Title: WACKER FATHEAD CHRONIC - GROWTH, 8/31/99
File: 0830tfg Transform: NO TRANSFORMATION

Shapiro - Wilk's Test for Normality

D = 0.1821
W = 0.9641

Critical W = 0.8680 (alpha = 0.01 , N = 20)
W = 0.9050 (alpha = 0.05 , N = 20)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: WACKER FATHEAD CHRONIC - GROWTH, 8/31/99
File: 0830tfg Transform: NO TRANSFORMATION

Bartlett's Test for Homogeneity of Variance

Calculated B1 statistic = 4.3333 (p-value = 0.3628)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

Critical B = 13.2767 (alpha = 0.01, df = 4)
= 9.4877 (alpha = 0.05, df = 4)

Title: WACKER FATHEAD CHRONIC - GROWTH, 8/31/99
File: 0830tfg Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	4	0.0716	0.0179	1.4749
Within (Error)	15	0.1821	0.0121	
Total	19	0.2537		

(p-value = 0.2591)

Critical F = 4.8932 (alpha = 0.01, df = 4,15)
= 3.0556 (alpha = 0.05, df = 4,15)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Title: WACKER FATHEAD CHRONIC - GROWTH, 8/31/99
File: 0830tfg Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG 0.05
1	0 CONTROL	0.5935	0.5935		
2	6.25 %	0.4717	0.4717	1.5628	
3	12.5 %	0.6332	0.6332	-0.5102	
4	25.0 %	0.5742	0.5742	0.2471	
5	50.0 %	0.5003	0.5003	1.1970	

Dunnett critical value = 2.3600 (1 Tailed, alpha = 0.05, df = 4,15)

Title: WACKER FATHEAD CHRONIC - GROWTH, 8/31/99
File: 0830tfg Transform: NO TRANSFORMATION

Dunnett's Test - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	0 CONTROL	4			
2	6.25 %	4	0.1839	31.0	0.1218
3	12.5 %	4	0.1839	31.0	-0.0397
4	25.0 %	4	0.1839	31.0	0.0193
5	50.0 %	4	0.1839	31.0	0.0933

Title: WACKER FATHEAD CHRONIC - GROWTH, 8/31/99
File: 0830tfi Transform: NO TRANSFORMATION

GRP	IDENTIFICATION	MEAN	SMOOTHED MEAN	CONCENTRATION
1	0 CONTROL	0.5935	0.5935	0.0000
2	6.25 %	0.4717	0.5597	6.2500
3	12.5 %	0.6332	0.5597	12.5000
4	25.0 %	0.5742	0.5597	25.0000
5	50.0 %	0.5003	0.5003	50.0000
6	100.0 %	0.2960	0.2960	100.0000

ICp estimate with p = 25 is 63.4945

Bootstrap estimate did not exist for 4 iterations.
Bootstrap results using 476 iterations:

Mean = 57.1070 Standard Deviation = 14.3754
95% Confidence Interval: (22.2030 , 78.5781)
Adjusted Interval: (-2.5718 , 87.6283)

Title: WACKER FATHEAD ACUTE - 8/31/99
File: 0830tfa Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

D = 0.0266
W = 0.8493

Critical W = 0.7490 (alpha = 0.01 , N = 8)
W = 0.8180 (alpha = 0.05 , N = 8)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: WACKER FATHEAD ACUTE - 8/31/99
File: 0830tfa Transform: ARC SINE(SQUARE ROOT(Y))

F-Test for Equality of Two Variances

GROUP	IDENTIFICATION	VARIANCE	F
1	0 CONTROL	0.0000	
2	100 %	0.0089	99999.0000

(p-value = 0.0000)

Critical F = 47.4672 (P=0.01, 3, 3)
15.4392 (P=0.05, 3, 3)

Since F > Critical F, REJECT Ho: Equal Variances (alpha = 0.01).

NOTE: This test requires positive variances. If one of the variances is zero, the test will always reject Ho: Equal Variances.

Title: WACKER FATHEAD ACUTE - 8/31/99
File: 0830tfa Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA Table

SOURCE	DF	SS	MS	F
Between	1	0.0133	0.0133	3.0000
Within (Error)	6	0.0266	0.0044	
Total	7	0.0398		

(p-value = 0.1340)

Critical F = 13.7450 (alpha = 0.01, df = 1,6)
= 5.9874 (alpha = 0.05, df = 1,6)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

Title: WACKER FATHEAD ACUTE - 8/31/99
File: 0830tfa Transform: ARC SINE(SQUARE ROOT(Y))

2 Sample t-Test - TABLE 1 OF 2 Ho: Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	TRANS t STAT	SIG 0.05
1	0 CONTROL	1.4120	1.0000		
2	100 %	1.3305	0.9500	1.7321	

Equal Var: t critical value = 1.9432 (1 Tailed, alpha = 0.05, df = 6)
(p-value = 0.0670)

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	TRANS T STAT	SIG 0.05
1	0 CONTROL	1.4120	1.0000		
2	100 %	1.3305	0.9500	1.7321	

Unequal Var: t critical value = 2.3534 (1 Tailed, alpha = 0.05, df = 3)
(p-value = 0.0908)

Title: WACKER FATHEAD ACUTE - 8/31/99
File: 0830tfa Transform: ARC SINE(SQUARE ROOT(Y))

2 Sample t-Test - TABLE 2 OF 2 Ho: Control<Treatment

Equal Variances:

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	0 CONTROL	4			
2	100 %	4	0.0363	3.7	0.0500

Unequal Variances:

GROUP	IDENTIFICATION	NUM OF REPS	MIN SIG DIFF (IN ORIG. UNITS)	% OF CONTROL	DIFFERENCE FROM CONTROL
1	0 CONTROL	4			
2	100 %	4	0.0459	4.7	0.0500

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Number: MX990830T
Lab: Wackersilt
Site/Source Name: CFT

Test Organism: C. dubia
Dates Delivered: 8/30, 9/1, 9/2
Dates Collected: " " "

Test Initiation: 8/31/99
Test Conclusion: 9/8/99
Dechlorination: —

Analyst(s): [signature]
Reviewed by:

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
0%	0	8/31	[signature]	24.5	7.61	—	8.2	—	361	—				
	1	9/1	[signature]	25	7.55	7.75	8.1	8.1	374	373				
	2	9/2	[signature]	24	7.68	7.71	8.2	8.0	341	380				
	3	9/3	[signature]	25	7.69	7.61	8.4	8.2	351	347				
	4	9/4	[signature]	25	7.59	7.68	8.3	8.2	339	361				
	5	9/5	[signature]	24.5	7.62	7.69	8.2	8.1	348	360				
	6	9/6	[signature]	25	7.53	7.63	8.4	8.0	351	357				
	7	9/7	[signature]	25	~~7.53~~ 7.62	7.61	~~8.4~~ 8.3	8.0	327	328				
	8	9/8	[signature]	—	—	7.64	—	8.0	—	339				
6.25%	0	8/31	[signature]	25	—	~~7.73~~	8.2	—	390	—				
	1	9/1	[signature]	25	—	7.73	8.1	8.2	400	397				
	2	9/2	[signature]	24.5	—	7.70	8.2	8.3	460	408				
	3	9/3	[signature]	25	—	7.69	8.2	8.2	462	481				
	4	9/4	[signature]	25	—	7.60	8.3	8.1	350	475				
	5	9/5	[signature]	25	—	7.60	8.3	8.2	347	362				
	6	9/6	[signature]	25	—	7.61	8.2	8.2	340	351				
	7	9/7	[signature]	25	—	~~7.61~~ 7.60	8.2	8.0	348	353				
	8	9/8	[signature]	—	—		—	8.0	—	352				
12.5%	0	8/31	[signature]	25	—	—	8.3	—	420	—				
	1	9/1	[signature]	25	—	7.72	8.2	8.2	428	434				
	2	9/2	[signature]	25	—	7.68	8.2	8.1	551	437				
	3	9/3	[signature]	25	—	7.62	8.3	8.1	562	560				
	4	9/4	[signature]	25	—	7.61	8.3	8.1	390	571				
	5	9/5	[signature]	25	—	7.56	8.2	8.1	381	396				
	6	9/6	[signature]	25	—	7.61	8.2	8.1	380	399				
	7	9/7	[signature]	25	—	7.60	8.2	8.1	379	384				
	8	9/8	[signature]	—	—	7.60	—	8.1	—	382				
25%	0	8/31	[signature]	25	—	—	8.3	—	488	—				
	1	9/1	[signature]	24.5	—	7.68	8.2	8.2	497	506				
	2	9/2	[signature]	25	—	7.67	8.2	8.1	826	502				
	3	9/3	[signature]	25	—	7.59	8.4	8.1	830	829				
	4	9/4	[signature]	25	—	7.58	8.4	8.1	446	839				
	5	9/5	[signature]	25	—	7.59	8.2	8.1	451	450				
	6	9/6	[signature]	25	—	7.50	8.2	8.1	438	462				
	7	9/7	[signature]	25	—	7.60	8.2	8.0	432	459				
	8	9/8	[signature]	—	—	7.60	—	8.0	—	461				

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Revision #: 1.01
Revision Date: 11/18/93

CERIODAPHNIA TOXICITY TEST: WATER QUALITY PARAMETERS

Number: MX990830T
Lab: Wackersilt
Site/Source Name: EFF

Test Organism: C. dubia
Dates Delivered:
Dates Collected:

Test Initiation: 8/31/99
Test Conclusion:
Dechlorination:

Analyst(s):
Reviewed by:

Conc.	Day	Date	Analyst Initials	Temp. (°C)	MEASUREMENTS pH New	pH Old	DO New	DO Old	Sp. Cond. New	Sp. Cond. Old	(mg/L) Alkalinity	Hardness	Ammonia	Chlorine
50%	0	8/31	[illegible]	25	—	—	8.3	—	620	—				
	1	9/1	[illegible]	25	—	7.64	8.2	8.2	629	655				
	2	9/2	[illegible]	24.5	—	7.60	8.3	8.1	1311	632				
	3	9/3	[illegible]	25	—	7.58	8.4	8.2	1291	1312				
	4	9/4	[illegible]	25	—	7.57	8.4	8.2	581	1299				
	5	9/5	[illegible]	25	—	7.48	8.4	8.2	590	596				
	6	9/6	[illegible]	25	—	7.46	8.3	8.2	564	607				
	7	9/7	[illegible]	—	—	7.41	—	8.1	—	591				
	8	9/8												
100%	0	8/31	[illegible]	25	7.59	—	8.3	—	911	—				
	1	9/1	[illegible]	25	7.64	7.62	8.4	8.2	905	928				
	2	9/2	[illegible]	24	7.21	7.71	8.4	8.1	2260	916				
	3	9/3	[illegible]	25	7.26	7.31	8.4	8.1	2190	2310				
	4	9/4	[illegible]	24.5	7.40	7.28	8.4	8.1	821	2260				
	5	9/5	[illegible]	25	7.40	7.39	8.3	8.2	840	846				
	6	9/6	[illegible]	24	7.44	7.39	8.3	8.3	833	847				
	7					7.46		8.3	[illegible]	840				
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													

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Revision #: 1.02
Revision Date: 11/26/97

CHRONIC RENEWAL CERIODAPHNIA TOXICITY TEST: SURVIVAL AND REPRODUCTION DATA

ob Number: NK990830T
ustabbr: Wackersitt
ple/Source Name:

Test Organism: C dubia
Dates Delivered: 8/30, 9/1, 9/3
Dates Collected:

Test Initiation: 8/31/99 ~ 10:30
Test Conclusion: 9/8/99 ~ 11:00
H_2O Batch #: 990831
Feeding Regime: 0.1 mL Sel-Yct, 1x/daily

Analyst(s):
Reviewed by:
Randomization Chart #:

Conc. % g/L	Rep.	Number Organisms @ Start	0	1	2	3	4	5	6	7	8	Total Mort.	0	1	2	3	4	5	6	7	8	Total Offspring
Hard	1	1	0	0	1							1	0	0	0							0
	2	1			1							1			0							0
	3	1			0	0	0	1				1			0	0	0	0				0
	4	1			0	0	0	1				1			0	0	0	0				0
	5	1										1										0
	6	1			0	0	0					1			0	0	0	0				0
	7	1			0	0	0	0	0	0		0			0	0	0	0	0	0	2	3
	8	1										1										0
	9	1			0	0	0	0	[illegible]	0	0	0			0	0	0	0	0	2	0	4
	10	1			0	0	0	1				1			0	0	0	0				0
Mid	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
	2	1										1					0	0	0	0		0
	3	1						1	1	0	0	0					0	0	0	0		0
	4	1						1				1					0	0				0
	5	1					1	0	1			1					0	0	0			0
	6	1										1					0	0				0
	7	1					0	0	0	0	0	0					0	0	2	0	0	2
	8	1					0		0	0	0	0					0	0	3	0	0	3
	9	1					0		0			1					2	0	0			2
	10	1					0	1	0	0	0	0					2	0	3	4	0	7
Low	1	1	0	0	0	0	1					1	0	0	0	0	0					0
	2	1										1										0
	3	1			0	0	0	0	0	1		1				0	0	0	0	0		0
	4	1			0							1				0						0
	5	1			0							1				0						0
	6	1			0							1				0						0
	7	1										1										0
	8	1										1			0	0						0
	9	1										1			0	0						0
	10	1										1										0
Ctrl	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	1							0	0	0	0					1	0	0	0	1	2
	3	1							0			1					0	0	0			0
	4	1							0			1					0	0	0			0
	5	1							0	0	0	0					0	0	0	1	0	1
	6	1							0			0					3	0	3	4	3	13
	7	1							0			0					2	0	0	0	3	5
	8	1							0			0					1	0	2	5	4	12
	9	1							0			0					2	5	0	10	10	23
	10	1							0			0										
Hard	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	2	12	16
	2	1					0		0	0	0	0					4	3	0	10	0	19
	3	1					0		0			0					0	0	0	0	0	0
	4	1					0					0					1	4	3	0	10	18
	5	1										1					5					5
	6	1					0	0	0			1					3	5	1	0		9
	7	1								0	0	0					4	0	3	3	8	18
	8	1									0	0					0	0	0	0	0	0
	9	1									0	0					0	0	2	6	9	21
	10	1									0	0					3	0	4	0	12	19
Low	1	1	0	0	0	0						1	0	0	0	0	0	0				0
	2	1				0	0	1				1				0	0	0				0
	3	1					0	1				1					0	0				0
	4	1					0					1					0	0				0
	5	1					1					1					0					0
	6	1					1	1	0	1		1					0	0	0	0		0
	7	1										1										0
	8	1				0	0	1				1				0	0	0				0
	9	1				0	0	1				1				0	0	0				0
	10	1										1										0

ANALYST:

ments:

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
6.25 %	7	3	10
TOTAL	15	5	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 7.
Since b is greater than 3.0 there is no significant difference
between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
12.5 %	4	6	10
TOTAL	12	8	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 4.
Since b is greater than 3.0 there is no significant difference
between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
25.0 %	2	8	10

TOTAL	10	10	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 2.
Since b is less than or equal to 3.0 there is a significant difference between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	8	2	10
50.0 %	0	10	10
TOTAL	8	12	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 0.
Since b is less than or equal to 3.0 there is a significant difference between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	8	2	10
100.0 %	0	10	10
TOTAL	8	12	20

Critical Fisher's value (10,10,8) (alpha=0.05) is 3.0. b value is 0.
Since b is less than or equal to 3.0 there is a significant difference between CONTROL and TREATMENT at the 0.05 level.

Summary of Fisher's Exact Tests

	NUMBER	NUMBER	SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	0.05
	CONTROL	10	2	
1	6.25 %	10	3	
2	12.5 %	10	6	
3	25.0 %	10	8	*
4	50.0 %	10	10	*
5	100.0 %	10	10	*

Title: WACKER CERIO CHRONIC - 8/31/99
File: 0830tc5 Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.2060	4.3560	6.8760	4.3560	1.2060
OBSERVED	0	8	4	6	0

Chi-Square = 7.2838 (p-value = 0.1216)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: WACKER CERIO CHRONIC - 8/31/99
File: 0830tc5 Transform: NO TRANSFORMATION

Probit Analysis - not Using Smoothed Proportions

DOSE	NUMBER SUBJECTS	NUMBER OBSERVED	OBSERVED PROPORTION	PREDICTED PROPORTION
6.25	10	3	0.3000	0.3442
12.50	10	6	0.6000	0.5221
25.00	10	8	0.8000	0.8335
50.00	10	10	1.0000	0.9974
100.00	10	10	1.0000	1.0000

Est. Mu = 11.7409 Est. Sigma = 13.6952
sd = 3.4482 sd = 5.3625

Chi-Square lack of fit = 0.4370 Likelihood lack of fit = 0.4632
Table Chi-square = 11.3449 (alpha = 0.01, df = 3)
Table Chi-square = 7.8147 (alpha = 0.05, df = 3)

Title: WACKER CERIO CHRONIC - 8/31/99
File: 0830tc5 Transform: NO TRANSFORMATION

Probit LC Estimates
WITHOUT CONTROL DATA

POINT	EST. END POINT	95% CONFIDENCE LIMITS	
LC 1	-20.1188	-47.2545	7.0169
LC 5	-10.7856	-31.0386	9.4674
LC10	-5.8101	-22.4907	10.8704
LC20	0.2148	-12.3353	12.7648
LC25	2.5037	-8.5798	13.5872
LC30	4.5592	-5.2885	14.4069
LC40	8.2713	0.3419	16.2006
LC50	11.7409	4.9825	18.4994
LC60	15.2105	8.6791	21.7420
LC70	18.9227	11.4975	26.3479
LC75	20.9782	12.6701	29.2862
LC80	23.2671	13.7619	32.7722
LC90	29.2920	16.0262	42.5578
LC95	34.2675	17.5661	50.9688
LC99	43.6006	20.1332	67.0681

Title: WACKER CERIO CHRONIC - REPRODUCTION, 8/31/99
File: 0830TCR Transform: NO TRANSFORMATION

Shapiro - Wilk's Test for Normality

D = 766.8639
W = 0.9437

Critical W = 0.8940 (alpha = 0.01 , N = 27)
W = 0.9230 (alpha = 0.05 , N = 27)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: WACKER CERIO CHRONIC - REPRODUCTION, 8/31/99
File: 0830TCR Transform: NO TRANSFORMATION

Bartlett's Test for Homogeneity of Variance

Calculated B1 statistic = 11.3305 (p-value = 0.0035)

Data FAIL B1 homogeneity test at 0.01 level. Try another transformation.

Critical B = 9.2103 (alpha = 0.01, df = 2)
= 5.9915 (alpha = 0.05, df = 2)

Using Average Degrees of Freedom
(Based on average replicate size of 9.00)

Calculated B2 statistic = 10.3126 (p-value = 0.0058)

Data FAIL B2 homogeneity test at 0.01 level. Try another transformation.

Title: WACKER CERIO CHRONIC - REPRODUCTION, 8/31/99
File: 0830TCR Transform: NO TRANSFORMATION

Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment Ho: Control<Treatment

GROUP	IDENTIFICATION	MEAN IN ORIGINAL UNITS	RANK SUM	CRIT. VALUE	REPS	SIG 0.05
1	0 CONTROL	15.6250				
2	6.25 %	6.8889	58.50	60	9	*
3	12.5 %	1.7000	56.00	72	10	*

Critical values are 1 tailed (k = 2)

Title: WACKER CERIO CHRONIC - REPRODUCTION, 8/30/99
File: 0830TCI Transform: NO TRANSFORMATION

GRP	IDENTIFICATION	MEAN	SMOOTHED MEAN	CONCENTRATION
1	0 CONTROL	15.6250	15.6250	0.0000
2	6.25 %	6.8889	6.8889	6.2500
3	12.5 %	1.7000	1.7000	12.5000
4	25 %	0.7000	0.7000	25.0000
5	50 %	0.0000	0.0000	50.0000
6	100 %	0.0000	0.0000	100.0000

ICp estimate with p = 25 is < 6.2500

Title: WACKER CERIO ACUTE - 8/30/99
File: 0830tca Transform: NO TRANSFORMATION

Shapiro - Wilk's Test for Normality

******** Shapiro - Wilk's Test is aborted ********

This test can not be performed because total number of replicates is greater than 50.

Total number of replicates = 60

Title: WACKER CERIO ACUTE - 8/30/99
File: 0830TCA Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's Test for Homogeneity of Variance
Bartlett's Test for Homogeneity of Variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Title: WACKER CERIO ACUTE - 8/30/99
File: 0830TCA Transform: ARC SINE(SQUARE ROOT(Y))

Steel's Many-One Rank Test - Ho: Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	DF	SIG 0.05
1	0 CONTROL	1.0472				
2	6.25 %	1.0472	105.00	75.00	10.00	
3	12.5 %	1.0472	105.00	75.00	10.00	
4	25 %	0.8378	85.00	75.00	10.00	
5	50 %	0.9425	95.00	75.00	10.00	
6	100 %	0.8378	85.00	75.00	10.00	

Critical values are 1 tailed (k = 5)

APPENDIX B

REFERENCE TOXICANT DATA SHEETS

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

Title: FATHEAD MINNOW CHRONIC REF. TOX. - 8/10/99
File: augreff5 Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.2060	4.3560	6.8760	4.3560	1.2060
OBSERVED	0	8	3	7	0

Chi-Square = 9.2501 (p-value = 0.0551)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data PASS normality test (alpha = 0.01). Continue analysis.

Title: FATHEAD MINNOW CHRONIC REF. TOX. - 8/10/99
File: augreff5 Transform: NO TRANSFORMATION

Probit Analysis - not Using Smoothed Proportions

DOSE	NUMBER SUBJECTS	NUMBER OBSERVED	OBSERVED PROPORTION	PREDICTED PROPORTION
1.00	40	2	0.0500	0.0398
2.50	40	9	0.2250	0.2061
4.00	40	19	0.4750	0.5448
5.50	40	35	0.8750	0.8520
8.00	40	40	1.0000	0.9953

Est. Mu = 3.8190 Est. Sigma = 1.6085
sd = 0.1910 sd = 0.1987

Chi-Square lack of fit = 1.3365 Likelihood lack of fit = 1.5174
Table Chi-square = 11.3449 (alpha = 0.01, df = 3)
Table Chi-square = 7.8147 (alpha = 0.05, df = 3)

Title: FATHEAD MINNOW CHRONIC REF. TOX. - 8/10/99
File: augreff5 Transform: NO TRANSFORMATION

Probit LC Estimates
WITHOUT CONTROL DATA

POINT	EST. END POINT	95% CONFIDENCE LIMITS	
LC 1	0.0772	-0.8691	1.0234
LC 5	1.1733	0.4633	1.8833
LC10	1.7577	1.1635	2.3519
LC20	2.4653	1.9922	2.9384
LC25	2.7341	2.2981	3.1701
LC30	2.9755	2.5668	3.3843
LC40	3.4115	3.0337	3.7894
LC50	3.8190	3.4446	4.1934
LC60	4.2265	3.8302	4.6229
LC70	4.6625	4.2189	5.1061
LC75	4.9039	4.4261	5.3817
LC80	5.1727	4.6517	5.6938
LC90	5.8804	5.2279	6.5328
LC95	6.4647	5.6919	7.2375
LC99	7.5609	6.5474	8.5743

Title: FATHEAD MINNOW CHRONIC REF. TOX. - 8/10/99
File: augreff5 Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5

Title: FHM CHRONIC REF. TOX. - GROWTH, 8/10/99
File: augreffi Transform: NO TRANSFORMATION

GRP	IDENTIFICATION	MEAN	SMOOTHED MEAN	CONCENTRATION
1	0 CONTROL	0.5065	0.5380	0.0000
2	1.0 g/L	0.5695	0.5380	1.0000
3	2.5 g/L	0.1393	0.1393	2.5000
4	4.0 g/L	0.0702	0.0702	4.0000
5	5.5 g/L	0.0172	0.0172	5.5000
6	8.0 g/L	0.0000	0.0000	8.0000

ICp estimate with p = 25 is 1.5060

Bootstrap results using 480 iterations:

Mean = 1.5057 Standard Deviation = 0.0163
95% Confidence Interval: (1.4698 , 1.5349)
Adjusted Interval: (1.4482 , 1.5522)

Title: FATHEAD MINNOW 96 HOUR ACUTE REF. TOX. - 8/10/99.
File: augreffp Transform: NO TRANSFORMATION

Chi-Square Test for Normality

Actual and Expected Frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.2060	4.3560	6.8760	4.3560	1.2060
OBSERVED	0	10	1	7	0

Chi-Square = 16.3511 (p-value = 0.0026)

Critical Chi-Square = 13.277 (alpha = 0.01 , df = 4)
= 9.488 (alpha = 0.05 , df = 4)

Data FAIL normality test (alpha = 0.01). Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normality and should not be performed with this data as is.

Title: FATHEAD MINNOW 96 HOUR ACUTE REF. TOX. - 8/10/99.
File: augreffp Transform: NO TRANSFORMATION

Trimmed Spearman - Karber	Estimate	VAR	95% C.I.	UNCONDITIONAL 95% C.I.
10.00%	5.0677	0.0387	(4.68, 5.45)	(4.67, 5.46)
20.00%	5.0013	0.0336	(4.64, 5.36)	(4.63, 5.37)
HIGH CALC 5.00%	5.0394	0.0395	(4.65, 5.43)	(4.64, 5.44)
LOW CALC 5.00%	5.0394	0.0395	(4.65, 5.43)	(4.64, 5.44)

GROUP	IDENTIFICATION	OBS PROP	SMOOTH PROP	DOSES
1	0 CONTROL	0.0000	0.0000	0.0000
2	1.0 g/L	0.0500	0.0500	1.0000
3	2.5 g/L	0.0750	0.0750	2.5000
4	4.0 g/L	0.1500	0.1500	4.0000
5	5.5 g/L	0.7000	0.7000	5.5000
6	8.0 g/L	1.0000	1.0000	8.0000

Title: CERIODAPHNIA CHRONIC REF. TOX. - SURVIVAL, 9/1/99
File: augrefc5 Transform: NO TRANSFORMATION

Probit Analysis - not Using Smoothed Proportions

DOSE	NUMBER SUBJECTS	NUMBER OBSERVED	OBSERVED PROPORTION	PREDICTED PROPORTION
0.50	10	0	0.0000	0.0159
1.00	10	3	0.3000	0.1735
1.50	10	4	0.4000	0.6052
2.00	10	10	1.0000	0.9298
3.00	10	10	1.0000	0.9999

Est. Mu = 1.3895 Est. Sigma = 0.4141
sd = 0.1083 sd = 0.1103

Chi-Square lack of fit = 3.7955 Likelihood lack of fit = 4.4471
Table Chi-square = 11.3449 (alpha = 0.01, df = 3)
Table Chi-square = 7.8147 (alpha = 0.05, df = 3)

Title: CERIODAPHNIA CHRONIC REF. TOX. - SURVIVAL, 9/1/99
File: augrefc5 Transform: NO TRANSFORMATION

Probit LC Estimates
WITHOUT CONTROL DATA

POINT	EST. END POINT	95% CONFIDENCE LIMITS	
LC 1	0.4260	-0.0993	0.9513
LC 5	0.7082	0.3133	1.1032
LC10	0.8587	0.5274	1.1900
LC20	1.0409	0.7759	1.3059
LC25	1.1101	0.8652	1.3550
LC30	1.1723	0.9421	1.4025
LC40	1.2845	1.0708	1.4983
LC50	1.3895	1.1772	1.6018
LC60	1.4944	1.2698	1.7190
LC70	1.6066	1.3560	1.8573
LC75	1.6688	1.3992	1.9383
LC80	1.7380	1.4447	2.0314
LC90	1.9202	1.5544	2.2860
LC95	2.0707	1.6384	2.5030
LC99	2.3529	1.7875	2.9183

Title: CERIODAPHNIA CHRONIC REF. TOX. - REPRODUCTION, 9/1/99
File: augrefci Transform: NO TRANSFORMATION

GRP	IDENTIFICATION	MEAN	SMOOTHED MEAN	CONCENTRATION
1	0 CONTROL	17.0000	17.0000	0.0000
2	0.5 g/L	15.7778	15.7778	0.5000
3	1.0 g/L	1.4000	1.8421	1.0000
4	1.5 g/L	2.3333	1.8421	1.5000

5	2.0 g/L	0.0000	0.0000	2.0000
6	3.0 g/L	0.0000	0.0000	3.0000

ICp estimate with p = 25 is 0.6086

Bootstrap estimate did not exist for 93 iterations.
Bootstrap results using 387 iterations:

Mean = 0.6098 Standard Deviation = 0.0409
95% Confidence Interval: (0.5125 , 0.6520)

Title: CERIODAPHNIA 48-HR ACUTE, REFTOX - 9/1/99
File: augrefca Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

******** Shapiro - Wilk's Test is aborted ********

This test can not be performed because total number of replicates is greater than 50.

Total number of replicates = 60

Title: CERIODAPHNIA 48-HR ACUTE, REFTOX - 9/1/99
File: augrefca Transform: NO TRANSFORMATION

GRP	IDENTIFICATION	MEAN	SMOOTHED MEAN	CONCENTRATION
1	0 CONTROL	1.0000	1.0000	0.0000
2	0.5 g/L	1.0000	1.0000	0.5000
3	1.0 g/L	1.0000	1.0000	1.0000
4	1.5 g/L	1.0000	1.0000	1.5000
5	2.0 g/L	0.0000	0.0000	2.0000
6	3.0 g/L	0.0000	0.0000	3.0000

ICp estimate with p = 50 is 1.7500

Bootstrap results using 480 iterations:

Mean = 1.7500 Standard Deviation = 0.0000
95% Confidence Interval: (1.7500 , 1.7500)

APPENDIX C

CHAINS-OF-CUSTODY

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Thomas J. Rothschild
Company Name: Wacker Siltronic Corp.
Mailing Address: 7200 N.W. Front Avenue
Portland, Oregon 97210
Phone: (503) 243-2020 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):

PO Number: 429059
Project Number:
Project Name: Aquatic Toxicity
EPA Protocol Containers: (Y)N Other:

Sample Turnaround
- [x] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Initials:

Reporting Request
- [x] State Compliance Format
- [ ] FAX Results - Preliminary
- [ ] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page ____ of ____
Job Number: MX-[illegible] T
Custabbr: [illegible] ☐NEW

☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Time	Media	Analysis Requested	Test/ Profile
99-85		1f		30 Aug 1999	0800	water	Bioassay	
		1.1						
		1r						
	RI	K						

Sampled By: Thomas J. Rothschild / Dianne Mullen
AUTHORIZED CUSTOMER SIGNATURE DATE:

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by? (Sign)	Date	Time
	Thomas J. Rothschild	30 Aug 99	1039	[signature]	8/30/99	1038
				LAB [signature]	[illegible]	13[illegible]

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

SCOEPA00027835

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Thomas J Rothschild
Company Name: Wacker Siltronic Corporation
Mailing Address: 7200 N.W. Front Avenue
Portland, Oregon 97210
Phone: (503) 243-2020 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):

PO Number: 429059
Project Number: 99-86
Project Name: —
EPA Protocol Containers: Y/N Other:

Sample Turnaround
- ☒ Standard
- ☐ Priority (Additonal Fee)
- ☐ Rush (Additional Fee)
- ☐ Emergency (Additional Fee)

Initials:

Reporting Request
- ☐ State Compliance Format
- ☐ FAX Results - Preliminary
- ☐ FAX Results-Final
- ☐ Verbals Results
- ☐ Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page ____ of ____
Job Number: 1X9904 20 T
Custabbr: (W) Kochi ☐NEW

☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date	Collection Time	Media	Analysis Requested	Test/ Profile
99-86		5F		1 Sep 1999	0800	water	Bioassay	
		2J						
		2R						
	B1	2X						

Sampled By: Dianne Mullan / Thomas J. Rothschild
AUTHORIZED CUSTOMER SIGNATURE DATE:

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Thomas J. Rothschild	1 Sep 99			9-1-99	1245
				LAB	9/1/99	1410

White Copy-Laboratory Yellow Copy - Customer

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SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

COFFEY LABORATORIES, INC.
CHAIN OF CUSTODY AGREEMENT

CENTRAL OREGON BRANCH
827 SW 7th
Redmond, OR 97756
PHONE/FAX (541) 548-0972

CORPORATE HEADQUARTERS
12423 NE Whitaker Way
Portland, OR 97230
(503) 254-1794 FAX: (503) 254-1452

EASTERN OREGON BRANCH
419 SW 5th
Pendleton, OR 97801
PHONE/FAX (541) 276-0385

Report Attention: Thomas J. Rothschild
Company Name: Wacker Siltronic Corporation
Mailing Address: 7200 N.W. Front Avenue
Portland, Oregon 97219
Phone: (503) 243-2020 FAX: (503) 417-4144

Report Instructions (Special - Additional- Job Specific):

PO Number: 429059
Project Number: 99-90
Project Name: —
EPA Protocol Containers: (Y)N Other:

Sample Turnaround
- [x] Standard
- [ ] Priority (Additonal Fee)
- [ ] Rush (Additional Fee)
- [ ] Emergency (Additional Fee)

Initials:

Reporting Request
- [ ] State Compliance Format
- [ ] FAX Results - Preliminary
- [ ] FAX Results-Final
- [ ] Verbals Results
- [ ] Extra Report Copy (Fees Associated)

FOR LABORATORY USE ONLY Page ___ of ___
Job Number: 11A19483971
Custabbr: Cedar Kirkland ☐NEW

☐ VISA ☐ M/C Cardholder:
Card #: Exp: / /
Cash / Check / CC:$ #:
Billing Code: 1 2 3 4
QC LEVEL: 1 2 3 4
FEDX BUS COURIERS UPS LAB CLIENT MAIL AIR

Sample ID	Loc.	ID	#	Collection Date / Time		Media	Analysis Requested	Test/ Profile
99-90	SS	3F		3 Sep 1999	0745	water	Bioassay	
	B4	3F						
	097	3						
	B1	3F						

Sampled By: Dianne Mullan/Thomas J. Rothschild
AUTHORIZED CUSTOMER SIGNATURE DATE:

Sample Comments	Relinquished by: (Please Sign)	Date	Time	Received by: (Sign)	Date	Time
	Thomas J. Rothschild	3Sep99			9/3/99	1045
				LAB	11/3/99	11:36

White Copy-Laboratory Yellow Copy - Customer

COMPLETE THIS FORM PER INSTRUCTIONS ON REVERSE SIDE

SUBMISSION OF SAMPLES WITH TESTING REQUIREMENTS TO CLI WILL BE UNDERSTOOD TO BE AN AGREEMENT FOR SERVICES IN ACCORDANCE WITH THE CONDITIONS LISTED ON THE BACK OF THE CLIENT COPY.

APPENDIX D

ORGANISM HISTORY

COFFEY LABORATORIES, INC.
12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524

Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

ORGANISM HISTORY

DATE: 8/30/99

SPECIES: Pimephales promelas

AGE: N/A

LIFE STAGE: Embryo

HATCH DATE: 8/30/99

BEGAN FEEDING: N/A

FOOD: N/A

Water Chemistry Record:	Mean	Range
TEMPERATURE:	25 °C	--
SALINITY / CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	120 mg/l	--
TOTAL ALKALINITY (as $CaCO_3$):	85 mg/l	--
pH:	8.11	--

Comments:

Elizabeth Johnson
Facility Supervisor

SCOEPA00027839

WACKER
Wacker Siltronic Corporation

To: Tom McCue

From: Petra Beissmann

Re: Historical Bioassay Results

Date: October 8, 1998

Tom, per your request I have assembled the bioassay results for the past three years. Since 1996 the Mixing Zone Effluent Dilution Evaluation has been in effect. The Test Concentrations were: 0, 6.25, 12.5, 25, 50 and 100% effluent.

Additionally, Tom Rothschild has confirmed that the cost to run a complete bioassay is $2,500.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC August, 1998	50%	100%
NOEC August, 1997	50%	100%
NOEC August, 1996	50%	100%
ZID Pass Criteria[1]	≥50%	≥50%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC August, 1998	50%	100%
NOEC August, 1997	50%	100%
NOEC August, 1996	50%	100%
Mixing Zone Pass Criteria[1]	≥ 17%	≥ 17%

[1] Raymond, Richard/CH2MHILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution study identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC >/= 50% effluent and the chronic test NOEC >/= 17% effluent.

October 7, 1998

WACKER
Wacker Siltronic Corporation

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER088:TM

Dear Dr. Zais,

Below are the results of the annual bioassay test performed in August as required in our NPDES permit number 101128. The results of the bioassay are in compliance with the conditions of our permit. Bioassay testing was conducted by Parametrix Environmental Toxicology Laboratory.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	50%	100%
ZID Pass Criteria[1]	≥50%	≥50%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	50%	100%
Mixing Zone Pass Criteria[1]	≥ 17%	≥ 17%

If you have any questions please contact me at 219-7532.

Very truly yours,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
NPDES DMR File

[1] Raymond, Richard/CH2MHILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution study identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC >/= 50% effluent and the chronic test NOEC >/= 17% effluent.

SCOEPA00027841

October 7, 1998

WACKER
Wacker Siltronic Corporation

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, Oregon 97201-4987

ER088:TM

Dear Dr. Zais,

Below are the results of the annual bioassay test performed in August as required in our NPDES permit number 101128. The results of the bioassay are in compliance with the conditions of our permit. Bioassay testing was conducted by Parametrix Environmental Toxicology Laboratory.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	50%	100%
ZID Pass Criteria[1]	≥50%	≥50%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	Pimephales promelas
NOEC	50%	100%
Mixing Zone Pass Criteria[1]	≥ 17%	≥ 17%

If you have any questions please contact me at 219-7532.

Very truly yours,

WACKER SILTRONIC CORPORATION

Thomas C. McCue
Environmental Manager

cc: Tom Rothschild
NPDES DMR File

[1] Raymond, Richard/CH2MHILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and a mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution study identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{Total}/Q_{Effluent}$) respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC >/= 50% effluent and the chronic test NOEC >/= 17% effluent.

PLEASE RETURN TO PETRA BEISSMANN MS 30
Z 463 352 341

US Postal Service
Receipt for Certified Mail
No Insurance Coverage Provided.
Do not use for International Mail *(See reverse)*

Sent to DR. ELLIOT ZAIS, DEQ	
Street & Number 2020 SW FOURTH AVE #400	
Post Office, State, & ZIP Code PORTLAND OR 97201-4987	
Postage	$ .55
Certified Fee	1.35
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	1.10
Return Receipt Showing to Whom, Date, & Addressee's Address	OCT 8 199
TOTAL Postage & Fees	$ 3.00
Postmark or Date	USPS

PS Form **3800**, April 1995

Is your **RETURN ADDRESS** completed on the reverse side?

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
ELLIOT ZAIS
DEPARTMENT OF ENVIRONMENTAL QUALITY
NORTHWEST REGION
2020 SW FOURTH AVENUE SUITE 400
PORTALND OR 97201-4987

4a. Article Number
Z 463 352 341

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery

5. Received By: *(Print Name)* DEQ/NWR

8. Addressee's Address *(Only if requested and fee is paid)*

6. Signature: *(Addressee or Agent)*
X

Thank you for using Return Receipt Service.

PS Form **3811**, December 1994 102595-97-B-0179 Domestic Return Receipt

Final Report

Toxicity Evaluation of an Effluent to *Ceriodaphnia dubia* and *Pimephales promelas*

Prepared for:
Wacker Siltronic/North Creek Analytical

August 1998

Parametrix, Inc.

SCOEPA00027844

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)
NAME: Wacker Siltronic Corporation
ADDRESS: PO Box 83180
Portland, OR 97283-0810

FACILITY LOCATION: 7200 NW Front Ave.
Portland, OR 97210

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) MONITORING REPORT (DMR) (2-16)

PERMIT NUMBER	DISCHARGE NUMBER
101128	Outfall 001

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	98	9	1	TO	98	9	30

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-65)	FREQUENCY OF ANALYSIS (66-68)	SAMPLE TYPE (69-70)
Process Waste Water Flow	SAMPLE MEASUREMENT	776,000	877,000	gal/day	--	--	--	--		Continuous	
	PERMIT REQUIREMENT	--	--		--	--	--			totalizing recorder	
BOD	SAMPLE MEASUREMENT	42.0	66.33	lbs/day	--	6.2	10.2	mg/l		1/7	24HC
	PERMIT REQUIREMENT	339	753		--	15	30				
TSS	SAMPLE MEASUREMENT	10.4	16.3	lbs/day	--	1.6	2.5	mg/l		1/7	24HC
	PERMIT REQUIREMENT	520	1532		--	23	61				
Cr^{+6} (1)	SAMPLE MEASUREMENT	<0.01	<0.01	lbs/day	--	<0.01	<0.01	mg/l		Batch	
	PERMIT REQUIREMENT	0.11	0.27		--	0.02	0.05				
Cr^{Total}	SAMPLE MEASUREMENT	0.01	0.02	lbs/day	--	<0.01	<0.01	mg/l		1/7	24HC
	PERMIT REQUIREMENT	0.2	0.6		--	0.3	1.0				
Fluoride	SAMPLE MEASUREMENT	31.1	43.2	lbs/day	--	4.6	5.9	mg/l		1/7	24HC
	PERMIT REQUIREMENT	393	804		--	17.4	32				
Total Phosphate	SAMPLE MEASUREMENT	--	--	--	--	0.06	0.10	mg/l		1/7	24HC
	PERMIT REQUIREMENT	--	--		--	23	61				

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
Tom McCue
Environmental Manager
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (Penalties under these statutes may include fines up to $10,000 and imprisonment of between 6 months and 5 years.)

Wacker Siltronic Corp. by:
Thomas McCue
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 503 | NUMBER 243-2020

DATE: YEAR 98 | MO 10 | DAY 7

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
(1) One batch on 5 September, 1998

SCOEPA00027845

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)
NAME Wacker Siltronic Corporation
ADDRESS PO Box 83180
Portland, OR 97283-0810
FACILITY 7200 NW Front Ave.
LOCATION Portland, OR 97210

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) DISCHARGE MONITORING REPORT (DMR) (2-16) (17-19)

PERMIT NUMBER	DISCHARGE NUMBER
101128	Outfall 001

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	98	09	01	TO	98	9	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
TTO	SAMPLE MEASUREMENT	--	--	lbs/day	--	--	0.025	mg/l		1/ 30	Grab
	PERMIT REQUIREMENT	--	--		--	--	1.37				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
Tom McCue
Environmental Manager
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319 (Penalties under these statutes may include fines up to $10,000 and imprisonment of between 6 months and 5 years)

Wacker Siltronic Corp. by:
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
503	243-2020	98	10	7
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

SCOEPA00027846

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)

NAME Wacker Siltronic Corporation

ADDRESS PO Box 83180
Portland, OR 97283-0810

FACILITY 7200 NW Front Ave.

LOCATION Portland, OR 97210

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

(2-16)	(17-19)
101128	Outfall 002
PERMIT NUMBER	DISCHARGE NUMBER

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	98	9	1	TO	98	9	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
MV-3 Flow	SAMPLE MEASUREMENT	517,000	653,000	gal/day	--	--	--	--		Continuous	
	PERMIT REQUIREMENT	--	--		--	--	--				
MV-3 Total phosphates	SAMPLE MEASUREMENT	--	--	--	--	0.11	0.18	mg/l		1/ 7	Grab
	PERMIT REQUIREMENT	--	--		--	2.0	5.0				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

Tom McCue
Environmental Manager

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)

Wacker Siltronic Corp. by:

Thomas C. McCue

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
503	243-2020	98	10	7
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

SCOEPA00027847

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)

NAME: Wacker Siltronic Corporation

ADDRESS: PO Box 83180
Portland, OR 97283-0810

FACILITY: 7200 NW Front Ave.

LOCATION: Portland, OR 97210

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

(2-16) (17-19)

101128	Outfall 003
PERMIT NUMBER	DISCHARGE NUMBER

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	98	9	1	TO	98	9	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	AVERAGE	(46-53) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Outfall flow	SAMPLE MEASUREMENT	1,290,000	1,466,000	gal/day	--	--	--	--		Continuous	
	PERMIT REQUIREMENT	--	--		--	--	--				
Outfall temperature	SAMPLE MEASUREMENT	--	--	--	--	--	77	°F		1/7	Grab
	PERMIT REQUIREMENT	--	--		--	--	85				
Outfall pH	SAMPLE MEASUREMENT	--	--	--	5.6 (1)	6.9	<9.0			Continuous	
	PERMIT REQUIREMENT	--	--		6.0	--	9.0				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

Tom McCue
Environmental Manager

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (Penalties under these statutes may include fines up to $10,000 and up to additional imprisonment of between 6 months and 5 years.)

Wacker Siltronic Corp. by:

Thomas C. McCue

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE

AREA CODE	NUMBER
503	243-2020

DATE

YEAR	MO	DAY
98	10	7

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

(1) One pH excursion on 15 September, 1998. pH = 5.6 for 3 minutes and 24 seconds.

SCOEPA00027848

Final Report

Toxicity Evaluation of an Effluent to *Ceriodaphnia dubia* and *Pimephales promelas*

Prepared for:
Wacker Siltronic/North Creek Analytical

August 1998

Parametrix, Inc.

SCOEPA00027849

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

RECEIVED SEP 9 1998

BOTHELL ▫ (425) 420-9200 ▫ FAX 420-9210
SPOKANE ▫ (509) 924-9200 ▫ FAX 924-9290
PORTLAND ▫ (503) 906-9200 ▫ FAX 906-9210

September 3, 1998

Thomas Rothschild
Wacker Siltronics Corporation
7200 NW Front
Portland, OR 97210

Dear Mr. Rothschild:

Subject: Bioassay Testing

Please find the enclosed two copies of your Bioassay report analyzed by Parametrix, Inc. There are three North Creek Analytical projects associated with this report: P808021, P808072, P808132. If you have any questions please give me a call.

Sincerely,

Crystal Burkholder
Project Manager
North Creek Analytical

cc: Please note that your Project Manager at North Creek Analytical has been switched. I look forward to working with you.

SCOEPA00027850

Parametrix, Inc. *Consultants in Engineering and Environmental Sciences*

5808 Lake Washington Blvd. N.E. Suite 200 Kirkland, WA 98033-7350
425-822-8880 • Fax: 425-889-8808

Ms. Mary A. Fritzmann Smith
9405 SW Nimbus Ave.
Beaverton, Oregon 97008

August 26, 1998
55-1945-10 (01)

SUBJECT: RESULTS OF EFFLUENT TOXICITY EVALUATION

Dear Ms. Smith:

Please find enclosed two copies of a report outlining the results of biological testing conducted on effluent samples collected by Wacker-Siltronic personnel on 3, 5, and 7 August 1998. Testing consisted of two chronic definitive bioassays using *Ceriodaphnia dubia* and *Pimephales promelas* as the test species.

In summary, toxicity was observed in the *C. dubia* bioassay at the 48-hour and 7-day exposures, with NOECs of 50% effluent for both survival and reproduction endpoints. The *P. promelas* bioassay, however, exhibited no toxicity for survival at either the 48-hour or 7-day exposure, and no toxicity for growth, as well. NOECs were all 100% effluent.

Should you have any questions or comments concerning these results, please call me or Ms. Dayle Ormerod at (425) 822-8880. Thank you.

Sincerely,

PARAMETRIX, INC.

Anna Echter

Anna Echter
Project Manager, Toxicology Laboratory

Enclosures

cc: D. Ormerod
file

Printed on Recycled Paper

Final Report

Toxicity Evaluation of an Effluent to *Ceriodaphnia dubia* and *Pimephales promelas*

Prepared for:
Wacker Siltronic/North Creek Analytical

August 1998

Parametrix, Inc.

SCOEPA00027852

TOXICITY EVALUATION OF AN EFFLUENT

TO *Ceriodaphnia dubia* AND *Pimephales promelas*

Prepared for

WACKER SILTRONIC
c/o NORTH CREEK ANALYTICAL
9405 SW Nimbus Ave.
Beaverton, Oregon 97008

Prepared by

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

AUGUST 1998

SIGNATURE PAGE

Submitted by: Parametrix, Inc.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

Prepared by: Anna Echter — 8/24/98
Anna Echter
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1. INTRODUCTION

This report summarizes the procedures and results of biological testing conducted for North Creek Analytical–Portland. All testing was conducted by Parametrix's Environmental Toxicology Laboratory in Kirkland, Washington.

Table 1. Introductory information.

Client name	Wacker Siltronic/North Creek Analytical
Parametrix job number	55-1945-10 (01)
Toxicity testing requirements	Chronic definitive *Ceriodaphnia dubia* and *Pimephales promelas* bioassays
Plant location	9405 SW Nimbus Ave., Beaverton, Oregon 97008
Test sponsor	Mary A. Fritzmann Smith
Name of receiving waterbody	Willamette River

2. SAMPLE SOURCE AND HANDLING

Table 2. Source information for effluent and sample handling.

Sampling point	Outfall 003
Collection dates and times	1) 8/3/98, 2:10 pm 2) 8/5/98, 10:15 am 3) 8/7/98, 10:20 am
Sample collection method	Composite
Time lapsed from sample collection to receipt by laboratory	1) 20 hrs. 2) 24 hrs. 3) 24 hrs.
Sample collected by	Wacker-Siltronic personnel

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Table 3. Initial chemical and physical determinations.

	Collection Dates:		
Parameter Measured	**8/3/98**	**8/5/98**	**8/7/98**
Temperature (°C)	22	12	15
Salinity (ppt)	0	0	0
Dissolved Oxygen (mg/L)	7.3	7.9	7.8
pH	7.3	7.4	7.3
Conductivity (µS)	758	641	852
Total Hardness (mg/L as $CaCO_3$)	220	160	210
Total Alkalinity (mg/L as $CaCO_3$)	24	22	22
Total Residual Chlorine (mg/L)	0.04	0.03	0.03
Ammonia (mg/L)	<1	<1	<1

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3. TEST CONDITIONS

Table 4. Summary of test conditions for the dual endpoint *Ceriodaphnia dubia* bioassay.

Test Dates	4-12 August 1998
Test Protocol	*Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* EPA/600/4-91/002, July 1994 *Whole Effluent Toxicity Testing Guidance Document.* ODEQ. January 1993
Test Material	Whole effluent
Test Organisms/Age	*Ceriodaphnia dubia* (water flea); ≤ 24 hours at initiation
Source of Organisms	In-house cultures
Acclimation Period	None
Number/Test Chamber	1
Volume/Test Chamber	15 mL
Test Concentrations	0, 6.25, 12.5, 25, 50 and 100% effluent
Replicates	Ten
Reference Toxicant	Sodium chloride
Test Duration	8 days
Control/Dilution Media	Laboratory-prepared synthetic water (80-100 mg/L hardness as $CaCO_3$)
Collection Date of Control/ Dilution Water	22 July 1998
Pretreatment of Dilution Water	1 µm filtration
Test Chambers	30 ml polypropylene cups
Lighting	Fluorescent bulbs (50-100 foot candles)
Photoperiod	16 hours light; 8 hours dark
Aeration	None
Feeding	Daily: 100 µL *Selenastrum* suspension; 100 µL yeast/Cerophyl/trout chow (YCT)
Renewal	Daily
Temperature	25 ± 1°C
Chemical Data	pH and dissolved oxygen for each test concentration and the control (both initial and final solutions); temperature and specific conductivity at test initiation and every 24 hours; hardness, alkalinity, ammonia, and residual chlorine for each new sample
Effect Measured	Mortality (defined as immobility) and reproduction
Test Acceptability	Control mortality ≤20%; ≥60% of control organisms produce three broods, an average total of 15 or more offspring for the first three broods must be produced
Endpoints reported	Median lethal concentration (LC50) Lowest observed effect concentration (LOEC) No observed effect concentration (NOEC)

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Table 5. Summary of test conditions for the dual endpoint *Pimephales promelas* bioassay.

Test Dates	4-11 August 1998
Test Protocol	*Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms.* EPA/600/4-91/002, July 1994 *Whole Effluent Toxicity Testing Guidance Document.* ODEQ. January 1993
Test Material	Whole effluent
Test Organisms/Age	*Pimephales promelas* (fathead minnow); ≤24 hours old
Source of Organisms	Aquatic Biosystems; Fort Collins, Colorado
Acclimation Period	None
Number/Test Chamber	10
Volume/Test Chamber	400 mL
Test Concentrations	0, 6.25, 12.5, 25, 50 and 100% effluent
Replicates	Four
Reference Toxicant	Potassium chloride
Test Duration	7 days
Control/Dilution Media	Laboratory-prepared synthetic water (80-100 mg/L hardness as $CaCO_3$)
Preparation Date of Control/ Dilution Water	22 July 1998
Pretreatment of Dilution Water	None
Test Chambers	1,000 ml HDPE beakers
Lighting	Fluorescent bulbs (50-100 foot candles)
Photoperiod	16 hours light; 8 hours dark
Aeration	None
Feeding	0.15 mL newly hatched brine shrimp nauplii twice daily
Renewal	Daily
Temperature	25 ± 2°C
Chemical Data	Dissolved oxygen, and pH for each test concentration and the control (both initial and final solutions); temperature and specific conductivity at test initiation and every 24 hours; hardness, alkalinity, ammonia, and residual chlorine at test initiation for 100% effluent
Effect Measured	Mortality and growth
Test Acceptability	Control mortality ≤ 20%; average mean control weight ≥0.25 mg
Endpoints reported	Median lethal concentration (LC50) Lowest observed effect concentration (LOEC) No observed effect concentration (NOEC)

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4. RESULTS

Records of biological and chemical data collected during testing and the statistical analyses used for reporting are included in the appendices of this report.

Bioassay results are summarized in Table 6 below. In summary, toxicity was observed in the *C. dubia* bioassay at the 48-hour and 7-day exposures, with NOECs of 50% effluent for both survival and reproduction endpoints. The *P. promelas* bioassay, however, exhibited no toxicity for survival at either the 48-hour or 7-day exposure, and no toxicity for growth, as well. NOECs were all 100% effluent.

Table 6. Summary of bioassay results.

Summary of 48-hour results:

	Survival (% effluent)	
Evaluation	***C. dubia***	***P. promelas***
NOEC	50	100
LOEC	100	>100
LC50	65	>100
Reference Toxicant (LC50) =	2.6 g/L NaCl	0.7 g/L KCl

Summary of chronic results:

	C. dubia		***P. promelas***	
Evaluation	**Survival (% effluent)**	**Reproduction (% effluent)**	**Survival (% effluent)**	**Growth % effluent)**
NOEC	50	50	100	100
LOEC	100	>50	>100	>100
LC50	65	N/A	>100	N/A
Reference Toxicant (LC50) =	1.7 g/L NaCl		0.7 g/L KCl	

N/A = Not applicable

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5. REFERENCES

EcoAnalysis, Inc. 1994. TOXIS Version 2.4. EcoAnalysis, Ojai, California.

U.S. EPA. 1994. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. EPA/600/4-91/002, July 1994. U.S. Environmental Protection Agency, Cincinnati, Ohio.

ODEQ. 1993. Whole effluent toxicity testing guidance document. January 1993. Oregon Department of Environmental Quality, Portland, Oregon.

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Appendix A

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APPENDIX A

CHRONIC DEFINITIVE *Ceriodaphnia dubia* BIOASSAY DATA

Parametrix, Inc.

Environmental Toxicology Laboratory *Ceriodaphnia dubia*

Chronic Daily Survival and Offspring

Client: NCA Portland Client Number: 55 1945 10 01 Test Dates: 8/4/98 - 8/12/98

Sample I.D./Source: Wacker Sample Collection Dates: 8/3, 8/5, 8/7 Dilution Media: Natural Spring Water

Temperature (°C) 0 25 24 25 48 25 72 25 96 25 120 25 144 25 168 25

♂ = Male

Conc	Rep	Survival (hours)									Offspring (hours)						
		0	24	48	72	96	120	144	168	192	72	96	120	144	168	192	Total
Con	A	1	1	1	1	1	1	1	1	1	5	0	0	13	4	0	22
	B	1	1	1	1	1	1	1	1	1	0	0	11	0	15	10	36
	C	1	1	1	1	1	1	1	1	1	0	0	7	10	0	10	27
	D	1	1	1	1	1	1	1	1	1	1	0	7	11	11	0	30
	E	1	1	1	1	1	1	1	1	1	4	5	1	2	9	1	22
	F	1	1	1	1	1	1	1	1	1	0	0	7	12	9	0	28
	G	1	1	1	1	1	1	1	1	1	0	0	0	7	13	0	20
	H	1	1	1	1	1	1	1	1	1	2	5	0	10	12	6	35
	I	1	1	1	1	1	1	1	1	1	0	0	0	10	12	2	24
	J	1	1	1	1	1	1	1	1	1	2	0	10	0	0	0	12
6.25%	A	1	1	1	1	1	1	1	1	1	6	1	0	0	0	0	7
	B	1	1	1	1	1	1	1	1	1	4	1	0	6	14	2	27
	C	1	1	1	1	1	1	1	1	1	3	6	0	15	14	11	49
MALE	D	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
	E	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	1
	F	1	1	1	1	1	1	1	1	1	0	0	10	15	5	0	30
	G	1	1	1	1	1	1	1	1	1	2	11	0	0	8	0	21
	H	1	1	1	1	1	1	1	1	1	1	2	0	8	10	3	24
MALE	I	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
	J	1	1	1	1	1	1	1	1	1	0	0	6	14	13	0	33
12.5%	A	1	1	1	1	1	1	1	1	1	0	0	0	11	11	0	22
	B	1	1	1	1	1	1	1	1	1	0	8	10	13	DIED #0	0	31
	C	1	1	1	1	1	1	1	1	1	1	0	0	3	4	16	24
	D	1	1	1	1	1	1	1	1	1	5	7	0	13	13	0	38
	E	1	1	1	1	1	1	1	1	1	2	0	8	11	16	1	38
	F	1	1	1	1	1	1	1	1	1	3	9	0	12	17	18	59
	G	1	1	1	1	1	1	1	1	1	0	2	0	0	5	3	10
	H	1	1	1	1	1	1	1	1	1	0	0	0	8	16	13	37
	I	1	1	1	1	1	1	1	1	0-1	0	2	1	13	17	0	33
♂	J	1	1	1	1	1	1	1	1	1	0	0	0	0	6	0	0
	Init.	JR	[illegible]	BL	[illegible]	JR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	JR	[illegible]	[illegible]	[illegible]	[illegible]	AE
	Time	1530	1500	1300	1310	1130	1135	1200	1100	1400	1330	1130	1155	1200	1115	1130	RK 8/13
	Date	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/7	8/8	8/9	8/10	8/11	8/12	8/13

Anna Echols

Ceriodaphnia dubia
Chronic Daily Survival and Offspring

Conc	Rep	Survival (hours)									Offspring (hours)						
		0	24	48	72	96	120	144	168	192	72	96	120	144	168	192	Total
25%	A	1	1	1	1	1	1	1	1	1	3	8	0	11	19	16	57
	B	1	1	1	1	1	1	1	1	1	2	6	0	13	15	0	36
	C	1	1	1	1	1	1	1	1	1	6	6	0	10	12	0	34
	D	1	1	1	1	1	1	1	1	1	6	7	0	15	20	0	42
	E	1	1	1	1	1	1	1	1	1	2	0	6	12	14	1	35
	F	1	1	1	1	1	1	1	1	1	0	5	6	7	0	12	30
	G	1	1	1	1	1	1	1	1	1	3	0	11	14	14	1	43
	H	1	1	1	1	1	1	1	1	1	0	6	0	10	13	2	31
♂	I	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
	J	1	1	1	1	1	1	1	1	1	0	0	3	10	10	0	23
50%	A	1	1	1	1	1	1	1	1	1	0	0	2	7	11	0	20
	B	1	1	1	1	1	1	1	1	1	0	1	0	6	8	6	21
	C	1	1	1	1	1	1	1	1	1	0	0	3	8	12	0	23
	D	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	E	1	1	1	1	1	1	1	1	1	0	3	0	9	14	0	26
MALE	F	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
	G	1	1	1	1	1	1	1	1	1	0	2	6	0	7	11	26
	H	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0
	I	1	1	1	1	1	1	1	1	1	0	3	0	8	9	5	25
	J	1	1	1	1	1	1	1	1	1	0	0	1	7	7	0	15
100%	A	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	B	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	D	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0
	E	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	F	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0
	G	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	H	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	I	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	J	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Init.	JK		BE		JP						JP				AE	
	Time	1530	1000	1300	1315	1145	1140	1230	1505	1130	1325	1145	1145	1230	1510	1140	RK 8/13
	Date	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/7	8/8	8/9	8/10	8/11	8/12	8/13

Ceriodaphnia dubia
Daily Water Quality Parameters

pH Solution

Date	8/4	8/5	8/5	8/6	8/6	8/7	8/7	8/8	8/8	8/9	8/9	8/10	8/10	8/11	8/11	8/12
Day	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8
Conc	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	7.8	8.3	8.2	8.3	8.3	8.4	7.9	8.5	8.1	8.5	8.3	8.2	8.4	8.3	8.3	8.3
6.25	7.8	8.3	8.1	8.3	8.1	8.3	7.8	8.5	8.1	8.5	8.3	8.2	8.3	8.4	8.3	8.3
12.5	7.7	8.3	8.1	8.3	8.2	8.3	7.8	8.5	8.1	8.5	8.2	8.2	8.3	8.4	8.3	8.3
25	7.7	8.3	8.0	8.2	8.1	8.1	7.7	8.4	8.0	8.4	8.2	8.2	8.2	8.3	8.2	8.2
50	7.6	8.2	7.8	8.1	7.9	8.1	7.5	8.3	7.9	8.3	8.1	8.1	8.1	8.2	8.0	8.1
100	7.4	7.8	7.3	7.5	7.3	—	6.8	—	—	—	—	—	—	—	—	—
Initials	JK			BE	BE											

Dissolved Oxygen (mg/L) Solution

Conc.	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	8.1	7.9	8.2	8.4	8.3	8.3	8.3	8.2	8.0	8.3	8.2	8.3	8.1	8.3	8.1	8.3
6.25	8.1	7.8	8.2	8.3	8.3	8.2	8.3	8.2	8.0	8.3	8.1	8.3	8.1	8.3	8.1	8.3
12.5	8.0	7.9	8.2	8.3	8.3	8.3	8.3	8.3	8.0	8.3	8.1	8.4	8.1	8.3	8.1	8.3
25	7.8	8.0	8.1	8.3	8.3	8.3	8.3	8.3	8.0	8.4	8.0	8.5	8.2	8.4	8.1	8.3
50	7.7	8.0	8.0	8.3	8.2	8.3	8.2	8.3	8.0	8.4	8.1	8.5	8.2	8.4	8.2	8.4
100	7.3	8.0	7.4	8.4	8.2	—	8.1	—	—	—	—	—	—	—	—	—
Initials	JK			BE	BE											

Conductivity (µMHOS)

Conc.	0 Hour	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	168 Hours	192
Cont.	194	197	196	195	195	194	196	198	212
100%	754	765	761	640	—	—	—	—	—
Initials	JK		BE						

Comments:

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: 1982 (x) Chronic ( ) Acute hours
Test Date: 4-Aug-98
Source: N. CREEK Test Material: EFF2 (%)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
0.00 D	1		F	1	1						1	1.00	22	
0.00 D	2		F	1	1						1	1.00	36	
0.00 D	3		F	1	1						1	1.00	27	
0.00 D	4		F	1	1						1	1.00	30	
0.00 D	5		F	1	1						1	1.00	22	
0.00 D	6		F	1	1						1	1.00	28	
0.00 D	7		F	1	1						1	1.00	20	
0.00 D	8		F	1	1						1	1.00	35	
0.00 D	9		F	1	1						1	1.00	24	
0.00 D	10		F	1	1						1	1.00	12	
6.25 D	1		F	1	1						1	1.00	7	
6.25 D	2		F	1	1						1	1.00	27	
6.25 D	3		F	1	1						1	1.00	49	
6.25 D	4		M	1	1						1	1.00		
6.25 D	5		F	1	1						1	1.00	1	
6.25 D	6		F	1	1						1	1.00	30	
6.25 D	7		F	1	1						1	1.00	21	
6.25 D	8		F	1	1						1	1.00	24	
6.25 D	9		M	1	1						1	1.00		
6.25 D	10		F	1	1						1	1.00	33	
12.50 D	1		F	1	1						1	1.00	22	
12.50 D	2		F	1	1						1	1.00	31	
12.50 D	3		F	1	1						1	1.00	24	
12.50 D	4		F	1	1						1	1.00	38	
12.50 D	5		F	1	1						1	1.00	38	
12.50 D	6		F	1	1						1	1.00	59	
12.50 D	7		F	1	1						1	1.00	10	
12.50 D	8		F	1	1						1	1.00	37	
12.50 D	9		F	1	1						0	0.00	33	
12.50 D	10		M	1	1						1	1.00		
25.00 D	1		F	1	1						1	1.00	57	
25.00 D	2		F	1	1						1	1.00	36	
25.00 D	3		F	1	1						1	1.00	34	
25.00 D	4		F	1	1						1	1.00	42	
25.00 D	5		F	1	1						1	1.00	35	
25.00 D	6		F	1	1						1	1.00	30	
25.00 D	7		F	1	1						1	1.00	43	
25.00 D	8		F	1	1						1	1.00	31	
25.00 D	9		M	1	1						1	1.00		
25.00 D	10		F	1	1						1	1.00	23	
50.00 D	1		F	1	1						1	1.00	20	
50.00 D	2		F	1	1						1	1.00	21	
50.00 D	3		F	1	1						1	1.00	23	
50.00 D	4		F	1	0						0	0.00	0	
50.00 D	5		F	1	1						1	1.00	26	
50.00 D	6		M	1	1						1	1.00		
50.00 D	7		F	1	1						1	1.00	26	

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: 1982 (x) Chronic ( ) Acute hours
Test Date: 4-Aug-98
Source: N. CREEK Test Material: EFF2 (%)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
50.00 D	8		F	1	0						0	0.00	0	
50.00 D	9		F	1	1						1	1.00	25	
50.00 D	10		F	1	1						1	1.00	15	
100.00 D	1		F	1	0						0	0.00	0	
100.00 D	2		F	1	0						0	0.00	0	
100.00 D	3		F	1	0						0	0.00	0	
100.00 D	4		F	1	0						0	0.00	0	
100.00 D	5		F	1	0						0	0.00	0	
100.00 D	6		F	1	0						0	0.00	0	
100.00 D	7		F	1	0						0	0.00	0	
100.00 D	8		F	1	0						0	0.00	0	
100.00 D	9		F	1	0						0	0.00	0	
100.00 D	10		F	1	0						0	0.00	0	

Parametrix Toxicology Laboratory

Test Date: 8/04/98
Sample Date: 8/03/98
Species: Ceriodaphnia dubia
Test Type: Chronic

Test Number: 1982
Test Material: Effluent - Industry %
Source: N. CREEK
North Creek Analytical

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	No transformation							
			X	0.000	D	10	1.00	0.000	
			X	6.250	D	10	1.00	0.000	
			X	12.500	D	10	1.00	0.000	
			X	25.000	D	10	1.00	0.000	
			X	50.000	D	10	.80	.422	
			X	100.000	D	10	0.00	0.000	
Proportion Alive	7	No transformation							
			X	0.000	D	10	1.00	0.000	
			X	6.250	D	10	1.00	0.000	
			X	12.500	D	10	.90	.316	
			X	25.000	D	10	1.00	0.000	
			X	50.000	D	10	.80	.422	
			X	100.000	D	10	0.00	0.000	
Reproduction		No transformation							
			X	0.000	D	10	25.60	7.214	
			X	6.250	D	8	24.00	15.014	
			X	12.500	D	9	32.44	13.575	
			X	25.000	D	9	36.78	9.718	
			X	50.000	D	9	17.33	10.416	
			X	100.000	D	10	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	No transformation Fisher Exact	50.000	100.000	2.00		
Proportion Alive	7	No transformation Fisher Exact	50.000	100.000	2.00		
Reproduction		No transformation Wilcoxon test with Bonfe	50.000	100.000	2.00	104.983	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	2	Graphical Interpolation	EC 50	64.842	-	1.54
Proportion Alive	7	Graphical Interpolation	EC 50	64.842	-	1.54

- GROWTH POINT ESTIMATE -

End Point	P	IC	95% CI
Reproduction	IC 25	39.975	34.75 - 53.71
	IC 50	57.091	44.44 - 68.97

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1982

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	Fisher Exact		
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

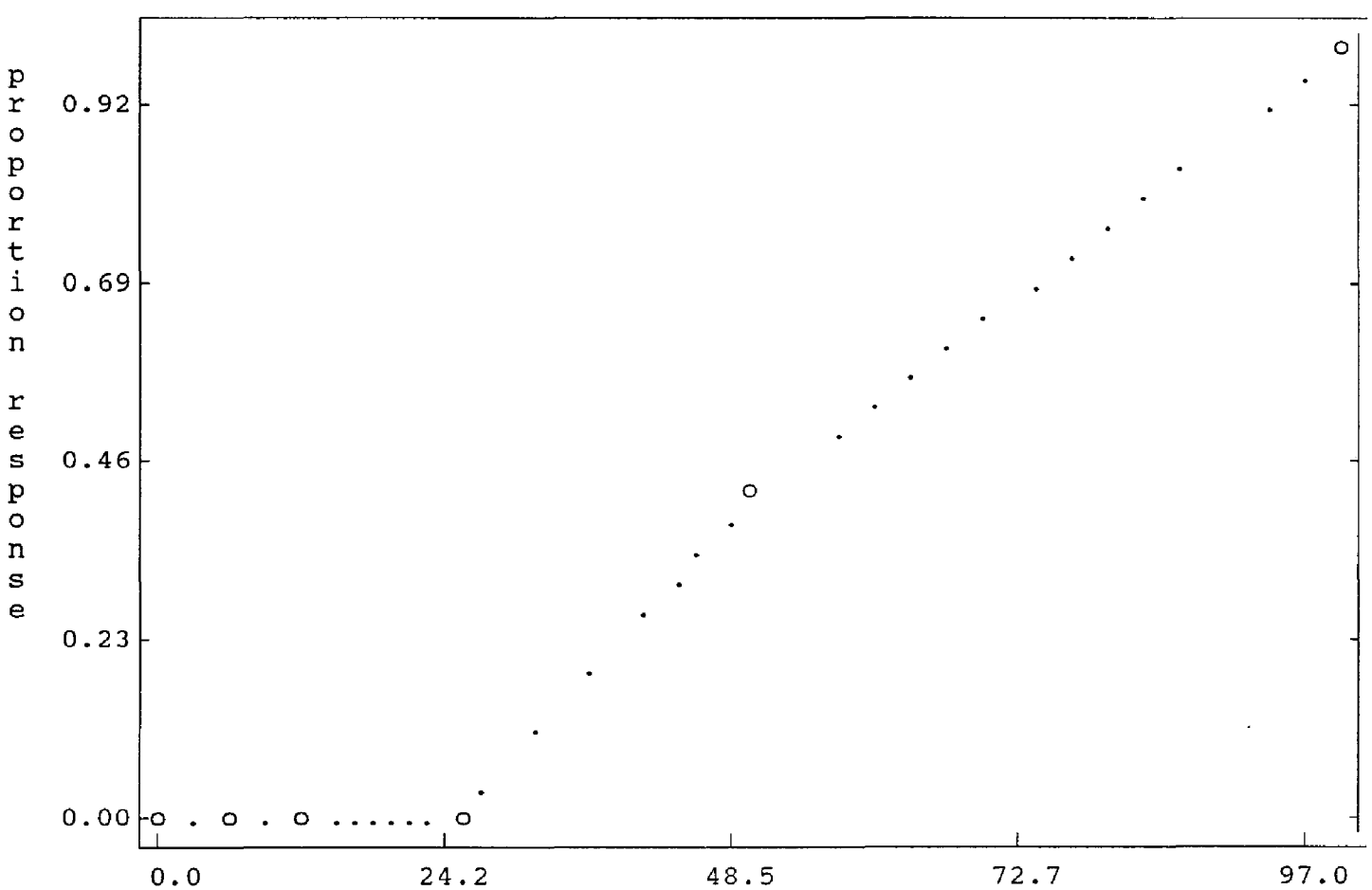
Species: Ceriodaphnia dubia
Test Material: Effluent – Industry (%)
Endpoint: Total young

Test Number: 1982
Test Date: 8/04/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	25.6000	29.7500	0.0000
6.2500	24.0000	29.7500	0.0000
12.5000	32.4444	29.7500	0.0000
25.0000	36.7778	29.7500	0.0000
50.0000	17.3333	17.3333	0.4174
100.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	39.9748	34.694	53.846
50	57.0913	42.216	69.391

Note: # bootstrap resamplings = 120



Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

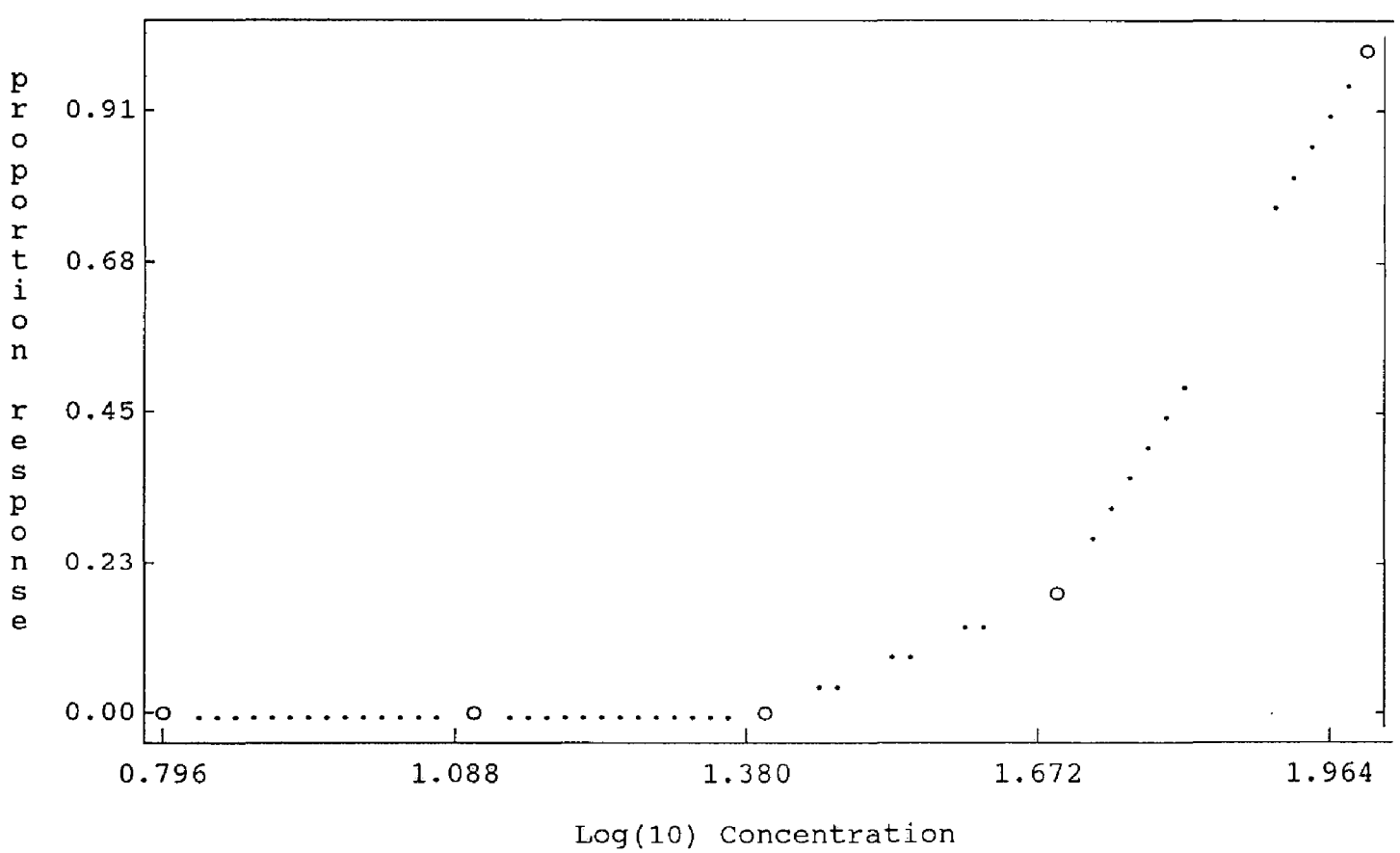
Species: Ceriodaphnia dubia
Test Material: Effluent – Industry (%)
Endpoint: Day2

Test Number: 1982
Test Date: 8/04/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
6.2500	0.0000	0.0000	0.0000
12.5000	0.0000	0.0000	0.0000
25.0000	0.0000	0.0000	0.0000
50.0000	0.2000	0.2000	0.2000
100.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	64.8420



Ceriodaphnia	Day2	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1982

Fisher Exact

Transformation		Prop. Conc	Alive	P
No transformation				
	X	0.00D	1.00	
	X	6.25D	1.00	1.000
	X	12.50D	1.00	1.000
	X	25.00D	1.00	1.000
	X	50.00D	.80	.237
	X	100.00D	0.00	.000

NOEC	LOEC	TU	Alpha	Tail	Based on
50	100	2	.05	One-sided	Fisher Exact

Ceriodaphnia Reproduction

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1982

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks	Critical Sum of Ranks
Data transformation: No transformation							
X	0.00D	25.60	7.214	10			
X	6.25D	24.00	15.014	8	.329	73.500	49.000
X	12.50D	32.44	13.575	9	-1.454	108.500	61.000
X	25.00D	36.78	9.718	9	-2.374	120.500	61.000
X	50.00D	17.33	10.416	9	1.756	68.500	61.000
X	100.00D	0.00	0.000	10	5.587	55.000	74.000

NOEC	LOEC	TU	Alpha	Tail	Based on
50	100	2	.05	One-sided	Wilcoxon w/ Bonf

Bonferroni T Test:

MSE	MSD % Reduction from Control	Critical T
104.98	41.1056	2.2965

Kolmogorov Test for Normality:

Alpha	D	Cutoff D	Normal?
.01	.14448	.1375	No

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1982

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	Fisher Exact		
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

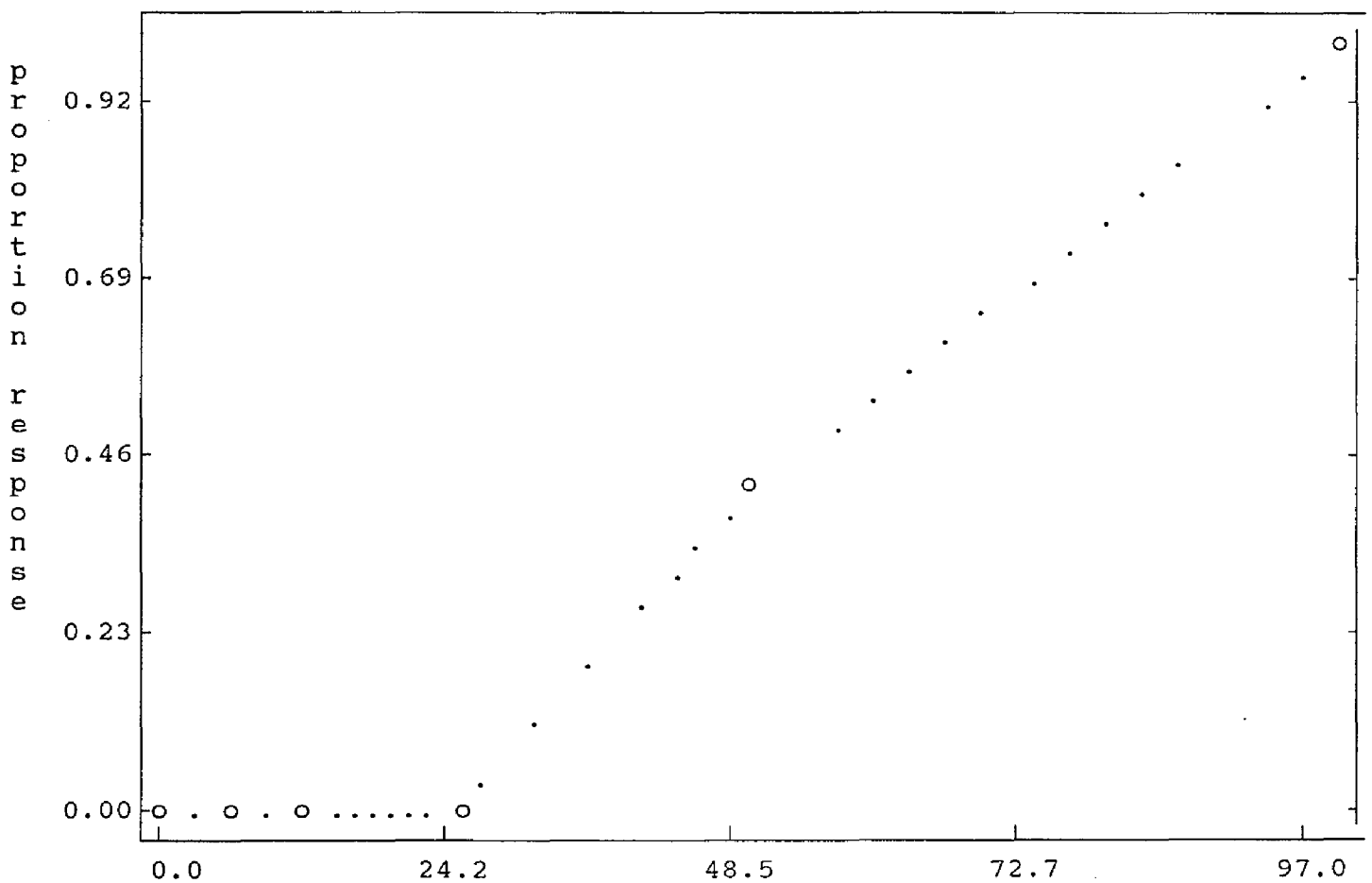
Species: Ceriodaphnia dubia
Test Material: Effluent – Industry (%)
Endpoint: Total young

Test Number: 1982
Test Date: 8/04/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	25.6000	29.7500	0.0000
6.2500	24.0000	29.7500	0.0000
12.5000	32.4444	29.7500	0.0000
25.0000	36.7778	29.7500	0.0000
50.0000	17.3333	17.3333	0.4174
100.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	39.9748	34.751	53.708
50	57.0913	44.444	68.967

Note: # bootstrap resamplings = 120



Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

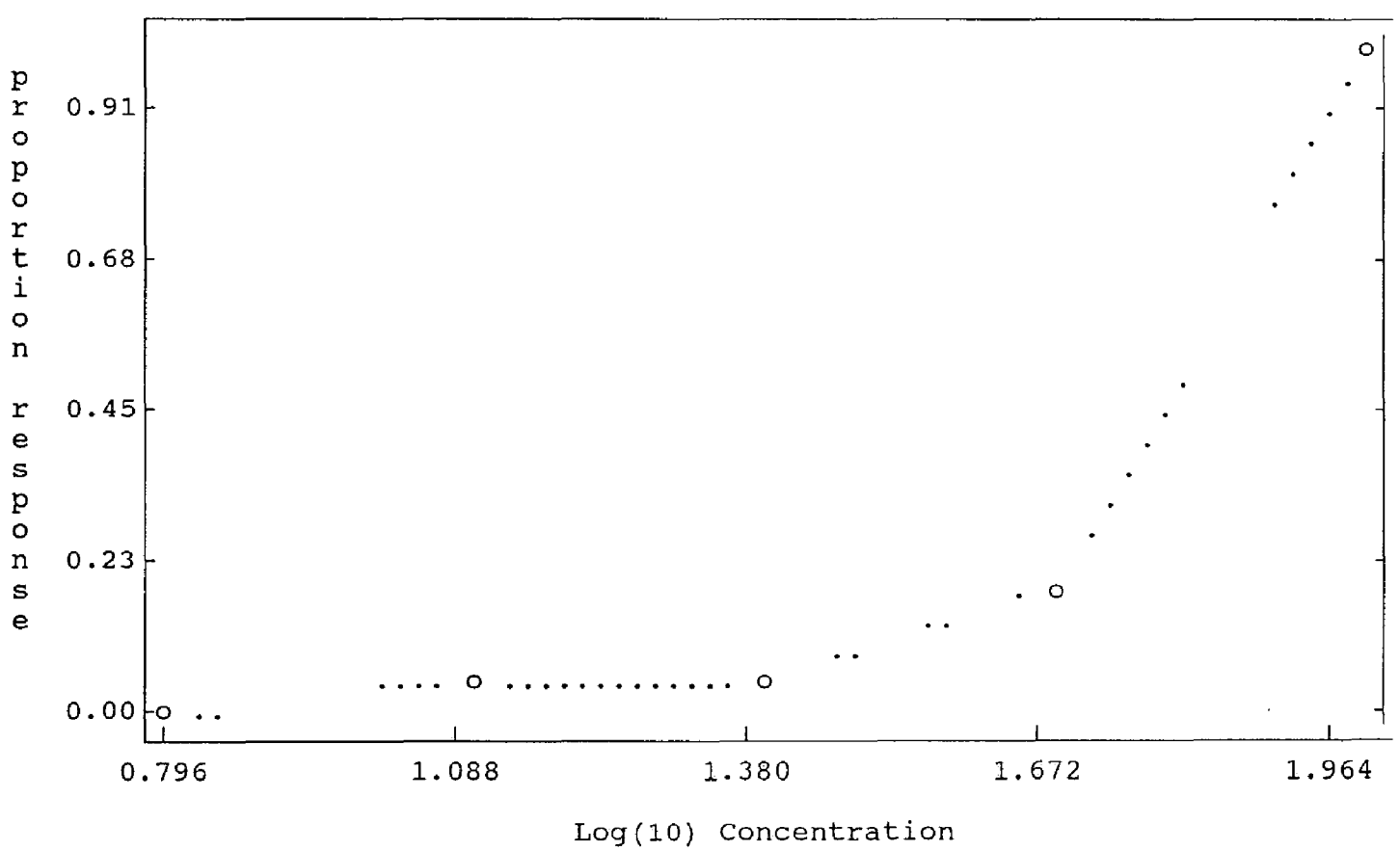
Species: Ceriodaphnia dubia
Test Material: Effluent – Industry (%)
Endpoint: End

Test Number: 1982
Test Date: 8/04/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
6.2500	0.0000	0.0000	0.0000
12.5000	0.1000	0.0500	0.0500
25.0000	0.0000	0.0500	0.0500
50.0000	0.2000	0.2000	0.2000
100.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	64.8420



Ceriodaphnia	Proportion Alive	Day 7

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1982

Fisher Exact

Transformation		Prop. Conc	Alive	P
No transformation				
	X	0.00D	1.00	
	X	6.25D	1.00	1.000
	X	12.50D	.90	.500
	X	25.00D	1.00	1.000
	X	50.00D	.80	.237
	X	100.00D	0.00	.000

NOEC	LOEC	TU	Alpha	Tail	Based on
50	100	2	.05	One-sided	Fisher Exact

Ceriodaphnia			Reproduction			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1982

EPA Flowchart (Chronic and Acute)	1 control

	Conc	Mean	SD	N	T	Sum of Ranks	Critical Sum of Ranks
Data transformation:		No transformation					
X	0.00D	25.60	7.214	10			
X	6.25D	24.00	15.014	8	.329	73.500	49.000
X	12.50D	32.44	13.575	9	−1.454	108.500	61.000
X	25.00D	36.78	9.718	9	−2.374	120.500	61.000
X	50.00D	17.33	10.416	9	1.756	68.500	61.000
X	100.00D	0.00	0.000	10	5.587	55.000	74.000

NOEC	LOEC	TU	Alpha	Tail	Based on
50	100	2	.05	One-sided	Wilcoxon w/ Bonf

Bonferroni T Test:	MSE	MSD % Reduction from Control	Critical T
	104.98	41.1056	2.2965

Kolmogorov Test for Normality:	Alpha	D	Cutoff D	Normal?
	.01	.14448	.1375	No

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	9999	0	No

Appendix B

SCOEPA00027880

APPENDIX B

CHRONIC DEFINITIVE *Pimephales promelas* BIOASSAY DATA

Parametrix, Inc.
5808 Lake Washington Blvd
Kirkland, WA 98033

Parametrix, Inc.
Environmental Toxicology Laboratory

Pimephales promelas
CHRONIC DAILY MONITORING

Client: VCA - Portland
Collection Dates: 8/3, 8/5, 8/7/98
Sample: Walker
Test Dates: 8/4/98 - 8/11/98

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Temp (°C)	25	25	25	25	25	25	25	25

pH

Conc.	Rep.	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control		8.3	8.1	7.9	7.7	7.5	8.1	7.9	8.3	7.7	8.4	7.7	8.2	7.9	7.8
6.25%		8.3	8.1	7.8	7.8	7.4	8.1	7.9	8.2	7.7	8.2	7.8	8.2	7.8	7.9
12.5%		8.2	8.0	7.8	7.7	7.3	8.1	7.8	8.1	7.5	8.2	7.5	8.1	7.7	7.8
25%		8.1	8.0	7.8	7.6	7.3	8.0	7.8	8.1	7.5	8.2	7.5	8.0	7.8	7.8
50 %		7.9	7.8	7.6	7.5	7.1	7.9	7.6	7.8	7.4	8.0	7.6	7.9	7.6	7.7
100 %		7.3	7.4	7.2	7.0	6.7	7.4	7.1	7.2	6.9	7.4	6.8	7.4	7.1	7.2

Dissolved Oxygen (mg/L)

		Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control		8.2	7.8	6.9	7.5	6.9	7.6	6.8	7.9	5.1	8.1	5.8	8.0	6.3	7.1
6.25%		8.1	7.8	6.6	7.7	6.3	7.6	7.1	7.6	5.2	7.9	6.0	8.0	6.6	7.7
12.5%		8.0	7.7	6.5	7.5	5.8	7.6	6.6	7.4	4.3	7.9	5.1	7.7	6.2	7.0
25 %		8.0	7.6	6.5	7.8	6.2	7.7	6.6	7.6	5.0	7.9	5.5	7.8	6.7	7.8
50 %		8.0	7.5	6.3	7.9	6.4	7.6	6.5	7.3	5.1	7.9	6.3	8.0	6.7	7.7
100 %		7.8	7.3	6.6	8.1	6.7	7.5	6.7	7.4	5.1	7.8	5.3	7.9	6.4	7.6

Specific Conductivity (µS)

		Initial	1	2	3	4	5	6	Final
Control		337	359	353	336	363	302	301	301
100%		754	806	775	784	719	842	852	859

Initials		JK	JK	JK	dkm	dkm	JK	JK	dkm	dkm	BE	BE	dkm	dkm	JK
Date		8/4	8/5	8/5	8/6	8/6	8/7	8/7	8/8	8/8	8/9	8/9	8/10	8/10	8/11

NT = Not Taken

Comments:

SCOEPA00027882

Parametrix, Inc.
Environmental Toxicology Laboratory

Parametrix, Inc.
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033

Pimephales promelas
Chronic Daily Survival

Client: NCA Portland-Wacker
Sample I.D./Source:
Dilution Media:
Test Initiation Time: 8/3, 8/5, 8/7/98 2:00 pm
Sample Collection Dates:
Test Dates: 8/4/98 - 8/11/98 cat

Conc.	Rep.	No. of Survivors 0	24	48	72	96	120	144	168
Control	A 19	10	10	10	10	9-1	9	9	9
	B 8	10	10	10	10	9-1	9	9	9
	C 9	10	10	10	10	10	10	9-1	9
	D 21	10	10	10	10	10	10	10	10
6.25 %	A 20	10	10	10	10	10	10	10	10
	B 7	10	10	10	10	10	10	10	10
	C 5	10	10	10	10	10	10	10	10
	D 11	10	10	10	10	10	10	10	10
12.5 %	A 15	10	10	10	10	10	10	10	10
	B 18	10	9-1	9	9	9	9	9	9
	C 13	10	10	10	10	10	10	10	10
	D 16	10	10	10	10	10	10	10	10
25 %	A 2	10	10	10	10	10	10	10	10
	B 4	10	10	10	10	10	10	10	10
	C 22	10	10	9-1	9	9	9	9	9
	D 14	10	10	9-1	9	9	9	9	9
50 %	A 24	10	10	10	10	10	10	10	10
	B 17	10	10	10	10	10	10	10	10
	C 23	10	10	10	10	10	10	10	10
	D 1	10	10	10	10	10	10	10	10
100 %	A 3	10	10	10	10	10	10	10	10
	B 6	10	10	10	10	10	10	10	10
	C 12	10	10	10	10	10	10	10	10
	D 10	10	10	10	10	10	10	10	10
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								
Initials									
Date		8/4/98	8/5	8/6	8/7	8/8	8/9	8/10	8/11

Comments

SCOEPA00027883

Parametrix, Inc.
Environmental Toxicology Laboratory

7-DAY CHRONIC *Pimephales promelas* BIOMASS DATA

Client: NCA Portland-Wacker Client No.: 55-1945-10(01)

Conc./Rep.	Pan No.	Foil weight (mg)	Foil & Organism weight (mg)	Organism weight (mg)
Control A	1	7.68	12.67	4.99
B	2	8.20	12.94	4.741
C	3	9.06	13.94	4.88
D	4	9.60	13.95	4.35
6.25% A	5	8.89	13.84	4.95
B	6	7.55	12.22	~~3.33~~ 4.67 cat
C	7	8.11	13.72	5.61
D	8	8.52	13.87	5.35
12.5% A	9	9.18	14.97	5.79
B	10	8.44	12.80	4.36
C	11	7.76	12.53	4.77
D	12	8.64	14.19	5.55
25% A	13	8.85	13.67	4.82
B	14	9.21	14.30	5.09
C	15	8.70	12.98	~~4.19~~ 4.28 cat
D	16	7.72	12.84	5.12
50% A	17	9.01	14.03	5.02
B	18	8.82	14.67	5.85
C	19	9.86	14.33	4.47
D	20	9.42	14.02	4.60
100% A	21	8.90	14.50	5.60
B	22	9.11	14.30	5.19
C	23	9.62	15.06	5.44
D	24	9.95	14.24	4.29
				cat

Comments:

Rev. 1/30/97

Parametrix Toxicology Laboratory

FISH TEST DATA

Test Number: 1981 (x) Chronic ( ) Acute hours
Test Date: 4-Aug-98
Source: N. CREEK Test Material: EFF2 (%)

Conc		Rep	Cont. No.	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Weight /Fish
0.00	D	1		10	10						9	.90	.49900
0.00	D	2		10	10						9	.90	.47400
0.00	D	3		10	10						9	.90	.48800
0.00	D	4		10	10						10	1.00	.43500
6.25	D	1		10	10						10	1.00	.49500
6.25	D	2		10	10						10	1.00	.46700
6.25	D	3		10	10						10	1.00	.56100
6.25	D	4		10	10						10	1.00	.53500
12.50	D	1		10	10						10	1.00	.57900
12.50	D	2		10	9						9	.90	.43600
12.50	D	3		10	10						10	1.00	.47700
12.50	D	4		10	10						10	1.00	.55500
25.00	D	1		10	10						10	1.00	.48200
25.00	D	2		10	10						10	1.00	.50900
25.00	D	3		10	9						9	.90	.42800
25.00	D	4		10	9						9	.90	.51200
50.00	D	1		10	10						10	1.00	.50200
50.00	D	2		10	10						10	1.00	.58500
50.00	D	3		10	10						10	1.00	.44700
50.00	D	4		10	10						10	1.00	.46000
100.00	D	1		10	10						10	1.00	.56000
100.00	D	2		10	10						10	1.00	.51900
100.00	D	3		10	10						10	1.00	.54400
100.00	D	4		10	10						10	1.00	.42900

SCOEPA00027885

Parametrix Toxicology Laboratory

Test Date: 8/04/98
Sample Date: 8/03/98
Species: Pimephales promelas
Test Type: Chronic

Test Number: 1981
Test Material: Effluent - Industry %
Source: N. CREEK
North Creek Analytical

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.41	0.000	
			X	6.250	D	4	1.41	0.000	
			X	12.500	D	4	1.37	.081	
			X	25.000	D	4	1.33	.094	
			X	50.000	D	4	1.41	0.000	
			X	100.000	D	4	1.41	0.000	
Proportion Alive	2	No transformation							
				0.000	D	4	1.00	0.000	
				6.250	D	4	1.00	0.000	
				12.500	D	4	.98	.050	
				25.000	D	4	.95	.058	
				50.000	D	4	1.00	0.000	
				100.000	D	4	1.00	0.000	
Proportion Alive	7	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.29	.081	
			X	6.250	D	4	1.41	0.000	
			X	12.500	D	4	1.37	.081	
			X	25.000	D	4	1.33	.094	
			X	50.000	D	4	1.41	0.000	
			X	100.000	D	4	1.41	0.000	
Proportion Alive	7	No transformation							
				0.000	D	4	.93	.050	
				6.250	D	4	1.00	0.000	
				12.500	D	4	.98	.050	
				25.000	D	4	.95	.058	
				50.000	D	4	1.00	0.000	
				100.000	D	4	1.00	0.000	
Weight		No transformation							
			X	0.000	D	4	.47	.028	
			X	6.250	D	4	.51	.042	
			X	12.500	D	4	.51	.067	
			X	25.000	D	4	.48	.039	
			X	50.000	D	4	.50	.062	
			X	100.000	D	4	.51	.058	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj.					
		Steel many-one rank test	>100.000	>100.000	< 1.00	.003	
Proportion Alive	7	Arc sine sqrt w/ adj.					
		Steel many-one rank test	>100.000	>100.000	< 1.00	.004	
Weight		No transformation					
		Dunnett	>100.000	>100.000	< 1.00	.003	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	2	Probit				
			EC 50	0.000	-	

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1981

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	906	Negative or zero slope with probit model indicates greater or equal proportions of responses with higher doses – EC/LC values may be
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Probit Analysis For EC/LC

Parametrix Toxicology Laboratory

Species: Pimephales promelas
Test Material: Effluent - Industry (%)
Endpoint: Day2

Test Number: 1981
Test Date: 8/04/98

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
6.2500	40	0	0.0000	0.0000	0.0210
12.5000	40	1	0.0250	0.0250	0.0175
25.0000	40	2	0.0500	0.0500	0.0146
50.0000	40	0	0.0000	0.0000	0.0120
100.0000	40	0	0.0000	0.0000	0.0099

Chi-square for heterogeneity (calculated) = 5.349
Probability(Chi-square > 5.349) = 0.14793

```
**************************************************************
*                           NOTE                             *
*                                                            *
*     Slope not significantly different from zero.           *
*     LC/EC fiducial limits cannot be computed.              *
**************************************************************
```

Parameter	Estimate	Std. Err.	95% Confidence Limits Lower	Upper
Intercept	3.164595	0.749714	1.695155	4.634034
Slope	-0.247848	0.541627	-1.309436	0.813741

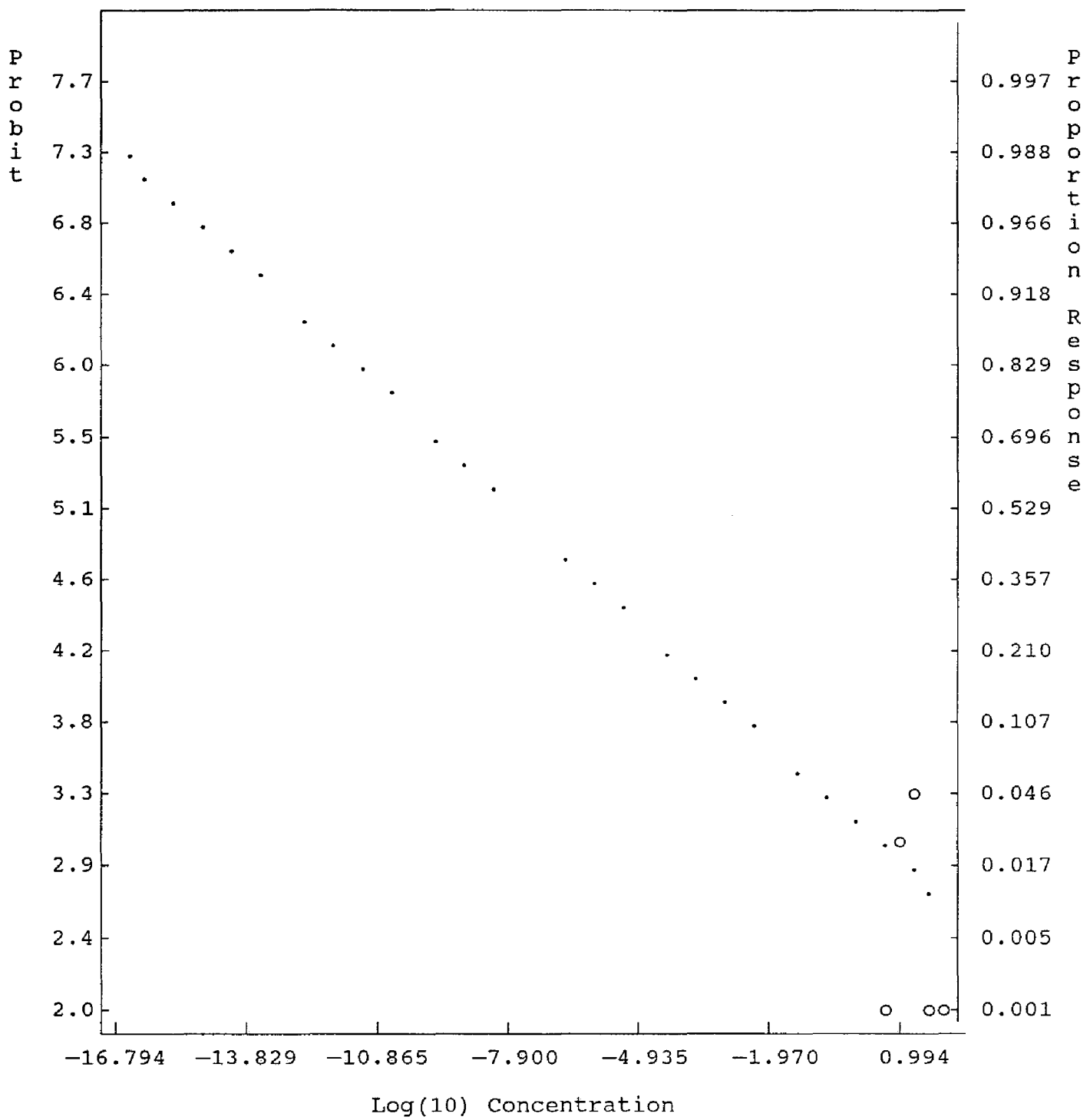
Theoretical spontaneous response rate = 0.0000

Estimated LC/EC values

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
50.00	0.000		

```
**************************************************************
*                          WARNING                           *
*                                                            *
* Slope of probit model is negative or zero, indicating lower *
* or same proportion of responses with higher doses.  EC/LC  *
* values may be nonsense.                                    *
**************************************************************
```

Plot of adjusted probits and predicted regression line



Fish Larvae	Day2	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1981

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		Arc sine sqrt w/ adj.				
X	0.00D	1.41	0.000	4		
X	6.25D	1.41	0.000	4	0.000	18.000
X	12.50D	1.37	.081	4	1.134	16.000
X	25.00D	1.33	.094	4	2.268	14.000
X	50.00D	1.41	0.000	4	0.000	18.000
X	100.00D	1.41	0.000	4	0.000	18.000
Data transformation:		No transformation				
	0.00D	1.00	0.000	4		
	6.25D	1.00	0.000	4	0.000	18.000
	12.50D	.98	.050	4	1.134	16.000
	25.00D	.95	.058	4	2.268	14.000
	50.00D	1.00	0.000	4	0.000	18.000
	100.00D	1.00	0.000	4	0.000	18.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
>100	>100	<1	.05	One-sided	Steel	10

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.00258	5.90137	2.41

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.771269	.884	No

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

Fish Larvae			Weight			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1981

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T
Data transformation:		No transformation			
X	0.00D	.47	.028	4	
X	6.25D	.51	.042	4	−1.117
X	12.50D	.51	.067	4	−1.041
X	25.00D	.48	.039	4	−.241
X	50.00D	.50	.062	4	−.675
X	100.00D	.51	.058	4	−1.075

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
>100	>100	<1	.05	One-sided	Dunnett	2.41

Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	.00263	18.4363	2.41

Shapiro-Wilk Test for Normality:	Alpha	W	Cutoff W	Normal?
	.01	.971467	.884	Yes

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	2.6647	.7515	Yes

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1981

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC	912	Chi–square test for heterogeniety significant – proceding to Spearman Karber Analysis
EC/LC	69	Cannot compute Spearman–Karber EC/LC 50
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Fish Larvae	Proportion Alive	Day 7

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1981

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		Arc sine sqrt w/ adj.				
X	0.00D	1.29	.081	4		
X	6.25D	1.41	0.000	4	−2.846	24.000
X	12.50D	1.37	.081	4	−1.897	22.000
X	25.00D	1.33	.094	4	−.949	20.000
X	50.00D	1.41	0.000	4	−2.846	24.000
X	100.00D	1.41	0.000	4	−2.846	24.000
Data transformation:		No transformation				
	0.00D	.93	.050	4		
	6.25D	1.00	0.000	4	−2.846	24.000
	12.50D	.98	.050	4	−1.897	22.000
	25.00D	.95	.058	4	−.949	20.000
	50.00D	1.00	0.000	4	−2.846	24.000
	100.00D	1.00	0.000	4	−2.846	24.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
>100	>100	<1	.05	One-sided	Steel	10

Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	.00369	6.91216	2.41

Shapiro-Wilk Test for Normality:	Alpha	W	Cutoff W	Normal?
	.01	.914881	.884	Yes

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	9999	0	No

Fish Larvae			Weight			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/04/98	EFF2 (%)	N. CREEK	EPAF 94	1981

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T
Data transformation:		No transformation			
X	0.00D	.47	.028	4	
X	6.25D	.51	.042	4	−1.117
X	12.50D	.51	.067	4	−1.041
X	25.00D	.48	.039	4	−.241
X	50.00D	.50	.062	4	−.675
X	100.00D	.51	.058	4	−1.075

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
>100	>100	<1	.05	One-sided	Dunnett	2.41

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.00263	18.4363	2.41

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.971467	.884	Yes

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	2.6647	.7515	Yes

Appendix C

SCOEPA00027895

APPENDIX C

REFERENCE TOXICANT DATA

STATIC ACUTE *Ceriodaphnia dubia* TOXICITY TEST

Client: IN HOUSE
Sample: Na Cl REFERENCE TOXICANT
Test Dates: 7/7/98 - 7/9/98

Sample Collection Date: N/A
Test Initiation Time: 1600
Source/Age of Organisms: IN HOUSE, <24 hrs.

Temp (°C) Day 0: 20.4 Day 1: 19 Day 2: 20

Conc.	Rep.	Number of Organisms 0	24	48	pH 0	24	48	Dissolved Oxygen (mg/L) 0	24	48	Specific Conductivity (µS) 0	48
Control	A	5	5	5	8.2	8.0	8.1	8.5	9.2	8.5	213	250
	B	5	5	5								
	C	5	5	5								
	D	5	5	5								
.3125g/l	A	5	5	5	8.2	8.0	8.1	8.5	9.2	8.5	808	823
	B	5	5	5								
	C	5	5	5								
	D	5	5	5								
.625g/l	A	5	5	5	8.2	8.0	8.1	8.5	9.2	8.5	1417	1486
	B	5	5	5								
	C	5	5	5								
	D	5	5	5								
1.25g/l	A	5	5	5	8.1	8.0	8.1	8.6	9.2	8.6	2600	2640
	B	5	5	5								
	C	5	5	5								
	D	5	5	5								
2.5g/l	A	5	5	2-3	8.1	8.0	8.1	8.7	9.2	8.6	4870	4940
	B	5	5	4-1								
	C	5	5	2-3								
	D	5	5	3-2								
5.0g/l	A	5	0-5	0	8.1	8.0	8.0	8.8	9.2	8.7	9290	9420
	B	5	0-5	0								
	C	5	0-5	0								
	D	5	0-5	0								
	A											
	B											
	C											
	D											
Initials		AE	AE	AE	BE	AE	AE	BE	AE	AE	BE	AE
Date		7/7	7/8	7/9	7/7	7/8	7/9	7/7	7/8	7/9	7/7	7/9

Shading represents areas for which data collection is not required.
NT = Not Taken

Comments

DSD

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: 1937 ( ) Chronic (x) Acute 48 hours
Test Date: 7-Jul-98
Source: DMR Test Material: NACL (g/l)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
0.00 D	1		F	5		5						1.00		
0.00 D	2		F	5		5						1.00		
0.00 D	3		F	5		5						1.00		
0.00 D	4		F	5		5						1.00		
.31 D	1		F	5		5						1.00		
.31 D	2		F	5		5						1.00		
.31 D	3		F	5		5						1.00		
.31 D	4		F	5		5						1.00		
.63 D	1		F	5		5						1.00		
.63 D	2		F	5		5						1.00		
.63 D	3		F	5		5						1.00		
.63 D	4		F	5		5						1.00		
1.25 D	1		F	5		5						1.00		
1.25 D	2		F	5		5						1.00		
1.25 D	3		F	5		5						1.00		
1.25 D	4		F	5		5						1.00		
2.50 D	1		F	5		2						.40		
2.50 D	2		F	5		4						.80		
2.50 D	3		F	5		2						.40		
2.50 D	4		F	5		3						.60		
5.00 D	1		F	5		0						0.00		
5.00 D	2		F	5		0						0.00		
5.00 D	3		F	5		0						0.00		
5.00 D	4		F	5		0						0.00		

Parametrix Toxicology Laboratory

Test Date: 7/07/98
Sample Date: 7/07/98
Species: Ceriodaphnia dubia
Test Type: Acute - 48 hours

Test Number: 1937
Test Material: Sodium chloride g/l
Source: DMR
Discharge Monitoring Report

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.35	0.000	
			X	.313	D	4	1.35	0.000	
			X	.625	D	4	1.35	0.000	
			X	1.250	D	4	1.35	0.000	
			X	2.500	D	4	.84	.201	
				5.000	D	4	.23	0.000	
Proportion Alive	2	No transformation							
				0.000	D	4	1.00	0.000	
				.313	D	4	1.00	0.000	
				.625	D	4	1.00	0.000	
				1.250	D	4	1.00	0.000	
				2.500	D	4	.55	.191	
				5.000	D	4	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj. Steel many-one rank test	1.250	2.500	80.00	.007	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI		TU
Proportion Alive	2	Spearman-Karber	EC 50	2.588	2.22 -	3.02	38.64

SCOEPA00027899

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/07/98	NACL (g/l)	DMR	EPAA 91	1937

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	-1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	No Analysis		
Transform:			
Tail:			
Constant:	.01	Variance:	.01
Root:		Alpha Normality:	.01
		NOEC:	.05

Calculate IC? N (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors

Spearman–Karber Analysis for EC/LC 50

Parametrix Toxicology Laboratory

Species: Ceriodaphnia dubia
Test Material: Sodium chloride (g/l
Endpoint: Prop

Test Number: 1937
Test Date: 7/07/98

Conc	Number Exposed	Mortalities
0.00	20	0
.31	20	0
.63	20	0
1.25	20	0
2.50	20	9
5.00	20	20

Spearman–Karber EC/LC 50 estimate: 2.588
95% lower confidence: 2.218
95% upper confidence: 3.020

Untrimmed Spearman–Karber

Ceriodaphnia	Proportion Alive	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/07/98	NACL (g/l)	DMR	EPAA 91	1937

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		Arc sine sqrt w/ adj.				
X	0.00D	1.35	0.000	4		
X	.31D	1.35	0.000	4	0.000	18.000
X	.63D	1.35	0.000	4	0.000	18.000
X	1.25D	1.35	0.000	4	0.000	18.000
X	2.50D	.84	.201	4	8.679	10.000
	5.00D	.23	0.000	4	19.258	10.000
Data transformation:		No transformation				
	0.00D	1.00	0.000	4		
	.31D	1.00	0.000	4	0.000	18.000
	.63D	1.00	0.000	4	0.000	18.000
	1.25D	1.00	0.000	4	0.000	18.000
	2.50D	.55	.191	4	8.679	10.000
	5.00D	0.00	0.000	4	19.258	10.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
1.25	2.5	80	.05	One-sided	Steel	10

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.00676	12.7840	2.41

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.522486	.884	No

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

Parametrix, Inc.
Environmental Toxicology Laboratory *Ceriodaphnia dubia*
Chronic Daily Survival and Offspring

Client: Reftox Client Number: N/A Test Dates: 7/21/98 – 7/28/98

Sample I.D./Source: NaCl Sample Collection Dates: N/A Dilution Media: Natural Spring Water

Temperature (°C) 0 25 24 26° 48 26° 72 24 96 26 120 25 144 24 168 25

Conc	Rep	Survival (hours)								Offspring (hours)						
		0	24	48	72	96	120	144	168	72	96	120	144	168		Total
Control	A	1	1	1	1	1	1	1	1	3	0	11	13	11		38
	B	1	1	1	1	1	1	1	1	3	0	12	12	3		30
	C	1	1	1	1	1	1	1	1	7	0	11	12	12		37
	D	1	1	1	1	1	1	1	1	1	0	8	13	8		30
	E	1	1	1	1	1	1	- 1	1	0	5	9	9	0		23
	F	1	1	1	1	1	1	1	1	4	0	12	0	0		16
	G	1	1	1	1	1	1	1	1	0	3	7	8	0		18
	H	1	1	1	1	1	1	1	1	4	0	13	13	0		30
	I	1	1	1	1	1	1	1	1	4	0	11	12	11		38
	J	1	1	1	1	1	1	1	1	4	0	14	11	0		29
.3125 g/L	A	1	1	1	1	1	1	1	1	5	0	12	14	0		31
	B	1	1	1	1	1	1	1	1	5	9	0	10	13		37
	C	1	1	1	1	1	1	1	1	6	6	0	13	9		34
	D	1	1	1	1	1	1	1	1	5	0	10	12	0		27
	E	1	1	1	1	1	1	1	1	4	0	8	9	11		32
	F	1	1	1	1	1	1	1	1	6	0	8	10	0		24
	G	1	1	1	1	1	1	1	1	5	9	0	12	12		38
	H	1	1	1	1	1	1	1	1	6	0	13	13	11		43
	I	1	1	1	1	1	1	1	1	5	0	10	0	0		15
	J	1	1	1	1	1	1	1	1	5	8	0	7	1		21
.625 g/L	A	1	1	1	1	1	1	1	1	4	0	9	12	0		25
	B	1	1	1	1	1	1	1	1	3	11	0	4	11		29
	C	1	1	1	1	1	1	1	1	4	0	12	12	0		28
	D	1	1	1	1	1	1	1	1	5	0	11	0	2		18
	E	1	1	1	1	1	1	1	1	6	0	10	9	0		25
	F	1	1	1	1	1	1	1	1	5	0	11	0	0		16
	G	1	1	1	1	1	1	1	1	4	0	14	16	0		34
	H	1	1	1	1	1	1	1	1	3	10	0	6	13		32
	I	1	1	1	1	1	1	1	1	5	8	0	11	2		26
	J	1	1	1	1	1	1	1	1	0	4	8	8	0		20
	Init.	AE	AE	AE	BE	AE	NM	AE	BE	BE	AE	NM	AE	BE		AE
	Time	1200	1200	1045	1330	1100	1400	1330	1115	1330	1100	1400	1330	1115		
	Date	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/24	7/25	7/26	7/27	7/28		7/29

Ceriodaphnia dubia
Chronic Daily Survival and Offspring

Conc	Rep	Survival (hours)								Offspring (hours)					Total
		0	24	48	72	96	120	144	168	72	96	120	144	168	
1.25 g/L	A	1	1	1	1	1	1	1	1	3	0	5	5	0	13
	B	1	1	1	1	1	1	0-1	0	0	4	9	0	0	13
	C	1	1	1	1	1	1	1	1	0	3	7	10	0	20
	D	1	1	1	1	1	1	1	1	0	2	6	0 AE 4	3	11
	E	1	1	1	1	1	1	1	1	0	4	7	4	0	15
	F	1	1	1	1	1	1	1	1	0	3	9	9	0	21
	G	1	1	1	1	1	1	1	1	0	2	9	0	0	11
	H	1	1	1	1	1	1	1	1	4	0	11	13	12	40
	I	1	1	1	1	1	1	1	1	1	1	10	0	0	12
	J	1	1	1	1	1	1	1	1	0	3	4	9	0	16
2.5 g/L	A	1	1	1	0-1	0	0	0	0	0	0	0	0	0	0
	B	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0
	C	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0
	D	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0
	E	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	F	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0
	G	1	1	1	0-1	0	0	0	0	0	0	0	0	0	0
	H	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0
	I	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0
	J	1	1	0-1	0	0	0	0	0	0	0	0	0	0	0
5 g/L	A	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	B	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	C	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	D	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	E	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	F	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	G	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	H	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	I	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	J	1	0-1	0	0	0	0	0	0	0	0	0	0	0	0
	Init.	AE	KM	KM	BE	AE	NM	AE	BE	BE	AE	NM	AE	BE	AE
	Time	1200	1210	1100	1330	1100	1400	1330	1115	1330	1100	1400	1330	1115	
	Date	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/24	7/25	7/26	7/27	7/28	7/29

DSQ cat

Ceriodaphnia dubia
Daily Water Quality Parameters

pH Solution																
Date	7/21	7/22	7/22	7/23	7/23	7/24	7/24	7/25	7/25	7/26	7/26	7/27	7/27	7/28		
Day	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8
g/L Conc	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	8.1	7.8	7.9	8.5	7.7	7.9	7.7	7.8	7.6	7.8	7.5	7.7	7.6	8.4		
.3125	8.0	7.8	7.9	8.3	7.7	8.0	7.8	7.8	7.6	7.8	7.5	7.6	7.6	8.3		
.625	7.9	7.8	7.9	8.3	7.7	8.0	7.8	7.8	7.6	7.9	7.5	7.6	7.6	8.3		
1.25	7.9	7.8	7.9	8.2	7.7	8.1	7.9	7.9	7.6	7.9	7.5	7.5	7.6	8.2		
2.5	7.9	7.8	7.9	8.1	7.8	8.0	—	—	—	—	—	—	—	—		
5.0	7.8	7.8	7.9	—	—	—	—	—	—	—	—	—	—	—		
Initials	AE	KM	KM	KM	KM	BE	BE	AE	AE	NM	NM	AE	AE	BE		

g/L Conc.	Dissolved Oxygen (mg/L) Solution															
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	8.1	8.2	8.4	8.3	8.2	8.3	8.2	8.3	8.0	8.1	8.2	8.4	8.3	8.2		
.3125	8.0	8.0	8.4	8.2	8.2	8.3	8.3	8.3	7.9	8.1	8.2	8.4	8.3	8.2		
.625	8.1	8.0	8.4	8.1	8.2	8.2	8.4	8.3	8.0	8.2	8.3	8.3	8.3	8.2		
1.25	8.1	8.0	8.4	8.1	8.2	8.2	8.4	8.1	8.0	8.2	8.3	8.3	8.3	8.2		
2.5	8.1	8.0	8.4	8.1	8.2	8.0	—	—	—	—	—	—	—	—		
5.0	8.3	8.1	8.5	—	8.3 KM	—	—	—	—	—	—	—	—	—		
Initials	AE	KM	KM	KM	KM	BE	BE	AE	AE	NM	NM	AE	AE	BE		

Conc.	Conductivity (μMHOS)							
	0 Hour	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hours	168 Hours *
Cont.	203	202	194	194	198	198	193	266
100%	9230	9140	—	—	—		—	—
Initials	AE	KM	KM	BE	AE	NA	AE	BE

Comments: * FINAL CONDUCTIVITY AT 168 HOURS

NEO

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: REFTOX867 (x) Chronic ( ) Acute hours
Test Date: 21-Jul-98
Source: REF Test Material: NACL (g/l)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
0.00 D	1		F	1	1						1	1.00	38	
0.00 D	2		F	1	1						1	1.00	30	
0.00 D	3		F	1	1						1	1.00	37	
0.00 D	4		F	1	1						1	1.00	30	
0.00 D	5		F	1	1						1	1.00	23	
0.00 D	6		F	1	1						1	1.00	16	
0.00 D	7		F	1	1						1	1.00	18	
0.00 D	8		F	1	1						1	1.00	30	
0.00 D	9		F	1	1						1	1.00	38	
0.00 D	10		F	1	1						1	1.00	29	
.31 D	1		F	1	1						1	1.00	31	
.31 D	2		F	1	1						1	1.00	37	
.31 D	3		F	1	1						1	1.00	34	
.31 D	4		F	1	1						1	1.00	27	
.31 D	5		F	1	1						1	1.00	32	
.31 D	6		F	1	1						1	1.00	24	
.31 D	7		F	1	1						1	1.00	38	
.31 D	8		F	1	1						1	1.00	43	
.31 D	9		F	1	1						1	1.00	15	
.31 D	10		F	1	1						1	1.00	21	
.63 D	1		F	1	1						1	1.00	25	
.63 D	2		F	1	1						1	1.00	29	
.63 D	3		F	1	1						1	1.00	28	
.63 D	4		F	1	1						1	1.00	18	
.63 D	5		F	1	1						1	1.00	25	
.63 D	6		F	1	1						1	1.00	16	
.63 D	7		F	1	1						1	1.00	34	
.63 D	8		F	1	1						1	1.00	32	
.63 D	9		F	1	1						1	1.00	26	
.63 D	10		F	1	1						1	1.00	20	
1.25 D	1		F	1	1						1	1.00	13	
1.25 D	2		F	1	1						0	0.00	13	
1.25 D	3		F	1	1						1	1.00	20	
1.25 D	4		F	1	1						1	1.00	11	
1.25 D	5		F	1	1						1	1.00	15	
1.25 D	6		F	1	1						1	1.00	21	
1.25 D	7		F	1	1						1	1.00	11	
1.25 D	8		F	1	1						1	1.00	40	
1.25 D	9		F	1	1						1	1.00	12	
1.25 D	10		F	1	1						1	1.00	16	
2.50 D	1		F	1	1						0	0.00	0	
2.50 D	2		F	1	0						0	0.00	0	
2.50 D	3		F	1	0						0	0.00	0	
2.50 D	4		F	1	0						0	0.00	0	
2.50 D	5		F	1	0						0	0.00	0	
2.50 D	6		F	1	0						0	0.00	0	
2.50 D	7		F	1	1						0	0.00	0	

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: REFTOX867 (x) Chronic ( ) Acute hours
Test Date: 21-Jul-98
Source: REF Test Material: NACL (g/l)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
2.50 D	8		F	1	0						0	0.00	0	
2.50 D	9		F	1	0						0	0.00	0	
2.50 D	10		F	1	0						0	0.00	0	
5.00 D	1		F	1	0						0	0.00	0	
5.00 D	2		F	1	0						0	0.00	0	
5.00 D	3		F	1	0						0	0.00	0	
5.00 D	4		F	1	0						0	0.00	0	
5.00 D	5		F	1	0						0	0.00	0	
5.00 D	6		F	1	0						0	0.00	0	
5.00 D	7		F	1	0						0	0.00	0	
5.00 D	8		F	1	0						0	0.00	0	
5.00 D	9		F	1	0						0	0.00	0	
5.00 D	10		F	1	0						0	0.00	0	

Parametrix Toxicology Laboratory

Test Date: 7/21/98
Sample Date: 7/21/98
Species: Ceriodaphnia dubia
Test Type: Chronic

Test Number: REFTOX867
Test Material: Sodium chloride g/l
Source: REF
Reference Toxicant

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	No transformation							
			X	0.000	D	10	1.00	0.000	
			X	.313	D	10	1.00	0.000	
			X	.625	D	10	1.00	0.000	
			X	1.250	D	10	1.00	0.000	
			X	2.500	D	10	.20	.422	
			X	5.000	D	10	0.00	0.000	
Proportion Alive	7	No transformation							
			X	0.000	D	10	1.00	0.000	
			X	.313	D	10	1.00	0.000	
			X	.625	D	10	1.00	0.000	
			X	1.250	D	10	.90	.316	
			X	2.500	D	10	0.00	0.000	
			X	5.000	D	10	0.00	0.000	
Reproduction		No transformation							
			X	0.000	D	10	28.90	7.852	
			X	.313	D	10	30.20	8.522	
			X	.625	D	10	25.30	5.870	
			X	1.250	D	10	17.20	8.741	
			X	2.500	D	10	0.00	0.000	
			X	5.000	D	10	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	No transformation Fisher Exact	1.250	2.500			
Proportion Alive	7	No transformation Fisher Exact	1.250	2.500			
Reproduction		No transformation Steel many-one rank test	.625	1.250		40.856	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	2	Graphical Interpolation	EC 50	1.928	-	
Proportion Alive	7	Graphical Interpolation	EC 50	1.701	-	

- GROWTH POINT ESTIMATE -

End Point	P	IC	95% CI
Reproduction	IC 25	.867	.53 - 1.34
	IC 50	1.426	1.08 - 1.74

SCOEPA00027908

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/21/98	NACL (g/l)	REF	EPAF 94	REFTOX867

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	Fisher Exact		
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

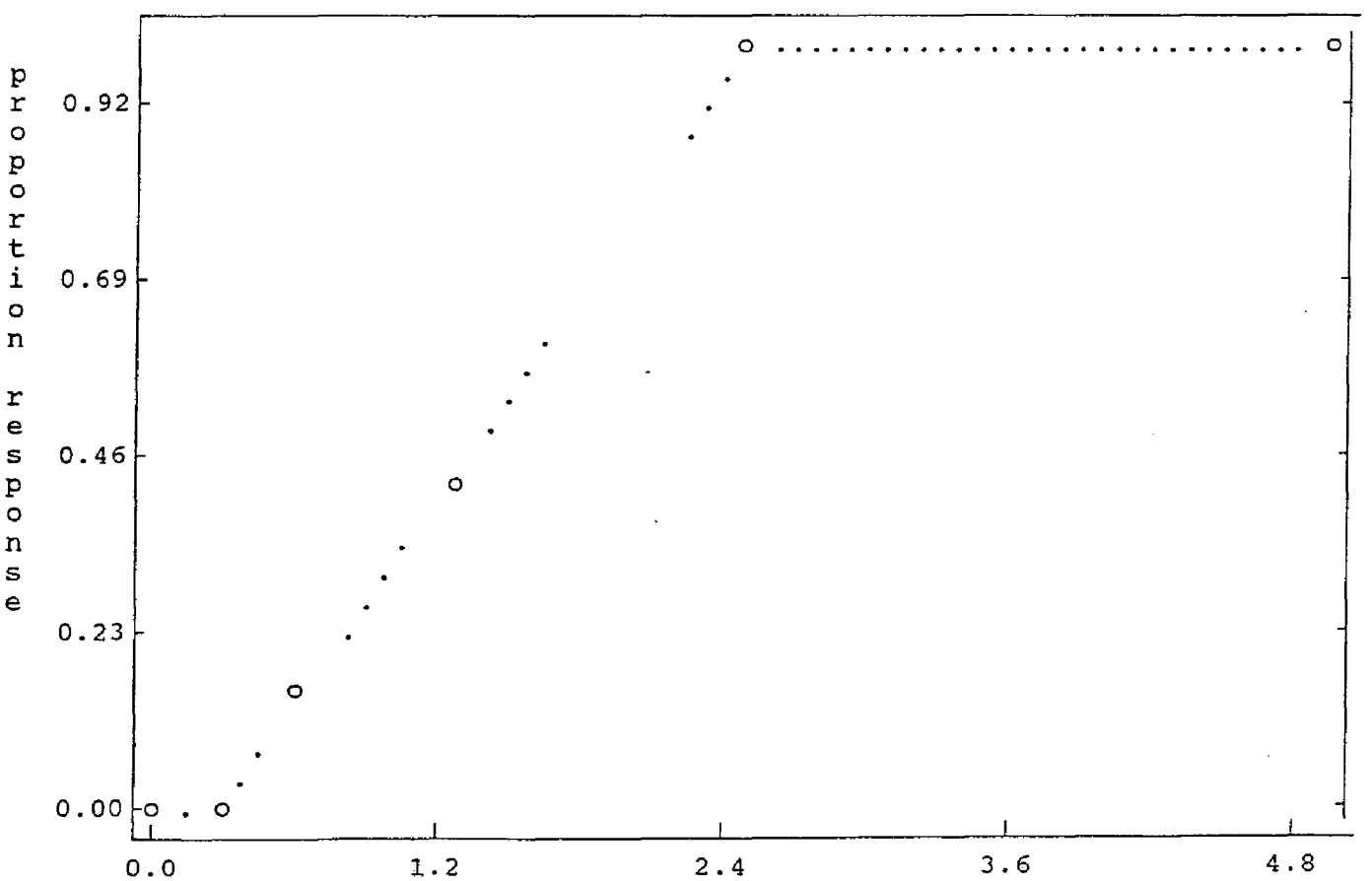
Species: Ceriodaphnia dubia
Test Material: Sodium chloride (g/l)
Endpoint: Total young

Test Number: REFTOX867
Test Date: 7/21/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	28.9000	29.5500	0.0000
0.3125	30.2000	29.5500	0.0000
0.6250	25.3000	25.3000	0.1438
1.2500	17.2000	17.2000	0.4179
2.5000	0.0000	0.0000	1.0000
5.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	0.8671	0.597	1.374
50	1.4262	1.114	1.708

Note: # bootstrap resamplings = 120



Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

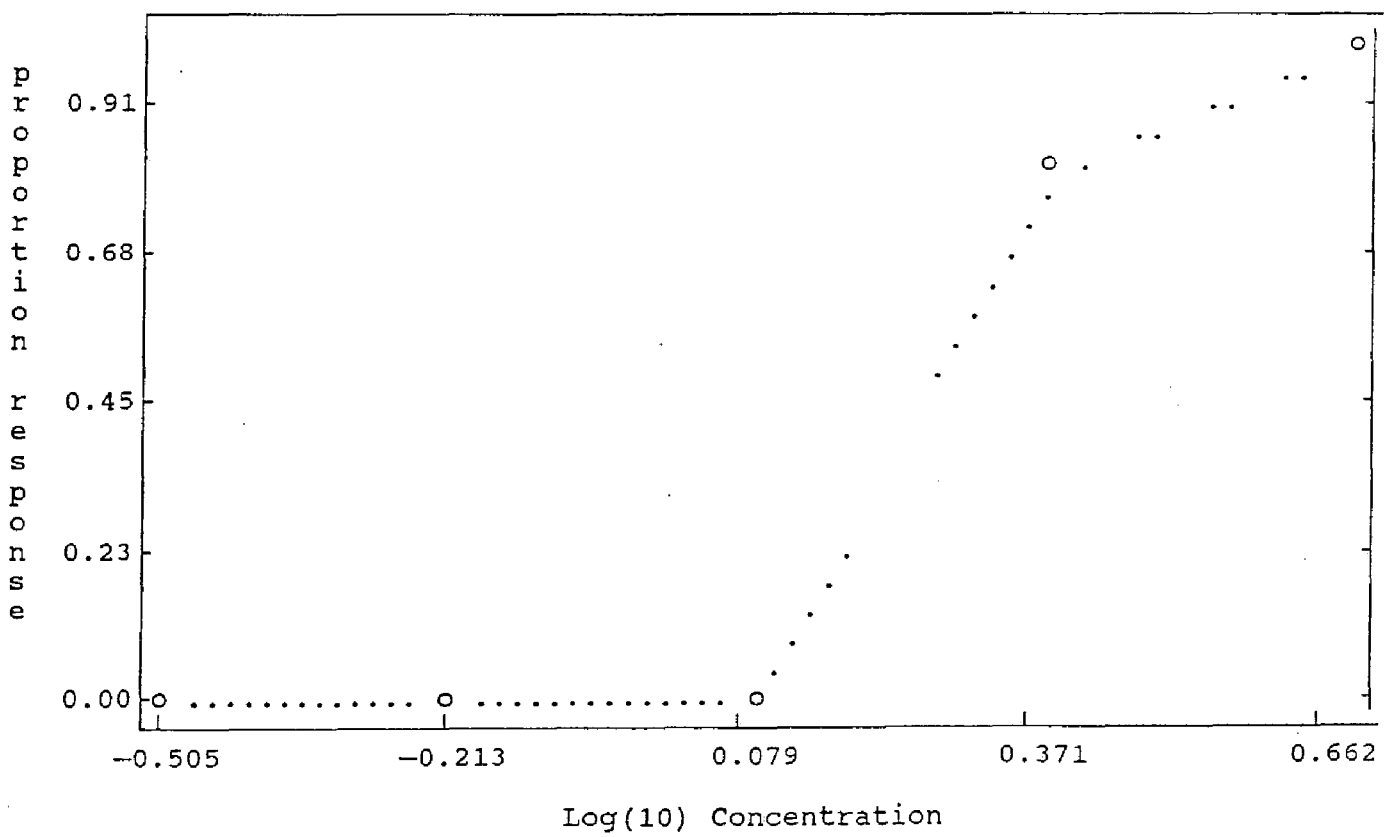
Species: Ceriodaphnia dubia
Test Material: Sodium chloride (g/l)
Endpoint: Day2

Test Number: REFTOX867
Test Date: 7/21/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
0.3125	0.0000	0.0000	0.0000
0.6250	0.0000	0.0000	0.0000
1.2500	0.0000	0.0000	0.0000
2.5000	0.8000	0.8000	0.8000
5.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	1.9278



Ceriodaphnia	Day2	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/21/98	NACL (g/l)	REF	EPAF 94	REFTOX867

Fisher Exact

Transformation		Prop. Conc	Alive	P
No transformation				
	X	0.00D	1.00	
	X	.31D	1.00	1.000
	X	.63D	1.00	1.000
	X	1.25D	1.00	1.000
	X	2.50D	.20	.000
	X	5.00D	0.00	.000

NOEC	LOEC	TU	Alpha	Tail	Based on
1.25	2.5		.05	One-sided	Fisher Exact

Ceriodaphnia			Reproduction			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/21/98	NACL (g/l)	REF	EPAF 94	REFTOX867

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation: No transformation						
X	0.00D	28.90	7.852	10		
X	.31D	30.20	8.522	10	−.455	110.500
X	.63D	25.30	5.870	10	1.259	88.500
X	1.25D	17.20	8.741	10	4.093	69.500
X	2.50D	0.00	0.000	10	10.110	55.000
X	5.00D	0.00	0.000	10	10.110	55.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
.625	1.25		.05	One-sided	Steel	75

Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	40.855	22.6406	2.289

Kolmogorov Test for Normality:	Alpha	D	Cutoff D	Normal?
	.01	.197949	.132	No

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	9999	0	No

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/21/98	NACL (g/l)	REF	EPAF 94	REFTOX867

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	Fisher Exact		
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

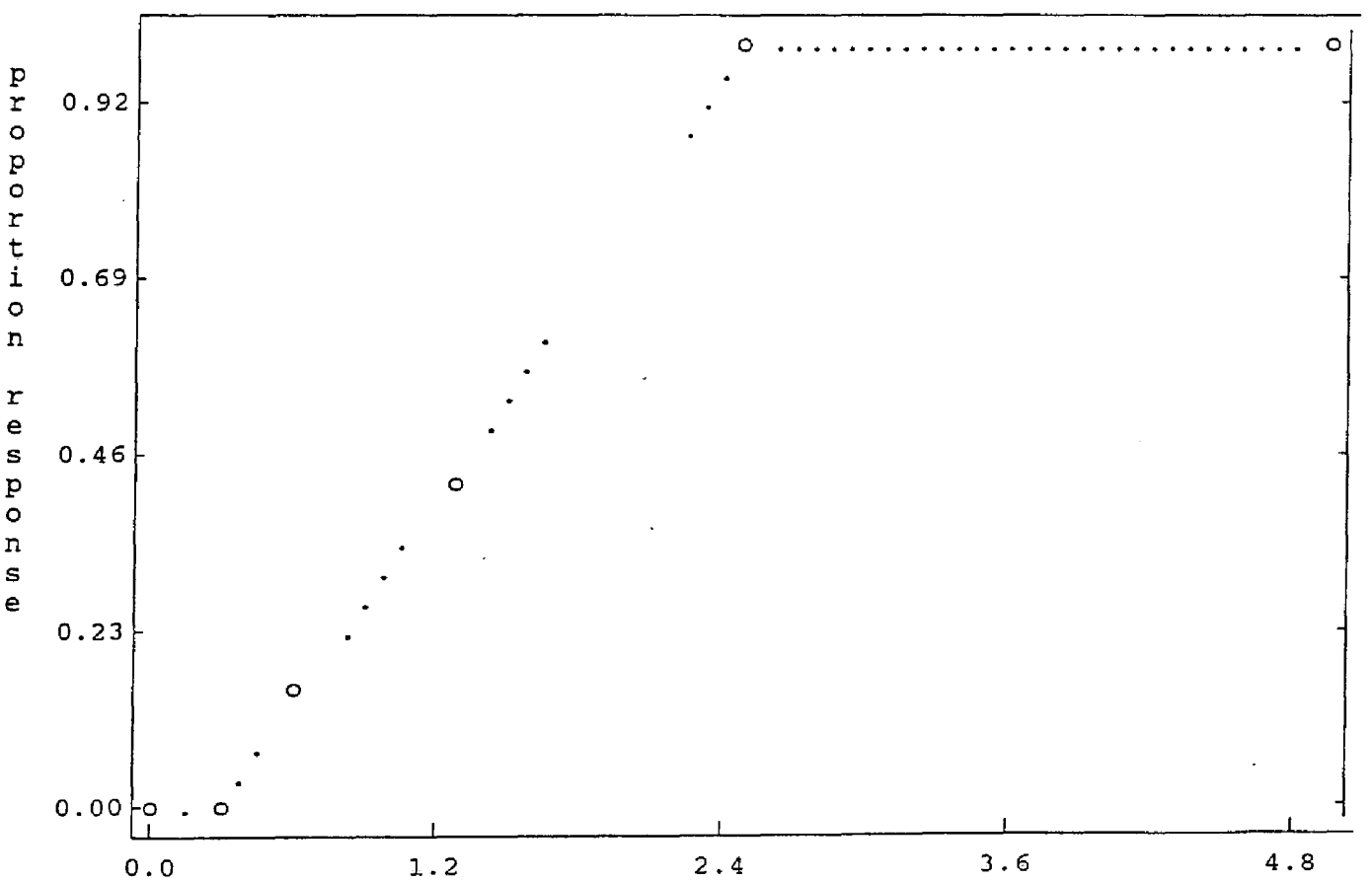
Species: Ceriodaphnia dubia
Test Material: Sodium chloride (g/l)
Endpoint: Total young

Test Number: REFTOX867
Test Date: 7/21/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	28.9000	29.5500	0.0000
0.3125	30.2000	29.5500	0.0000
0.6250	25.3000	25.3000	0.1438
1.2500	17.2000	17.2000	0.4179
2.5000	0.0000	0.0000	1.0000
5.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	0.8671	0.533	1.337
50	1.4262	1.081	1.739

Note: # bootstrap resamplings = 120



Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

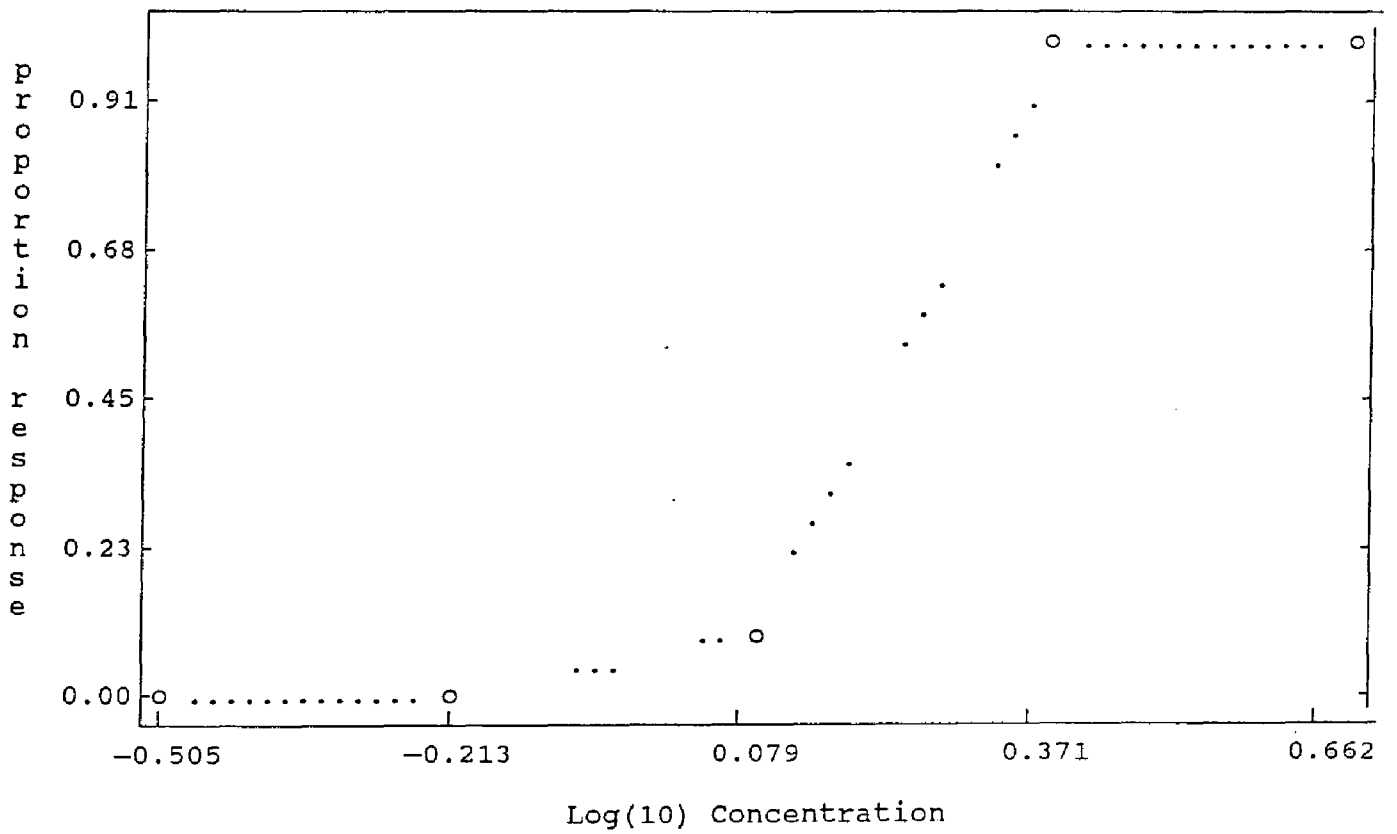
Species: Ceriodaphnia dubia
Test Material: Sodium chloride (g/l)
Endpoint: End

Test Number: REFTOX867
Test Date: 7/21/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
0.3125	0.0000	0.0000	0.0000
0.6250	0.0000	0.0000	0.0000
1.2500	0.1000	0.1000	0.1000
2.5000	1.0000	1.0000	1.0000
5.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	1.7010



Ceriodaphnia	Proportion Alive	Day 7

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/21/98	NACL (g/l)	REF	EPAF 94	REFTOX867

Fisher Exact

Transformation		Prop. Conc	Alive	P
No transformation				
	X	0.00D	1.00	
	X	.31D	1.00	1.000
	X	.63D	1.00	1.000
	X	1.25D	.90	.500
	X	2.50D	0.00	.000
	X	5.00D	0.00	.000

NOEC	LOEC	TU	Alpha	Tail	Based on
1.25	2.5		.05	One-sided	Fisher Exact

Ceriodaphnia			Reproduction			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/21/98	NACL (g/l)	REF	EPAF 94	REFTOX867

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		No transformation				
X	0.00D	28.90	7.852	10		
X	.31D	30.20	8.522	10	−.455	110.500
X	.63D	25.30	5.870	10	1.259	88.500
X	1.25D	17.20	8.741	10	4.093	69.500
X	2.50D	0.00	0.000	10	10.110	55.000
X	5.00D	0.00	0.000	10	10.110	55.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
.625	1.25		.05	One-sided	Steel	75

Dunnett Test:

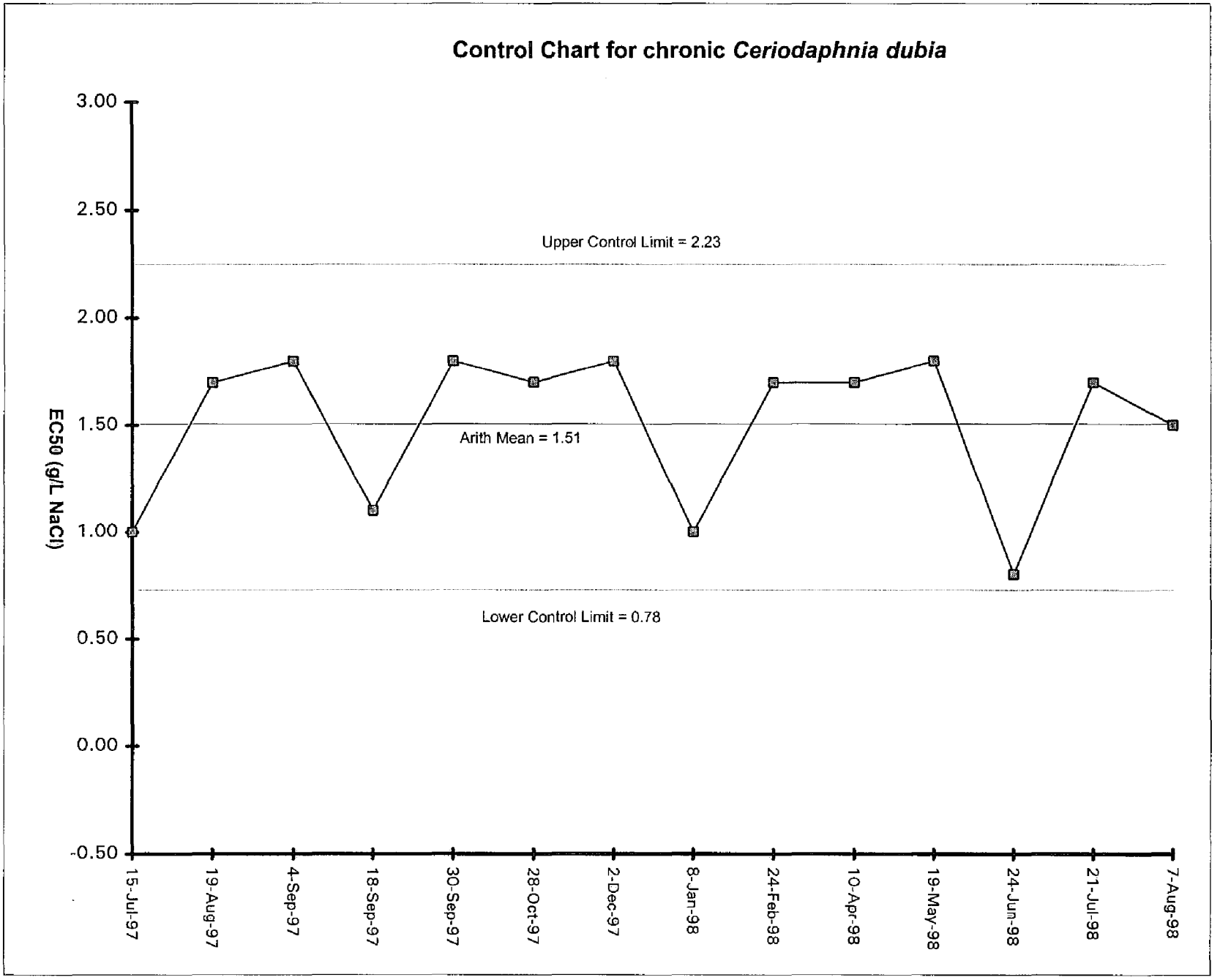
MSE	MSD % Reduction from Control	Critical T
40.855	22.6406	2.289

Kolmogorov Test for Normality:

Alpha	D	Cutoff D	Normal?
.01	.197949	.132	No

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No


Control Chart for chronic *Ceriodaphnia dubia*
EC50 (g/L NaCl)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
Upper Control Limit = 2.23
Arith Mean = 1.51
Lower Control Limit = 0.78
15-Jul-97
19-Aug-97
4-Sep-97
18-Sep-97
30-Sep-97
28-Oct-97
2-Dec-97
8-Jan-98
24-Feb-98
10-Apr-98
19-May-98
24-Jun-98
21-Jul-98
7-Aug-98

Parametrix, Inc.
5808 Lake Washington Blvd
Kirkland, WA 98033

Parametrix, Inc.
Environmental Toxicology Laboratory

Pimephales promelas
CHRONIC DAILY MONITORING

Client: Reftox
Collection Dates: N/A
Sample: KCl
Test Dates: 7/10/98 - 7/17/98

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Temp (°C)	25	25	25	25	25	25	25	24

g/L Conc.	Rep.	pH Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control		8.1	8.0	7.9	7.9	7.7	7.8	7.9	7.8	8.0	7.8	8.0	7.5	~~6.5~~ 7.6	7.8
.125		8.1	8.0	7.9	7.9	7.6	7.8	7.8	7.8	7.9	7.8	8.0	7.6	~~6.5~~ 7.6	7.8
.25		8.1	8.0	7.9	7.9	7.7	7.8	7.9	7.8	7.9	7.8	8.0	7.6	~~6.0~~ 7.5	7.8
.5		8.1	8.0	7.9	8.0	7.8	7.9	7.9	7.8	7.9	7.9	8.0	7.6	7.6	7.9
1.0		8.1	8.0	8.0	—	7.9	—	—	—	—	—	—	—	—	—
2.0		8.1	~~8.0~~	8.1	—	—	—	—	—	—	—	—	—	—	—

		Dissolved Oxygen (mg/L) Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control		8.2	8.0	7.9	7.9	7.8	8.2	8.2	8.1	7.8	8.1	7.7	8.0	~~7.6~~	7.3
.125		8.1	8.0	8.0	7.7	7.5	8.1	7.9	7.9	7.8	7.9	7.8	8.0	~~7.6~~	7.4
.25		8.1	8.1	8.1	7.8	7.5	8.1	7.9	7.9	7.7	7.9	7.7	7.8	~~7.5~~	7.4
.5		8.1	8.1	7.9	7.9	7.8	8.1	7.9	8.0	7.7	7.8	7.5	7.7	~~7.6~~	7.5
1.0		8.1	8.1	7.9	—	7.9	—	—	—	—	—	—	—	—	—
2.0		8.0	—	7.9	—	—	—	—	—	—	—	—	—	—	—

		Specific Conductivity (µS) Initial	1	2	3	4	5	6	Final
Control		319	327	332	343	353	335	346	344
100%		3910	4040 *	—	—	—	—	—	—

Initials	AE	JN	JN	BE	BE	JM	JM	JM	JM	AE	AE	JM	JM	BE
Date	7/10	7/11	7/11	7/12	7/12	7/13	7/13	7/14	7/14	7/15	7/15	7/15	7/16	7/17

NT = Not Taken

Comments: * Conductivity final

Day 6
Final D.C
7.1
7.2
7.1
7.1

SCOEPA00027920

Parametrix, Inc.
Environmental Toxicology Laboratory

Parametrix, Inc.
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033

Pimephales promelas
Chronic Daily Survival

Client: Reftox
Sample I.D./Source: KCl
Dilution Media: EPA SFW
Test Initiation Time: 1000
Sample Collection Dates: N/A
Test Dates: 7/10/98 - 7/17/98

Conc.	Rep.	No. of Survivors 0	24	48	72	96	120	144	168
Control	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C			-					
	D								
.125 g/L	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C								
	D								
.25 g/L	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C								
	D								
.5 g/L	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C								
	D								
1.0 g/L	A	10	1-9	0-1	0	0	0	0	0
	B	10	0-10	0	0	0	0	0	0
	C								
	D								
2.0 g/L	A	10	0-10	0	0	0	0	0	0
	B	10	0-10	0	0	0	0	0	0
	C								
	D								
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								
Initials		JC	JC	AE	JM	JM	AE	JM	BE
Date		7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17

Comments: DW

Parametrix, Inc.
Environmental Toxicology Laboratory

7-DAY CHRONIC *Pimephales promelas* BIOMASS DATA

Client: Reflex Client No.: N/A

Conc./Rep.	Pan No.	Foil weight (mg)	Foil & Organism weight (mg)	Organism weight (mg)
Control A	73	9.83	13.19	~~4.07~~ 3.36 RK
B	74	9.81	13.39	3.58
.125g/L A	75	10.81	14.06	3.25
B	76	9.91	13.72	~~3.20~~ 3.81 gm
.25g/L A	77	8.99	12.19	3.20
B	78	9.07	12.42	3.35
.5g/L A	79	9.40	12.59	3.19
B	80	10.12	13.57	3.45

Comments:

DEO
RK

Rev. 1/30/97

Parametrix Toxicology Laboratory

FISH TEST DATA

Test Number: REFTOX866 (x) Chronic ( ) Acute hours
Test Date: 10-Jul-98
Source: REF Test Material: KCL (g/l)

Conc		Rep	Cont. No.	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Weight /Fish
0.00	D	1		10	10	10					10	1.00	.33600
0.00	D	2		10	10	10					10	1.00	.35800
.13	D	1		10	10	10					10	1.00	.32500
.13	D	2		10	10	10					10	1.00	.38100
.25	D	1		10	10	10					10	1.00	.32000
.25	D	2		10	10	10					10	1.00	.33500
.50	D	1		10	10	10					10	1.00	.31900
.50	D	2		10	10	10					10	1.00	.34500
1.00	D	1		10	0	0					0	0.00	
1.00	D	2		10	0	0					0	0.00	
2.00	D	1		10	0	0					0	0.00	
2.00	D	2		10	0	0					0	0.00	

Parametrix Toxicology Laboratory

Test Date: 7/10/98
Sample Date: 7/10/98
Species: Pimephales promelas
Test Type: Chronic

Test Number: REFTOX866
Test Material: Potassium chloride g/l
Source: REF
Reference Toxicant

SUMMARY

End Point	Day	Transformation		Conc	#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.						
			X	0.000 D	2	1.41	0.000	
			X	.125 D	2	1.41	0.000	
			X	.250 D	2	1.41	0.000	
			X	.500 D	2	1.41	0.000	
				1.000 D	2	.16	0.000	
				2.000 D	2	.16	0.000	
Proportion Alive	2	No transformation						
				0.000 D	2	1.00	0.000	
				.125 D	2	1.00	0.000	
				.250 D	2	1.00	0.000	
				.500 D	2	1.00	0.000	
				1.000 D	2	0.00	0.000	
				2.000 D	2	0.00	0.000	
Proportion Alive	4	Arc sine sqrt w/ adj.						
			X	0.000 D	2	1.41	0.000	
			X	.125 D	2	1.41	0.000	
			X	.250 D	2	1.41	0.000	
			X	.500 D	2	1.41	0.000	
				1.000 D	2	.16	0.000	
				2.000 D	2	.16	0.000	
Proportion Alive	4	No transformation						
				0.000 D	2	1.00	0.000	
				.125 D	2	1.00	0.000	
				.250 D	2	1.00	0.000	
				.500 D	2	1.00	0.000	
				1.000 D	2	0.00	0.000	
				2.000 D	2	0.00	0.000	
Proportion Alive	7	Arc sine sqrt w/ adj.						
			X	0.000 D	2	1.41	0.000	
			X	.125 D	2	1.41	0.000	
			X	.250 D	2	1.41	0.000	
			X	.500 D	2	1.41	0.000	
				1.000 D	2	.16	0.000	
				2.000 D	2	.16	0.000	
Proportion Alive	7	No transformation						
				0.000 D	2	1.00	0.000	
				.125 D	2	1.00	0.000	
				.250 D	2	1.00	0.000	
				.500 D	2	1.00	0.000	
				1.000 D	2	0.00	0.000	
				2.000 D	2	0.00	0.000	
Weight		No transformation						
			X	0.000 D	2	.35	.016	
			X	.125 D	2	.35	.040	
			X	.250 D	2	.33	.011	
			X	.500 D	2	.33	.018	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj. Dunnett + t-test					
Proportion Alive	4	Arc sine sqrt w/ adj. Dunnett + t-test					
Proportion Alive	7	Arc sine sqrt w/ adj.					

Dunnett + t-test

Weight

No transformation
Dunnett > .500 > .500 < .001

- PROPORTION POINT ESTIMATE -						
End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	2	Graphical Interpolation	EC 50	.707	-	
Proportion Alive	4	Graphical Interpolation	EC 50	.707	-	
Proportion Alive	7	Graphical Interpolation	EC 50	.707	-	

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	7/10/98	KCL (g/l)	REF	EPAF 94	REFTOX866

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	40	No variation in the data

Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

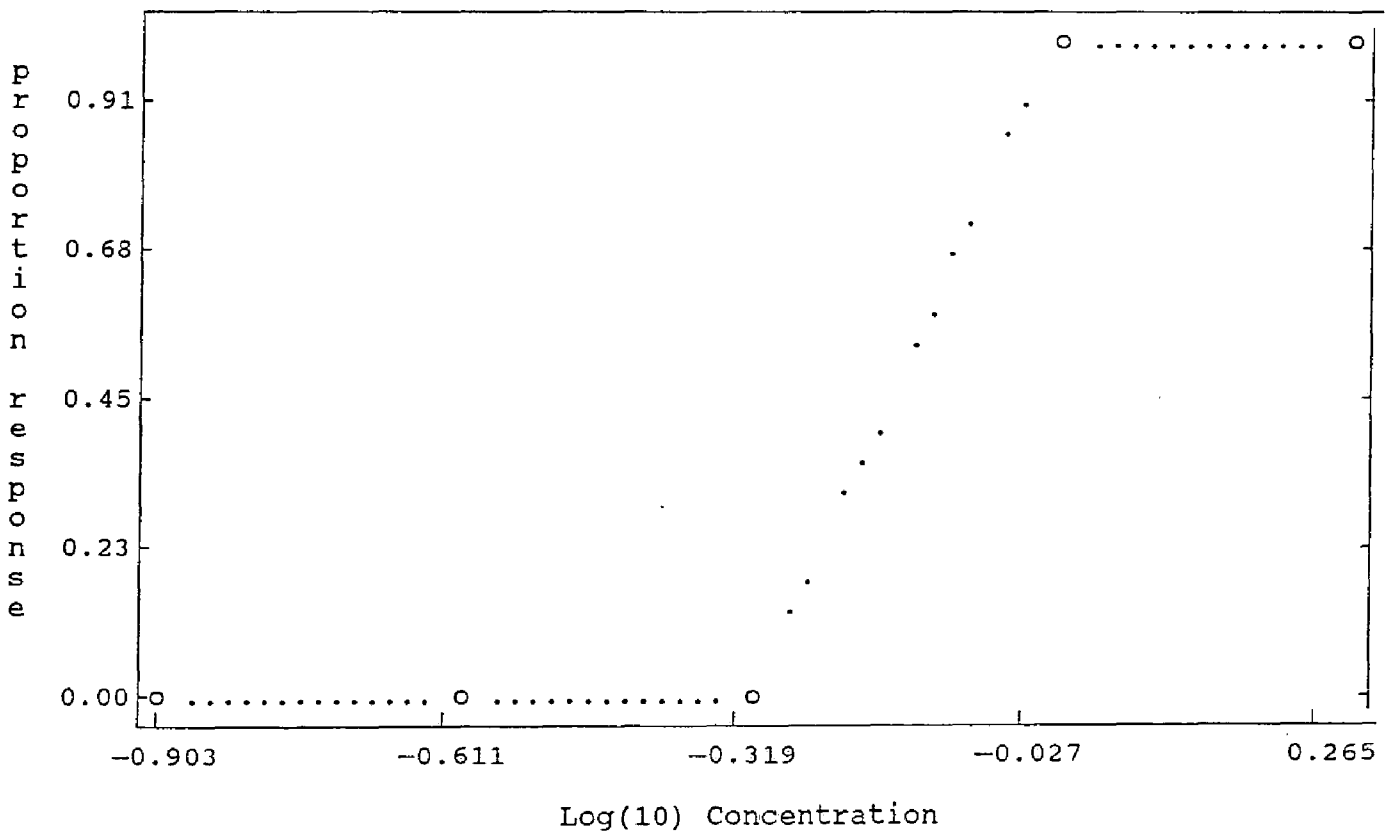
Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: Day2

Test Number: REFTOX866
Test Date: 7/10/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
0.1250	0.0000	0.0000	0.0000
0.2500	0.0000	0.0000	0.0000
0.5000	0.0000	0.0000	0.0000
1.0000	1.0000	1.0000	1.0000
2.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	0.7071



Fish Larvae	Day2	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	7/10/98	KCL (g/l)	REF	EPAF 94	REFTOX866

EPA Flowchart (Chronic and Acute) 1 control

Transformation		Conc	Mean	SD	N
Arc sine sqrt w/ adj.					
	X	0.00D	1.41	0.000	2
	X	.13D	1.41	0.000	2
	X	.25D	1.41	0.000	2
	X	.50D	1.41	0.000	2
		1.00D	.16	0.000	2
		2.00D	.16	0.000	2
No transformation					
		0.00D	1.00	0.000	2
		.13D	1.00	0.000	2
		.25D	1.00	0.000	2
		.50D	1.00	0.000	2
		1.00D	0.00	0.000	2
		2.00D	0.00	0.000	2

Error occurred during statistics:

No variation in the data

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	7/10/98	KCL (g/l)	REF	EPAF 94	REFTOX866

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	40	No variation in the data

Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

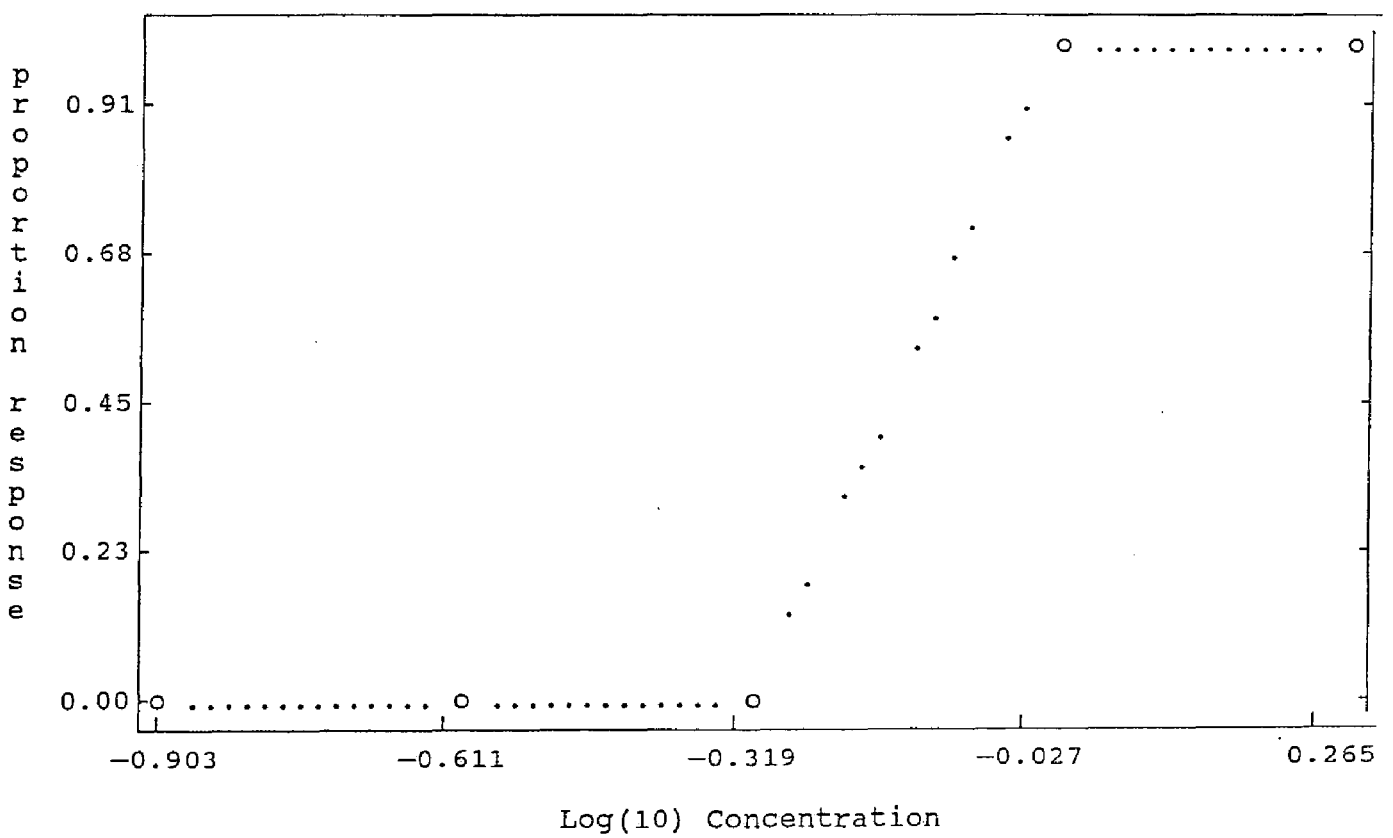
Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: Day4

Test Number: REFTOX866
Test Date: 7/10/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
0.1250	0.0000	0.0000	0.0000
0.2500	0.0000	0.0000	0.0000
0.5000	0.0000	0.0000	0.0000
1.0000	1.0000	1.0000	1.0000
2.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	0.7071



Fish Larvae		Day4				Day 4
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	7/10/98	KCL (g/l)	REF	EPAF 94	REFTOX866

EPA Flowchart (Chronic and Acute) 1 control

Transformation		Conc	Mean	SD	N
Arc sine sqrt w/ adj.					
	X	0.00D	1.41	0.000	2
	X	.13D	1.41	0.000	2
	X	.25D	1.41	0.000	2
	X	.50D	1.41	0.000	2
		1.00D	.16	0.000	2
		2.00D	.16	0.000	2
No transformation					
		0.00D	1.00	0.000	2
		.13D	1.00	0.000	2
		.25D	1.00	0.000	2
		.50D	1.00	0.000	2
		1.00D	0.00	0.000	2
		2.00D	0.00	0.000	2

Error occurred during statistics:

No variation in the data

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	7/10/98	KCL (g/l)	REF	EPAF 94	REFTOX866

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	40	No variation in the data

Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

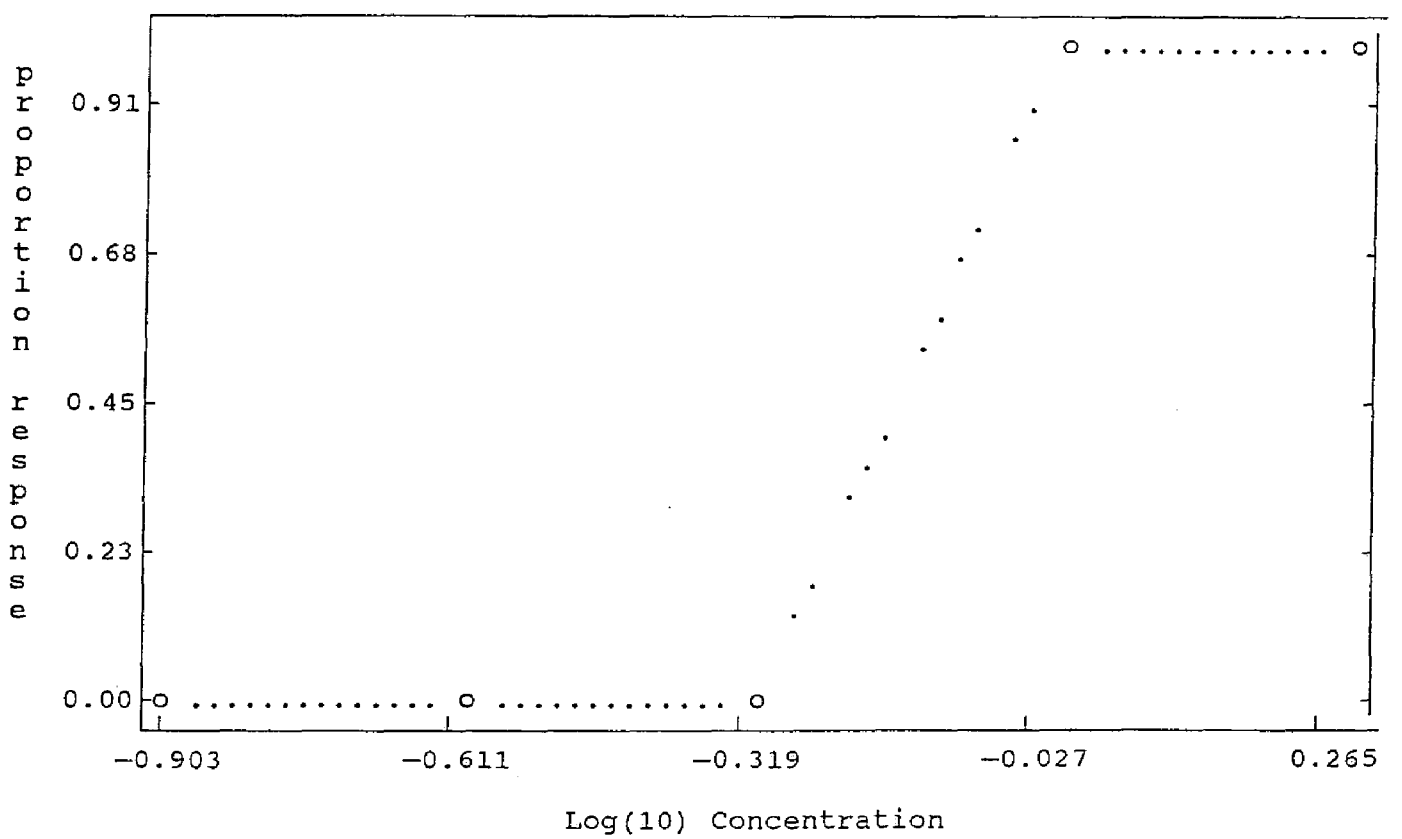
Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: Prop

Test Number: REFTOX866
Test Date: 7/10/98

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
0.1250	0.0000	0.0000	0.0000
0.2500	0.0000	0.0000	0.0000
0.5000	0.0000	0.0000	0.0000
1.0000	1.0000	1.0000	1.0000
2.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	0.7071



Fish Larvae	Proportion Alive	Day 7

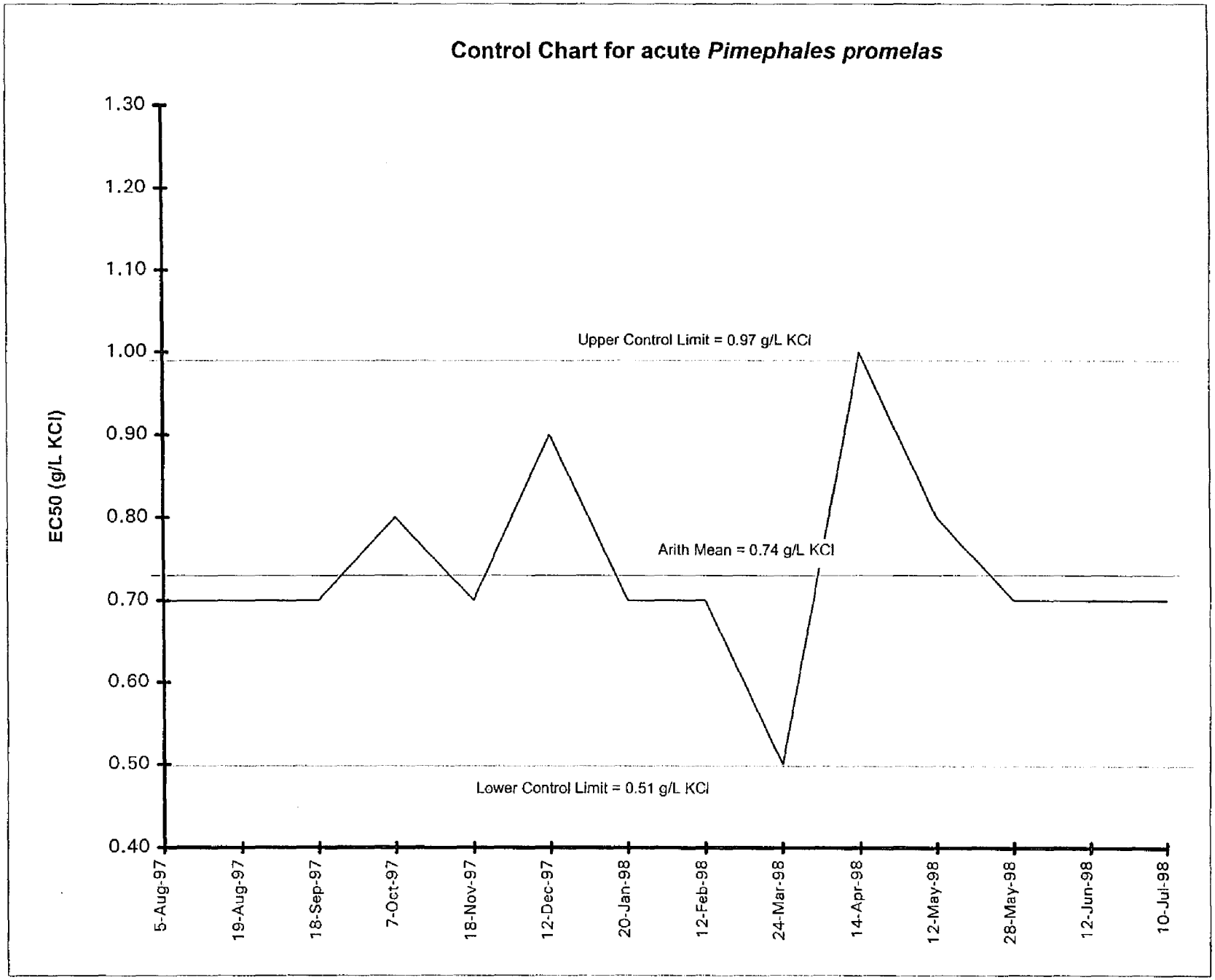
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	7/10/98	KCL (g/l)	REF	EPAF 94	REFTOX866

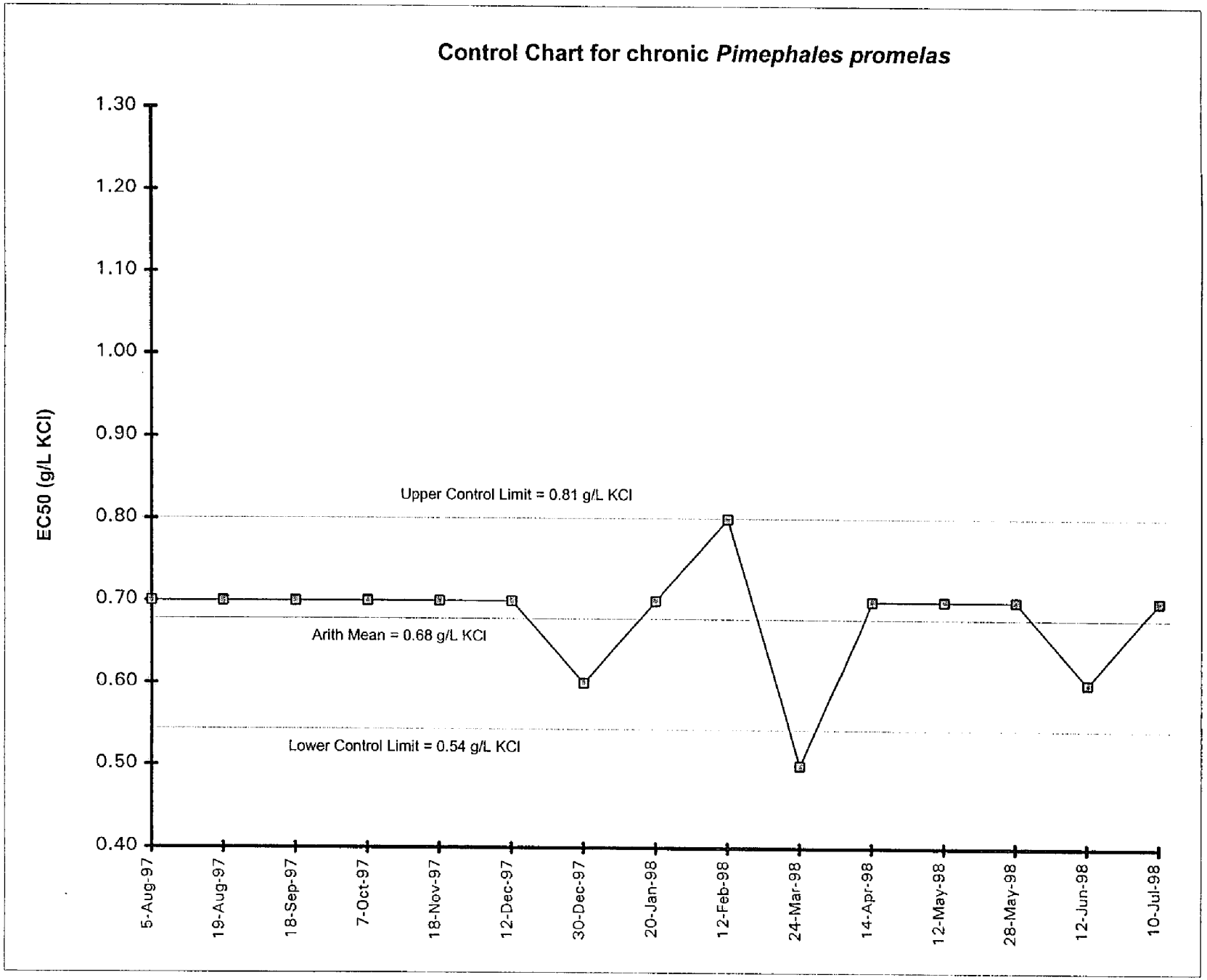
EPA Flowchart (Chronic and Acute) 1 control

Transformation		Conc	Mean	SD	N
Arc sine sqrt w/ adj.					
	X	0.00D	1.41	0.000	2
	X	.13D	1.41	0.000	2
	X	.25D	1.41	0.000	2
	X	.50D	1.41	0.000	2
		1.00D	.16	0.000	2
		2.00D	.16	0.000	2
No transformation					
		0.00D	1.00	0.000	2
		.13D	1.00	0.000	2
		.25D	1.00	0.000	2
		.50D	1.00	0.000	2
		1.00D	0.00	0.000	2
		2.00D	0.00	0.000	2

Error occurred during statistics:

No variation in the data


Control Chart for acute *Pimephales promelas*
EC50 (g/L KCl)
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
Upper Control Limit = 0.97 g/L KCl
Arith Mean = 0.74 g/L KCl
Lower Control Limit = 0.51 g/L KCl
5-Aug-97
19-Aug-97
18-Sep-97
7-Oct-97
18-Nov-97
12-Dec-97
20-Jan-98
12-Feb-98
24-Mar-98
14-Apr-98
12-May-98
28-May-98
12-Jun-98
10-Jul-98


Control Chart for chronic *Pimephales promelas*
EC50 (g/L KCl)
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
Upper Control Limit = 0.81 g/L KCl
Arith Mean = 0.68 g/L KCl
Lower Control Limit = 0.54 g/L KCl
5-Aug-97
19-Aug-97
18-Sep-97
7-Oct-97
18-Nov-97
12-Dec-97
30-Dec-97
20-Jan-98
12-Feb-98
24-Mar-98
14-Apr-98
12-May-98
28-May-98
12-Jun-98
10-Jul-98

SCOEPA00027937

APPENDIX D

CHAIN-OF-CUSTODY FORMS AND INITIAL WATER QUALITY PARAMETERS

North Creek Analytical - Portland Subcontract Order
P808021

Sending Laboratory	Receiving Laboratory
rth Creek Analytical - Portland 05 SW Nimbus Ave. Beaverton, OR 97008 Phone: 503/906-9200 Fax: 503/906-9210 Project Manager: Mary A. Fritzmann Smith	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 425-822-8880 Fax: 425-889-8808

Subcontract Order Comments

08/03/98 14:10

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
P808021-01	Water	8/3/98				A	
		8/4/98	Subcontract Outside	8/17/98			Bioassay

Released By Gina Vandenhoff Date 8/3/98 Received By [signature] Date 8/4/98

Released By _____ Date _____ Received By _____ Date _____

SCOEPA00027939

North Creek Analytical - Portland Subcontract Order
P808072

Sending Laboratory	Receiving Laboratory
..orth Creek Analytical - Portland 9405 SW Nimbus Ave. Beaverton, OR 97008 Phone: 503/906-9200 Fax: 503/906-9210 Project Manager: Mary A. Fritzmann Smith	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 425-822-8880 Fax: 425-889-8808

Subcontract Order Comments

08/05/98 10:15

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
P808072-01	Water	8/5/98				A	
		8/6/98	Subcontract Outside	8/19/98			Bioassay

Released By Sara McClurg Date 8-5-98 Received By Todd Collard Date 8/6/98

Released By _____ Date _____ Received By _____ Date _____

SCOEPA00027940

North Creek Analytical - Portland Subcontract Order
P808132

Sending Laboratory	Receiving Laboratory
th Creek Analytical - Portland 9405 SW Nimbus Ave. Beaverton, OR 97008 Phone: 503/906-9200 Fax: 503/906-9210 Project Manager: Mary A. Fritzmann Smith	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 425-822-8880 Fax: 425-889-8808

Subcontract Order Comments

08/07/98 10:20

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
P808132-01	Water	[illegible]/98				A	
		8/8/98	Subcontract Outside	8/21/98			Bioassay

Released By Sara Mellway Date 8-7-98 Received By Todd Pollard Date 8/8/98

Released By _____ Date _____ Received By _____ Date _____

SCOEPA00027941

Parametrix Environmental Toxicology Laboratory
5808 Lake Washington Boulevard NE, Suite 200
Kirkland, WA 98033

INITIAL WATER QUALITY PARAMETERS

SOURCE: Waeker - Siltronic **CLIENT:** NCA - Portland **CLIENT NO:** 55-1945-10(01)

SAMPLE #1	SAMPLE #2	SAMPLE #3
Date Sample Collected: 8/3/98	Date Sample Collected: 8/5/98	Date Sample Collected: 8/7/98
Date Sample Received: 8/4/98	Date Sample Received: 8/6/98	Date Sample Received: 8/8/98
Temperature (°C): 22	Temperature (°C): 12	Temperature (°C): 15
Salinity (ppt): 0	Salinity (ppt): 0	Salinity (ppt): 0
Dissolved Oxygen (mg/L): 7.3	Dissolved Oxygen (mg/L): 7.9	Dissolved Oxygen (mg/L): 7.8
pH: 7.3	pH: 7.4	pH: 7.3
Conductivity (µS): 758	Conductivity (µS): 641	Conductivity (µS): 852
Hardness (mg/L $CaCO_3$): 220	Hardness (mg/L $CaCO_3$): 160	Hardness (mg/L $CaCO_3$): 210
Alkalinity (mg/L $CaCO_3$): 24	Alkalinity (mg/L $CaCO_3$): 22	Alkalinity (mg/L $CaCO_3$): 22
Residual Chlorine (mg/L): 0.04	Residual Chlorine (mg/L): 0.03	Residual Chlorine (mg/L): 0.03
Ammonia (mg/L): <1	Ammonia (mg/L): <1	Ammonia (mg/L): <1
Initials: JK	Initials: JA	Initials: JA

NT= Not Taken

Rev. 2/20/96

Final Report

RECEIVED SEP 1 9 1997

Toxicity Evaluation of an Effluent to *Ceriodaphnia dubia and Pimephales promelas*

Prepared for:
North Creek Analytical

August 1997

Parametrix, Inc.

SCOEPA00027943

TOXICITY EVALUATION OF AN EFFLUENT TO

Ceriodaphnia dubia AND *Pimephales promelas*

Prepared for

NORTH CREEK ANALYTICAL
9405 SW Nimbus Avenue
Beaverton, Oregon 97008-7132

Prepared by

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

AUGUST 1997

SCOEPA00027944

SIGNATURE PAGE

Submitted by: Parametrix Environmental Toxicology Laboratory
5808 Lake Washington Blvd. NE, Suite 200
Kirkland, Washington 98033

Prepared by: Dayle Ormerod — 8/15/97
Dayle Ormerod — Date
Manager, Toxicology Laboratory

Approved by: Deb Lester — 8/26/97
Deb Lester — Date
QA/QC Officer

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SCOEPA00027946

EXECUTIVE SUMMARY OF TEST CONDITIONS AND RESULTS

Dual endpoint *Ceriodaphnia dubia* and *Pimephales promelas* bioassays.

Test Title:	Toxicity Evaluation of an Effluent to *Ceriodaphnia dubia* and *Pimephales promelas*
Testing Dates:	*Ceriodaphnia dubia*: 5-11 August 1997 *Pimephales promelas*: 5-12 August 1997
Test Facility:	Parametrix, Inc.; 5808 Lake Washington Boulevard NE; Kirkland, Washington 98033
Test Sponsor:	Ms. Mary Smith; North Creek Analytical; 9405 SW Nimbus Avenue; Beaverton, Oregon 97008-7132
Test Material:	Effluent samples collected on 4, 6, and 8 August 1997
Test Species:	*Ceriodaphnia dubia* (Water flea) *Pimephales promelas* (Fathead minnow)
Source:	*Ceriodaphnia dubia*: Laboratory stock cultures *Pimephales promelas*: Aquatic BioSystems; Fort Collins, Colorado
Test Type:	Dual endpoint for *Ceriodaphnia dubia* and *Pimephales promelas*
Duration:	*Ceriodaphnia dubia:* 48 hours and 6 days *Pimephales promelas*: 48 hours and 7 days
Test Concentrations:	0, 6.25, 12.5, 25, 50 and 100% effluent

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Summary of 48-hour results:

	Ceriodaphnia dubia	*Pimephales promelas*
Evaluation	Survival (% Effluent)	Survival (% Effluent)
NOEC	50%	100%
LOEC	100%	>100%
LC50	82%	>100%

Summary of chronic results:

	Ceriodaphnia dubia		*Pimephales promelas*	
Evaluation	Survival (% Effluent)	Reproduction (% Effluent)	Survival (% Effluent)	Growth (% Effluent)
NOEC	50%	<6.25%	100%	100%
LOEC	100%	6.25%	>100%	>100%
LC50	67%	6%	0.04%	N/A
Reference toxicant (LC50) =	22 ppb Cu		0.7 ppt KCl	

N/A = Not applicable

SCOEPA00027948

1. INTRODUCTION

This report summarizes the procedures and results of biological testing conducted on effluent samples collected from Wacker Siltronics on 4, 6, and 8 August 1997. All testing was conducted by Parametrix's Environmental Toxicology Laboratory in Kirkland, Washington. Testing consisted of two dual endpoint chronic bioassays using *Ceriodaphnia dubia* and *Pimephales promelas* as the test species.

The median lethal concentration (LC50), the Lowest Observed Effect Concentration (LOEC), and the No Observed Effect Concentration (NOEC) are reported for each bioassay.

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2. TEST METHODS AND CONDITIONS

2.1 Sample Handling

Effluent samples were collected on 4, 6, and 8 August 1997, and delivered to Parametrix's Environmental Toxicology Laboratory, where they were refrigerated at 4° C until used for testing. Upon sample arrival, a subsample was collected for analysis of temperature, pH, salinity, dissolved oxygen, conductivity, hardness, alkalinity, ammonia and total residual chlorine. Whole, unmanipulated samples were used to conduct all toxicity testing.

2.2 Source and Condition of Organisms

C. dubia were obtained from laboratory stock cultures and were ≤24 hours old at test initiation. *P. promelas* were obtained from Aquatic BioSystems in Fort Collins, Colorado and were ≤24 hours old at test initiation.

A reference toxicant test was conducted on each test species to assess the relative health of the test organisms and to ensure that their sensitivity fell within an expected concentration range. Copper, as copper sulfate, was used as the reference toxicant for the *C. dubia* bioassay, while potassium chloride was used as the reference toxicant for the *P. promelas* bioassay.

2.3 Test Methods

Chronic bioassay testing was conducted in accordance with *Short-Term Methods for Measuring the Chronic Toxicity of Surface and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, July 1994. Test procedures were modified in accordance with *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993. Summaries of test conditions are presented in Tables 1 and 2.

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Table 1. Summary of test conditions for the dual endpoint *Ceriodaphnia dubia* bioassay.

Job Name: North Creek Analytical | Job Number: 55-1945-10 (01)

Date: 5-11 August 1997

Test Protocols:	*Short Term Methods for Measuring the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, July 1994. *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.
Test Material:	Whole effluent collected from Wacker Siltronics
Test Organisms/Age:	*C. dubia*; ≤24 hrs old
Source:	In-house culture
Number/Container:	1
Volume/Container:	15 mL
Test Concentrations:	0, 6.25, 12.5, 25, 50 and 100% effluent
Replicates:	Ten
Reference Toxicant:	Copper, as copper sulfate
Test Duration:	7 days
Control/Dilution Media:	Trout water from Gold Creek Trout Farm; Woodinville, Washington
Test Chambers:	30 mL polypropylene cups
Lighting:	Fluorescent bulbs (50-100 foot candles)
Photoperiod:	16 hours light; 8 hours dark
Aeration:	None
Feeding:	Daily: 100 µL *Selenastrum* suspension; 100 µL yeast/Cerophyll/trout chow (YCT)
Temperature:	25 ± 1° C
Chemical Data:	pH and dissolved oxygen measured at renewal for each concentration and the control (both initial and final solutions); temperature measured in environmental chamber at initiation and every 24 hours; specific conductivity measured at test initiation and termination in control and 100% effluent; conductivity, salinity, hardness, alkalinity, ammonia and residual chlorine measured for each new effluent sample
Effect Measured:	Mortality (defined as immobility) and reproduction
Test Acceptability:	Control mortality ≤20%; ≥60% of control organisms produce three broods, an average total of 15 or more offspring for the first three broods must be produced

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Table 2. Summary of test conditions for the dual endpoint *Pimephales promelas* bioassay.

Job Name: North Creek Analytical | Job Number: 55-1945-10 (01)

Date: 5-12 August 1997

Test Protocols:	*Short Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002, July 1994. *Whole Effluent Toxicity Testing Guidance Document*, Oregon Department of Environmental Quality, January 1993.
Test Material:	Whole effluent collected from Wacker Siltronics
Test Organisms/Age:	*P. promelas* (fathead minnow); ≤48 hrs old
Source:	Aquatic BioSystems, Inc.; Fort Collins, Colorado
Number/Container:	Ten
Volume/Container:	400 mL
Test Concentrations:	0, 6.25, 12.5, 25, 50 and 100% effluent
Replicates:	Four
Reference Toxicant:	Potassium chloride
Test Duration:	7 days
Renewal:	Daily
Control/Dilution Media:	Lab prepared synthetic water (80-100 mg/L as $CaCO_3$)
Test Chambers:	800 mL polypropylene beakers
Lighting:	Fluorescent bulbs (50-100 foot candles)
Photoperiod:	16 hours light; 8 hours dark
Aeration:	None
Feeding:	0.15 mL newly hatched brine shrimp nauplii twice daily
Temperature:	25 ± 1° C
Chemical Data:	pH and dissolved oxygen measured at renewal for concentration and the control (both initial and final solutions); specific conductivity measured at test initiation and termination in control and 100% effluent; temperature measured in environmental chamber at test initiation and every 24 hours; conductivity, hardness, alkalinity, ammonia, and residual chlorine measured for each new effluent sample
Effect Measured:	Mortality and growth
Test Acceptability:	Control mortality ≤20%; average mean control weight ≥ 0.25 mg

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3. RESULTS

Daily records of biological and chemical data collected during testing are included in the appendices of this report.

3.1 Initial Chemical and Physical Determinations

The results of initial chemical and physical determinations made for the effluent samples are summarized in Table 3.

Table 3. Initial chemical and physical determinations for effluent samples

	Effluent Collection Dates		
Parameter Measured	8/4/97	8/6/97	8/8/97
Receiving Temperature (°C)	12	15	12
Salinity (ppt)	0	0	0
Dissolved oxygen (ppm)	8.0	5.7	7.8
Receiving pH	7.0	7.1	7.1
Conductivity (μHMOS)	700	1,000	1,100
Hardness (ppm as $CaCO_3$)	250	390	440
Alkalinity (ppm as $CaCO_3$)	18	32	18
Residual Chlorine (ppm) Initial:	<0.01	0.02	<0.01
Ammonia (ppm)	1	1	1

3.2 Bioassay Results

Toxicity test results are summarized in the Executive Summary at the front of this report and again in Table 4. No toxicity was observed in the 48-hour or 7-day *P. promelas* bioassays, with NOECs of 100% effluent for both survival endpoints and chronic growth. Toxicity was observed in the 48-hour acute *C. dubia* bioassay, with an NOEC of 50% effluent. Toxicity was also observed in the 7-day *C. dubia* bioassay, with NOECs of 50% effluent for survival and <6.25% effluent for reproduction. The results of reference toxicant testing and control responses were within the expected ranges.

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Table 4. Summary of bioassay results.

Summary of 48-hour results:

Evaluation	*Ceriodaphnia dubia* Survival (% Effluent)	*Pimephales promelas* Survival (% Effluent)
NOEC	50%	100%
LOEC	100%	>100%
LC50	82%	>100%

Summary of chronic results:

Evaluation	*Ceriodaphnia dubia* Survival (% Effluent)	*Ceriodaphnia dubia* Reproduction (% Effluent)	*Pimephales promelas* Survival (% Effluent)	*Pimephales promelas* Growth (% Effluent)
NOEC	50%	<6.25%	100%	100%
LOEC	100%	6.25%	>100%	>100%
LC50	67%	6%	0.04%	N/A
Reference toxicant (LC50) =	22 ppb Cu		0.7 ppt KCl	

N/A = Not applicable

SCOEPA00027954

4. REFERENCES

EcoAnalysis, Inc. 1994. TOXIS Version 2.2. EcoAnalysis, Inc., Ojai, California.

ODEQ. 1993. *Whole Effluent Toxicity Testing Guidance Document*. January 1993. Oregon Department of Environmental Quality, Portland, Oregon.

U.S. EPA 1994. *Short-term Methods for Measuring the Chronic Toxicity of Surface and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002. United States Environmental Protection Agency, Cincinnati, Ohio.

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Appendix A

SCOEPA00027956

APPENDIX A

DUAL ENDPOINT *Ceriodaphnia dubia* TOXICITY TEST DATA

Parametrix, Inc.
Environmental Toxicology Laboratory *Ceriodaphnia dubia*
Chronic Daily Survival and Offspring

Client: NEA - Portland Client Number: 55-1945-10 (01) Test Dates: 8/5 - 8/11/97

Sample I.D./Source: Wacker Sample Collection Dates: 8/4, 8/6, 8/8 Dilution Media: Spring H2O

Temperature (°C) 0 25 24 25 48 25 72 25 96 25 120 25 144 25 168 —

Conc	Rep	Survival (hours)								Offspring (hours)					
		0	24	48	72	96	120	144	168	72	96	120	144	168	Total
Con	A	1	1	1	1	1	1	1		0	5	9	11		25
	B	1	1	1	1	1	1	1		0	4	11	13		28
	C	1	1	1	1	1	1	1		0	4	8	12		24
	D	1	1	1	1	1	1	1		0	4	9	10		23
	E	1	1	1	1	1	1	1		0	2	12	15		29
	F	1	1	1	1	1	1	1		0	3	10	15		28
	G	1	1	1	1	1	1	1		0	4	8	12		24
M	H	1	1	1	1	1	1	1		0	0	0	0		0
	I	1	1	1	1	1	1	1		0	0	8	12		20
	J	1	1	1	1	1	1	1		0	3	7	13		23
6.25%	A	1	1	1	1	1	1	1		0	0	0	0		0
	B	1	1	1	1	1	1	1		0	2	10	10		22
M	C	1	1	1	1	1	1	1		0	0	0	0		0
	D	1	1	1	1	1	1	1		0	3	7	4		14
	E	1	1	1	1	1	1	1		0	3	8	0		11
	F	1	1	1	1	1	1	1		0	5	6	0		11
	G	1	1	1	1	1	1	1		0	0	0	0		0
	H	1	1	1	1	1	1	1		0	0	0	0		0
M	I	1	1	1	1	1	1	1		0	0	0	0		0
	J	1	1	1	1	1	1	1		0	0	1	1		2
12.5%	A	1	1	1	1	1	1	1		0	0	0	0		0
	B	1	1	1	0-1	0	0	0		0	0	0	0		0
	C	1	1	1	1	1	1	1		0	3	8	13		24
M	D	1	1	1	1	1	1	1		0	0	0	0		0
M	E	1	1	1	1	1	1	1		0	0	0	0		0
M	F	1	1	1	1	1	1	1		0	0	0	0		0
	G	1	1	1	1	1	1	1		0	0	0	0		0
	H	1	1	1	1	1	1	1		0	0	7	10		17
	I	1	1	1	0-1	0	0	0		0	0	0	0		0
	J	1	1	1	1	1	1	1		0	0	0	0		0
	Init.	JK	JK	JK	JK	AE	AC	AE		JK	AE	AC	AE		DEO
	Date	8/5	8/6	8/7	8/8	8/9	8/10	8/11		8/8	8/9	8/10	8/11		8/12/97

M = organism is a male.

DEO

Parametrix, Inc.
Environmental Toxicology Laboratory

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Ceriodaphnia dubia
Chronic Daily Survival and Offspring

Conc	Rep	Survival (hours)									Offspring (hours)						
		0	24	48	72	96	120	144	168		72	96	120	144	168		Total
25%	A	1	1	1	1	1	1	1				1	7	10			18
	B	1	1	1	1	0-1	0	0				0	0	0			0
M	C	1	1	1	0/1	1	1	1				0	0	0			0
M	D	1	1	1	1	1	1	1				0	0	0			0
	E	1	1	1	1	1	1	1				3	7	7			17
	F	1	1	1	1	1	1	1				4	10	10			24
	G	1	1	1	1	1	1	1				0	6	8			14
	H	1	1	1	1	1	1	1				1	6	9			16
	I	1	1	1	1	1	1	1				2	8	11			21
M	J	1	1	1	1	1	1	1				0	0	0			0
50%	A	1	1	1	1	1	1	1				0	8	7			15
	B	1	1	1	1	1	1	1				0	8	8			16
	C	1	1	1	0-1	0	0	0				0	0	0			0
	D	1	1	1	1	1	1	1				3	7	8			18
	E	1	1	1	1	1	1	1				2	9	9			20
	F	1	1	1	1	1	1	1				1	7	9			17
	G	1	1	1	1	1	1	1				0	0	0			0
	H	1	1	1	1	1	1	1				2	9	9			20
	I	1	1	1	1	1	1	1				2	10	7			19
	J	1	1	1	1	1	1	1				3	5	1			9
100%	A	1	1	0-1	0	0	0	0				0	0	0			0
	B	1	1	0-1	0	0	0	0				0	0	0			0
	C	1	1	0-1	0	0	0	0				0	0	0			0
	D	1	1	1	0-1	0	0	0				0	0	0			0
	E	1	1	1	1	1	0-1	0				0	0	0			0
	F	1	1	0-1	0	0	0	0				0	0	0			0
	G	1	1	1	0-1	0	0	0				0	0	0			0
	H	1	1	0-1	0	0	0	0				0	0	0			0
	I	1	1	0-1	0	0	0	0				0	0	0			0
	J	1	1	0-1	0	0	0	0				0	0	0			0
	Init.	JK	JK	JK	JK	AE	AC	AE				AE	AE	AE			DEO
	Date	8/5	8/6	8/7	8/8	8/9	8/10	8/11				8/9	8/10	8/11			8/12/97

Comments: M = organism is a male

DEO

Parametrix, Inc.
Environmental Toxicology Laboratory

Ceriodaphnia dubia
Daily Water Quality Parameters

pH Solution																
Date	8/5	8/6	8/6	8/7	8/7	8/8	8/8	8/9	8/9	8/10	8/10	8/11				
Day	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8
Conc	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	7.5	7.9	7.9	7.9	7.8	7.8	7.6	8.1	7.6	7.9	7.8	7.7				
6.25 %	7.5	7.9	7.7	7.9	7.6	7.8	7.6	8.2	7.6	7.9	7.8	7.7				
12.5 %	7.4	7.9	7.7	7.9	7.6	7.6	2.5	8.2	7.6	7.9	7.8	7.8				
25 %	7.4	7.9	7.6	7.9	7.5	7.6	2.5	8.2	7.6	7.9	7.8	7.8				
50 %	7.3	7.8	7.4	7.8	7.3	7.3	7.4	8.1	7.4	7.8	7.7	7.7				
100 %	7.1	7.5	7.0	7.6	7.0	7.0	22	8.0	7.1	7.5	7.3	—	—	—	—	—
Initials	JK	JK	JK	JK	JK	JK	JK	AE	AE	AC	AC	AE				

Dissolved Oxygen (mg/L) Solution																
Conc.	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	7.8	7.8	7.8	8.0	7.8	7.8	8.0	8.0	8.0	7.8	8.0	7.8				
6.25 %	7.8	7.8	7.8	8.0	7.8	7.8	8.0	8.0	8.2	7.8	8.0	7.8				
12.5 %	7.8	7.8	7.8	8.0	7.8	7.6	7.8	8.2	8.2	7.8	8.0	7.8				
25 %	7.8	7.8	7.8	8.0	7.6	7.6	7.8	8.2	8.0	7.8	8.0	7.9				
50 %	7.8	8.0	7.8	8.0	7.6	7.6	7.8	8.2	7.9	7.8	8.0	7.9				
100 %	7.8	8.0	7.8	8.0	7.6	7.6	7.6	8.0	7.7	7.6	7.4	—	—	—	—	—
Initials	JK	JK	JK	JK	JK	JK	JK	AE	AE	AC	AC	AE				

Conductivity (µMHOS)			
Conc.	0 Hour	168 Hours	
Cont.	175	185	
100%	800	* 1410	
Initials	JK	AE	

Comments: * Specific conductivity for 100% measured at 120 hrs (8/10/97)

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: 1524 (x) Chronic ( ) Acute hours
Test Date: 5-Aug-97
Source: N. CREEK Test Material: EFF2 (%)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6 End	Prop Alive	Total Young	Max Young
0.00 D	1		F	1	1					1		25	
0.00 D	2		F	1	1					1		28	
0.00 D	3		F	1	1					1		24	
0.00 D	4		F	1	1					1		23	
0.00 D	5		F	1	1					1		29	
0.00 D	6		F	1	1					1		28	
0.00 D	7		F	1	1					1		24	
0.00 D	8		M	1	1					1			
0.00 D	9		F	1	1					1		20	
0.00 D	10		F	1	1					1		23	
6.25 D	1		F	1	1					1		0	
6.25 D	2		F	1	1					1		22	
6.25 D	3		M	1	1					1			
6.25 D	4		F	1	1					1		14	
6.25 D	5		F	1	1					1		11	
6.25 D	6		F	1	1					1		11	
6.25 D	7		F	1	1					1		0	
6.25 D	8		F	1	1					1		0	
6.25 D	9		M	1	1					1			
6.25 D	10		F	1	1					1		2	
12.50 D	1		F	1	1					1		0	
12.50 D	2		F	1	1					0		0	
12.50 D	3		F	1	1					1		24	
12.50 D	4		M	1	1					1			
12.50 D	5		M	1	1					1			
12.50 D	6		M	1	1					1			
12.50 D	7		F	1	1					1		0	
12.50 D	8		F	1	1					1		17	
12.50 D	9		F	1	1					0		0	
12.50 D	10		F	1	1					1		0	
25.00 D	1		F	1	1					1		18	
25.00 D	2		F	1	1					0		0	
25.00 D	3		M	1	1					1			
25.00 D	4		M	1	1					1			
25.00 D	5		F	1	1					1		17	
25.00 D	6		F	1	1					1		24	
25.00 D	7		F	1	1					1		14	
25.00 D	8		F	1	1					1		16	
25.00 D	9		F	1	1					1		21	
25.00 D	10		M	1	1					1			
50.00 D	1		F	1	1					1		15	
50.00 D	2		F	1	1					1		16	
50.00 D	3		F	1	1					0		0	
50.00 D	4		F	1	1					1		18	
50.00 D	5		F	1	1					1		20	
50.00 D	6		F	1	1					1		17	
50.00 D	7		F	1	1					1		0	

SCOEPA00027961

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: 1524 (x) Chronic ( ) Acute hours
Test Date: 5-Aug-97
Source: N. CREEK Test Material: EFF2 (%)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6 End	Prop Alive	Total Young	Max Young
50.00 D	8		F	1	1					1		20	
50.00 D	9		F	1	1					1		19	
50.00 D	10		F	1	1					1		9	
100.00 D	1		F	1	0					0		0	
100.00 D	2		F	1	0					0		0	
100.00 D	3		F	1	0					0		0	
100.00 D	4		F	1	1					0		0	
100.00 D	5		F	1	1					0		0	
100.00 D	6		F	1	0					0		0	
100.00 D	7		F	1	1					0		0	
100.00 D	8		F	1	0					0		0	
100.00 D	9		F	1	0					0		0	
100.00 D	10		F	1	0					0		0	

SCOEPA00027962

Parametrix Toxicology Laboratory

Test Date: 8/05/97
Sample Date: 8/04/97
Species: Ceriodaphnia dubia
Test Type: Chronic

Test Number: 1524
Test Material: Effluent - Industry %
Source: N. CREEK
North Creek Analytical

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	No transformation							
			X	0.000	D	10	1.00	0.000	
			X	6.250	D	10	1.00	0.000	
			X	12.500	D	10	1.00	0.000	
			X	25.000	D	10	1.00	0.000	
			X	50.000	D	10	1.00	0.000	
			X	100.000	D	10	.30	.483	
Proportion Alive	6	No transformation							
			X	0.000	D	10	1.00	0.000	
			X	6.250	D	10	1.00	0.000	
			X	12.500	D	10	.80	.422	
			X	25.000	D	10	.90	.316	
			X	50.000	D	10	.90	.316	
			X	100.000	D	10	0.00	0.000	
Reproduction		No transformation							
			X	0.000	D	9	24.89	2.934	
			X	6.250	D	8	7.50	8.246	
			X	12.500	D	7	5.86	10.205	
			X	25.000	D	7	15.71	7.675	
			X	50.000	D	10	13.40	7.749	
			X	100.000	D	10	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	No transformation Fisher Exact	50.000	100.000	2.00		
Proportion Alive	6	No transformation Fisher Exact	50.000	100.000	2.00		
Reproduction		No transformation Wilcoxon test with Bonfe	< 6.250	6.250	> 16.00	45.857	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	2	Graphical Interpolation	EC 50	82.034	-	1.22
Proportion Alive	6	Graphical Interpolation	EC 50	67.039	-	1.49

- GROWTH POINT ESTIMATE -

End Point	P	IC	95% CI
Reproduction	IC 25	2.757	2.31 - 3.51
	IC 50	5.513	4.57 - 54.18

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1524

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	Fisher Exact		
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

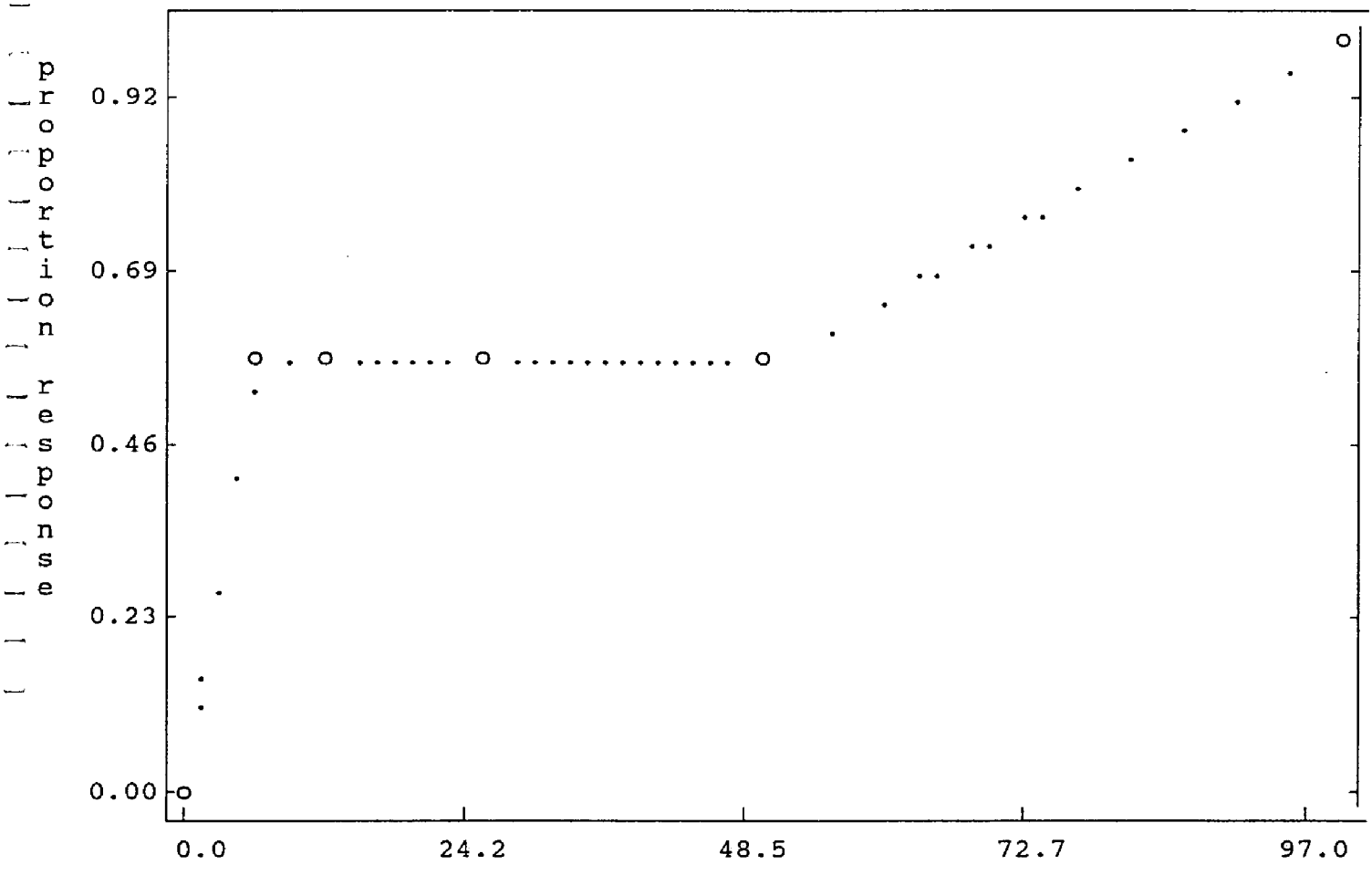
Species: Ceriodaphnia dubia
Test Material: Effluent - Industry (%)
Endpoint: Total young

Test Number: 1524
Test Date: 8/05/97

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	24.8889	24.8889	0.0000
6.2500	7.5000	10.7812	0.5668
12.5000	5.8571	10.7812	0.5668
25.0000	15.7143	10.7812	0.5668
50.0000	13.4000	10.7812	0.5668
100.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	2.7566	2.313	3.731
50	5.5132	4.515	55.146

Note: # bootstrap resamplings = 120



Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

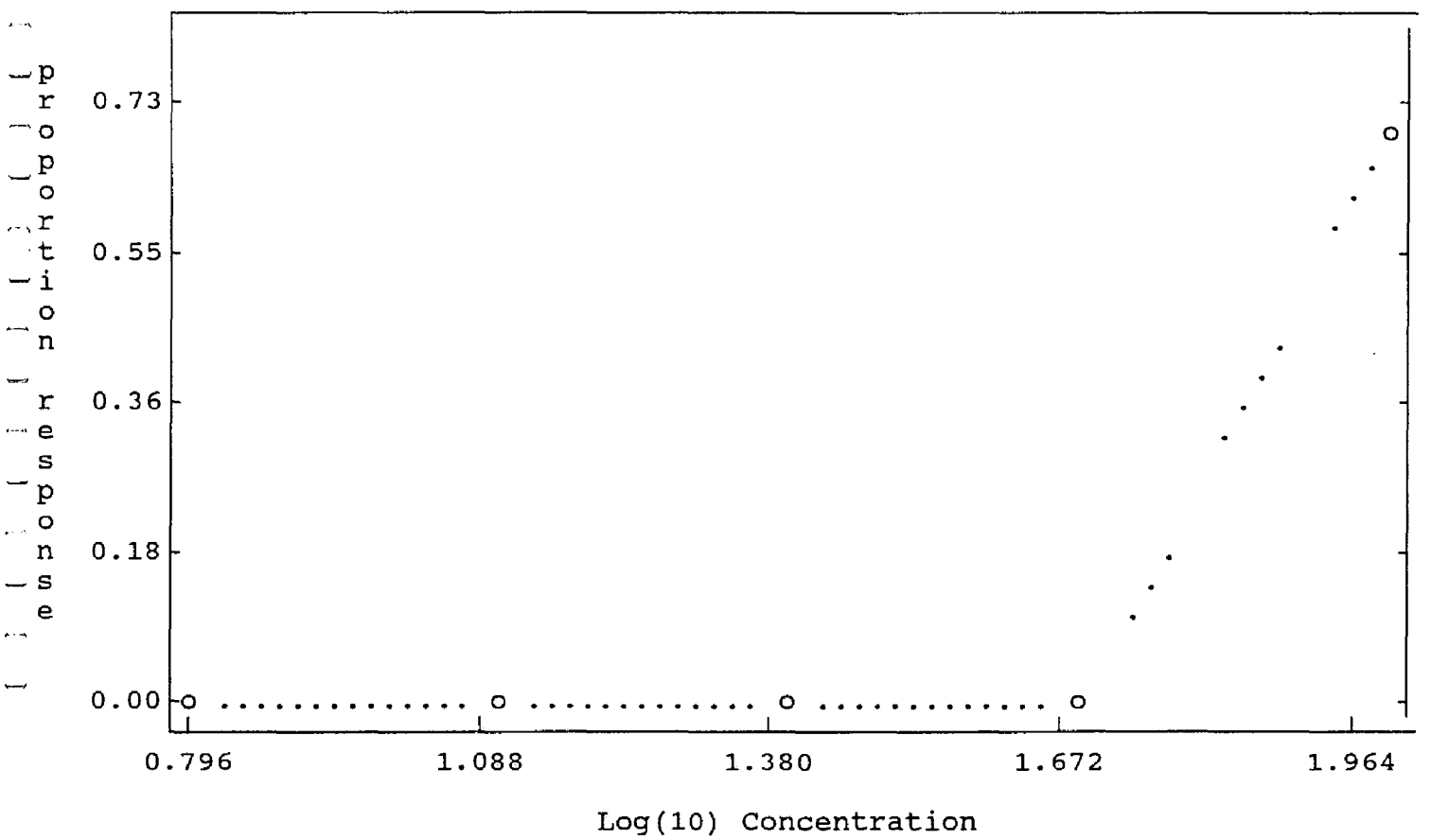
Species: Ceriodaphnia dubia
Test Material: Effluent – Industry (%)
Endpoint: Day2

Test Number: 1524
Test Date: 8/05/97

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
6.2500	0.0000	0.0000	0.0000
12.5000	0.0000	0.0000	0.0000
25.0000	0.0000	0.0000	0.0000
50.0000	0.0000	0.0000	0.0000
100.0000	0.7000	0.7000	0.7000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	82.0335



Ceriodaphnia	Day2	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1524

Fisher Exact

Transformation		Prop. Conc	Alive	P
No transformation				
	X	0.00D	1.00	
	X	6.25D	1.00	1.000
	X	12.50D	1.00	1.000
	X	25.00D	1.00	1.000
	X	50.00D	1.00	1.000
	X	100.00D	.30	.002

NOEC	LOEC	TU	Alpha	Tail	Based on
50	100	2	.05	One-sided	Fisher Exact

TOXIS ANALYSIS SUMMARY

Ceriodaphnia	Reproduction

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1524

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks	Critical Sum of Ranks
Data transformation:		No transformation					
X	0.00D	24.89	2.934	9			
X	6.25D	7.50	8.246	8	5.285	37.000	47.000
X	12.50D	5.86	10.205	7	5.577	32.000	37.000
X	25.00D	15.71	7.675	7	2.688	33.000	37.000
X	50.00D	13.40	7.749	10	3.692	56.000	71.000
X	100.00D	0.00	0.000	10	7.999	55.000	71.000

NOEC	LOEC	TU	Alpha	Tail	Based on
<6.25	6.25	>16	.05	One-sided	Wilcoxon w/ Bonf

Bonferroni T Test:

MSE	MSD % Reduction from Control	Critical T
45.857	28.7841	2.3025

Kolmogorov Test for Normality:

Alpha	D	Cutoff D	Normal?
.01	.127451	.1425	Yes

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1524

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	Fisher Exact		
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

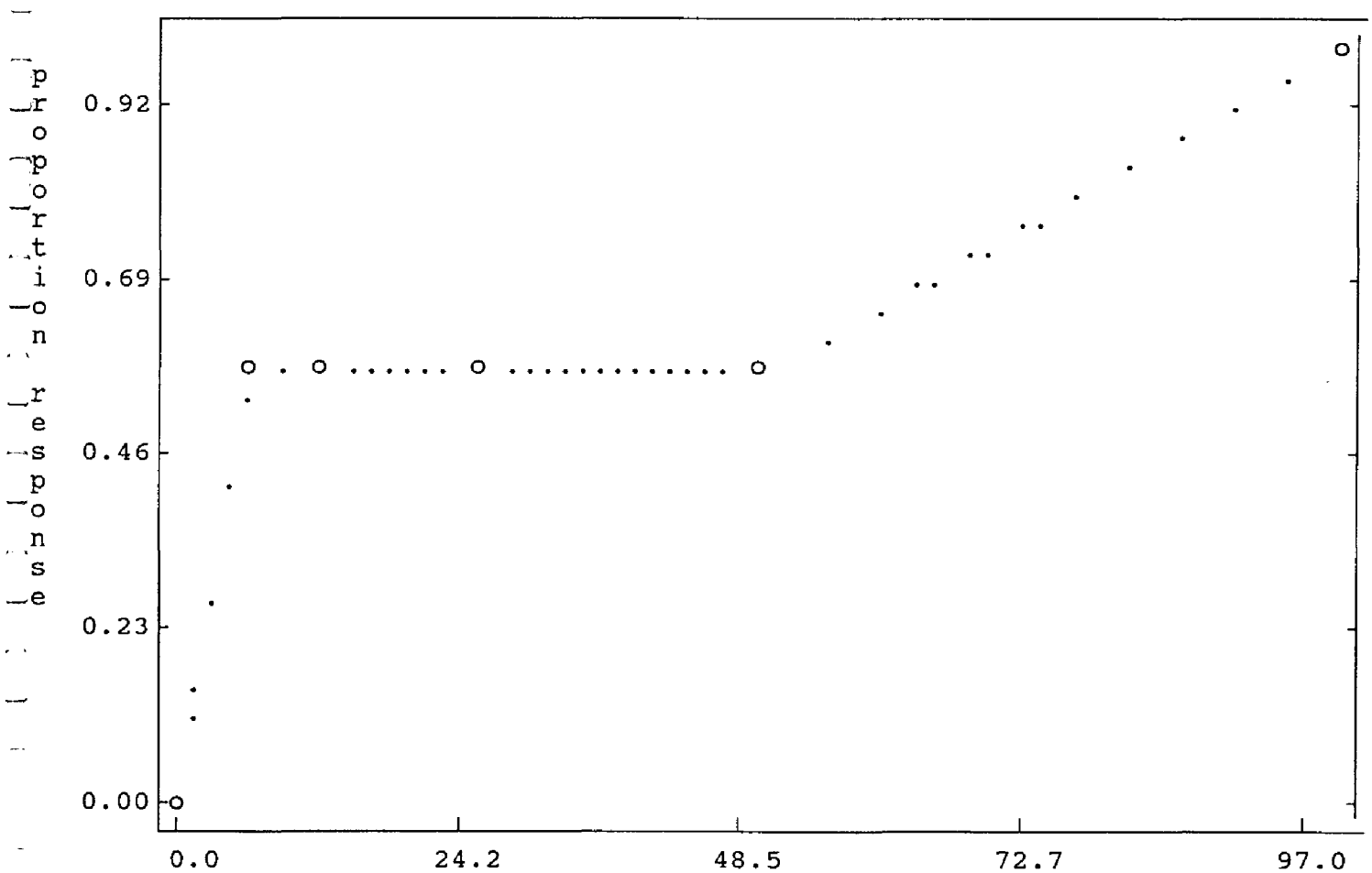
Species: Ceriodaphnia dubia
Test Material: Effluent - Industry (%)
Endpoint: Total young

Test Number: 1524
Test Date: 8/05/97

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	24.8889	24.8889	0.0000
6.2500	7.5000	10.7812	0.5668
12.5000	5.8571	10.7812	0.5668
25.0000	15.7143	10.7812	0.5668
50.0000	13.4000	10.7812	0.5668
100.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	2.7566	2.305	3.506
50	5.5132	4.574	54.183

Note: # bootstrap resamplings = 120



Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

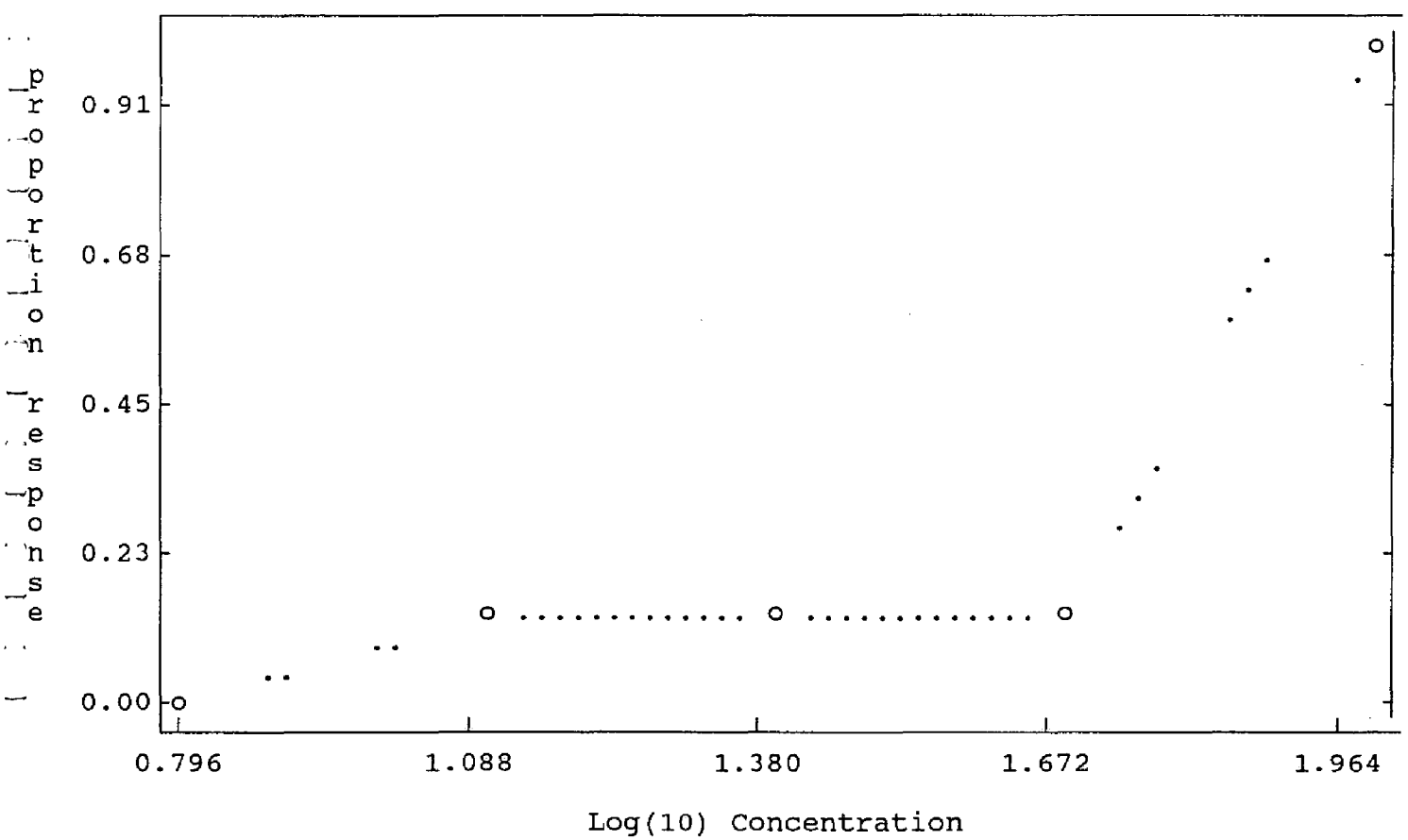
Species: Ceriodaphnia dubia
Test Material: Effluent - Industry (%)
Endpoint: Day6

Test Number: 1524
Test Date: 8/05/97

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
6.2500	0.0000	0.0000	0.0000
12.5000	0.2000	0.1333	0.1333
25.0000	0.1000	0.1333	0.1333
50.0000	0.1000	0.1333	0.1333
100.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	67.0392



Ceriodaphnia	Day6	Day 6

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1524

Fisher Exact

Transformation		Prop. Conc	Alive	P
No transformation				
	X	0.00D	1.00	
	X	6.25D	1.00	1.000
	X	12.50D	.80	.237
	X	25.00D	.90	.500
	X	50.00D	.90	.500
	X	100.00D	0.00	.000

NOEC	LOEC	TU	Alpha	Tail	Based on
50	100	2	.05	One-sided	Fisher Exact

Ceriodaphnia	Reproduction

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1524

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks	Critical Sum of Ranks
Data transformation: No transformation							
X	0.00D	24.89	2.934	9			
X	6.25D	7.50	8.246	8	5.285	37.000	47.000
X	12.50D	5.86	10.205	7	5.577	32.000	37.000
X	25.00D	15.71	7.675	7	2.688	33.000	37.000
X	50.00D	13.40	7.749	10	3.692	56.000	71.000
X	100.00D	0.00	0.000	10	7.999	55.000	71.000

NOEC	LOEC	TU	Alpha	Tail	Based on
<6.25	6.25	>16	.05	One-sided	Wilcoxon w/ Bonf

Bonferroni T Test:

MSE	MSD % Reduction from Control	Critical T
45.857	28.7841	2.3025

Kolmogorov Test for Normality:

Alpha	D	Cutoff D	Normal?
.01	.127451	.1425	Yes

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

Appendix B

SCOEPA00027974

APPENDIX B

DUAL ENDPOINT *Pimephales promelas* TOXICITY TEST DATA

Parametrix, Inc.
5808 Lake Washington Blvd
Kirkland, WA 98033

Parametrix, Inc.
Environmental Toxicology Laboratory

Pimephales promelas
CHRONIC DAILY MONITORING

Client: ACA - Portland Collection Dates: 8/4, 8/6, 8/8

Sample: Wacker Siltronics Test Dates: 8/5 - 8/12

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Temp (°C)	15	25	25	25	25	25	25	25

		pH													
Conc.	Rep.	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control		7.7	7.7	7.6	7.7	7.5	7.8	7.7	7.7	7.6	7.4	7.7	7.6	7.2	7.5
6.25%		7.6	7.7	7.6	7.7	7.5	7.7	7.6	7.7	7.6	7.4	7.7	7.6	7.5	7.4
12.5%		7.6	7.6	7.6	7.7	7.4	7.7	7.6	7.7	7.6	7.3	7.7	7.5	7.4	7.4
25%		7.6	7.6	7.5	7.6	7.5	7.7	7.6	7.7	7.6	7.3	7.7	7.5	7.0	7.5
50%		7.4	7.4	7.4	7.5	7.3	7.5	7.5	7.6	7.5	7.2	7.6	7.4	7.5	7.4
100%		7.0	7.1	7.0	7.2	7.1	7.3	7.2	7.2	7.3	6.7	7.2	7.1	7.5	7.1

		Dissolved Oxygen (mg/L)													
		Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control		8.0	7.5	7.4	7.7	6.9	7.4	7.2	7.6	7.0	7.6	7.2	6.9	6.3	6.4
6.25%		8.0	7.5	7.3	7.2	6.6	7.4	7.2	7.7	7.0	7.6	7.2	7.0	6.5	6.4
12.5%		8.0	7.6	7.3	7.2	6.5	7.2	7.2	7.6	7.1	7.5	7.2	6.8	6.6	6.0
25%		7.8	7.6	7.3	7.2	6.9	7.4	7.2	7.6	7.2	7.5	7.2	7.0	6.6	6.0
50%		7.6	7.4	7.2	7.0	6.3	7.2	7.0	7.6	7.2	7.4	7.2	6.9	6.6	6.1
100%		7.2	7.2	6.9	6.2	6.4	7.0	6.8	7.5	7.1	7.2	6.8	7.0	6.3	5.6

		Specific Conductivity (µS)													
		Initial													
Control		240													320
100%		750													1400
Initials		JK	PS	PS	JK	AC	JK	LJT	PS	PS	AC	AC	PS	PS	PS
Date		8/5	8/6	8/6	8/7	8/7	8/8	8/8	8/9	8/9	8/10	8/10	8/11	8/11	8/12

	Control	100% Effluent 1st Sample	2nd Sample	3rd Sample
Hardness				
Alkalinity				
Chlorine (total residual)				
Ammonia (mg/L)				

NT = Not Taken
Shading respresents areas for which data collection is not required.

Parametrix, Inc.
Environmental Toxicology Laboratory

Parametrix, Inc.
5808 Lake Washington Blvd
Kirkland, WA 98033

Pimephales promelas
Chronic Daily Survival

Client: NCA-Portland
Sample I.D./Source: Wacker
Dilution Media: EPA Synthetic Freshwater
Client Number: 55-1945-10
Sample Collection Dates: 8/4, 8/6, 8/8
Test Dates: 8/5/97 - 8/12/97

Conc.	Rep.	No. of Survivors							
		0	24	48	72	96	120	144	168
Control	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	9-1	9
6.25%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	9-1	9	9	9	9
	D	10	10	10	10	9-1	9	9	9
12.5%	A	10	10	10	10	10	9-1	9	9
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
25%	A	10	10	10	10	10	10	9-1	9
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
50%	A	10	10	10	10	10	10	10	9-1
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	9-1	9	9	9	9
100%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								
Initials		JK	PS	JK	JC	PS	AC	PS	PS
Date		8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12

Comments

PSW

Parametrix, Inc.
Environmental Toxicology Laboratory

7-DAY CHRONIC *Pimephales promelas* BIOMASS DATA

Client: NCA - Portland Client No.: 55-1945-~~07~~ 10 -01

Conc./Rep.	Pan No.	Foil weight (mg)	Foil & Organism weight (mg)	Organism weight (mg)
Control A	1	9.80	13.42	3.62
B	2	8.68	11.87	3.19
C	3	8.29	12.25	3.96
D	4	8.87	12.60	3.73
6.25 % A	5	8.77	12.29	3.52
B	6	8.99	12.76	3.77
C	7	9.40	13.16	3.76
D	8	9.37	13.79	4.42
12.5 % A	9	10.47	14.32	3.85
B	10	9.37	13.61	4.24
C	11	9.06	13.05	3.99
D	12	9.24	13.67	4.43
25 % A	13	8.98	12.68	3.70
B	14	9.69	14.70	5.01
C	15	9.42	13.80	4.38
D	16	9.55	14.19	4.64
50 % A	17	9.41	13.68	4.27
B	18	9.50	13.68	4.18
C	19	10.64	15.04	4.40
D	20	9.78	14.08	4.30
100 % A	21	9.32	13.73	4.41
B	22	9.45	13.96	4.51
C	23	10.58	14.85	4.27
D	24	9.49	14.00	4.51
			AC 8/13	AC 8/13

Comments:

Rev. 1/30/97

QEO

SCOEPA00027978

Parametrix Toxicology Laboratory

FISH TEST DATA

Test Number: 1514 (x) Chronic ( ) Acute hours
Test Date: 5-Aug-97
Source: N. CREEK Test Material: EFF2 (%)

Conc		Rep	Cont. No.	Start	Daily Survival 1	2	3	4	5	6 End	Prop Alive	Weight /Fish
0.00	D	1		10	10	10				10	1.00	.36200
0.00	D	2		10	10	10				10	1.00	.31900
0.00	D	3		10	10	10				10	1.00	.39600
0.00	D	4		10	10	10				9	.90	.37300
6.25	D	1		10	10	10				10	1.00	.35200
6.25	D	2		10	10	10				10	1.00	.37700
6.25	D	3		10	10	9				9	.90	.37600
6.25	D	4		10	10	9				9	.90	.44200
12.50	D	1		10	10	10				9	.90	.38500
12.50	D	2		10	10	10				10	1.00	.42400
12.50	D	3		10	10	10				10	1.00	.39900
12.50	D	4		10	10	10				10	1.00	.44300
25.00	D	1		10	10	10				9	.90	.37000
25.00	D	2		10	10	10				10	1.00	.50100
25.00	D	3		10	10	10				10	1.00	.43800
25.00	D	4		10	10	10				10	1.00	.46400
50.00	D	1		10	10	10				9	.90	.42700
50.00	D	2		10	10	10				10	1.00	.41800
50.00	D	3		10	10	10				10	1.00	.44000
50.00	D	4		10	10	9				9	.90	.43000
100.00	D	1		10	10	10				10	1.00	.44100
100.00	D	2		10	10	10				10	1.00	.45100
100.00	D	3		10	10	10				10	1.00	.42700
100.00	D	4		10	10	10				10	1.00	.45100

Parametrix Toxicology Laboratory

Test Date: 8/05/97
Sample Date: 8/04/97
Species: Pimephales promelas
Test Type: Chronic

Test Number: 1514
Test Material: Effluent - Industry %
Source: N. CREEK
North Creek Analytical

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.41	0.000	
			X	6.250	D	4	1.41	0.000	
			X	12.500	D	4	1.41	0.000	
			X	25.000	D	4	1.41	0.000	
			X	50.000	D	4	1.41	0.000	
			X	100.000	D	4	1.41	0.000	
Proportion Alive	2	No transformation							
				0.000	D	4	1.00	0.000	
				6.250	D	4	1.00	0.000	
				12.500	D	4	1.00	0.000	
				25.000	D	4	1.00	0.000	
				50.000	D	4	1.00	0.000	
				100.000	D	4	1.00	0.000	
Proportion Alive	4	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.41	0.000	
			X	6.250	D	4	1.33	.094	
			X	12.500	D	4	1.41	0.000	
			X	25.000	D	4	1.41	0.000	
			X	50.000	D	4	1.37	.081	
			X	100.000	D	4	1.41	0.000	
Proportion Alive	4	No transformation							
				0.000	D	4	1.00	0.000	
				6.250	D	4	.95	.058	
				12.500	D	4	1.00	0.000	
				25.000	D	4	1.00	0.000	
				50.000	D	4	.98	.050	
				100.000	D	4	1.00	0.000	
Proportion Alive	7	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.37	.081	
			X	6.250	D	4	1.33	.094	
			X	12.500	D	4	1.37	.081	
			X	25.000	D	4	1.37	.081	
			X	50.000	D	4	1.33	.094	
			X	100.000	D	4	1.41	0.000	
Proportion Alive	7	No transformation							
				0.000	D	4	.98	.050	
				6.250	D	4	.95	.058	
				12.500	D	4	.98	.050	
				25.000	D	4	.98	.050	
				50.000	D	4	.95	.058	
				100.000	D	4	1.00	0.000	
Weight		No transformation							
			X	0.000	D	4	.36	.032	
			X	6.250	D	4	.39	.039	
			X	12.500	D	4	.41	.026	
			X	25.000	D	4	.44	.055	
			X	50.000	D	4	.43	.009	
			X	100.000	D	4	.44	.011	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj.					
		Steel many-one rank test	>100.000	>100.000	< 1.00	0.000	
Proportion Alive	4	Arc sine sqrt w/ adj.					
		Steel many-one rank test	>100.000	>100.000	< 1.00	.003	

SCOEPA00027980

Proportion Alive	7	Arc sine sqrt w/ adj. Steel many-one rank test	>100.000	>100.000	< 1.00	.006
Weight		No transformation Dunnett	>100.000	>100.000	< 1.00	.001

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	4	Probit	EC 50	.015	-	******
Proportion Alive	7	Probit	EC 50	.035	-	******

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Fish Larvae	Day2	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		Arc sine sqrt w/ adj.				
X	0.00D	1.41	0.000	4		
X	6.25D	1.41	0.000	4	0.000	18.000
X	12.50D	1.41	0.000	4	0.000	18.000
X	25.00D	1.41	0.000	4	0.000	18.000
X	50.00D	1.41	0.000	4	0.000	18.000
X	100.00D	1.41	0.000	4	0.000	18.000
Data transformation:		No transformation				
	0.00D	1.00	0.000	4		
	6.25D	1.00	0.000	4	0.000	18.000
	12.50D	1.00	0.000	4	0.000	18.000
	25.00D	1.00	0.000	4	0.000	18.000
	50.00D	1.00	0.000	4	0.000	18.000
	100.00D	1.00	0.000	4	0.000	18.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
>100	>100	<1	.05	One-sided	Steel	10

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
0	0	2.41

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	0	.884	No

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

Fish Larvae	Weight

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T
Data transformation:		No transformation			
X	0.00D	.36	.032	4	
X	6.25D	.39	.039	4	−1.045
X	12.50D	.41	.026	4	−2.165
X	25.00D	.44	.055	4	−3.480
X	50.00D	.43	.009	4	−2.855
X	100.00D	.44	.011	4	−3.448

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
>100	>100	<1	.05	One-sided	Dunnett	2.41

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.00107	15.4287	2.41

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.96455	.884	Yes

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	10.200	.06974	Yes

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	906	Negative or zero slope with probit model indicates greater or equal proportions of responses with higher doses – EC/LC values may be
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Probit Analysis For EC/LC

Parametrix Toxicology Laboratory

Species: Pimephales promelas
Test Material: Effluent - Industry (%)
Endpoint: Day4

Test Number: 1514
Test Date: 8/05/97

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
6.2500	40	2	0.0500	0.0500	0.0328
12.5000	40	0	0.0000	0.0000	0.0201
25.0000	40	0	0.0000	0.0000	0.0118
50.0000	40	1	0.0250	0.0250	0.0067
100.0000	40	0	0.0000	0.0000	0.0036

Chi-square for heterogeneity (calculated) = 3.842
Probability(Chi-square > 3.842) = 0.27905

****
* NOTE *
* *
* Slope not significantly different from zero. *
* LC/EC fiducial limits cannot be computed. *
****

Parameter	Estimate	Std. Err.	95% Confidence Limits Lower	Upper
Intercept	3.717180	0.760515	2.226571	5.207788
Slope	-0.701875	0.616896	-1.910991	0.507242

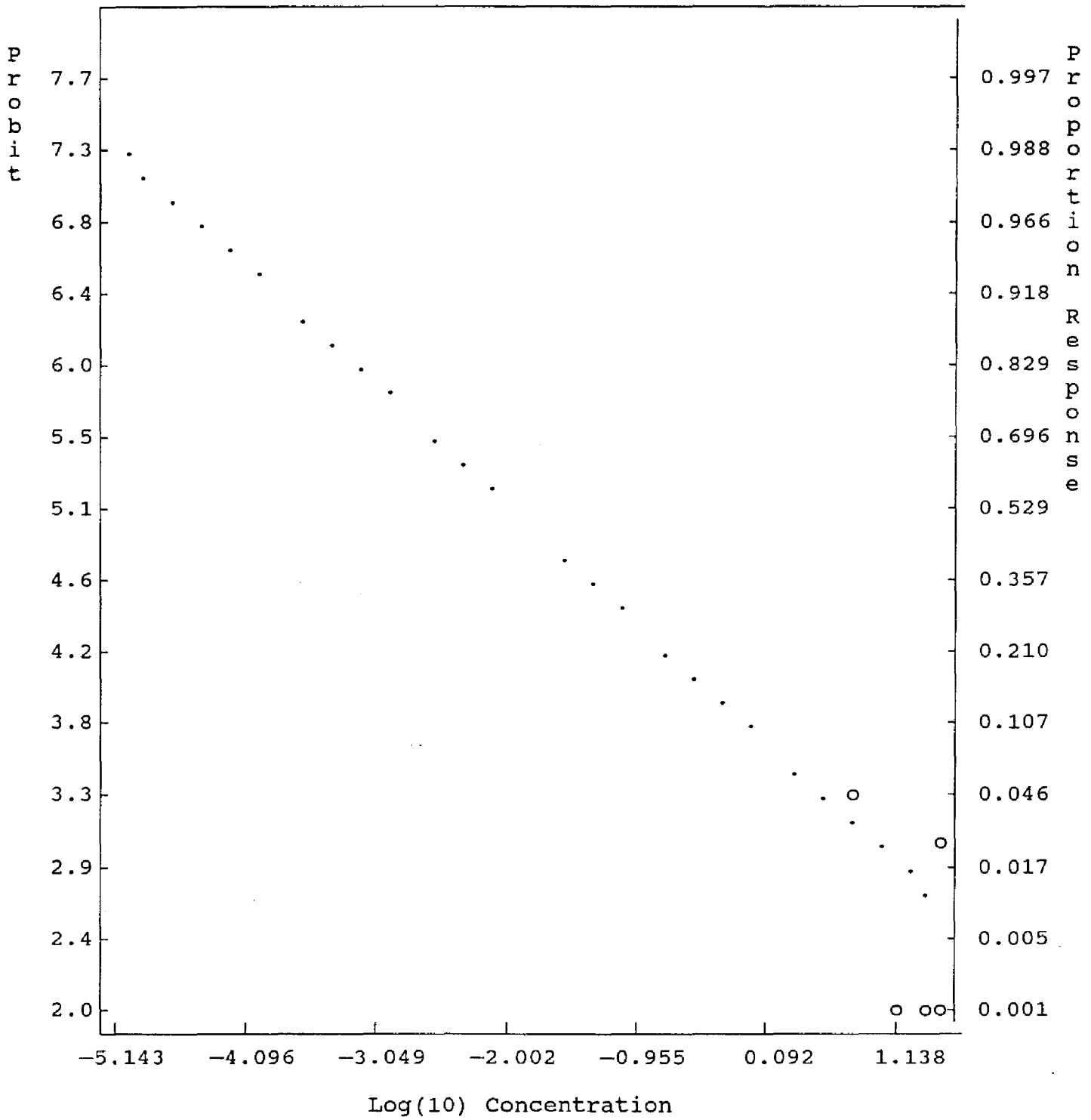
Theoretical spontaneous response rate = 0.0000

Estimated LC/EC values

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
50.00	0.015		

****
* WARNING *
* *
* Slope of probit model is negative or zero, indicating lower *
* or same proportion of responses with higher doses. EC/LC *
* values may be nonsense. *
****

Plot of adjusted probits and predicted regression line



Fish Larvae	Day4	Day 4

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation: Arc sine sqrt w/ adj.						
X	0.00D	1.41	0.000	4		
X	6.25D	1.33	.094	4	2.268	14.000
X	12.50D	1.41	0.000	4	0.000	18.000
X	25.00D	1.41	0.000	4	0.000	18.000
X	50.00D	1.37	.081	4	1.134	16.000
X	100.00D	1.41	0.000	4	0.000	18.000
Data transformation: No transformation						
	0.00D	1.00	0.000	4		
	6.25D	.95	.058	4	2.268	14.000
	12.50D	1.00	0.000	4	0.000	18.000
	25.00D	1.00	0.000	4	0.000	18.000
	50.00D	.98	.050	4	1.134	16.000
	100.00D	1.00	0.000	4	0.000	18.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
>100	>100	<1	.05	One-sided	Steel	10

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.00258	5.90137	2.41

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.771269	.884	No

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

Fish Larvae			Weight			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T
Data transformation:		No transformation			
X	0.00D	.36	.032	4	
X	6.25D	.39	.039	4	−1.045
X	12.50D	.41	.026	4	−2.165
X	25.00D	.44	.055	4	−3.480
X	50.00D	.43	.009	4	−2.855
X	100.00D	.44	.011	4	−3.448

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
>100	>100	<1	.05	One-sided	Dunnett	2.41

Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	.00107	15.4287	2.41

Shapiro-Wilk Test for Normality:	Alpha	W	Cutoff W	Normal?
	.01	.96455	.884	Yes

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	10.200	.06974	Yes

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	906	Negative or zero slope with probit model indicates greater or equal proportions of responses with higher doses – EC/LC values may be
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Probit Analysis For EC/LC

Parametrix Toxicology Laboratory

Species: Pimephales promelas
Test Material: Effluent - Industry (%)
Endpoint: End

Test Number: 1514
Test Date: 8/05/97

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
Control	40	1	0.0250	0.0000	0.0210
6.2500	40	2	0.0500	0.0297	0.0255
12.5000	40	1	0.0250	0.0041	0.0135
25.0000	40	1	0.0250	0.0041	0.0067
50.0000	40	2	0.0500	0.0297	0.0031
100.0000	40	0	0.0000	-0.0214	0.0014

Chi-square for heterogeneity (calculated) = 2.188
Probability(Chi-square > 2.188) = 0.53433

****
* NOTE *
*
* Slope not significantly different from zero. *
* LC/EC fiducial limits cannot be computed. *
****

Parameter	Estimate	Std. Err.	95% Confidence Limits Lower	Upper
Intercept	3.739458	2.442925	-1.048675	8.527590
Slope	-0.867201	2.414893	-5.600392	3.865989
Spontaneous Response Rate	0.020968	0.019436	-0.017128	0.059063

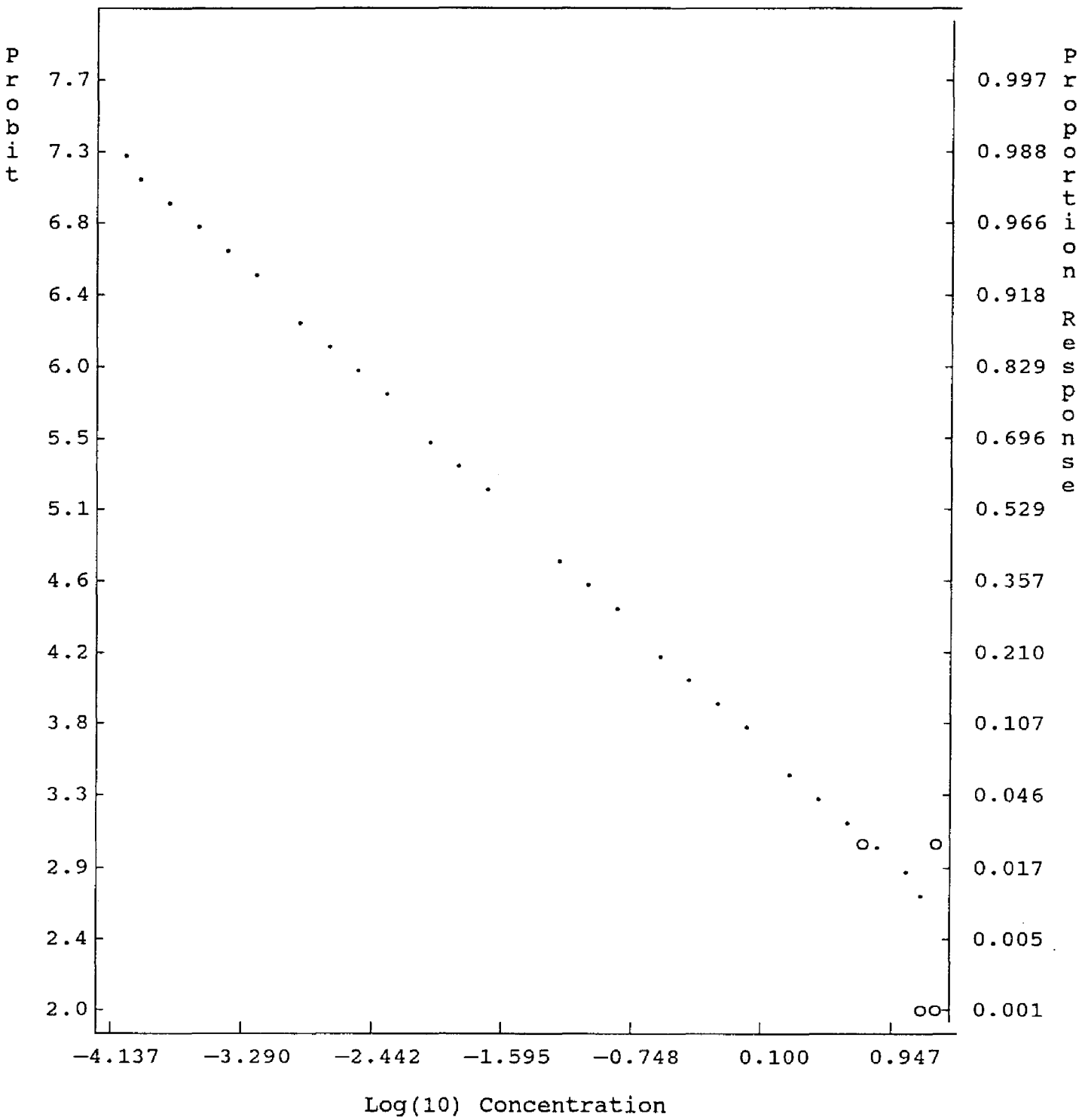
Regression equation is:
probit(adjusted prop. resp.) = intercept + slope*log(10) Concentration

Estimated LC/EC values

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
50.00	0.035		

****
* WARNING *
*
* Slope of probit model is negative or zero, indicating lower *
* or same proportion of responses with higher doses. EC/LC *
* values may be nonsense. *
****

Plot of adjusted probits and predicted regression line



Fish Larvae	Proportion Alive	Day 7

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		Arc sine sqrt w/ adj.				
X	0.00D	1.37	.081	4		
X	6.25D	1.33	.094	4	.728	16.000
X	12.50D	1.37	.081	4	0.000	18.000
X	25.00D	1.37	.081	4	0.000	18.000
X	50.00D	1.33	.094	4	.728	16.000
X	100.00D	1.41	0.000	4	−.728	20.000
Data transformation:		No transformation				
	0.00D	.98	.050	4		
	6.25D	.95	.058	4	.728	16.000
	12.50D	.98	.050	4	0.000	18.000
	25.00D	.98	.050	4	0.000	18.000
	50.00D	.95	.058	4	.728	16.000
	100.00D	1.00	0.000	4	−.728	20.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
>100	>100	<1	.05	One-sided	Steel	10

Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	.00627	7.12886	2.41

Shapiro-Wilk Test for Normality:	Alpha	W	Cutoff W	Normal?
	.01	.840894	.884	No

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	9999	0	No

Fish Larvae	Weight

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	EFF2 (%)	N. CREEK	EPAF 94	1514

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T
Data transformation:		No transformation			
X	0.00D	.36	.032	4	
X	6.25D	.39	.039	4	−1.045
X	12.50D	.41	.026	4	−2.165
X	25.00D	.44	.055	4	−3.480
X	50.00D	.43	.009	4	−2.855
X	100.00D	.44	.011	4	−3.448

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
>100	>100	<1	.05	One−sided	Dunnett	2.41

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.00107	15.4287	2.41

Shapiro−Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.96455	.884	Yes

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	10.200	.06974	Yes

SCOEPA00027995

APPENDIX C

REFERENCE TOXICANT DATA

STATIC ACUTE Ceriodaphnia dubia TOXICITY TEST

~~Client~~ Reftox
Sample CuSO4
Source of Organisms In-house

Date Collected N/C
Test Dates 8/12/97 - 8/14/97
Age of Organisms <24 hrs

Temp (°C) Day 0 25 Day 1 25 Day 2 25

Conc.	Rep.	Number of Organisms			pH			Dissolved Oxygen (mg/L)			Specific Conductivity (µS)	
		0	24	48	0	24	48	0	24	48	0	48
Control	A	5	5	5	7.8	8.0	8.0	7.6	7.6	7.5	180	220
	B	5	5	5								
	C	5	5	5								
	D	5	5	5								
2.5 ppb	A	5	5	5	7.8	8.1	7.9	7.7	7.6	7.4	190	200
	B	5	5	5								
	C	5	5	5								
	D	5	5	5								
5.0 ppb	A	5	5	4-1	7.8	8.1	7.9	7.8	7.6	7.4	190	200
	B	5	5	5								
	C	5	5	5								
	D	5	5	5								
10.0 ppb	A	5	5	5	7.7	8.1	7.9	7.8	7.6	7.5	190	200
	B	5	5	5								
	C	5	5	5								
	D	5	5	5								
20.0 ppb	A	5	5	5	7.7	8.1	7.9	7.8	7.6	7.5	190	200
	B	5	5	5								
	C	5	3-2	2-1								
	D	5	4-1	2-2								
40.0 ppb	A	5	0-5	0	7.7	8.1	7.9	7.8	7.6	7.5	190	200
	B	5	0-5	0								
	C	5	0-5	0								
	D	5	0-5	0								
	A											
	B											
	C											
	D											
Initials		AC	AE	PS	AC	AE	PS	AC	AE	PS	AC	PS
Date		8/12	8/13	8/14	8/12	8/13	8/14	8/12	8/13	8/14	8/12	8/14

Shading represents areas for which data collection is not required.
NT = Not Taken

Comments

SCOEPA00027997

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: REFTOX761 (x) Chronic ( ) Acute hours
Test Date: 12-Aug-97
Source: REF Test Material: CUSO (ug/l)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
0.00 D	1		F	5	5							1.00		
0.00 D	2		F	5	5							1.00		
0.00 D	3		F	5	5							1.00		
0.00 D	4		F	5	5							1.00		
2.50 D	1		F	5	5							1.00		
2.50 D	2		F	5	5							1.00		
2.50 D	3		F	5	5							1.00		
2.50 D	4		F	5	5							1.00		
5.00 D	1		F	5	4							.80		
5.00 D	2		F	5	5							1.00		
5.00 D	3		F	5	5							1.00		
5.00 D	4		F	5	5							1.00		
10.00 D	1		F	5	5							1.00		
10.00 D	2		F	5	5							1.00		
10.00 D	3		F	5	5							1.00		
10.00 D	4		F	5	5							1.00		
20.00 D	1		F	5	5							1.00		
20.00 D	2		F	5	5							1.00		
20.00 D	3		F	5	2							.40		
20.00 D	4		F	5	2							.40		
40.00 D	1		F	5	0							0.00		
40.00 D	2		F	5	0							0.00		
40.00 D	3		F	5	0							0.00		
40.00 D	4		F	5	0							0.00		

SCOEPA00027998

Parametrix Toxicology Laboratory

Test Date: 8/12/97
Sample Date: 8/12/97
Species: Ceriodaphnia dubia
Test Type: Chronic

Test Number: REFTOX761
Test Material: Copper sulfate ug/l
Source: REF
Reference Toxicant

SUMMARY

End Point	Day	Transformation		Conc	#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.						
			X	0.000 D	4	1.35	0.000	
			X	2.500 D	4	1.35	0.000	
			X	5.000 D	4	1.29	.119	
			X	10.000 D	4	1.35	0.000	
			X	20.000 D	4	1.02	.381	
				40.000 D	4	.23	0.000	
Proportion Alive	2	No transformation						
				0.000 D	4	1.00	0.000	
				2.500 D	4	1.00	0.000	
				5.000 D	4	.95	.100	
				10.000 D	4	1.00	0.000	
				20.000 D	4	.70	.346	
				40.000 D	4	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj. Steel many-one rank test	20.000	40.000		.027	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	2	Spearman-Karber	EC 50	22.191	18.95 - 25.98	

SCOEPA00027999

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/12/97	CUSO (ug/l)	REF	EPAA 91	REFTOX761

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	-1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	No Analysis		
Transform:			
Tail:			
Constant:	.01	Variance:	.01
Root:		Alpha Normality:	.01
		NOEC:	.05

Calculate IC? N (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC	912	Chi-square test for heterogeniety significant - proceding to Spearman Karber Analysis
EC/LC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors

Spearman-Karber Analysis for EC/LC 50

Parametrix Toxicology Laboratory

Species: Ceriodaphnia dubia
Test Material: Copper sulfate (ug/l
Endpoint: Prop

Test Number: REFTOX761
Test Date: 8/12/97

Conc	Number Exposed	Mortalities
0.00	20	0
2.50	20	0
5.00	20	1
10.00	20	0
20.00	20	6
40.00	20	20

Spearman-Karber EC/LC 50 estimate: 22.191
95% lower confidence: 18.954
95% upper confidence: 25.982

Untrimmed Spearman-Karber

Ceriodaphnia	Proportion Alive	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/12/97	CUSO (ug/l)	REF	EPAA 91	REFTOX761

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation: Arc sine sqrt w/ adj.						
X	0.00D	1.35	0.000	4		
X	2.50D	1.35	0.000	4	0.000	18.000
X	5.00D	1.29	.119	4	.516	16.000
X	10.00D	1.35	0.000	4	0.000	18.000
X	20.00D	1.02	.381	4	2.864	14.000
	40.00D	.23	0.000	4	9.709	10.000
Data transformation: No transformation						
	0.00D	1.00	0.000	4		
	2.50D	1.00	0.000	4	0.000	18.000
	5.00D	.95	.100	4	.516	16.000
	10.00D	1.00	0.000	4	0.000	18.000
	20.00D	.70	.346	4	2.864	14.000
	40.00D	0.00	0.000	4	9.709	10.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
20	40		.05	One-sided	Steel	10

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.02660	23.2773	2.41

Shapiro-Wilk Test for Normality:

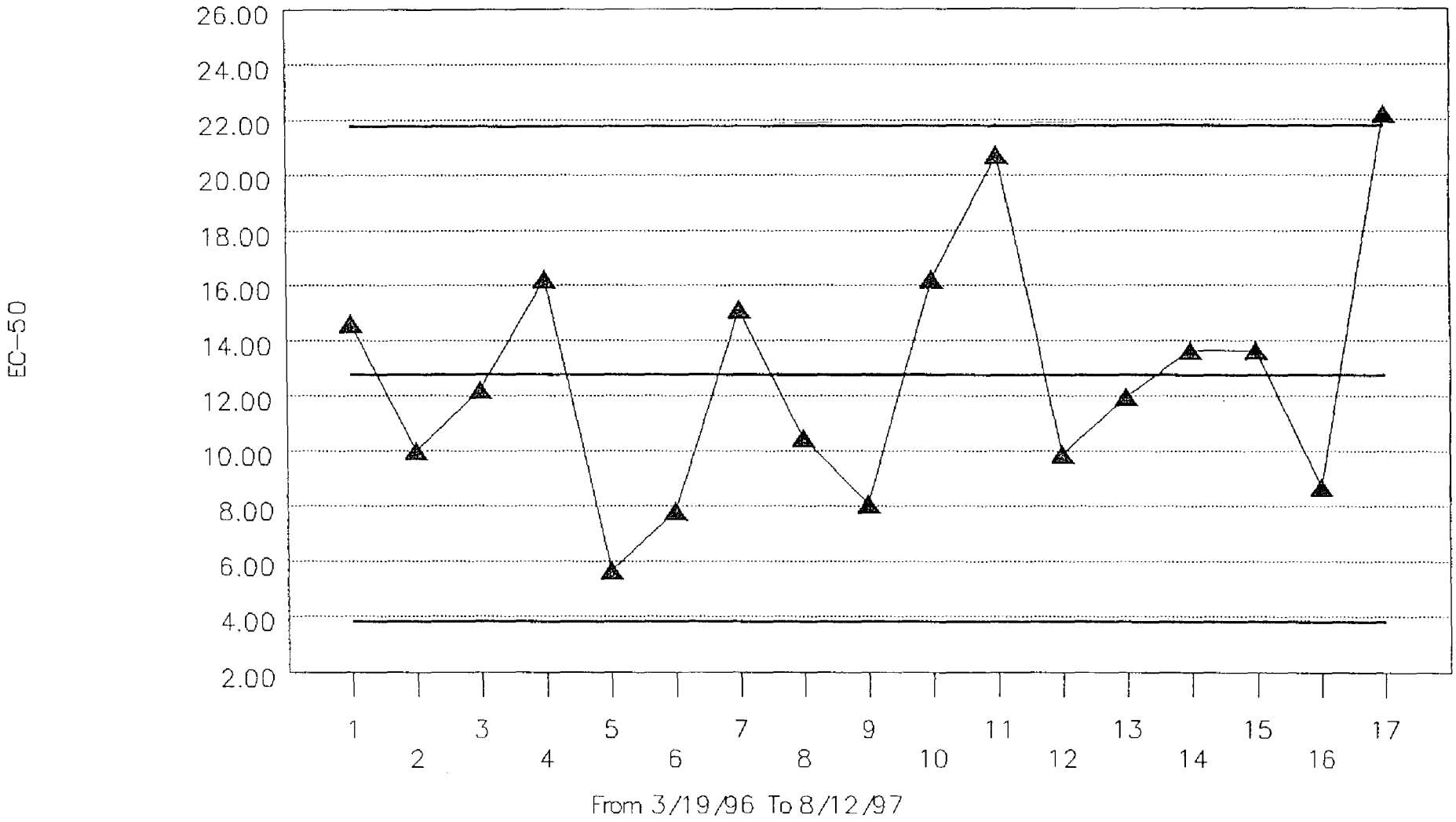
Alpha	W	Cutoff W	Normal?
.01	.716554	.884	No

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

CONTROL CHART

Ceriodaphnia dubia/Copper sulfate



Parametrix, Inc.
5808 Lake Washington Blvd
Kirkland, WA 98033

Parametrix, Inc.
Environmental Toxicology Laboratory

Pimephales promelas
CHRONIC DAILY MONITORING

Client: 'U HOUSE — Collection Dates: N/A

Sample: KCl — Test Dates: 8/5/97 - 8/12/97

Temp (°C)	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	25	25	25	25	25	25	25	25

pH

Conc.	Rep.	Initial	Initia	Final	Initia	Final	Initia	Final	Initia	Final	Initia	Final	Initia	Final	Final
Control		7.7	7.7	7.5	7.8	7.7	7.7	7.5	7.8	7.6	7.8	7.6	7.3	7.6	7.6
.125		7.7	7.7	7.6	7.7	7.6	7.6	7.5	7.8	7.6	7.8	7.6	7.4	7.6	7.6
.25		7.7	7.8	7.6	7.7	7.6	7.7	7.5	7.8	7.7	7.8	7.7	7.5	7.7	7.7
.5		7.8	7.8	7.6	7.7	7.6	7.7	7.5	7.9	7.7	7.8	7.6	7.5	7.7	7.7
1.0		7.8	7.8	7.6	7.8	7.7	7.7	7.6	8.0	7.8	7.9	7.7	7.5	7.8	7.7
2.0		7.9	—	7.7		—	—	—	—	—	-	—	—	—	—

Dissolved Oxygen (mg/L)

		Initial	Initia	Final	Initia	Final	Initia	Final	Initia	Final	Initia	Final	Initia	Final	Final
Control		7.7	7.4	7.4	7.6	7.2	7.4	7.0	7.8	7.2	7.5	7.1	7.4	7.2 5.6	6.5
.125		7.7	7.4	7.4	7.4	7.3	7.4	6.8	7.7	7.2	7.6	6.9	7.4	6.7	6.5
.25		7.7	7.6	7.3	7.5	7.2	7.4	6.8	7.7	7.2	7.5	7.0	7.4	7.4 6.8	6.6
.5		7.7	7.6	7.3	7.5	7.4	7.4	6.8	7.6	7.2	7.3	6.8	7.2	7.2	6.6
1.0		7.6	7.6	7.3	7.6	7.3	7.6	6.8	7.6	7.3	7.4	6.9	7.6	7.4	6.6
2.0		7.6	—	7.4	—	—	—	—	—	—	—	—	—	—	—

Specific Conductivity (µS)

		Initial	1	2	3	4	5	6	Final
Control		290		290	300	310	320	300	335
100%		3600	3600	—	—	—	—	—	—
Initials		PS	JP	PS	PS	PS	JP LB	PS	PS	AC	AC	BE	BE	PS
Date		8/5	8/6	8/6	8/7	8/7	8/8	8/8	8/9	8/9	8/10	8/10	8/11	8/11	8/12

	Control	100% Effluent 1st Sample	2nd Sample	3rd Sample
Hardness				
Alkalinity				
Chlorine (total residual)				
Ammonia (mg/L)				

NT = Not Taken
Shading respresents areas for which data collection is not required.

SCOEPA00028004

Parametrix, Inc.
Environmental Toxicology Laboratory

Parametrix, Inc.
5808 Lake Washington Blv
Kirkland, WA 98033

Pimephales promelas
Chronic Daily Survival

Client: Inhouse Ref. toxicant
Sample I.D./Source: KCl
Dilution Media: EPA Synthetic freshwater
Client Number:
Sample Collection Dates:
Test Dates: 8/5-8/12/97

Conc.	Rep.	No. of Survivors							
		0	24	48	72	96	120	144	168
Control	A	10	10	10	10	10	10	10	10
	B	10	10 9-1	9	9	9	9	9	9
	C								
	D								
.125	A	10	10	10	10	10	10	10	9
	B	10	10	10	9-1	9	9	9	10
	C								
	D								
.25	A	10	8-2	8	8	8	8	8	8
	B	10	10	10	10	10	10	10	10
	C								
	D								
.5	A	10	10	10	10	10	10	10	10
	B	10	10	10	8-2	8	8	8	8
	C								
	D								
1.0	A	10	1-9	1	1	1	1	1	1
	B	10	0-10	0	0	0	0	—	—
	C								
	D								
2.0	A	10	0-10	0	0	0	0	—	—
	B	10	0-10	0	0	0	0	—	—
	C								
	D								
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								
Initials		NM	JC	PS	JC	PS	AC	BE	PS
Date		8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12

Comments:

SCOEPA00028005

Parametrix, Inc.
Environmental Toxicology Laboratory

7-DAY CHRONIC *Pimephales promelas* BIOMASS DATA

Client: N/A Client No.: N/A

Conc./Rep.	Pan No.	Foil weight (mg)	Foil & Organism weight (mg)	Organism weight (mg)
Control A	1	9.39	12.67	3.28
B	2	9.73	12.74	3.01
.125 g/L A	3	10.37	13.38	3.01
B	4	9.85	12.72	2.87
.25 g/L A	5	9.93	12.37	2.44
B	6	11.99	15.30	3.31
.5 g/L A	7	9.30	12.79	3.49
B	8	10.60	14.11	3.51
1.0 g/L A	9	9.65	10.06	0.41
			AC 8/13	AC 8/13

Comments:

Rev. 1/30/97

SCOEPA00028006

Parametrix Toxicology Laboratory

FISH TEST DATA

Test Number: REFTOX760 (x) Chronic ( ) Acute hours
Test Date: 5-Aug-97
Source: REF Test Material: KCL (g/l)

Conc		Rep	Cont. No.	Start	Daily Survival 1	2	3	4	5	6 End	Prop Alive	Weight /Fish
0.00	D	1		10		10		10		10	1.00	.32800
0.00	D	2		10		9		9		9	.90	.30100
.13	D	1		10		10		10		9	.90	.30100
.13	D	2		10		10		9		10	1.00	.28700
.25	D	1		10		8		8		8	.80	.24400
.25	D	2		10		10		10		10	1.00	.33100
.50	D	1		10		10		10		10	1.00	.34900
.50	D	2		10		10		8		8	.80	.35100
1.00	D	1		10		1		1		1	.10	.04100
1.00	D	2		10		0		0		0	0.00	0.00000
2.00	D	1		10		0		0		0	0.00	0.00000
2.00	D	2		10		0		0		0	0.00	0.00000

Parametrix Toxicology Laboratory

Test Date: 8/05/97
Sample Date: 8/05/97
Species: Pimephales promelas
Test Type: Chronic

Test Number: REFTOX760
Test Material: Potassium chloride g/l
Source: REF
Reference Toxicant

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.							
			X	0.000	D	2	1.33	.115	
			X	.125	D	2	1.41	0.000	
			X	.250	D	2	1.26	.216	
			X	.500	D	2	1.41	0.000	
			X	1.000	D	2	.24	.115	
				2.000	D	2	.16	0.000	
Proportion Alive	2	No transformation							
				0.000	D	2	.95	.071	
				.125	D	2	1.00	0.000	
				.250	D	2	.90	.141	
				.500	D	2	1.00	0.000	
				1.000	D	2	.05	.071	
				2.000	D	2	0.00	0.000	
Proportion Alive	4	Arc sine sqrt w/ adj.							
			X	0.000	D	2	1.33	.115	
			X	.125	D	2	1.33	.115	
			X	.250	D	2	1.26	.216	
			X	.500	D	2	1.26	.216	
			X	1.000	D	2	.24	.115	
				2.000	D	2	.16	0.000	
Proportion Alive	4	No transformation							
				0.000	D	2	.95	.071	
				.125	D	2	.95	.071	
				.250	D	2	.90	.141	
				.500	D	2	.90	.141	
				1.000	D	2	.05	.071	
				2.000	D	2	0.00	0.000	
Proportion Alive	7	Arc sine sqrt w/ adj.							
			X	0.000	D	2	1.33	.115	
			X	.125	D	2	1.33	.115	
			X	.250	D	2	1.26	.216	
			X	.500	D	2	1.26	.216	
			X	1.000	D	2	.24	.115	
				2.000	D	2	.16	0.000	
Proportion Alive	7	No transformation							
				0.000	D	2	.95	.071	
				.125	D	2	.95	.071	
				.250	D	2	.90	.141	
				.500	D	2	.90	.141	
				1.000	D	2	.05	.071	
				2.000	D	2	0.00	0.000	
Weight		No transformation							
			X	0.000	D	2	.31	.019	
			X	.125	D	2	.29	.010	
			X	.250	D	2	.29	.062	
			X	.500	D	2	.35	.001	
			X	1.000	D	2	.02	.029	
				2.000	D	2	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj. Dunnett + t-test				.012	
Proportion Alive	4	Arc sine sqrt w/ adj. Dunnett + t-test				.022	

SCOEPA00028008

Proportion Alive	7	Arc sine sqrt w/ adj. Dunnett + t-test	.022
Weight		No transformation Dunnett + t-test	.001

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	4	Probit				
			EC 50	.721	.46 - .86	
Proportion Alive	7	Probit				
			EC 50	.721	.46 - .86	

- GROWTH POINT ESTIMATE -

End Point	P	IC	95% CI
Weight			
	IC 25	.629	.45 - .69
	IC 50	.764	.64 - .86

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	KCL (g/l)	REF	EPAF 94	REFTOX760

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	-1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: P (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	66	No convergence in 25 iterations - this usually means that a probit model is not appropriate for the data
IC	0	Analysis completed with no errors
PROP	44	Not enough replication for Steel test

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

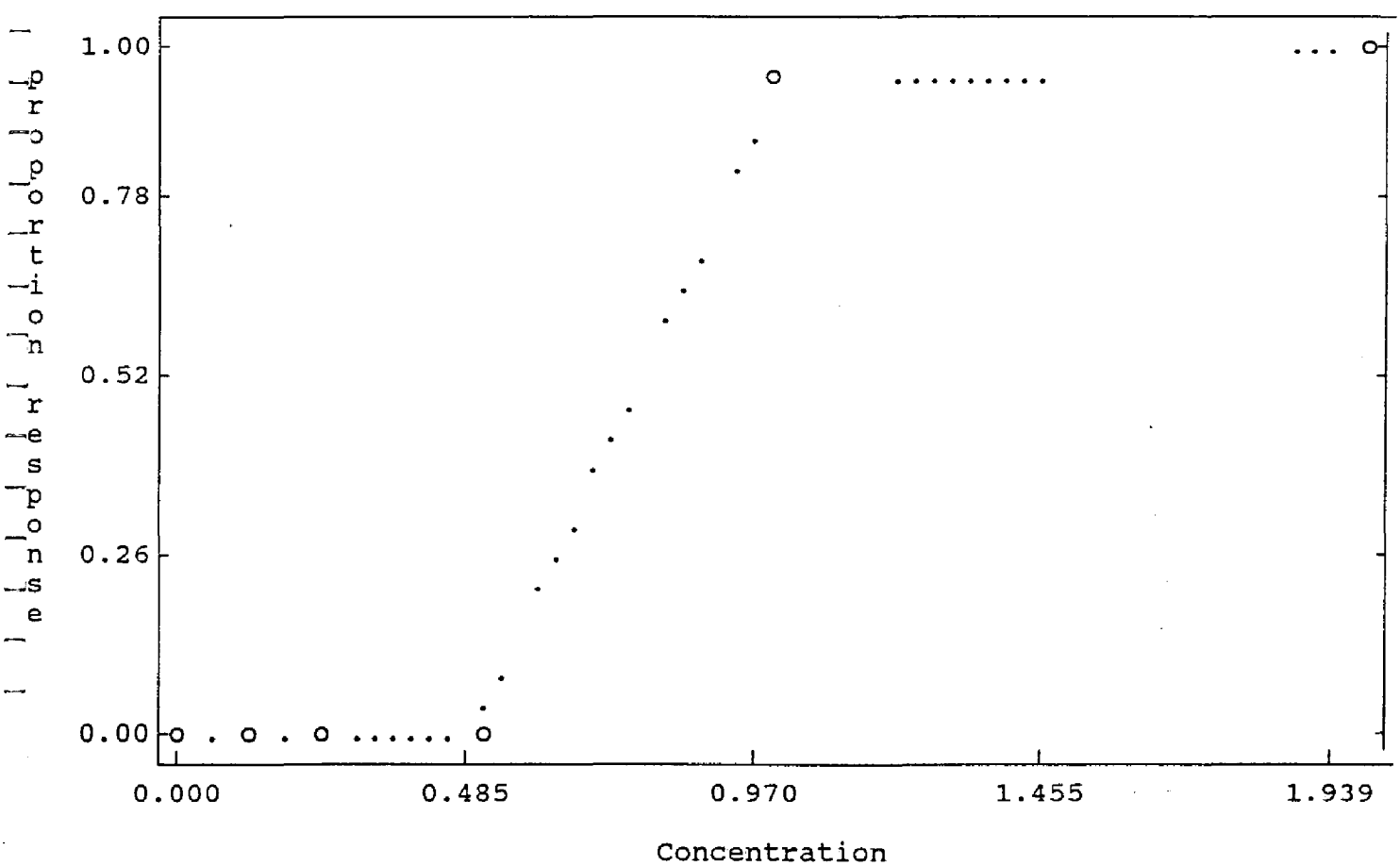
Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: Weight

Test Number: REFTOX760
Test Date: 8/05/97

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.3145	0.3145	0.0000
0.1250	0.2940	0.3105	0.0127
0.2500	0.2875	0.3105	0.0127
0.5000	0.3500	0.3105	0.0127
1.0000	0.0205	0.0205	0.9348
2.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	0.6287	0.452	0.688
50	0.7642	0.635	0.860

Note: # bootstrap resamplings = 120
Note: Confidence limit adjustment factor = 4.0



Fish Larvae		Day2				Day 2
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	KCL (g/l)	REF	EPAF 94	REFTOX760

EPA Flowchart (Chronic and Acute) 1 control

Transformation		Conc	Mean	SD	N
Arc sine sqrt w/ adj.					
	X	0.00D	1.33	.115	2
	X	.13D	1.41	0.000	2
	X	.25D	1.26	.216	2
	X	.50D	1.41	0.000	2
	X	1.00D	.24	.115	2
		2.00D	.16	0.000	2
No transformation					
		0.00D	.95	.071	2
		.13D	1.00	0.000	2
		.25D	.90	.141	2
		.50D	1.00	0.000	2
		1.00D	.05	.071	2
		2.00D	0.00	0.000	2

Error occurred during statistics:

Not enough replication for Steel test

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	KCL (g/l)	REF	EPAF 94	REFTOX760

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	-1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	44	Not enough replication for Steel test

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

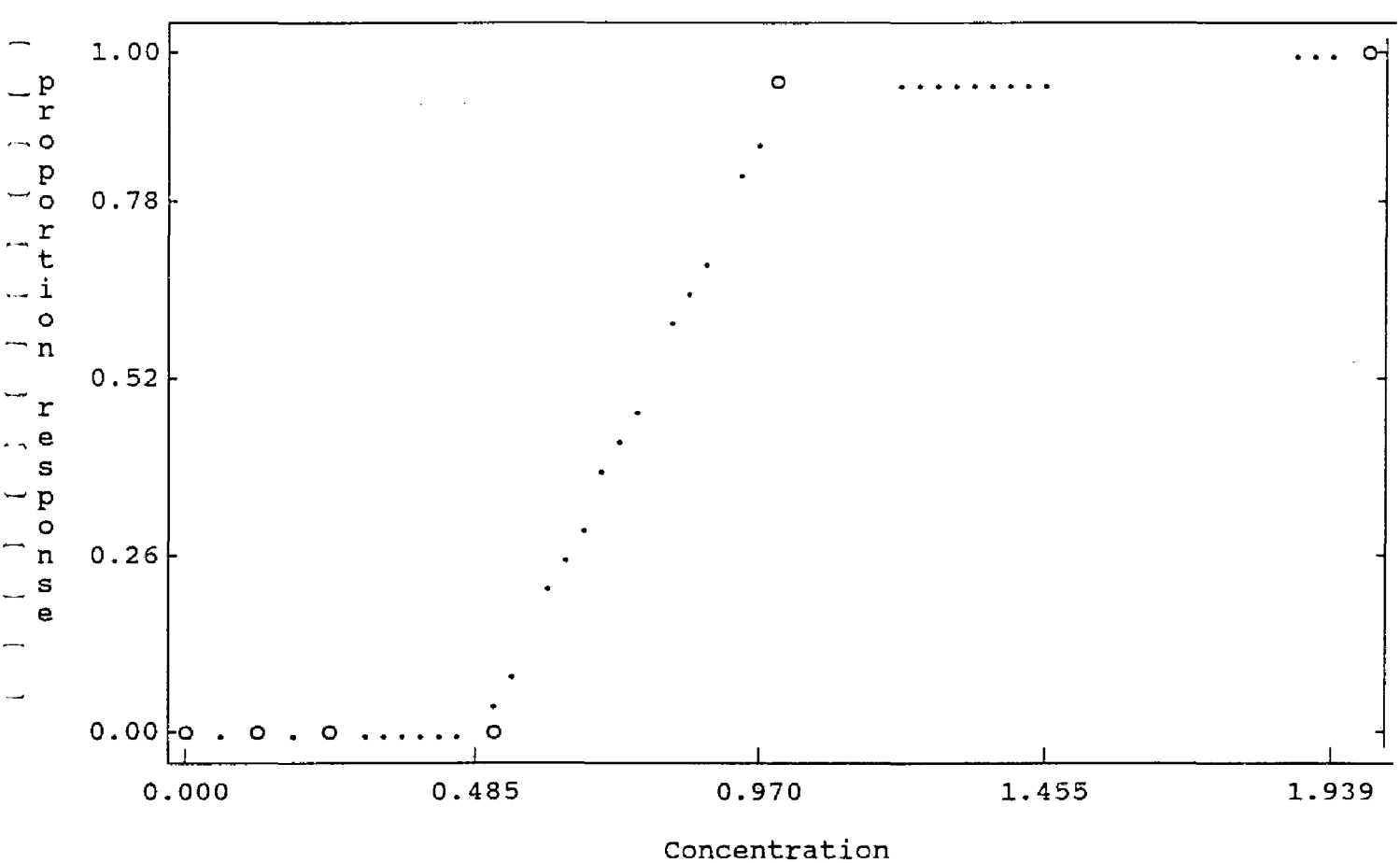
Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: Weight

Test Number: REFTOX760
Test Date: 8/05/97

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.3145	0.3145	0.0000
0.1250	0.2940	0.3105	0.0127
0.2500	0.2875	0.3105	0.0127
0.5000	0.3500	0.3105	0.0127
1.0000	0.0205	0.0205	0.9348
2.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	0.6287	0.455	0.691
50	0.7642	0.644	0.861

Note: # bootstrap resamplings = 120
Note: Confidence limit adjustment factor = 4.0



Probit Analysis For EC/LC

Parametrix Toxicology Laboratory

Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: Day4

Test Number: REFTOX760
Test Date: 8/05/97

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
Control	20	1	0.0500	0.0000	0.0667
0.1250	20	1	0.0500	-0.0179	0.0000
0.2500	20	2	0.1000	0.0357	0.0000
0.5000	20	2	0.1000	0.0357	0.0357
1.0000	20	19	0.9500	0.9464	0.9464
2.0000	20	20	1.0000	1.0000	1.0000

Chi-square for heterogeneity (calculated) = 0.446
Probability(Chi-square > 0.446) = 0.93049

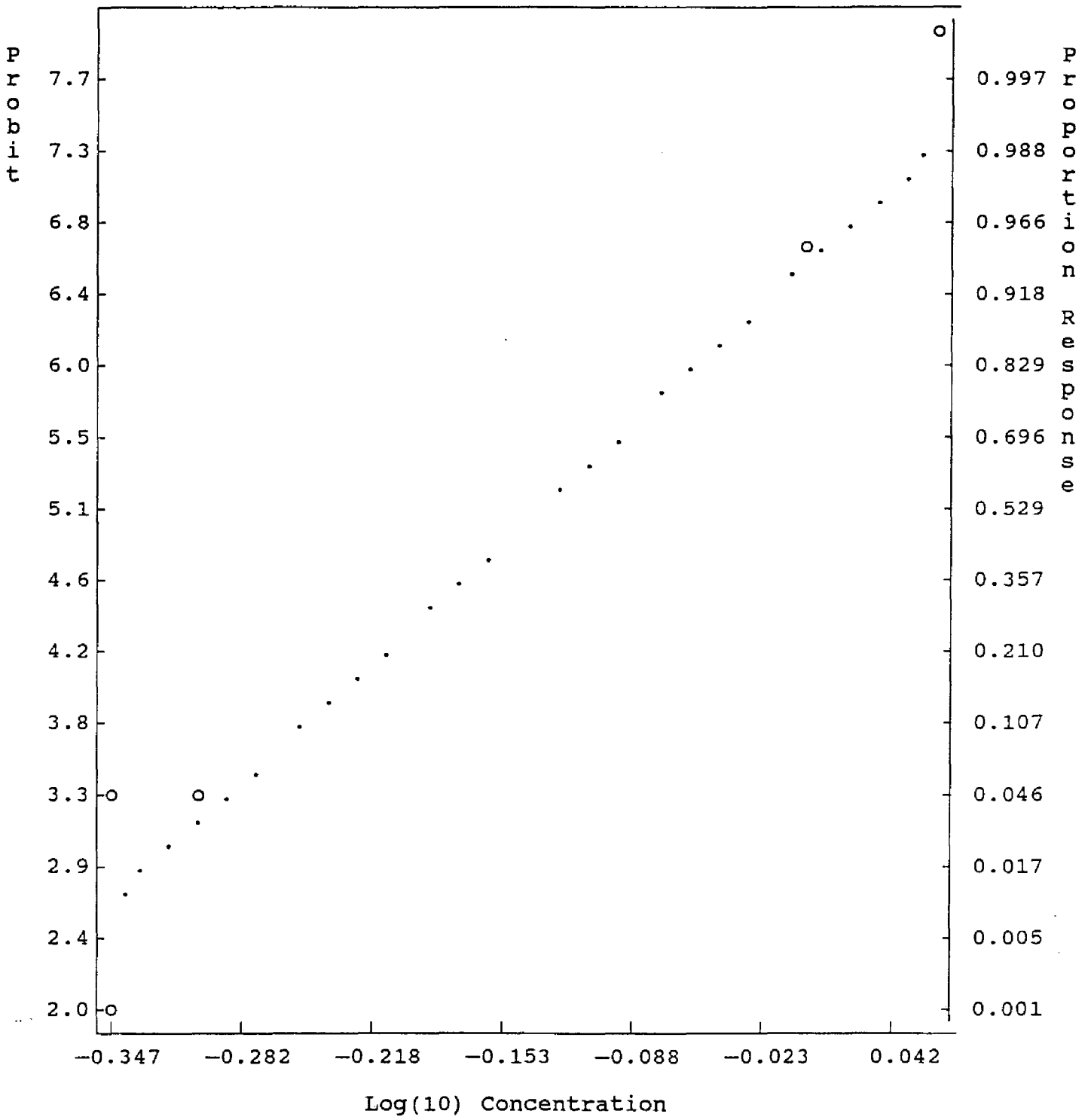
Parameter	Estimate	Std. Err.	95% Confidence Limits Lower	Upper
Intercept	6.611181	0.498245	5.634622	7.587741
Slope	11.340909	3.686916	4.114553	18.567264
Spontaneous Response Rate	0.066667	0.032203	0.003548	0.129786

Regression equation is:
probit(adjusted prop. resp.) = intercept + slope*log(10) Concentration

Estimated LC/EC values

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
50.00	0.721	0.460	0.858

Plot of adjusted probits and predicted regression line



Fish Larvae		Day4				Day 4
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	KCL (g/l)	REF	EPAF 94	REFTOX760

EPA Flowchart (Chronic and Acute) 1 control

Transformation		Conc	Mean	SD	N
Arc sine sqrt w/ adj.					
	X	0.00D	1.33	.115	2
	X	.13D	1.33	.115	2
	X	.25D	1.26	.216	2
	X	.50D	1.26	.216	2
	X	1.00D	.24	.115	2
		2.00D	.16	0.000	2
No transformation					
		0.00D	.95	.071	2
		.13D	.95	.071	2
		.25D	.90	.141	2
		.50D	.90	.141	2
		1.00D	.05	.071	2
		2.00D	0.00	0.000	2

Error occurred during statistics:

Not enough replication for Steel test

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	KCL (g/l)	REF	EPAF 94	REFTOX760

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	-1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	44	Not enough replication for Steel test

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

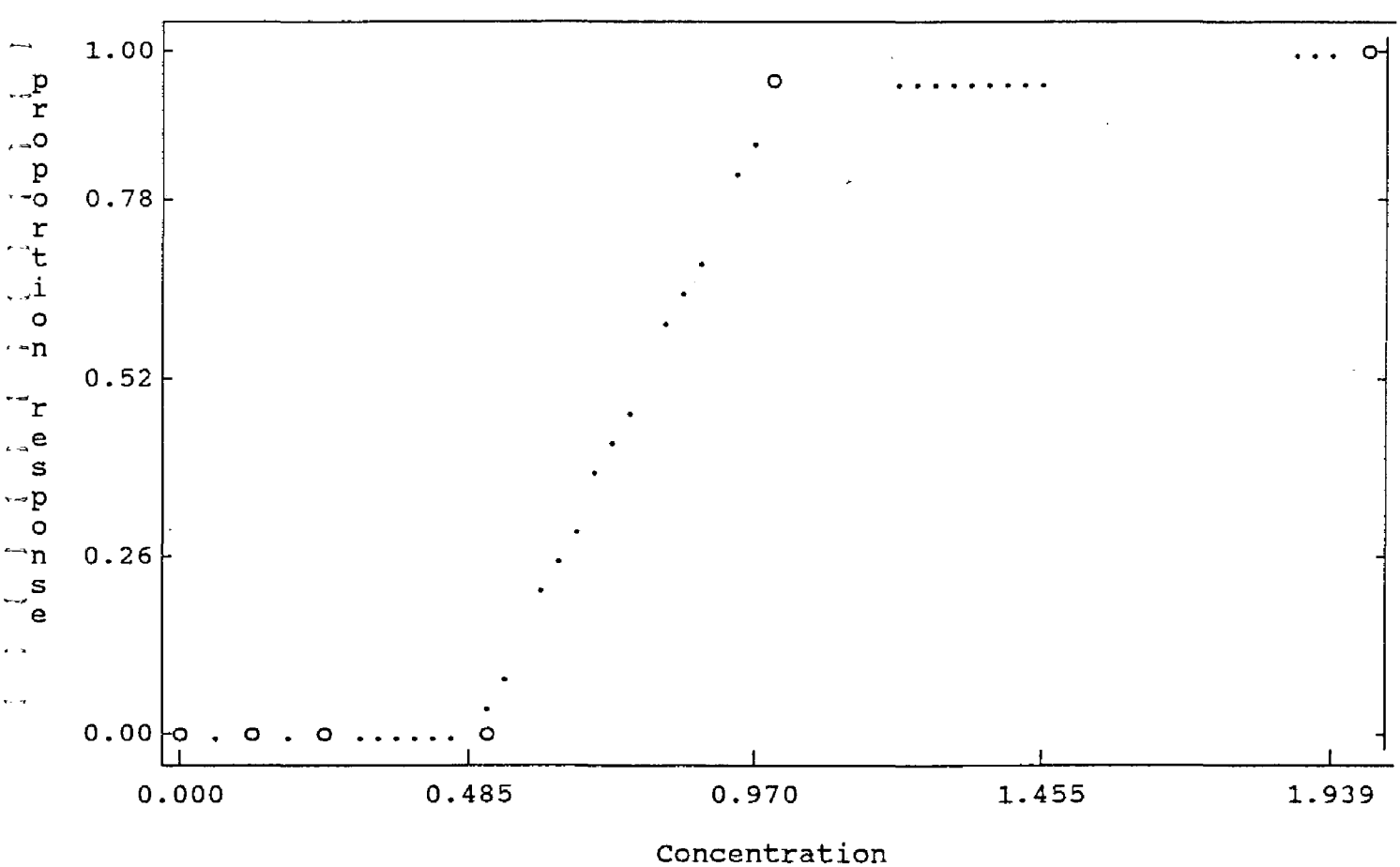
Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: Weight

Test Number: REFTOX760
Test Date: 8/05/97

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.3145	0.3145	0.0000
0.1250	0.2940	0.3105	0.0127
0.2500	0.2875	0.3105	0.0127
0.5000	0.3500	0.3105	0.0127
1.0000	0.0205	0.0205	0.9348
2.0000	0.0000	0.0000	1.0000

P Value	Estimated Concentration	95% Confidence Limits Lower	Upper
25	0.6287	0.475	0.687
50	0.7642	0.642	0.860

Note: # bootstrap resamplings = 120
Note: Confidence limit adjustment factor = 4.0



Probit Analysis For EC/LC

Parametrix Toxicology Laboratory

Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: End

Test Number: REFTOX760
Test Date: 8/05/97

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
Control	20	1	0.0500	0.0000	0.0667
0.1250	20	1	0.0500	−0.0179	0.0000
0.2500	20	2	0.1000	0.0357	0.0000
0.5000	20	2	0.1000	0.0357	0.0357
1.0000	20	19	0.9500	0.9464	0.9464
2.0000	20	20	1.0000	1.0000	1.0000

Chi−square for heterogeneity (calculated) = 0.446
Probability(Chi−square > 0.446) = 0.93049

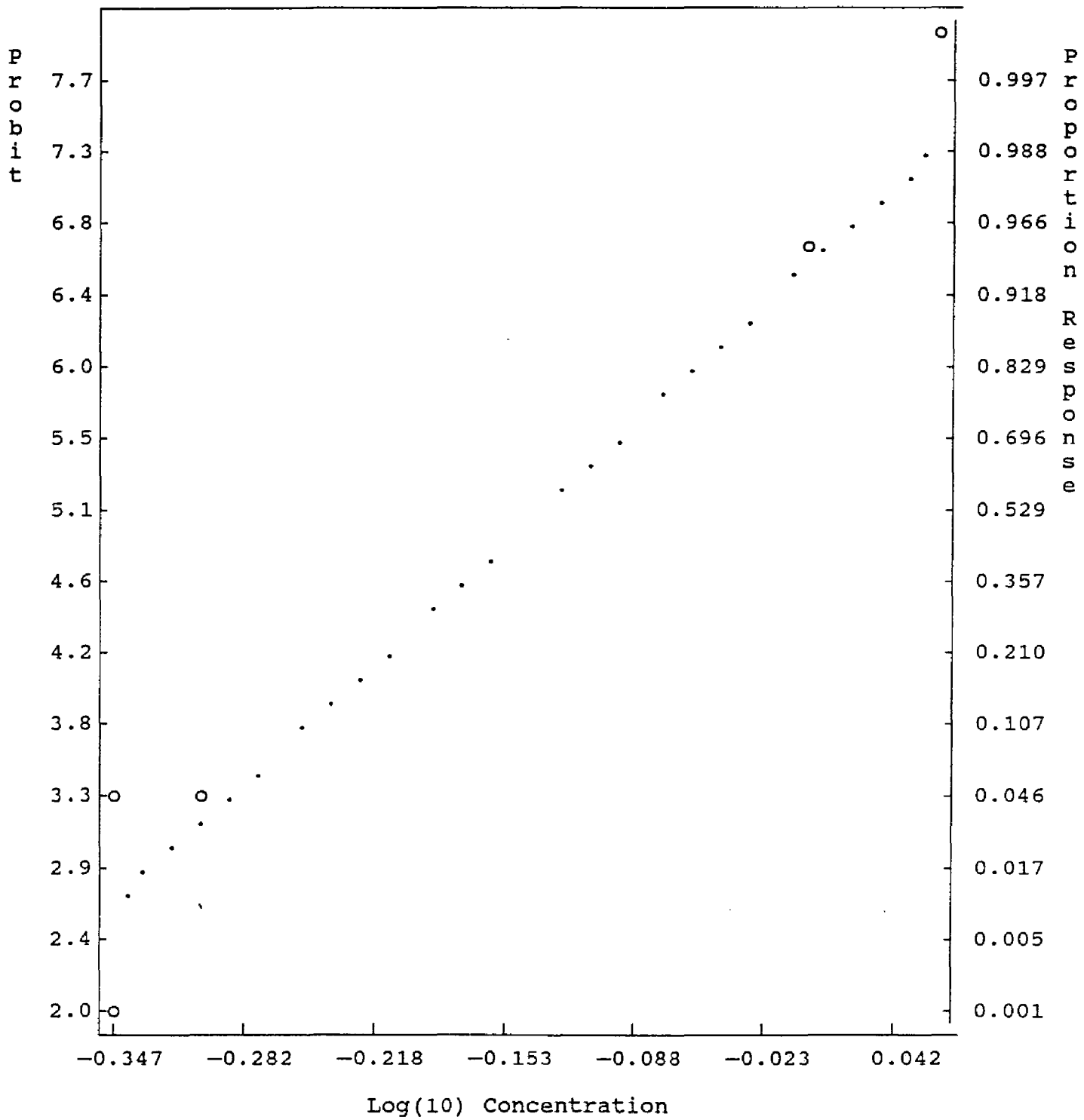
Parameter	Estimate	Std. Err.	95% Confidence Limits Lower	Upper
Intercept	6.611181	0.498245	5.634622	7.587741
Slope	11.340909	3.686916	4.114553	18.567264
Spontaneous Response Rate	0.066667	0.032203	0.003548	0.129786

Regression equation is:
probit(adjusted prop. resp.) = intercept + slope*log(10) Concentration

Estimated LC/EC values

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
50.00	0.721	0.460	0.858

Plot of adjusted probits and predicted regression line



Fish Larvae	Proportion Alive	Day 7

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/05/97	KCL (g/l)	REF	EPAF 94	REFTOX760

EPA Flowchart (Chronic and Acute) 1 control

Transformation		Conc	Mean	SD	N
Arc sine sqrt w/ adj.					
	X	0.00D	1.33	.115	2
	X	.13D	1.33	.115	2
	X	.25D	1.26	.216	2
	X	.50D	1.26	.216	2
	X	1.00D	.24	.115	2
		2.00D	.16	0.000	2
No transformation					
		0.00D	.95	.071	2
		.13D	.95	.071	2
		.25D	.90	.141	2
		.50D	.90	.141	2
		1.00D	.05	.071	2
		2.00D	0.00	0.000	2

Error occurred during statistics:

Not enough replication for Steel test

SCOEPA00028023

APPENDIX D

CHAIN OF CUSTODY FORMS AND INITIAL WATER QUALITY PARAMETERS

North Creek Analytical - Portland Subcontract Order
P708037

Sending Laboratory	Receiving Laboratory
North Creek Analytical - Portland [illegible]05 SW Nimbus Ave. [illegible]verton, OR 97008 Phone: 503/643-9200 Fax: 503/644-2202 Project Manager: Mary A. Fritzmann Smith	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 206-822-8880 Fax: N/A

Subcontract Order Comments

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
P708037-01	Water	8/4/97					Dual End Pt - Acute & Chronic
		8/5/97	Subcontract Outside	8/18/97			Bioassay

Released By Sara Kelley Company NCA-P Date 8-4-97

Received By Justin Kaplan Company GMX Date 8/5/97

SCOEPA00028025

North Creek Analytical - Portland Subcontract Order
P708102

Sending Laboratory	Receiving Laboratory
North Creek Analytical - Portland 9405 SW Nimbus Ave. verton, OR 97008 Phone: 503/643-9200 Fax: 503/644-2202 Project Manager: Mary A. Fritzmann Smith	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 206-822-8880 Fax: N/A

Subcontract Order Comments

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
P708102-01	Water	8/6/97				A	
		8/7/97	Subcontract Outside	8/20/97			Bioassay

Released By Sara McCarthy Company NCA-P Date 8-6-97

Received By [illegible] Company AMX Date 8/7/97

SCOEPA00028026

North Creek Analytical - Portland Subcontract Order
P708170

Sending Laboratory	Receiving Laboratory
North Creek Analytical - Portland 5 SW Nimbus Ave. Beaverton, OR 97008 Phone: 503/643-9200 Fax: 503/644-2202 Project Manager: Mary A. Fritzmann Smith	Parametrix, Inc. 5808 Lake Washington Blvd. NE Kirkland, WA 98033 Phone: 206-822-8880 Fax: N/A

Subcontract Order Comments

Sample/Analysis Information

Sample Name	Matrix	Sampled/ Expires	Analysis Requested	Due	Lab Number	Container	Comments
P708170-01	Water	8/8/97					
		8/9/97	Subcontract Outside	8/22/97		Bioassay	

Released By Sara McClary Company NCA-P Date 8-8-97 @ 0950

Received By Anna Echter Company PMX Date 8/8/97

SCOEPA00028027

Parametrix Environmental Toxicology Laboratory
5808 Lake Washington Boulevard NE, Suite 200
Kirkland, WA 98033

INITIAL WATER QUALITY PARAMETERS

SOURCE: Wacker Siltronic **CLIENT:** NCA - Portland **CLIENT NO:** 55-1945-10 (01)

SAMPLE #1	SAMPLE #2	SAMPLE #3
Date Sample Collected: 8/4/97	Date Sample Collected: 8/6/97	Date Sample Collected: 8/5/97
Date Sample Received: 8/5/97	Date Sample Received: 8/7/97	Date Sample Received: 8/6/97
Temperature (°C): 12	Temperature (°C): 15	Temperature (°C): 12
Salinity (ppt): 0	Salinity (ppt): 0	Salinity (ppt): 0
Dissolved Oxygen (mg/L): 8.0	Dissolved Oxygen (mg/L): 5.7	Dissolved Oxygen (mg/L): 7.8
pH: 7.0	pH: 7.1	pH: 7.1
Conductivity (µS): 700	Conductivity (µS): 1000	Conductivity (µS): 1100
Hardness (mg/L $CaCO_3$): 250	Hardness (mg/L $CaCO_3$): 390	Hardness (mg/L $CaCO_3$): 440
Alkalinity (mg/L $CaCO_3$): 18	Alkalinity (mg/L $CaCO_3$): 32	Alkalinity (mg/L $CaCO_3$): 18
Residual Chlorine (mg/L): <0.01	Residual Chlorine (mg/L): .02	Residual Chlorine (mg/L): <0.01
Ammonia (mg/L): 1	Ammonia (mg/L): 1	Ammonia (mg/L): 1
Initials:	Initials: AC	Initials: JK

NT= Not Taken

Rev. 2/20/96

SCOEPA00028028

WACKER
Wacker Siltronic Corporation

October 10, 1997 ER37:ES

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

Dear Dr Zais,

Below are the results of our annual bioassay test performed in August as required by our NPDES permit. The results of the bioassay are in compliance with the conditions of our permit. Bioassay testing was done by Parametrix Environmental Toxicology Laboratory.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	*Pimephales promelas*
NOEC	50%	100%
ZID Pass Criteria[1]	⩾50%	⩾50%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	*Pimephales promelas*
NOEC	50%	100%
Mixing Zone Pass Criteria	⩾17%	⩾17%

If you have any questions please contact me at 219-7532.

Very truly yours,

WACKER SILTRONIC CORPORATION

Thomas C. McCue

cc: Tom Rothschild
NPDES-DMR File

[1] Raymond, Richard/CH2MHILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution study identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{total}/Q_{effluent}$) respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC⩾50% effluent and the chronic test NOEC⩾ 17% effluent.

Wacker Siltronic Corporation
P.O. Box 83180
Portland, OR 97283-0180
Phone (503) 243-2020
TDD (503) 241-7519

An ISO 9001 Certified Corporation

TOXICITY EVALUATION OF AN EFFLUENT TO

Ceriodaphnia dubia AND *Pimephales promelas*

Prepared for

NORTH CREEK ANALYTICAL
9405 SW Nimbus Avenue
Beaverton, Oregon 97008-7132

Prepared by

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

AUGUST 1997

SCOEPA00028030

MEMORANDUM

CH2M HILL

TO: Tom McCue/Wacker
Sandra Archer/Wacker

COPIES: Mike Stanaway/CH2M HILL/CVO

FROM: Gary Hickman/CH2M HILL/CVO

DATE: June 2, 1995

SUBJECT: Wacker Siltronic Corporation
Wastewater Toxicity Study
Project Approach and Progress Report

PROJECT: OPE40202.A0

Background

This memo summarizes the study approach, work completed, and test results, for the wastewater toxicity study performed for the Wacker Siltronic Corporation facility in Portland, Oregon.

Unless otherwise stated, use of the terms "effluent" and "whole effluent" in this memo refers to Effluent 001, which is discharged to the Willamette River under Wacker's NPDES discharge permit[1]. This effluent consists primarily of three waste streams: concentrated acid drain (CAD), weak acid drain (WAD) and (RO/DI water concentrate, boiler, and cooling water) blow down (BD). Wastewater treatment includes fluoride precipitation of CAD and neutralization of combined CAD and WAD.

The NPDES discharge permit[1] defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and mixing zone having a 50-foot radius from the point of discharge at Outfall 003. A mixing zone dilution study conducted for the Wacker facility[2] identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{total}/Q_{effluent}$), respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC≥50% effluent and the chronic test NOEC≥17% effluent.

[1] Oregon Department of Environmental Quality. National Pollutant Discharge Elimination System, Waste Discharge Permit Number 101128, Issued to Wacker Siltronic Corporation, July 14, 1993.
[2] Raymond, Richard/CH2M HILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994.

SCOEPA00028031

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "*Return Receipt Requested*" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
DR ELLIOT ZAIS
WATER QUALITY SOURCE CONT.
DEQ - NW. REGION
2020 S.W. 4th. AVE - SUITE 400
PORTLAND, OR. 97201-4987
ER-39.

4a. Article Number
Z 282.748.139

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery

5. Received By: *(Print Name)*

8. Addressee's Address *(Only if requested and fee is paid)*

6. Signature: *(Addressee or Agent)*
X

DEQ/NWR

PS Form **3811**, December 1994 102595-97-B-0179 Domestic Return Receipt

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.

FQDC PORTLAND OR OCR 6 97208 10/15/97

UNITED STATES POSTAL SERVICE

First-Class Mail
Postage & Fees Paid
USPS
Permit No. G-10

○ Print your name, address, and ZIP Code in this box ○

ERIC SPIERING M/S 10
WACKER SILTRONIC
P.O. BOX 83180
PORTLAND, OR 97283

SCOEPA00028033

Spiering MS 10
ER39. Z 282 748 139

US Postal Service
Receipt for Certified Mail
No Insurance Coverage Provided.
Do not use for International Mail *(See reverse)*

Sent to DR ELLIOT ZAIS DEQ-NW REGION	
Street & Number 2020 S.W. 4th. AVE-STE 400	
Post Office, State, & ZIP Code PORTLAND, OR. 97201-4987	
Postage	$ 78
Certified Fee	1.35
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	1.10
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	$ 3.23
Postmark or Date	

PS Form **3800**, April 1995

PORTLAND, OR. SAINT JOHNS STA.
OCT 14 1997

SCOEPA00028034

Stick postage stamps to article to cover First-Class postage, certified mail fee, and charges for any selected optional services *(See front).*

1. If you want this receipt postmarked, stick the gummed stub to the right of the return address leaving the receipt attached, and present the article at a post office service window or hand it to your rural carrier *(no extra charge).*

2. If you do not want this receipt postmarked, stick the gummed stub to the right of the return address of the article, date, detach, and retain the receipt, and mail the article.

3. If you want a return receipt, write the certified mail number and your name and address on a return receipt card, Form 3811, and attach it to the front of the article by means of the gummed ends if space permits. Otherwise, affix to back of article. Endorse front of article **RETURN RECEIPT REQUESTED** adjacent to the number.

4. If you want delivery restricted to the addressee, or to an authorized agent of the addressee, endorse **RESTRICTED DELIVERY** on the front of the article.

5. Enter fees for the services requested in the appropriate spaces on the front of this receipt. If return receipt is requested, check the applicable blocks in item 1 of Form 3811.

6. Save this receipt and present it if you make an inquiry. 102595-97-B-0145

PS Form **3800**, April 1995 *(Reverse)*

WACKER
Wacker Siltronic Corporation

October 10, 1997 ER37:ES

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

Dear Dr Zais,

Below are the results of our annual bioassay test performed in August as required by our NPDES permit. The results of the bioassay are in compliance with the conditions of our permit. Bioassay testing was done by Parametrix Environmental Toxicology Laboratory.

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	*Pimephales promelas*
NOEC	50%	100%
ZID Pass Criteria[1]	⩾50%	⩾50%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	*Pimephales promelas*
NOEC	50%	100%
Mixing Zone Pass Criteria	⩾17%	⩾17%

If you have any questions please contact me at 219-7532.

Very truly yours,

WACKER SILTRONIC CORPORATION

Thomas C. McCue

cc: Tom Rothschild
NPDES-DMR File

[1] Raymond, Richard/CH2MHILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution study identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{total}/Q_{effluent}$) respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC⩾50% effluent and the chronic test NOEC⩾ 17% effluent.

An ISO 9001 Certified Corporation

Wacker Siltronic Corporation
P.O. Box 83180
Portland, OR 97283-0180
Phone (503) 243-2020
TDD (503) 241-7519

TOXICITY EVALUATION OF AN EFFLUENT TO

Ceriodaphnia dubia AND *Pimephales promelas*

Prepared for

NORTH CREEK ANALYTICAL
9405 SW Nimbus Avenue
Beaverton, Oregon 97008-7132

Prepared by

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

AUGUST 1997

SCOEPA00028037

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)

NAME: W[illegible] Siltronic Corporation

ADDRESS: PO [illegible]x 83180
Portland, OR 97283-0810

FACILITY: 7200 NW Front Ave.

LOCATION: Portland, OR 97210

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

(2-16) PERMIT NUMBER: 10112[illegible]

(17-19) DISCHARGE NUMBER:

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

MONITORING PERIOD

	YEAR (20-21)	MO (22-23)	DAY (24-25)		YEAR (26-27)	MO (28-29)	DAY (30-31)
FROM	97	9	1	TO	97	9	30

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (46-53) MINIMUM	AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-65)	FREQUENCY OF ANALYSIS (66-69)	SAMPLE TYPE (69-70)
TTO	SAMPLE MEASUREMENT	--	--	lbs/day	--	--	< 0.01	mg/l		1/ 30	Grab
	PERMIT REQUIREMENT	--	--		--	--	1.37				
MV-3 Flow	SAMPLE MEASUREMENT	589,000	959,000	gal/day	--	--	--	--		Continuous	
	PERMIT REQUIREMENT	--	--		--	--	--				
MV-3 Total phosphates	SAMPLE MEASUREMENT	--	--	--	--	0.4	0.5	mg/l		1/ 7	Grab
	PERMIT REQUIREMENT	--	--		--	2.0	5.0				
Outfall flow	SAMPLE MEASUREMENT	1,150,000	1,572,000	gal/day	--	--	--	--		Continuous	
	PERMIT REQUIREMENT	--	--		--	--	--				
Outfall temperature	SAMPLE MEASUREMENT	--	--	--	--	--	76	°F		1/ 7	Grab
	PERMIT REQUIREMENT	--	--		--	--	85				
Outfall pH	SAMPLE MEASUREMENT	--	--	--	3.5	7.3	9.7			Continuous	
	PERMIT REQUIREMENT	--	--		6.0	--	9.0				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

John L. Pittman
Director Plant Engineering

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years)

Wacker Siltronic Corp. by:

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 503 | NUMBER 243-2020

DATE: YEAR 97 | MO 10 | DAY 9

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

1. pH outage of 3.5 on 14 Sep 97 for 9 minutes 10 seconds

1. pH outage of 9.7 on 14 Sep 97 for 24 minutes 45 seconds

SCOEPA00028038

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)

NAME: Wacker Siltronic Corporation

ADDRESS: PO Box 83180

Portland, OR 97283-0810

FACILITY: 7200 NW Front Ave.

LOCATION: Porltand, OR 97210

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

(3-16) 1011 PERMIT NUMBER

(17-19) DISCHARGE NUMBER

Form Approved. ( )

OMB No. 2040-0004

Approval expires 10-31-94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	97	9	1	TO	97	9	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-65)	FREQUENCY OF ANALYSIS (66-69)	SAMPLE TYPE (69-70)
Process Waste Water Flow	SAMPLE MEASUREMENT	562,000	926,000	gal/day	--	--	--	--		Continuous	
	PERMIT REQUIREMENT	--	--		--	--	--			totalizing recorder	
BOD	SAMPLE MEASUREMENT	32.2	65.6	lbs/day	--	5.7	8.9	mg/l		1/ 7	24HC
	PERMIT REQUIREMENT	339	753		--	15	30				
TSS	SAMPLE MEASUREMENT	19.0	34.9	lbs/day	--	3.4	4.8	mg/l		1/ 7	24HC
	PERMIT REQUIREMENT	520	1532		--	23	61				
Cr^{+6} (1)	SAMPLE MEASUREMENT	0	0	lbs/day	--	0	0	mg/l		Batch	
	PERMIT REQUIREMENT	0.11	0.27		--	0.02	0.05				
Cr^{Total}	SAMPLE MEASUREMENT	0.02	0.03	lbs/day	--	< 0.01	< 0.01	mg/l		1/ 7	24HC
	PERMIT REQUIREMENT	0.2	0.6		--	0.3	1.0				
Fluoride	SAMPLE MEASUREMENT	10.8	19.6	lbs/day	--	2.0	2.8	mg/l		1/ 7	24HC
	PERMIT REQUIREMENT	393	804		--	17.4	32				
Total Phosphate	SAMPLE MEASUREMENT	--	--	--	--	0.1	0.1	mg/l		1/ 7	24HC
	PERMIT REQUIREMENT	--	--		--	23	61				

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

John L. Pittman
Director Plant Engineering

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 USC § 1001 AND 33 USC § 1319 (Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years)

Wacker Siltronic Corp. by:

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 503 NUMBER 243-2020

DATE: YEAR 97 MO 10 DAY 9

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

(1) No chrome batches this month

SCOEPA00028039

Is your RETURN ADDRESS completed on the reverse side?

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write *"Return Receipt Requested"* on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
DR ELLIOT ZAIS
WATER QUALITY SOURCE CONTROL
DEQ - N.W. REGION
2020 S.W. 4th - STE 400
PORTLAND, OR. 97201-4987

ER 37

4a. Article Number
Z 282 748 131

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery

5. Received By: *(Print Name)* DEQ/NWR

8. Addressee's Address *(Only if requested and fee is paid)*

6. Signature: *(Addressee or Agent)*
X

PS Form **3811,** December 1994 102595-97-B-0179 Domestic Return Receipt

Thank you for using Return Receipt Service.

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Eric Spiering M/S 30

WACKER SILTRONIC CORPORATION
7200 N.W. FRONT AVENUE
P.O. BOX 83180
PORTLAND, OR 97283-0180

Spieling M/530
ER3.7 Z 282 748 131

US Postal Service
Receipt for Certified Mail
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Do not use for International Mail *(See reverse)*

Sent to DR ELLIOT LAIS DEQ - WATER QUALITY SOURCE	
Street & Number 2020 S.W. 4th AVE - STE 400	
Post Office, State, & ZIP Code PORTLAND, OR. 97201-4987	
Postage	$ 55
Certified Fee	1.35
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	1.10
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	$ 3.00
Postmark or Date	

PS Form 3800, April 1995

PORTLAND, OR SAINT JOHNS SQ
OCT 10 1997
USPS

SCOEPA00028042

WACKER
Wacker Siltronic Corporation

October 10, 1997 ER39:ES

Dr. Elliot Zais
Water Quality Source Control
Department of Environmental Quality Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

Dear Dr Zais,

While preparing the bioassay results for 1997 we noticed that our files do not show evidence of submitting the bioassay results in 1996. In order to correct this in our records we are submitting to you the results of our bioassay test from 1996. The results of the bioassay are in compliance with the conditions of our permit. Bioassay testing was done by Parametrix Environmental Toxicology Laboratory.

1996 Bioassay Results:

48-hour Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	*Pimephales promelas*
NOEC	50%	100%
ZID Pass Criteria[1]	≥50%	≥50%

Chronic Results:	Survival (% Effluent)	
	Ceriodaphnia dubia	*Pimephales promelas*
NOEC	50%	100%
Mixing Zone Pass Criteria	≥17%	≥17%

If you have any questions please contact me at 219-7532.

Very truly yours,
WACKER SILTRONIC CORPORATION

Thomas C. McCue

cc: Tom Rothschild
NPDES-DMR File, 1996

[1] Raymond, Richard/CH2MHILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994. The NPDES discharge permit defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and mixing zone having a 50-foot radius from the point of discharge at Outfall 003. The mixing zone dilution study identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{total}/Q_{effluent}$) respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC≥50% effluent and the chronic test NOEC≥ 17% effluent.

Wacker Siltronic Corporation
P.O. Box 83180
Portland, OR 97283-0180
Phone (503) 243-2020
TDD (503) 241-7519

SCOEPA00028043

TOXICITY EVALUATION OF EFFLUENT SAMPLE FROM WACKER SILTRONICS TO *Ceriodaphnia dubia* AND *Pimephales promelas*

Prepared for

NORTH CREEK ANALYTICAL
9405 SW Nimbus Avenue
Beaverton, Oregon 97008-7132

Prepared by

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

AUGUST 1996

SCOEPA00028044

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

Offices:
BOTHELL ▪ (206) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Correspondence to: 18939 - 120th Ave. NE, #101, Bothell, WA 98011

September 6, 1996

Thomas J. Rothschild
Wacker Siltronic Corporation
PO ox 83810
Portland, OR 97283-0180

#20

RE: Bioassay/August 1996

Dear Thomas:

In response to your request, we are providing three copies of the bioassay report from Parametrix, Inc. The chain of custody forms are also included. The samples were received in our lab on the following dates:

1) August 7, 1996, NCA# P608111, 96-71

2) August 9, 1996, NCA# P608168, 96-77

3) August 12, 1996, NCA# P608211, 96-80

4) August 14, 1996, NCA# P608273, 96-83

5) August 16, 1996, NCA# P608317, 96-89

Each of these three water samples were shipped overnight to Parametrix, Inc., Kirkland, WA. If you have any questions, please call me at (503) 643-9200.

Sincerely,

Howard Holmes

Howard Holmes
Project Manager

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 485-2992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order # P608111

REPORT TO: Wacker Siltronic
ATTENTION: Tom Rothschild
ADDRESS: 7200 N.W. Front Ave
Portland, OR
PHONE: 243-2020 FAX: 241-7599
PROJECT NAME: Bioassay - 96
PROJECT NUMBER: 96.71
SAMPLED BY: Tom Rothschild

INVOICE TO: Wacker Siltronic
ATTENTION:
ADDRESS: 7200 N.W. Front Ave
Portland, OR
P.O. NUMBER: 46998 NCA QUOTE #:

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 Standard | 7 | 5 | 4 | 3 | 2 | 1 | Same Day
Fuels & Hydrocarbon Analyses: 5 Standard | 3-4 | 2 | 1 | Same Day
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: Bioassay (7)	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	96.71	7 Aug 96 0830	P608111-1	X	W	1	
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

RELINQUISHED BY (Signature): Thomas J. Rothschild DATE: 07 Aug 96
PRINT NAME: Thomas J Rothschild FIRM: WACKER SILTRONIC TIME: 1100
RELINQUISHED BY (Signature): Bill Fahey DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY (Signature): Bill Fahey DATE: 8/7/96
PRINT NAME: FIRM: NCA TIME: 1100
RECEIVED BY (Signature): Karin Fahey DATE: 8-7-96
PRINT NAME: Karin Fahey FIRM: NCA TIME: 1400

ADDITIONAL REMARKS:
(1) Dial End-Point - Acute and Chronic; EPA/600/4-89/001 and EPA/600/4-90/027

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SCOEPA00028046

24°

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order # P608168

REPORT TO: Wacker Siltronic	INVOICE TO: Wacker Siltronic
ATTENTION: Tom Rothschild	ATTENTION:
ADDRESS: 7200 N.W. Front Ave Portland, OR	ADDRESS: 7200 N.W. Front Ave Portland, OR
PHONE: 243-2020 FAX: 241-7599	P.O. NUMBER: 46998 NCA QUOTE #:
PROJECT NAME: Bioassay-96	
PROJECT NUMBER: 96-77	
SAMPLED BY:	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* *Turnaround Requests less than standard may incur Rush Charges.*

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: Bioassay (1)	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	96-77	8 Aug 96 0810		X	W	1	
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

RELINQUISHED BY (Signature): Dianne Mullan	DATE: 8/9/96	RECEIVED BY (Signature): Bob Fahey	DATE: 8/9/96
PRINT NAME: Dianne Mullan	FIRM: Wacker Siltronic TIME: 1110	PRINT NAME:	FIRM: NCA TIME: 1110
RELINQUISHED BY (Signature): Bob Fahey	DATE:	RECEIVED BY (Signature): Sara McClurg	DATE: 8-9-96
PRINT NAME:	FIRM: TIME:	PRINT NAME: Sara McClurg	FIRM: NCA TIME: 1315

ADDITIONAL REMARKS:
(1) Dual End-Point-Acute and Chronic, EPA/600/4-89/001 and EPA/600/4-90/027

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SCOEPA00028047

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NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order # PC0821

REPORT TO: Wacker Siltronic
ATTENTION: Tom Rothschild
ADDRESS: 7200 N.W. Front Ave
Portland OR
PHONE: 243-2020 FAX: 241-7599
PROJECT NAME: Bioassay-96
PROJECT NUMBER:
SAMPLED BY: Dianne Mullan

INVOICE TO: Wacker Siltronic
ATTENTION:
ADDRESS: Same
P.O. NUMBER: 44998 NCA QUOTE #:

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* *Turnaround Requests less than standard may incur Rush Charges.*

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: Bioassay (*)	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	96.80	12 Aug 96 0800	PC0821-1	X	W	1	
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

RELINQUISHED BY (Signature): Dianne E Mullan DATE: 8.12.96
PRINT NAME: Dianne E Mullan FIRM: Wacker Siltronic TIME:

RECEIVED BY (Signature): Bob Fokas DATE: 8/12/96
PRINT NAME: FIRM: NCA TIME: 1045

RELINQUISHED BY (Signature): Bob Fokas DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY (Signature): K L. Stanley DATE: 8-12-96
PRINT NAME: Karin Stanley FIRM: NCA TIME: 1200

ADDITIONAL REMARKS:
(*) Dual End-Point-Acute and Chronic: EPA/600/4-89/001 and EPA/600/4-90/027

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NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order # P608273

REPORT TO: Wacker Siltronic	INVOICE TO:
ATTENTION: Tom Rothschild	ATTENTION:
ADDRESS: 7200 N.W. Front Ave Portland, OR	ADDRESS:
PHONE: 243.2020 FAX: 241-7599	P.O. NUMBER: 46998 NCA QUOTE #:
PROJECT NAME: Biossay	
PROJECT NUMBER:	
SAMPLED BY: Dianne Mullan	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* *Turnaround Requests less than standard may incur Rush Charges.*

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: Biossay (1)	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	96-83	8.14.96	P608273-1	X	W	1	
2.				X			
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

RELINQUISHED BY (Signature): Dianne Mullan	DATE: 8.14.96	RECEIVED BY (Signature): Bob Fahlsholz	DATE: 8/14/96
PRINT NAME: Dianne Mullan	FIRM: Wacker Siltronic TIME: 1100	PRINT NAME: Bob Fahlsholz	FIRM: NCA TIME: 1300
RELINQUISHED BY (Signature): Bob Fahlsholz	DATE: 8.14.96	RECEIVED BY (Signature): K L Stanley	DATE: 8/14/96
PRINT NAME:	FIRM: TIME: 1530	PRINT NAME: Karin Stanley	FIRM: NCA TIME: 1530

ADDITIONAL REMARKS: (1) Dual End Point - Acute and Chronic; EPA/600/4-89/001 And EPA/600/4-90/027

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COC Rev 8, 1/96

SCOEPA00028049

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NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order # P608317

REPORT TO: Wacker Siltronic
ATTENTION: Tom Rothschild
ADDRESS: 7200 N.W. Front Ave
Portland, OR
PHONE: 243-2020 FAX: 241-7599
PROJECT NAME: Bioassay - 96
PROJECT NUMBER:
SAMPLED BY: Dianne Mullan

INVOICE TO: Wacker Siltronic
ATTENTION:
ADDRESS: same
P.O. NUMBER: 46998 NCA QUOTE #:

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day
Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: Bioassay (1)	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	96-89	8-16-96 0815		X	W	1	
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

RELINQUISHED BY (Signature): Dianne E Mullan DATE: 8-16-96
PRINT NAME: Dianne E Mullan FIRM: Wacker Siltronic TIME: 1010

RECEIVED BY (Signature): Bob Fabis DATE: 8/16/96
PRINT NAME: FIRM: NCA TIME: 1010

RELINQUISHED BY (Signature): Bob Fabis DATE: 8-16-96
PRINT NAME: FIRM: NCA TIME: 1230

RECEIVED BY (Signature): Sara McClurg DATE: 8-16-96
PRINT NAME: Sara McClurg FIRM: NCA TIME: 1230

ADDITIONAL REMARKS:
(1) Dual End point - Acute and Chronic:
EPA/600/4-89/001 and EPA/600/4-90/027

PAGE OF

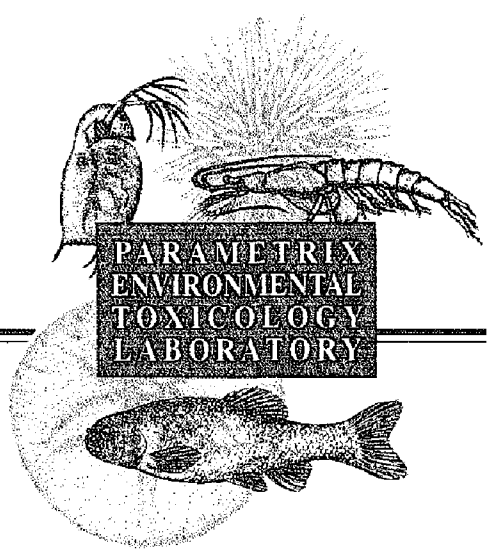
COC Rev 8, 1996

SCOEPA00028050

Final Report

Toxicity Evaluation of Effluent Samples from Wacker Siltronics to *Ceriodaphnia dubia* and *Pimephales promelas*

Prepared for:
North Creek Analytical



August 1996

Parametrix, Inc.

SCOEPA00028051

TOXICITY EVALUATION OF EFFLUENT SAMPLE FROM WACKER SILTRONICS TO *Ceriodaphnia dubia* AND *Pimephales promelas*

Prepared for

NORTH CREEK ANALYTICAL
9405 SW Nimbus Avenue
Beaverton, Oregon 97008-7132

Prepared by

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

AUGUST 1996

SCOEPA00028052

SIGNATURE PAGE

Submitted by: Parametrix, Inc.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

Prepared by: _____ 8/26/96
Justin Koplis — Date
Project Manager

Approved by: _____ 8/27/96
Dayle Ormerod — Date
Manager, Toxicology Laboratory

Approved by: _____ 8/29/96
Charles Wisdom, Ph.D. — Date
QA/QC Officer

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2. TEST METHODS AND CONDITIONS 2
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   3.1 Initial Chemical And Physical Determinations 5
   3.2 Bioassay Results 5

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B Dual endpoint *Pimephales promelas* bioassay data
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4 Summary of bioassay results 6

SCOEPA00028054

SUMMARY OF TEST CONDITIONS AND RESULTS

Dual endpoint *Ceriodaphnia dubia* and *Pimephales promelas* bioassays.

Test Title:	Toxicity Evaluation of Effluent Samples from Wacker Siltronics to *Ceriodaphnia dubia* and *Pimephales promelas*
Testing Dates:	*Ceriodaphnia dubia*: 13-20 August 1996 *Pimephales promelas*: 8-15 August 1996
Test Facility:	Parametrix, Inc.; 5808 Lake Washington Boulevard NE; Kirkland, Washington 98033
Test Sponsor:	Mr. Howard Holmes; North Creek Analytical; 9405 SW Nimbus Avenue; Beaverton, Oregon 97008-7132
Test Material:	Effluent samples collected on 7, 9, 12, 14 and 16 August 1996
Test Species:	*Ceriodaphnia dubia* *Pimephales promelas* (Fathead minnow)
Source:	*Ceriodaphnia dubia*: Laboratory stock cultures *Pimephales promelas*: Aquatic BioSystems; Fort Collins, Colorado
Test Type:	Dual endpoint for *Ceriodaphnia dubia* and *Pimephales promelas*
Duration:	*Ceriodaphnia dubia:* 48 hours and 7 days *Pimephales promelas*: 48 hours and 7 days
Test Concentrations:	0, 6.25, 12.5, 25, 50 and 100% effluent

SCOEPA00028055

Sample #s P608111-1, P608168-1, P608211-1, P608273-1 and P608317-1

Summary of 48-hour results:

	Ceriodaphnia dubia	*Pimephales promelas*
Evaluation	Survival	Survival
NOEC	50%	100%
LOEC	100%	>100%
LC50	61%	>100%

Summary of final results:

	Ceriodaphnia dubia		*Pimephales promelas*	
Evaluation	Survival	Reproduction	Survival	Growth
NOEC	50%	<6.25%	100%	100%
LOEC	100%	6.25%	>100%	>100%
LC50	61%	N/A	>100%	N/A
Reference toxicant (LC50) =	7.8 ppb Cu		0.6 ppt KCl	

N/A = Not applicable

SCOEPA00028056

1. INTRODUCTION

This report summarizes the procedures and results of biological testing conducted on effluent samples collected by the City of Portland on 7, 9, 12, 14 and 16 August 1996. All testing was conducted by Parametrix's Environmental Toxicology Laboratory in Kirkland, Washington. Testing consisted of two dual endpoint chronic bioassays using *Ceriodaphnia dubia* and *Pimephales promelas* as test organisms.

SCOEPA00028057

2. TEST METHODS AND CONDITIONS

2.1 Sample Handling

Effluent samples were collected on 7, 9, 12, 14 and 16 August 1996, and shipped via overnight carrier to Parametrix's Environmental Toxicology Laboratory, where they were refrigerated at 4° C until used for testing. Upon sample arrival, a subsample was collected for analysis of temperature, pH, salinity, dissolved oxygen, conductivity, hardness, alkalinity, ammonia and total residual chlorine. Whole, dechlorinated samples were used to conduct all toxicity testing.

2.2 Source and Condition of Organisms

C. dubia were obtained from laboratory stock cultures and were ≤24 hours old at test initiation. *P. promelas* were obtained from Aquatic BioSystems in Fort Collins, Colorado and were ≤48 hours old at test initiation.

A reference toxicant test was conducted on each test species to assess the relative health of the test organisms and to ensure that their sensitivity fell within an expected concentration range. Copper, as copper sulfate, was used as the reference toxicant for the *C. dubia* bioassay, while potassium chloride was used as the reference toxicant for the *P. promelas* bioassay.

2.3 Test Methods

Chronic bioassay testing was conducted in accordance with Short-Term Methods for Measuring the Chronic Toxicity of Surface and Receiving Waters to Freshwater Organisms, EPA/600/4-91/002, July 1994. Test procedures were modified in accordance with Whole Effluent Toxicity Testing Guidance Document, Oregon Department of Environmental Quality, January 1993. Summaries of test conditions are presented in Tables 1 and 2.

SCOEPA00028058

Table 1. Summary of test conditions for the dual endpoint *Ceriodaphnia dubia* bioassay.

Job Name: North Creek Analytical — Job Number: 55-1945-07 (01)

Date: 13-20 August 1996

Test Protocol:	Short-Term Methods for Measuring the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms, EPA/600/4-91/002, July 1994. Whole Effluent Toxicity Testing Guidance Document, Oregon Department of Environmental Quality, January 1993.
Test Material:	Whole effluent collected by the City of Portland
Test Organisms/Age:	*C. dubia*; ≤24 hrs old
Source:	In-house culture
Number/Container:	1
Volume/Container:	15 mL
Test Concentrations:	0, 6.25, 12.5, 25, 50 and 100% effluent
Replicates:	Ten
Reference Toxicant:	Copper, as copper sulfate
Test Duration:	7 days
Control/Dilution Media:	Natural Spring water from Gold Creek Trout Farm; Woodinville, Washington
Test Chambers:	30 mL polypropylene cups
Lighting:	Fluorescent bulbs (50-100 foot candles)
Photoperiod:	16 hours light; 8 hours dark
Aeration:	None
Feeding:	Daily: 100 µL *Selenastrum* suspension; 100 µL yeast/Cerophyll/trout chow (YCT)
Temperature:	25 ± 1° C
Chemical Data:	pH and dissolved oxygen measured at renewal for each concentration and the control (both initial and final solutions); temperature measured in environmental chamber at initiation and every 24 hours; specific conductivity measured at test initiation and termination in control and 100% effluent; conductivity, salinity, hardness, alkalinity, ammonia and residual chlorine measured for each new effluent sample
Effect Measured:	Mortality (defined as immobility) and reproduction
Test Acceptability:	Control mortality ≤20%; ≥60% of control organisms produce three broods, an average total of 15 or more offspring for the first three broods must be produced

SCOEPA00028059

Table 2. Summary of test conditions for the dual endpoint *Pimephales promelas* bioassay.

Job Name: North Creek Analytical — Job Number: 55-1945-07 (01)

Date: 8-15 August 1996

Test Protocol:	Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms, EPA/600/4-91/002, July 1994. Whole Effluent Toxicity Testing Guidance Document, Oregon Department of Environmental Quality, January 1993.
Test Material:	Whole effluent collected by the City of Portland
Test Organisms/Age:	*P. promelas* (fathead minnow); ≤48 hrs old
Source:	Aquatic BioSystems, Inc.; Fort Collins, Colorado
Number/Container:	Ten
Volume/Container:	400 mL
Test Concentrations:	0, 6.25, 12.5, 25, 50 and 100% effluent
Replicates:	Four
Reference Toxicant:	Potassium chloride
Test Duration:	7 days
Renewal:	Daily
Control/Dilution Media:	Lab prepared synthetic water (80-120 mg/L as $CaCO_3$)
Test Chambers:	1 liter glass beakers
Lighting:	Fluorescent bulbs (50-100 foot candles)
Photoperiod:	16 hours light; 8 hours dark
Aeration:	None
Feeding:	0.15 mL newly hatched brine shrimp nauplii twice daily
Temperature:	25 ± 1° C
Chemical Data:	pH and dissolved oxygen measured at renewal for concentration and the control (both initial and final solutions); specific conductivity measured at test initiation and termination in control and 100% effluent; temperature measured in environmental chamber at test initiation and every 24 hours; conductivity, hardness, alkalinity, ammonia, and residual chlorine measured for each new effluent sample
Effect Measured:	Mortality and growth
Test Acceptability:	Control mortality ≥20%; average mean control weight ≥ 0.25 mg

SCOEPA00028060

3. RESULTS

Daily records of biological and chemical data collected during testing are included in the appendices of this report.

3.1 Initial Chemical and Physical Determinations

The results of initial chemical and physical determinations made for the effluent samples are summarized in Table 3.

Table 3. Initial chemical and physical determinations for effluent samples

	Effluent Collection Dates		
Parameter Measured	Sample # P608111-1 8/7/96	Sample # P608168-1 8/9/96	Sample # P608211-1 8/12/96
Receiving Temperature (°C)	20	17	15
Salinity (ppt)	0	0	0
Dissolved oxygen (ppm)	7.0	7.0	8.0
Receiving pH	7.0	6.5	7.6
Conductivity (μHMOS)	900	1,025	900
Hardness (ppm as $CaCO_3$)	262	316	320
Alkalinity (ppm as $CaCO_3$)	14	14	16
Residual Chlorine (ppm)	<0.01	<0.01	<0.01
Ammonia (ppm)	1	1	<1

	Effluent Collection Dates	
Parameter Measured	Sample # P608273-1 8/14/96	Sample # P608317-1 8/16/96
Receiving Temperature (°C)	20	17
Salinity (ppt)	0	0
Dissolved oxygen (ppm)	6.6	7.4
Receiving pH	6.7	6.9
Conductivity (μHMOS)	800	1,200
Hardness (ppm as $CaCO_3$)	280	480
Alkalinity (ppm as $CaCO_3$)	10	20
Residual Chlorine (ppm)	<0.01	<0.01
Ammonia (ppm)	<1	<1

SCOEPA00028061

3.2 Bioassay Results

Bioassay results are summarized in the Executive Summary and again in Table 4. The results of reference toxicant testing and control responses were within the expected ranges. Toxicity was observed for the acute data taken at 48 hours for the *C. dubia* bioassay with a NOEC of 50% and a LOEC 100% effluent. No acute toxicity was observed in the *P. promelas* bioassay. Toxicity was also observed for survival of the chronic *C. dubia* bioassay with a NOEC of 50% effluent and for reproduction, with a NOEC of 50% and a LOEC of 100% effluent. No toxicity was observed in the final results for the chronic *P. promelas* bioassay with a NOEC of 100% effluent for survival. The chronic *C. dubia* bioassay was reconducted due to not originally meeting control test acceptability criteria.

SCOEPA00028062

Table 4. Summary of bioassay results.

Summary of 48-hour results:

	Ceriodaphnia dubia	*Pimephales promelas*
Evaluation	Survival	Survival
NOEC	50%	100%
LOEC	100%	>100%
LC50	61%	>100%

Summary of final results:

	Ceriodaphnia dubia		*Pimephales promelas*	
Evaluation	Survival	Reproduction	Survival	Growth
NOEC	50%	<6.25%	100%	100%
LOEC	100%	6.25%	>100%	>100%
LC50	61%	N/A	>100%	N/A
Reference toxicant (LC50) =	7.8 ppb Cu		0.6 ppt KCl	

N/A = Not applicable

SCOEPA00028063

4. REFERENCES

EcoAnalysis, Inc. 1994. TOXIS Version 2.2. EcoAnalysis, Inc., Ojai, California.

ODEQ. 1993. Whole effluent toxicity testing guidance document. January 1993. Oregon Department of Environmental Quality, Portland, Oregon.

U.S. EPA 1994. Short-term methods for measuring the chronic toxicity of surface and receiving waters to freshwater organisms, EPA/600/4-91/002. United States Environmental Protection Agency, Cincinnati, Ohio.

SCOEPA00028064

SCOEPA00028065

APPENDIX A

DUAL ENDPOINT *Ceriodaphnia dubia* BIOASSAY DATA

Parametrix, Inc.
Environmental Toxicology Laboratory ***Ceriodaphnia dubia*** Page 1 of ___
Chronic Daily Survival and Offspring

Client: NCA - Portland Client Number: 55 1945 07 (01) Test Dates: 8/13/96 - 8/20/96

Sample I.D./Source: Wacker Siltronic / Portland Sample Collection Dates: 8/12, 8/14, 8/16 Dilution Media: Spring Water

Temperature (°C) 0 25 24 25 48 25 72 25 96 25 120 25 144 25 168 25

Conc	Rep	Survival (hours)									Offspring (hours)						
		0	24	48	72	96	120	144	168		72	96	120	144	168		Total
Con	A	1	1	1	1	1	1	1	1		0	4	0	0	6		10
	B	1	1	1	1	1	1	1	1		0	6	8	11	0		25
	C	1	1	1	1	1	1	1	1		0	0	6	0	4		10
	D	1	1	1	1	1	1	1	1		0	5	2	5	6		18
	E	1	1	1	1	1	1	1	1		0	8	6	10	2		26
	F	1	1	1	1	1	1	1	1		0	5	7	4	4		20
	G	1	1	1	1	1	1	1	1		0	5	0	5	10		20
	H	1	1	1	1	1	1	1	1		0	4	3	7	6		20
	I	1	1	1	1	1	1	1	1		2	4	0	0	0		6
	J	1	1	1	1	1	1	1	1		0	3	0	6	9		18
6.25%	A	1	1	1	1	1	1	1	1		0	5	7	0	0		12
	B	1	1	1	1	1	1	1	1		0	4	8	0	0		12
	C	1	1	1	1	1	1	1	1		0	5	10	8	0		23
	D	1	1	1	1	1	1	1	1		0	1	0	0	4		5
	E	1	1	1	1	1	1	1	1		0	6	8	0	0		14
	F	1	1	1	1	1	1	1	1		0	3	9	0	0		12
	G	1	1	1	1	1	1	1	1		0	5	4	0	0		9
	H	1	1	1	1	1	1	1	1		0	6	6	0	0		12
	I	1	1	1	1	1	1	1	1		0	3	0	0	4		7
	J	1	1	1	1	1	1	1	1		0	4	2	0	0		6
12.5%	A	1	1	1	1	1	1	1	1		0	6	8	0	0		14
	B	1	1	1	1	1	1	1	1		0	6	11	0	0		17
	C	1	1	1	1	1	1	1	1		0	8	9	0	0		17
	D	1	1	1	1	1	1	1	1		0	0	5	0	0		5
	E	1	1	1	1	1	0-1	0	0		0	4	0	0	0		4
	F	1	1	1	1	1	1	1	1		0	0	7	0	0		7
	G	1	1	1	1	1	1	1	1		0	3	4	0	0		7
	H	1	1	1	1	1	1	1	1		0	1	5	0	0		6
	I	1	1	1	1	1	1	1	1		0	6	10	8	0		24
	J	1	1	1	0-1	0	0	0	0		0	0	0	0	0		0
	Init.	JK	JK	MW	JK	MW	MD	JK	JK		JK	MW	MD	JK	JK		JK
	Date	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20		8/16	8/17	8/18	8/19	8/20		8/20

Ceriodaphnia dubia
Chronic Daily Survival and Offspring

Conc	Rep	Survival (hours)									Offspring (hours)						
		0	24	48	72	96	120	144	168		72	96	120	144	168		Total
25%	A	1	1	1	1	1	1	1	1		0	1	6	2	0		9
	B	1	1	1	1	1	1	1	1		0	1	5	4	0		10
	C	1	0-1	0	0	0	0	0	0		0	0	0	0	0		0
	D	1	1	1	1	1	1	1	1		0	5	7	0	0		12
	E	1	1	1	1	1	1	1	1		0	6	7	0	0		13
	F	1	1	1	1	1	1	1	1		0	6	4	3	0		13
	G	1	1	1	1	1	1	1	1		0	5	4	2 4 JK	0		11
	H	1	1	1	1	1	1	1	1		0	4	5	0	0		9
	I	1	1	1	1	1	1	1	1		0	2	4	5	0		11
	J	1	1	1	1	1	1	1	1		0	5	2	5	0		12
50%	A	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	B	1	1	1	1	1	1	1	1		0	2	0	5	4		11
	C	1	1	1	1	1	1	1	1		0	1	0	7	4		12
	D	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	E	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	F	1	1	1	1	1	1	1	1		0	4	5	0	4		13
	G	1	1	1	1	1	1	1	1		0	0	0	5	0		5
	H	1	1	1	1	1	1	1	1		0	7	3	2	0		12
	I	1	1	1	1	1	1	1	1		0	9	0	7	0		16
	J	1	1	1	1	1	1	1	1		0	3	6	0	6		15
100%	A	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	B	1	0-1	0	0	0	0	0	0		0	0	0	0	0		0
	C	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	D	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	E	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	F	1	0-1	0	0	0	0	0	0		0	0	0	0	0		0
	G	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	H	1	0-1	0	0	0	0	0	0		0	0	0	0	0		0
	I	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	J	1	1	0-1	0	0	0	0	0		0	0	0	0	0		0
	Init.	JK	JK	MW	JK	MW	MD	JK	JK		JK	MW	MD	JK	JK		JK
	Date	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20		8/16	8/17	8/18	8/19	8/20		8/20

Comments:

Parametrix, Inc.
Environmental Toxicology Laboratory

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Ceriodaphnia dubia
Daily Water Quality Parameters

pH Solution																
Date	8/13	8/14	8/14	8/15	8/15	8/16	8/16	8/17	8/17	8/18	8/18	8/19	8/19	8/20		
Day	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8
Conc	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Con	7.9	8.0	8.0	7.9	7.9	8.0	8.0	8.0	7.9	~~8.0~~	8.1	7.9	7.9	8.0		*8.1
6.25%	7.9	8.0	8.0	7.9	7.8	8.0	8.0	7.8	7.9	~~8.0~~	8.1	7.9	7.8	8.0		*8.1
12.5%	7.9	8.0	8.0	7.9	7.4	8.0	8.0	7.6	7.9	8.1	8.0	7.9	7.8	8.0		
25%	7.8	7.9	7.9	7.8	7.0	8.0	7.9	7.5	7.8	8.1	7.9	7.9	7.7	7.9		
50%	7.7	7.8	7.8	7.7	6.8	7.9	7.8	6.9	7.8	8.0	7.8	7.8	7.5	7.8		
100%	7.4	7.7	7.5	7.6	6.4	—	—	—	—	—	—	—	—	—		
Initials	JK	JK	JK	MW	MW	JK	JK	MW	MW	MD	MD	JK	JK	JK		

Dissolved Oxygen (mg/L) Solution																
Conc.																
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Con	7.2	7.4	7.4	7.6	7.6	7.6	7.6	7.4	7.7	7.4	7.4	7.4	7.2	7.4		
6.25%	7.2	7.4	7.4	7.6	7.6	7.6	7.6	7.5	7.7	7.4	7.4	7.4	7.4	7.4		
12.5%	7.2	7.4	7.4	7.6	7.5	7.6	7.6	7.6	7.7	7.4	7.4	7.4	7.4	7.4		
25%	7.2	7.4	7.5	7.6	7.3	7.6	7.6	7.6	7.8	7.4	7.4	7.4	7.4	7.4		
50%	7.2	7.5	7.5	7.5	7.1	7.6	7.6	7.8	7.8	7.5	7.4	7.6	7.4	7.4		
100%	7.2	7.5	7.6	7.4	7.0	—	—	—	—	—	—	—	—	—		
Initials	JK	JK	JK	MW	MW	JK	JK	MW	MW	MD	MD	JK	JK	JK		

Conductivity (µMHOS)			
Conc.	0 Hour	168 Hours	
Cont.	190	226	
100%	1000	990	
Initials	JK	JK	

Comments: # 48 hrs

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: 930 (x) Chronic ( ) Acute hours
Test Date: 13-Aug-96
Source: N. CREEK Test Material: EFF2 (%)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
0.00 D	1		F	1	1						1	1.00	10	
0.00 D	2		F	1	1						1	1.00	25	
0.00 D	3		F	1	1						1	1.00	10	
0.00 D	4		F	1	1						1	1.00	18	
0.00 D	5		F	1	1						1	1.00	26	
0.00 D	6		F	1	1						1	1.00	20	
0.00 D	7		F	1	1						1	1.00	20	
0.00 D	8		F	1	1						1	1.00	20	
0.00 D	9		F	1	1						1	1.00	6	
0.00 D	10		F	1	1						1	1.00	18	
6.25 D	1		F	1	1						1	1.00	12	
6.25 D	2		F	1	1						1	1.00	12	
6.25 D	3		F	1	1						1	1.00	23	
6.25 D	4		F	1	1						1	1.00	5	
6.25 D	5		F	1	1						1	1.00	14	
6.25 D	6		F	1	1						1	1.00	12	
6.25 D	7		F	1	1						1	1.00	9	
6.25 D	8		F	1	1						1	1.00	12	
6.25 D	9		F	1	1						1	1.00	7	
6.25 D	10		F	1	1						1	1.00	6	
12.50 D	1		F	1	1						1	1.00	14	
12.50 D	2		F	1	1						1	1.00	17	
12.50 D	3		F	1	1						1	1.00	17	
12.50 D	4		F	1	1						1	1.00	5	
12.50 D	5		F	1	1						0	0.00	4	
12.50 D	6		F	1	1						1	1.00	7	
12.50 D	7		F	1	1						1	1.00	7	
12.50 D	8		F	1	1						1	1.00	6	
12.50 D	9		F	1	1						1	1.00	24	
12.50 D	10		F	1	1						0	0.00	0	
25.00 D	1		F	1	1						1	1.00	9	
25.00 D	2		F	1	1						1	1.00	10	
25.00 D	3		F	1	0						0	0.00	0	
25.00 D	4		F	1	1						1	1.00	12	
25.00 D	5		F	1	1						1	1.00	13	
25.00 D	6		F	1	1						1	1.00	13	
25.00 D	7		F	1	1						1	1.00	11	
25.00 D	8		F	1	1						1	1.00	9	
25.00 D	9		F	1	1						1	1.00	11	
25.00 D	10		F	1	1						1	1.00	12	
50.00 D	1		F	1	0						0	0.00	0	
50.00 D	2		F	1	1						1	1.00	11	
50.00 D	3		F	1	1						1	1.00	12	
50.00 D	4		F	1	0						0	0.00	0	
50.00 D	5		F	1	0						0	0.00	0	
50.00 D	6		F	1	1						1	1.00	13	
50.00 D	7		F	1	1						1	1.00	5	

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: 930 (x) Chronic ( ) Acute hours
Test Date: 13-Aug-96
Source: N. CREEK Test Material: EFF2 (%)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
50.00 D	8		F	1	1						1	1.00	12	
50.00 D	9		F	1	1						1	1.00	16	
50.00 D	10		F	1	1						1	1.00	15	
100.00 D	1		F	1	0						0	0.00	0	
100.00 D	2		F	1	0						0	0.00	0	
100.00 D	3		F	1	0						0	0.00	0	
100.00 D	4		F	1	0						0	0.00	0	
100.00 D	5		F	1	0						0	0.00	0	
100.00 D	6		F	1	0						0	0.00	0	
100.00 D	7		F	1	0						0	0.00	0	
100.00 D	8		F	1	0						0	0.00	0	
100.00 D	9		F	1	0						0	0.00	0	
100.00 D	10		F	1	0						0	0.00	0	

Parametrix Toxicology Laboratory

Test Date: 8/13/96
Sample Date: 8/12/96
Species: Ceriodaphnia dubia
Test Type: Chronic

Test Number: 930
Test Material: Effluent - Industry %
Source: N. CREEK
North Creek Analytical

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	No transformation							
			X	0.000	D	10	1.00	0.000	
			X	6.250	D	10	1.00	0.000	
			X	12.500	D	10	1.00	0.000	
			X	25.000	D	10	.90	.316	
			X	50.000	D	10	.70	.483	
				100.000	D	10	0.00	0.000	
Proportion Alive	7	No transformation							
			X	0.000	D	10	1.00	0.000	
			X	6.250	D	10	1.00	0.000	
			X	12.500	D	10	.80	.422	
			X	25.000	D	10	.90	.316	
			X	50.000	D	10	.70	.483	
				100.000	D	10	0.00	0.000	
Reproduction		No transformation							
			X	0.000	D	10	17.30	6.601	
			X	6.250	D	10	11.20	5.138	
			X	12.500	D	10	10.10	7.490	
			X	25.000	D	10	10.00	3.801	
			X	50.000	D	10	8.40	6.484	
				100.000	D	10	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	No transformation Fisher Exact	50.000	100.000	2.00		
Proportion Alive	7	No transformation Fisher Exact	50.000	100.000	2.00		
Reproduction		No transformation Dunnett	< 6.250	6.250	> 16.00	36.511	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI	TU
Proportion Alive	2	Graphical Interpolation	EC 50	60.951	-	1.64
Proportion Alive	7	Graphical Interpolation	EC 50	60.951	-	1.64

- GROWTH POINT ESTIMATE -

End Point	P	IC	95% CI
Reproduction	IC 50	46.094	6.09 - 64.64

SCOEPA00028072

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/13/96	EFF2 (%)	N. CREEK	EPAF94	930

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	Fisher Exact	Auto growth select	1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	EPA Flowchart	Auto growth select	1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

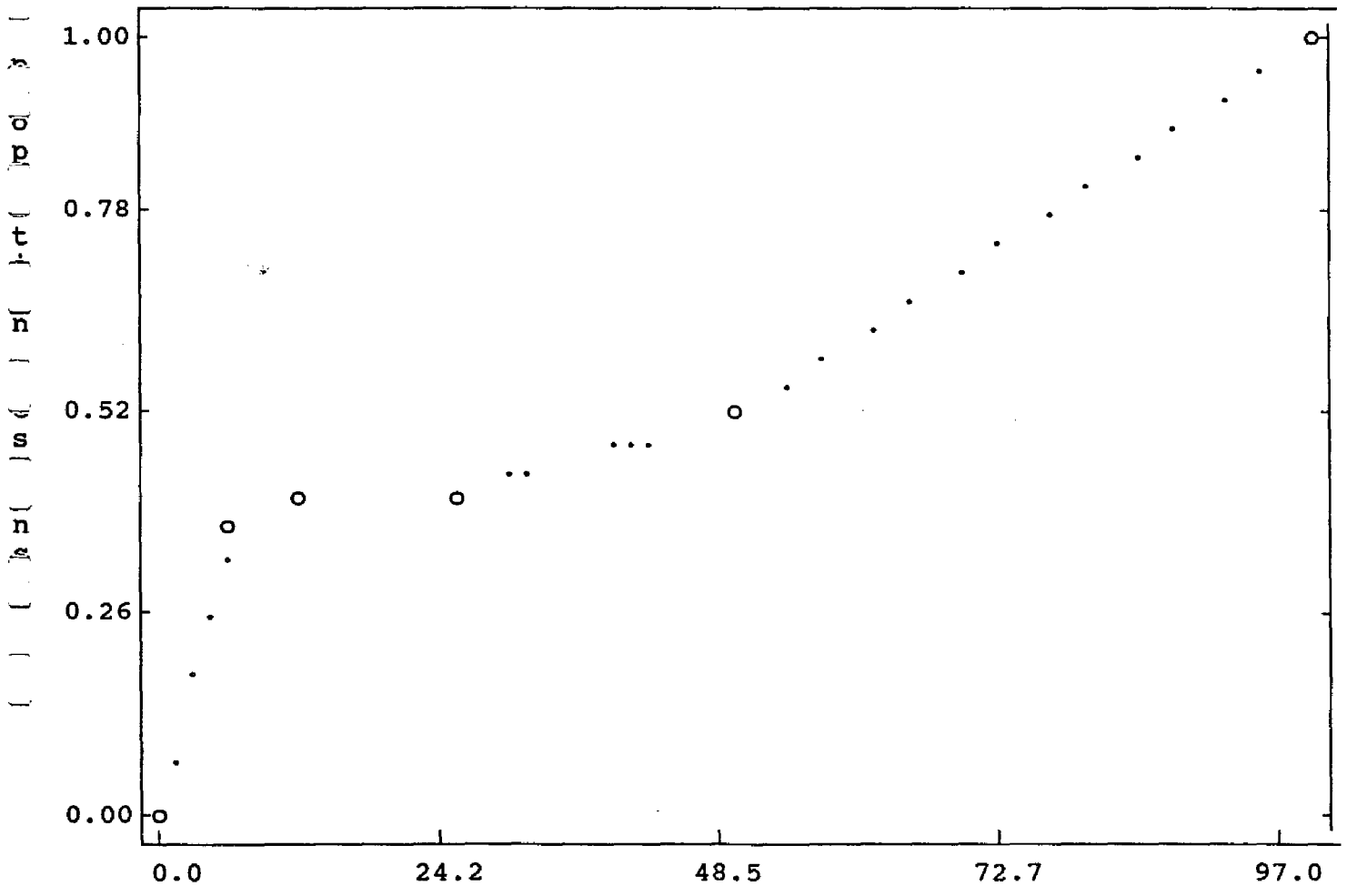
pecies: Ceriodaphnia dubia
Test Material: Effluent – Industry (%)
Endpoint: Total young

Test Number: 930
Test Date: 8/13/96

oncentration	Mean	Pooled Mean	Proportion Response
0.0000	17.3000	17.3000	0.0000
6.2500	11.2000	11.2000	0.3526
12.5000	10.1000	10.1000	0.4162
25.0000	10.0000	10.0000	0.4220
50.0000	8.4000	8.4000	0.5145
100.0000	0.0000	0.0000	1.0000

Value	Estimated Concentration	95% Confidence Limits Lower	Upper
50	46.0938	6.189	64.058

ote: # bootstrap resamplings = 120



Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

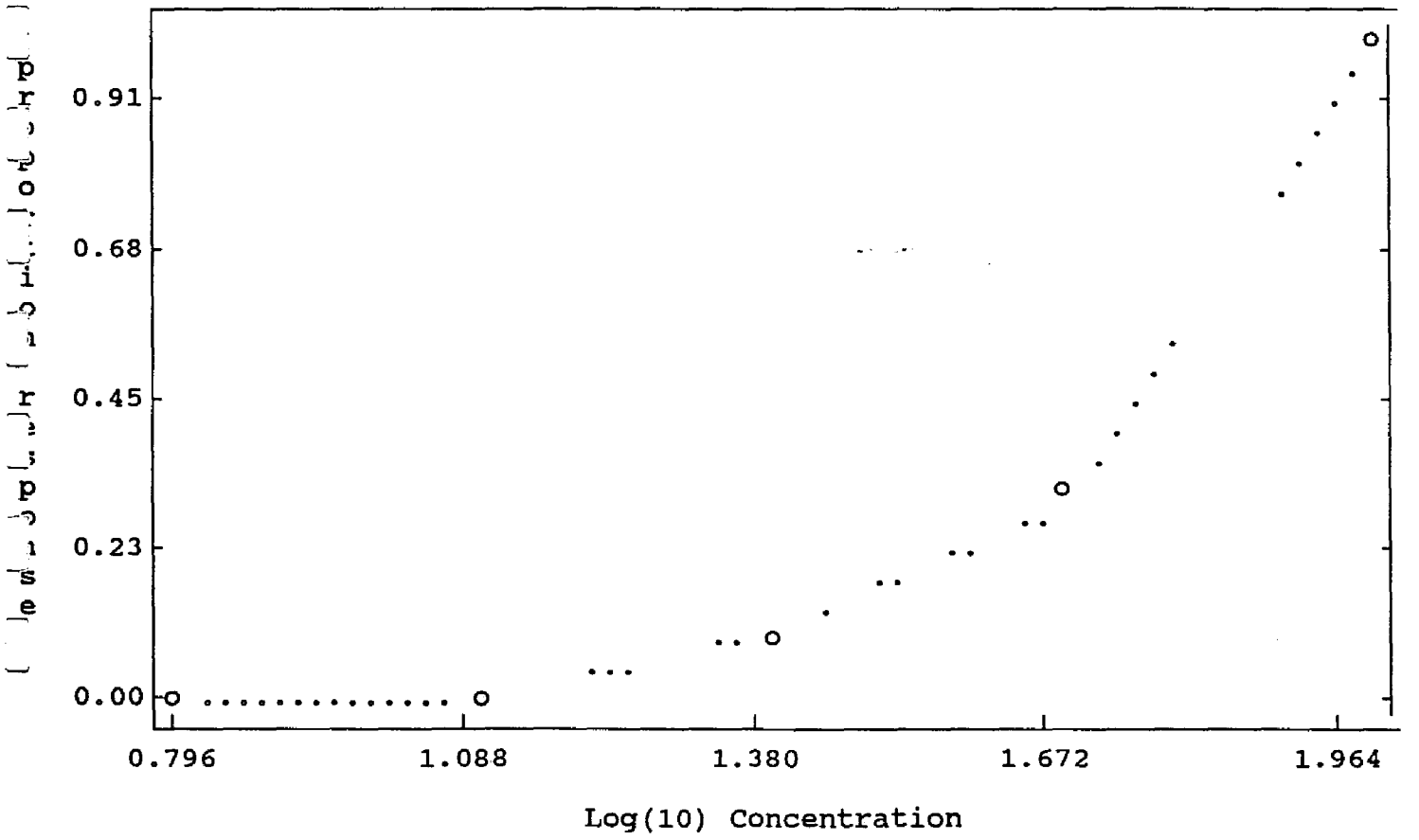
pecies: Ceriodaphnia dubia
Test Material: Effluent - Industry (%)
Endpoint: Day2

Test Number: 930
Test Date: 8/13/96

oncentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
6.2500	0.0000	0.0000	0.0000
12.5000	0.0000	0.0000	0.0000
25.0000	0.1000	0.1000	0.1000
50.0000	0.3000	0.3000	0.3000
100.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	60.9507



Ceriodaphnia Day2 Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/13/96	EFF2 (%)	N. CREEK	EPAF94	930

Fisher Exact Auto growth select 1 control

Transformation		Prop. Conc	Alive	P
No transformation				
	X	0.00D	1.00	
	X	6.25D	1.00	1.000
	X	12.50D	1.00	1.000
	X	25.00D	.90	.500
	X	50.00D	.70	.105
		100.00D	0.00	.000

NOEC	LOEC	TU	Alpha	Tail	Based on
50	100	2	.05	One-sided	Fisher Exact

Ceriodaphnia			Reproduction			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/13/96	EFF2 (%)	N. CREEK	EPAF94	930

EPA Flowchart Auto growth select 1 control

	Conc	Mean	SD	N	T
Data transformation: No transformation					
X	0.00D	17.30	6.601	10	
X	6.25D	11.20	5.138	10	2.257
X	12.50D	10.10	7.490	10	2.664
X	25.00D	10.00	3.801	10	2.701
X	50.00D	8.40	6.484	10	3.294
	100.00D	0.00	0.000	10	

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
<6.25	6.25	>16	.05	One-sided	Dunnett	2.225

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
36.511	34.7545	2.225

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.970797	.93	Yes

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	4.3451	.36130	Yes

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/13/96	EFF2 (%)	N. CREEK	EPAF94	930

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	Fisher Exact	Auto growth select	1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	EPA Flowchart	Auto growth select	1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.05

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
IC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Inhibition Concentration (ICp) Using Linear Interpolation Analysis

Parametrix Toxicology Laboratory

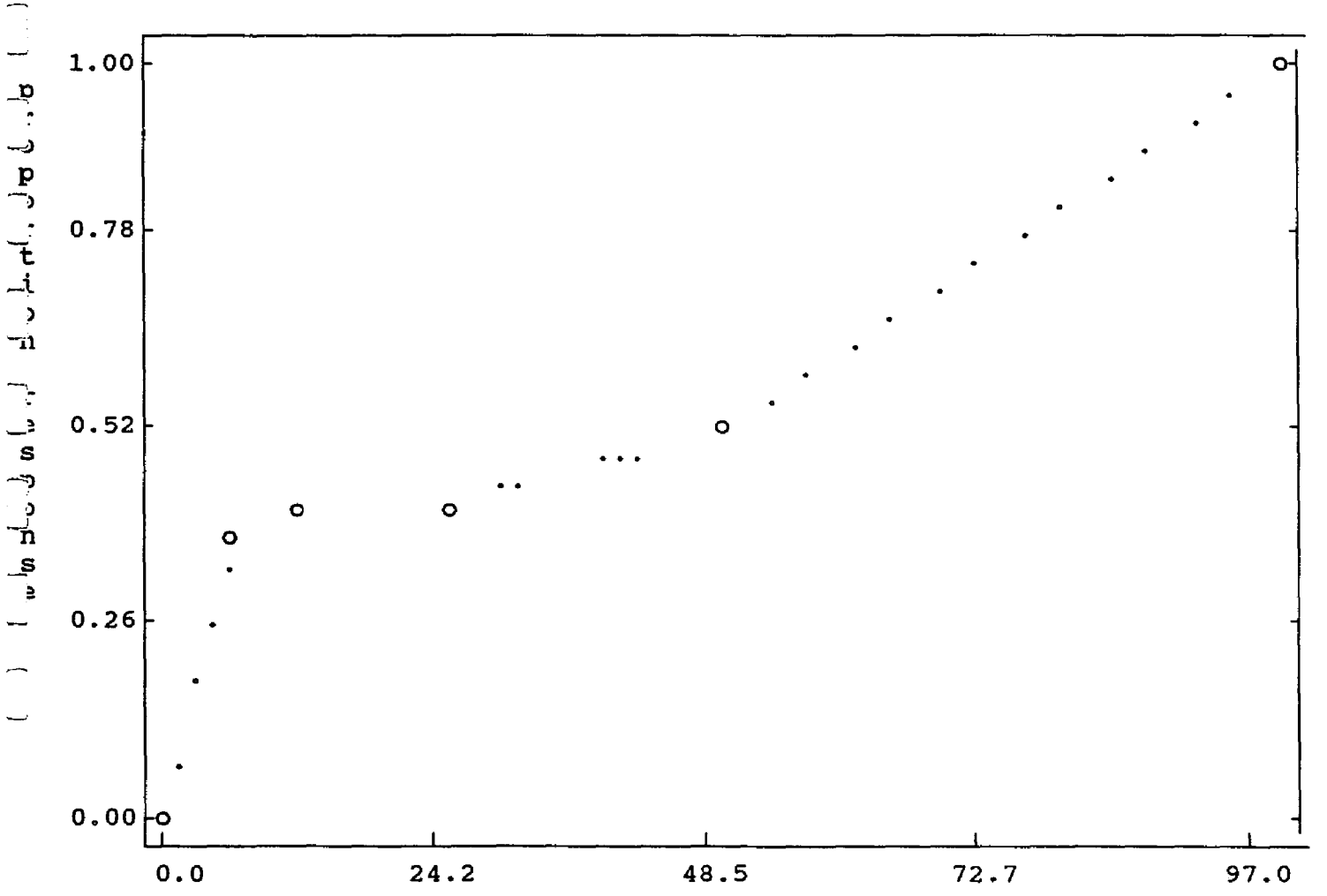
Species: Ceriodaphnia dubia
Test Material: Effluent – Industry (%)
Endpoint: Total young

Test Number: 930
Test Date: 8/13/96

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	17.3000	17.3000	0.0000
6.2500	11.2000	11.2000	0.3526
12.5000	10.1000	10.1000	0.4162
25.0000	10.0000	10.0000	0.4220
50.0000	8.4000	8.4000	0.5145
100.0000	0.0000	0.0000	1.0000

Value	Estimated Concentration	95% Confidence Limits Lower	Upper
50	46.0938	6.091	64.644

Note: # bootstrap resamplings = 120



Graphical Interpolation Analysis For EC/LC

Parametrix Toxicology Laboratory

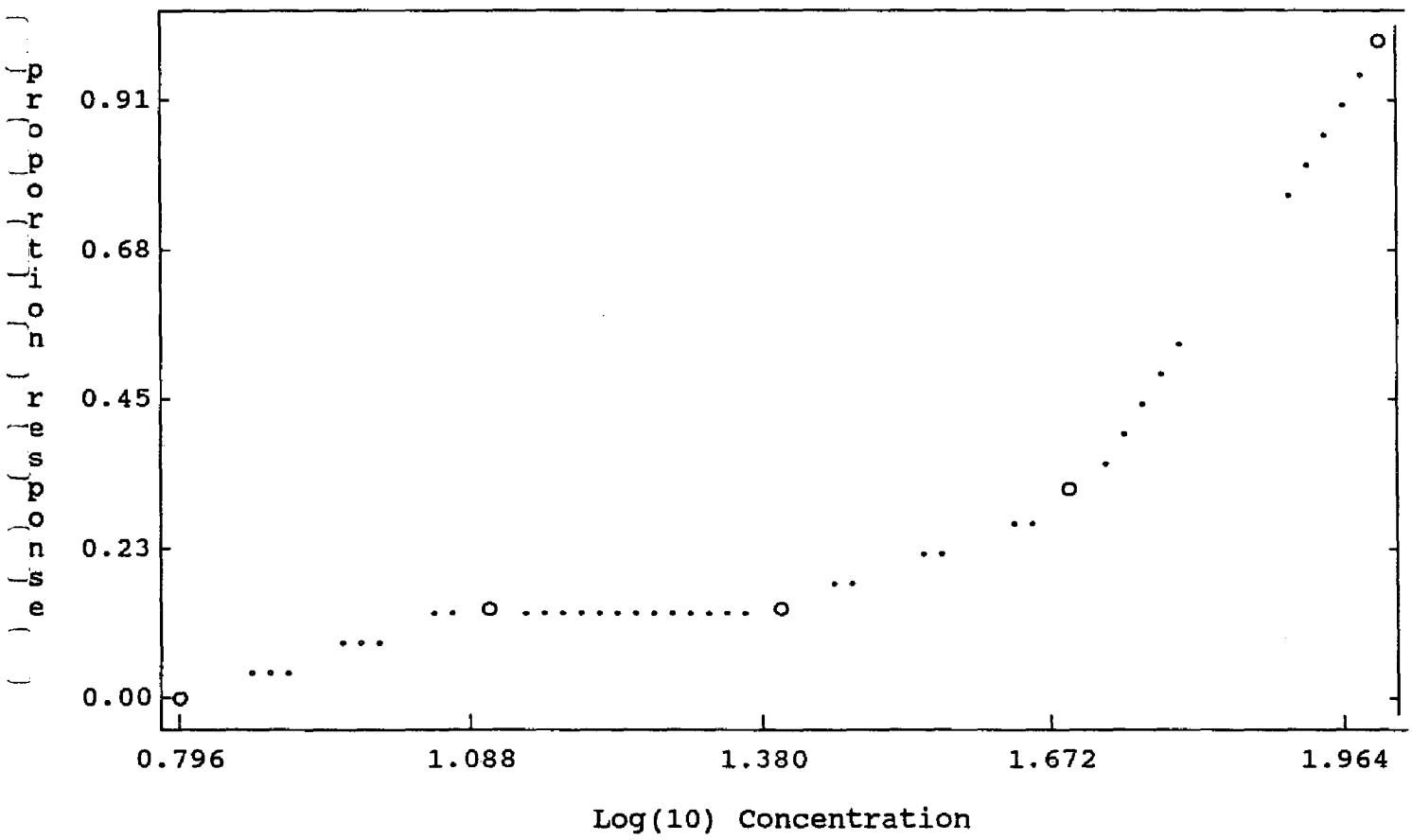
Species: Ceriodaphnia dubia
Test Material: Effluent – Industry (%)
Endpoint: Prop

Test Number: 930
Test Date: 8/13/96

Concentration	Mean	Pooled Mean	Proportion Response
0.0000	0.0000	0.0000	
6.2500	0.0000	0.0000	0.0000
12.5000	0.2000	0.1500	0.1500
25.0000	0.1000	0.1500	0.1500
50.0000	0.3000	0.3000	0.3000
100.0000	1.0000	1.0000	1.0000

Note: Quantal data were input.
Note: Proportion response computed by applying Abbott's formula to the pooled means.

P Value	Estimated Concentration
50	60.9507



Ceriodaphnia	Proportion Alive	Day 7

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/13/96	EFF2 (%)	N. CREEK	EPAF94	930

Fisher Exact	Auto growth select	1 control

Transformation		Prop. Conc	Alive	P
No transformation				
	X	0.00D	1.00	
	X	6.25D	1.00	1.000
	X	12.50D	.80	.237
	X	25.00D	.90	.500
	X	50.00D	.70	.105
		100.00D	0.00	.000

NOEC	LOEC	TU	Alpha	Tail	Based on
50	100	2	.05	One-sided	Fisher Exact

8/21/96 TOXIS ANALYSIS SUMMARY

Ceriodaphnia			Reproduction			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	8/13/96	EFF2 (%)	N. CREEK	EPAF94	930

EPA Flowchart	Auto growth select	1 control

	Conc	Mean	SD	N	T
Data transformation:		No transformation			
X	0.00D	17.30	6.601	10	
X	6.25D	11.20	5.138	10	2.257
X	12.50D	10.10	7.490	10	2.664
X	25.00D	10.00	3.801	10	2.701
X	50.00D	8.40	6.484	10	3.294
	100.00D	0.00	0.000	10	

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
<6.25	6.25	>16	.05	One-sided	Dunnett	2.225

Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	36.511	34.7545	2.225

Shapiro-Wilk Test for Normality:	Alpha	W	Cutoff W	Normal?
	.01	.970797	.93	Yes

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	4.3451	.36130	Yes

Appendix B

APPENDIX B

DUAL ENDPOINT *Pimephales promelas* BIOASSAY DATA

Parametrix, Inc.
5808 Lake Washington Blvd
Kirkland, WA 98033

Parametrix, Inc.
Environmental Toxicology Laboratory

Pimephales promelas
CHRONIC DAILY MONITORING

Client: NCA - Portland
Collection Dates: 8/7, 8/9, 8/12
Sample: P608111-1, P608168-1, P608211-1
Test Dates: 8/8/96 – 8/15/96

Temp (°C)	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	25	25	25	25	25	25	25	25

pH

Conc.	Rep.	Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control		8.0	7.9	7.9	7.7	7.5	7.6	7.4	7.8	7.7	7.8	7.6	7.9	7.6	7.5
6.25%		7.9	7.8	7.8	7.7	7.4	7.5	7.4	7.8	7.7	7.7	7.5	7.8	7.6	7.4
12.5%		7.9	7.7	7.7	7.7	7.4	7.5	7.4	7.8	7.7	7.8	7.5	7.8	7.6	7.4
25 %		7.8	7.6	7.8	7.6	7.4	7.4	7.3	7.7	7.6	7.7	7.5	7.7	7.5	7.3
50 %		7.6	7.4	7.5	7.5	7.2	7.3	7.3	7.6	7.6	7.6	7.3	7.6	7.4	7.3
100%		7.0	7.2	7.2	7.1	6.8	6.9	6.8	7.2	7.1	7.2	6.9	7.2	7.0	6.9

Dissolved Oxygen (mg/L)

		Initial	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Final
Control		7.2	7.6	~~7.8~~	7.2	6.2	7.1	6.7	7.1	7.2	7.0	6.0	7.2	6.3	6.4
6.25%		7.2	7.6	~~8.6~~	7.2	5.6	7.2	6.7	7.2	7.1	6.8	6.2	7.1	5.9	6.0
12.5%		7.2	7.6	~~8.6~~	7.2	5.9	6.9	6.6	7.2	7.2	6.9	5.9	7.2	6.1	6.2
25 %		7.2	7.6	~~8.7~~	7.2	6.1	7.0	6.6	6.9	7.2	6.9	6.0	7.2	6.0	6.2
50%		7.0	7.4	6.6	7.3	5.8	7.0	6.5	6.9	7.2	6.8	5.4	7.0	5.9	6.2
100%		6.6	7.2	6.3	7.2	5.9	7.0	6.5	6.8	6.7	6.8	5.8	7.0	5.7	6.2

Specific Conductivity (µS)

		Initial													
Control		280													360
100%		1000													1100
Initials		DH	Be	DH	MW	PS	MD	MD	PS	PS	JK	JK	DH	DH	DH
Date		8/8	8/9	8/9	8/10	8/10	8/11	8/11	8/12	8/12	8/13	8/13	8/14	8/14	8/15

	Control	100% Effluent 1st Sample	2nd Sample	3rd Sample
Hardness	NT	262	316	320
Alkalinity	NT	14	14	16
Chlorine (total residual)	<0.01	<0.01	<0.01	<0.01
Ammonia (mg/L)	NT	1	1	<1

NT = Not Taken
Shading respresents areas for which data collection is not required.

* 6.8
6.6
6.6
6.7
DH 8/9

SCOEPA00028085

Parametrix, Inc.
Environmental Toxicology Laboratory

Parametrix, Inc.
5808 Lake Washington Blv
Kirkland, WA 98033

Pimephales promelas
Chronic Daily Survival

Client: NCA - Portland
Sample I.D./Source: 141 / Portland
Dilution Media: 90H

Client Number: 55 1945 07 (01)
Sample Collection Dates: 8/7, 8/9, 8/12
Test Dates: 8/8/96 - 8/15/96

Conc.	Rep.	No. of Survivors							
		0	24	48	72	96	120	144	168
Control	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
6.25%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	9-1	9	9	9	9
	D	10	10	10	10	10	10	10	10
12.5%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
25%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
50%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
100%	A	10	10	10	10	10	10	10	10
	B	10	10	10	10	10	10	10	10
	C	10	10	10	10	10	10	10	10
	D	10	10	10	10	10	10	10	10
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								
Initials		JK	JH	PS	MD	PS	JK	JH	DH
Date		8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15

Comments

SCOEPA00028086

Parametrix, Inc.
Environmental Toxicology Laboratory

7-DAY CHRONIC BIOMASS DATA

Client: NCA - Portland Client No.: 55 1945 07 (01) Species: Pimephales promelas

Conc./Rep.	Pan No.	Foil wt. (mg)	Foil & Org. wt. (mg)	Org. wt. (mg)	Conc./Rep.	Pan No.	Foil Wt. (mg)	Foil & Org. wt. (mg)	Org. wt. (mg)
Con a	25	7.85	14.87	7.02					
b	26	7.95	13.67	5.72					
c	27	8.64	15.47	6.83					
d	28	8.42	15.13	6.71					
6.25% a	29	8.92	16.93	8.01					
b	30	8.34	15.55	7.21					
c	31	8.30	15.23	6.93					
d	32	7.72	14.58	6.86					
12.5% a	33	9.29	16.91	7.62					
b	34	9.12	15.80	6.68					
c	35	8.42	16.08	7.66					
d	36	8.57	16.18	7.61					
25% a	37	9.18	17.23	8.05					
b	38	9.09	16.52	7.43					
c	39	9.24	16.36	7.12					
d	40	8.41	15.36	6.95					
50% a	41	9.20	17.36	8.16					
b	42	9.55	17.94	8.39					
c	43	8.53	16.73	8.20					
d	44	9.23	16.70	7.47					
100% a	45	9.48	17.80	8.32					
b	46	9.54	17.34	7.80					
c	47	9.32	17.64	8.32					
d	48	8.76	17.14	8.38					

Comments:

v. 3/7/96

SCOEPA00028087

Parametrix Toxicology Laboratory

FISH TEST DATA

Test Number: 929 (x) Chronic ( ) Acute hours
Test Date: 8-Aug-96
Source: N. CREEK Test Material: EFF2 (%)

Conc		Rep	Cont. No.	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Weight /Fish
0.00	D	1		10	10						10	1.00	.70200
0.00	D	2		10	10						10	1.00	.57200
0.00	D	3		10	10						10	1.00	.68300
0.00	D	4		10	10						10	1.00	.67100
6.25	D	1		10	10						10	1.00	.80100
6.25	D	2		10	10						10	1.00	.72100
6.25	D	3		10	10						9	.90	.69300
6.25	D	4		10	10						10	1.00	.68600
12.50	D	1		10	10						10	1.00	.76200
12.50	D	2		10	10						10	1.00	.66800
12.50	D	3		10	10						10	1.00	.76600
12.50	D	4		10	10						10	1.00	.76100
25.00	D	1		10	10						10	1.00	.80500
25.00	D	2		10	10						10	1.00	.74300
25.00	D	3		10	10						10	1.00	.71200
25.00	D	4		10	10						10	1.00	.69500
50.00	D	1		10	10						10	1.00	.81600
50.00	D	2		10	10						10	1.00	.83900
50.00	D	3		10	10						10	1.00	.82000
50.00	D	4		10	10						10	1.00	.74700
100.00	D	1		10	10						10	1.00	.83200
100.00	D	2		10	10						10	1.00	.78000
100.00	D	3		10	10						10	1.00	.83200
100.00	D	4		10	10						10	1.00	.83800

Parametrix Toxicology Laboratory

Test Date: 8/08/96
Sample Date: 8/07/96
Species: Pimephales promelas
Test Type: Chronic

Test Number: 929
Test Material: Effluent - Industry %
Source: N. CREEK
North Creek Analytical

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.41	0.000	
			X	6.250	D	4	1.41	0.000	
			X	12.500	D	4	1.41	0.000	
			X	25.000	D	4	1.41	0.000	
			X	50.000	D	4	1.41	0.000	
			X	100.000	D	4	1.41	0.000	
Proportion Alive	2	No transformation							
				0.000	D	4	1.00	0.000	
				6.250	D	4	1.00	0.000	
				12.500	D	4	1.00	0.000	
				25.000	D	4	1.00	0.000	
				50.000	D	4	1.00	0.000	
				100.000	D	4	1.00	0.000	
Proportion Alive	7	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.41	0.000	
			X	6.250	D	4	1.37	.081	
			X	12.500	D	4	1.41	0.000	
			X	25.000	D	4	1.41	0.000	
			X	50.000	D	4	1.41	0.000	
			X	100.000	D	4	1.41	0.000	
Proportion Alive	7	No transformation							
				0.000	D	4	1.00	0.000	
				6.250	D	4	.98	.050	
				12.500	D	4	1.00	0.000	
				25.000	D	4	1.00	0.000	
				50.000	D	4	1.00	0.000	
				100.000	D	4	1.00	0.000	
Weight		No transformation							
			X	0.000	D	4	.66	.058	
			X	6.250	D	4	.73	.053	
			X	12.500	D	4	.74	.048	
			X	25.000	D	4	.74	.048	
			X	50.000	D	4	.81	.040	
			X	100.000	D	4	.82	.027	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC		TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj.						
		Steel many-one rank test	>100.000	>100.000	<	1.00	0.000	
Proportion Alive	7	Arc sine sqrt w/ adj.						
		Steel many-one rank test	>100.000	>100.000	<	1.00	.001	
Weight		No transformation						
		Dunnett	>100.000	>100.000	<	1.00	.002	

SCOEPA00028089

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/08/96	EFF2 (%)	N. CREEK	EPAF94	929

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart	Auto growth select	1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	-1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart	Auto growth select	1 control
Transform:	No transformation		
Tail:	One-tailed, decreasing		
Constant:	-.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.01

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	69	Cannot compute Spearman-Karber EC/LC 50
IC	71	No linear interpolation estimate can be calculated - none of the group response means < 100-p % of the control response me
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Fish Larvae	Proportion Alive	Day 7

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/08/96	EFF2 (%)	N. CREEK	EPAF94	929

EPA Flowchart Auto growth select 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		Arc sine sqrt w/ adj.				
X	0.00D	1.41	0.000	4		
X	6.25D	1.37	.081	4	1.732	16.000
X	12.50D	1.41	0.000	4	0.000	18.000
X	25.00D	1.41	0.000	4	0.000	18.000
X	50.00D	1.41	0.000	4	0.000	18.000
X	100.00D	1.41	0.000	4	0.000	18.000
Data transformation:		No transformation				
	0.00D	1.00	0.000	4		
	6.25D	.98	.050	4	1.732	16.000
	12.50D	1.00	0.000	4	0.000	18.000
	25.00D	1.00	0.000	4	0.000	18.000
	50.00D	1.00	0.000	4	0.000	18.000
	100.00D	1.00	0.000	4	0.000	18.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
>100	>100	<1	.05	One-sided	Steel	10

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.00110	4.57146	2.41

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.465078	.884	No

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	9999	0	No

TOXIS ANALYSIS SUMMARY

Fish Larvae			Weight			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/08/96	EFF2 (%)	N. CREEK	EPAF94	929

EPA Flowchart Auto growth select 1 control

	Conc	Mean	SD	N	T
Data transformation:		No transformation			
X	0.00D	.66	.058	4	
X	6.25D	.73	.053	4	−2.064
X	12.50D	.74	.048	4	−2.487
X	25.00D	.74	.048	4	−2.472
X	50.00D	.81	.040	4	−4.491
X	100.00D	.82	.027	4	−4.945

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
>100	>100	<1	.01	One-sided	Dunnett	3.21

Dunnett Test:

MSE	MSD % Reduction from Control	Critical T
.00218	16.1543	3.21

Shapiro-Wilk Test for Normality:

Alpha	W	Cutoff W	Normal?
.01	.954889	.884	Yes

Bartlett Test for Equal Variance:

Alpha	B	P(B)	Equal Var?
.01	1.6159	.89930	Yes

Fish Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/08/96	EFF2 (%)	N. CREEK	EPAF94	929

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart	Auto growth select	1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	EPA Flowchart	Auto growth select	1 control
Transform:	No transformation		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	0.00	Alpha Normality:	.01
		NOEC:	.01

Calculate IC? Y (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
IC	71	No linear interpolation estimate can be calculated – none of the group response means < 100–p % of the control response me
PROP	0	Analysis completed with no errors
GROW	0	Analysis completed with no errors

Fish Larvae	Day2	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/08/96	EFF2 (%)	N. CREEK	EPAF94	929

EPA Flowchart Auto growth select 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		Arc sine sqrt w/ adj.				
X	0.00D	1.41	0.000	4		
X	6.25D	1.41	0.000	4	0.000	18.000
X	12.50D	1.41	0.000	4	0.000	18.000
X	25.00D	1.41	0.000	4	0.000	18.000
X	50.00D	1.41	0.000	4	0.000	18.000
X	100.00D	1.41	0.000	4	0.000	18.000
Data transformation:		No transformation				
	0.00D	1.00	0.000	4		
	6.25D	1.00	0.000	4	0.000	18.000
	12.50D	1.00	0.000	4	0.000	18.000
	25.00D	1.00	0.000	4	0.000	18.000
	50.00D	1.00	0.000	4	0.000	18.000
	100.00D	1.00	0.000	4	0.000	18.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
>100	>100	<1	.05	One-sided	Steel	10

Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	0	0	2.41

Shapiro-Wilk Test for Normality:	Alpha	W	Cutoff W	Normal?
	.01	0	.884	No

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	9999	0	No

Fish Larvae			Weight			
Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/08/96	EFF2 (%)	N. CREEK	EPAF94	929

EPA Flowchart Auto growth select 1 control

	Conc	Mean	SD	N	T
Data transformation:		No transformation			
X	0.00D	.66	.058	4	
X	6.25D	.73	.053	4	−2.064
X	12.50D	.74	.048	4	−2.487
X	25.00D	.74	.048	4	−2.472
X	50.00D	.81	.040	4	−4.491
X	100.00D	.82	.027	4	−4.945

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical T
>100	>100	<1	.01	One-sided	Dunnett	3.21

Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	.00218	16.1543	3.21

Shapiro-Wilk Test for Normality:	Alpha	W	Cutoff W	Normal?
	.01	.954889	.884	Yes

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	1.6159	.89930	Yes

Appendix C

SCOEPA00028096

APPENDIX C

REFERENCE TOXICANT DATA

STATIC ACUTE CERIODAPHNIA TOXICITY TEST

Sample: CuSO4 | Date Collected: N/A
Source: In-house | Test Dates: 7/31/96 - 8/2/96
Source of Organisms: In-house | Age of Organisms: <24 hours

Temp (°C) Day 0: 25 Day 1: 25 Day 2: 25

Conc.	Rep.	Number of Organisms			pH			Dissolved Oxygen (mg/L)			Specific Conductivity (µS)		
		0	24	48	0	24	48	0	24	48	0	24	48
Control	A	5	5	5	7.8	7.7	7.8	7.6	7.6	7.4	180	200	200
	B	5	5	5									
	C	5	5	5									
	D	5	5	5									
2.5 ppb	A	5	5	5	7.8	7.8	7.8	7.6	7.6	7.4	190	200	210
	B	5	5	5									
	C	5	5	5									
	D	5	5	5									
5.0 ppb	A	5	5	5	7.9	7.8	7.8	7.8	7.8	7.4	190	210	210
	B	5	5	5									
	C	5	5	5									
	D	5	5	5									
10.0 ppb	A	5	2-3	0-2	7.9	7.8	7.8	7.8	7.8	7.4	190	210	210
	B	5	3-2	2-1									
	C	5	2-3	1-1									
	D	5	1-4	0-1									
20.0 ppb	A	5	0-5	-	7.9	7.8	-	7.7	7.8	-	190	210	-
	B	5	0-5	-									
	C	5	0-5	-									
	D	5	0-5	-									
40.0 ppb	A	5	0-5	-	7.9	7.8	-	7.7	7.8	-	200	220	-
	B	5	0-5	-									
	C	5	0-5	-									
	D	5	0-5	-									
	A												
	B												
	C												
	D												
		AC	AC	AC	1µW	AC	AC	1µW	AC	AC	1µW	AC	AC
		7/31	8/1	8/2	7/31	8/1	8/2	7/31	8/1	8/2	7/31	8/1	8/2

Shading represents areas for which data collection is not required.
NT = Not Taken

Chemistry (To)	Control	100 % Effluent
Hardness (mg/L CaCO3)		
Alkalinity (mg/L CaCO3)		
Total ResidualChlorine (mg/L)		
Ammonia (mg/L)		

Comments

Parametrix Toxicology Laboratory

WATER FLEA TEST DATA

Test Number: REFTOX540 ( ) Chronic (x) Acute 48 hours
Test Date: 31-Jul-96
Source: REF Test Material: CUSO (ug/l)

Conc	Rep	Cont. No.	Sex	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Total Young	Max Young
0.00 D	1		F	5	5							1.00		
0.00 D	2		F	5	5							1.00		
0.00 D	3		F	5	5							1.00		
0.00 D	4		F	5	5							1.00		
2.50 D	1		F	5	5							1.00		
2.50 D	2		F	5	5							1.00		
2.50 D	3		F	5	5							1.00		
2.50 D	4		F	5	5							1.00		
5.00 D	1		F	5	5							1.00		
5.00 D	2		F	5	5							1.00		
5.00 D	3		F	5	5							1.00		
5.00 D	4		F	5	5							1.00		
10.00 D	1		F	5	0							0.00		
10.00 D	2		F	5	2							.40		
10.00 D	3		F	5	1							.20		
10.00 D	4		F	5	0							0.00		
20.00 D	1		F	5	0							0.00		
20.00 D	2		F	5	0							0.00		
20.00 D	3		F	5	0							0.00		
20.00 D	4		F	5	0							0.00		
40.00 D	1		F	5	0							0.00		
40.00 D	2		F	5	0							0.00		
40.00 D	3		F	5	0							0.00		
40.00 D	4		F	5	0							0.00		

SCOEPA00028099

Parametrix Toxicology Laboratory

Test Date: 7/31/96
Sample Date: 7/31/96
Species: Ceriodaphnia dubia
Test Type: Acute - 48 hours

Test Number: REFTOX540
Test Material: Copper sulfate ug/l
Source: REF
Reference Toxicant

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.							
			X	0.000	D	4	1.35	0.000	
			X	2.500	D	4	1.35	0.000	
			X	5.000	D	4	1.35	0.000	
			X	10.000	D	4	.40	.221	
				20.000	D	4	.23	0.000	
				40.000	D	4	.23	0.000	
Proportion Alive	2	No transformation							
				0.000	D	4	1.00	0.000	
				2.500	D	4	1.00	0.000	
				5.000	D	4	1.00	0.000	
				10.000	D	4	.15	.191	
				20.000	D	4	0.00	0.000	
				40.000	D	4	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj.					
		Steel many-one rank test	5.000	10.000		.008	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI		TU
Proportion Alive	2	Spearman-Karber					
			EC 50	7.846	7.02 -	8.76	

SCOEPA00028100

Water Flea

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/31/96	CUSO (ug/l)	REF	EPAA 91	REFTOX540

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control=
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GR Reproduction		
Analysis:	No Analysis		
Transform:			
Tail:			
Constant:	.01	Variance:	.01
Root:		Alpha Normality:	.01
		NOEC:	.05

Calculate IC? N (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
PROP	0	Analysis completed with no errors

Spearman-Karber Analysis for EC/LC 50

Parametrix Toxicology Laboratory

Species: Ceriodaphnia dubia
Test Material: Copper sulfate (ug/l
Endpoint: Prop

Test Number: REFTOX540
Test Date: 7/31/96

Conc	Number Exposed	Mortalities
0.00	20	0
2.50	20	0
5.00	20	0
10.00	20	17
20.00	20	20
40.00	20	20

Spearman-Karber EC/LC 50 estimate: 7.846
95% lower confidence: 7.024
95% upper confidence: 8.764

Untrimmed Spearman-Karber

Ceriodaphnia	Proportion Alive	Day 2

Lab	Species	Date	Test Material	Permit	Protocol	Test Number
WAPTL	CD	7/31/96	CUSO (ug/l)	REF	EPAA 91	REFTOX540

EPA Flowchart (Chronic and Acute) 1 control

	Conc	Mean	SD	N	T	Sum of Ranks
Data transformation:		Arc sine sqrt w/ adj.				
X	0.00D	1.35	0.000	4		
X	2.50D	1.35	0.000	4	0.000	18.000
X	5.00D	1.35	0.000	4	0.000	18.000
X	10.00D	.40	.221	4	14.846	10.000
	20.00D	.23	0.000	4	17.583	10.000
	40.00D	.23	0.000	4	17.583	10.000
Data transformation:		No transformation				
	0.00D	1.00	0.000	4		
	2.50D	1.00	0.000	4	0.000	18.000
	5.00D	1.00	0.000	4	0.000	18.000
	10.00D	.15	.191	4	14.846	10.000
	20.00D	0.00	0.000	4	17.583	10.000
	40.00D	0.00	0.000	4	17.583	10.000

NOEC	LOEC	TU	Alpha	Tail	Based on	Critical Sum of Ran
5	10		.05	One-sided	Steel	10

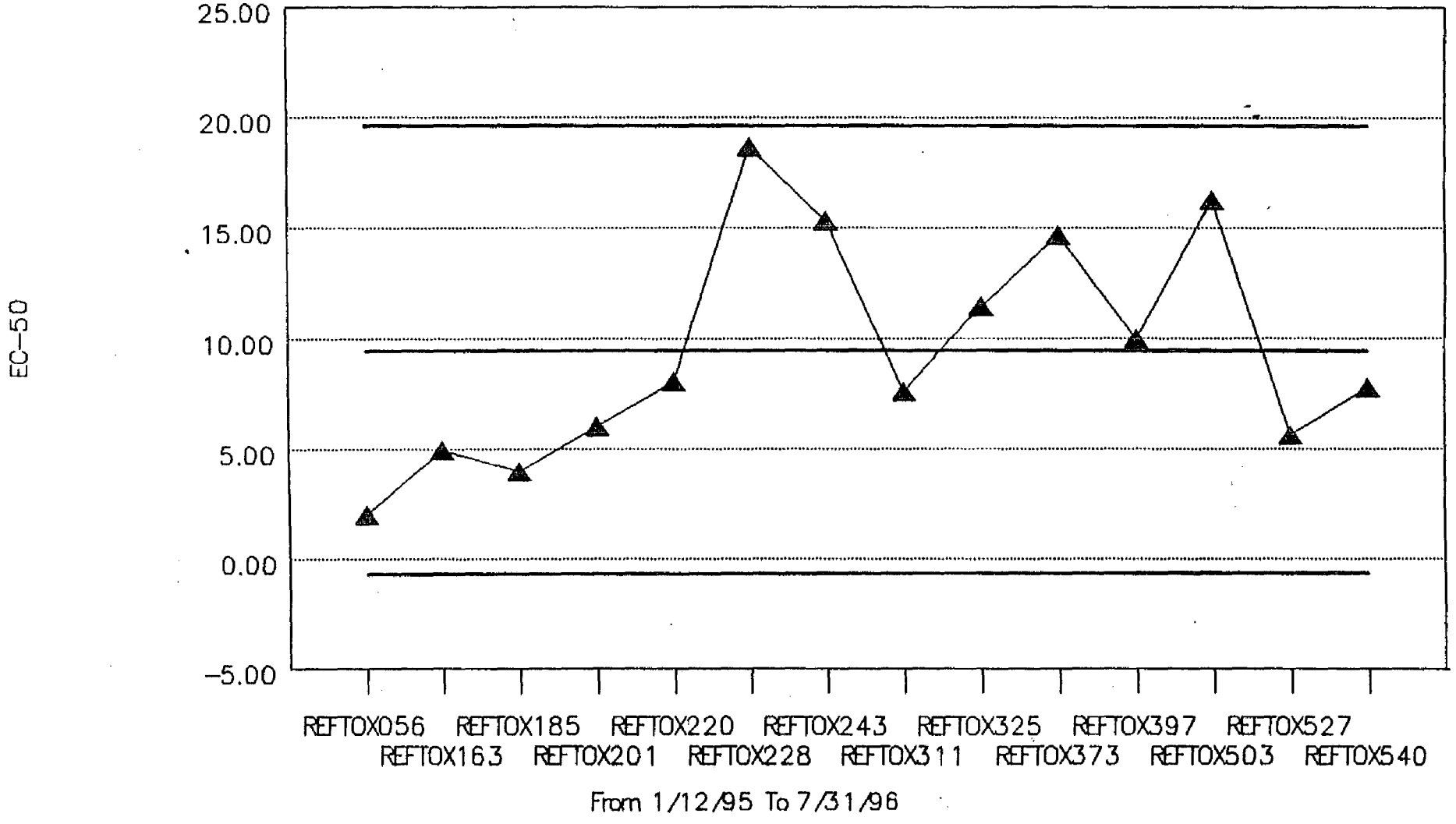
Dunnett Test:	MSE	MSD % Reduction from Control	Critical T
	.00811	13.6886	2.41

Shapiro-Wilk Test for Normality:	Alpha	W	Cutoff W	Normal?
	.01	.537325	.884	No

Bartlett Test for Equal Variance:	Alpha	B	P(B)	Equal Var?
	.01	9999	0	No

CONTROL CHART

Ceriodaphnia dubia/Copper sulfate



STATIC ACUTE FATHEAD MINNOW DEFINITIVE TEST

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE
Kirkland, Washington 98033

Sample: KCl
Source: N/A
Source of Organisms: ABS
Date Collected: N/A
Test Dates: 8/8 - 8/10/96
Age of Organisms: < 24 hrs

Temp (C) Day 0: 25 Day 1: 25 Day 2: 25 Day 3: _____ Day 4: _____

Conc.	Rep.	No. of Organisms 0	24	48	72	96	pH 0	24	48	72	96	Dissolved Oxygen (mg/L) 0	24	48	72	96	Specific Conductivity 0	96
CON	A	5	5	5			8.0	8.0	8.1			7.0	7.2	7.0			290	335
	B	5	5	5														
	C																	
	D																	
.125g/L	A	5	5	5			8.0	8.0	8.1			7.0	7.2	7.0			500	560
	B	5	5	5														
	C																	
	D																	
.25g/L	A	5	5	5			8.0	8.0	7.8			7.0	7.2	6.1			700	~~580~~ 800
	B	5	5	4-1														
	C																	
	D																	
.5g/L	A	5	5	5			8.0	8.0	8.1			7.0	7.2	6.9			1100	~~MP0~~ 300
	B	5	5	4-1														
	C																	
	D																	
1g/L	A	5	0-5	0			8.0	8.1	-			7.2	7.0	-			1950	2200*
	B	5	0-5	0														
	C																	
	D																	
2g/L	A	5	0-5	0			8.0	8.1	-			7.4	7.0	-			3500	3900*
	B	5	0-5	0														
	C																	
	D																	
	A																	
	B																	
	C																	
	D																	
Initials		JK	JK	MD			JK	JK	MD			JK	JK	MD			JK	MD
Date		8/8	8/9	8/10			8/8	8/9	8/10			8/8	8/9	8/10			8/8	8/10

Chemistry (To) _____ 100 % Effluent _____ Comments: ± 24 hrs
Hardness (mg/L as CaCO3) _____
Alkalinity (mg/L as CaCO3) _____
Chlorine (mg/L) _____
Ammonia (mg/L) _____

Parametrix Toxicology Laboratory

FISH TEST DATA

Test Number: REFTOX552 ( ) Chronic (x) Acute 48 hours
Test Date: 8-Aug-96
Source: REF Test Material: KCL (g/l)

Conc		Rep	Cont. No.	Start	Daily Survival 1	2	3	4	5	6	End	Prop Alive	Weight /Fish
0.00	D	1		5		5						1.00	
0.00	D	2		5		5						1.00	
.13	D	1		5		5						1.00	
.13	D	2		5		5						1.00	
.25	D	1		5		5						1.00	
.25	D	2		5		4						.80	
.50	D	1		5		5						1.00	
.50	D	2		5		4						.80	
1.00	D	1		5		0						0.00	
1.00	D	2		5		0						0.00	
2.00	D	1		5		0						0.00	
2.00	D	2		5		0						0.00	

Parametrix Toxicology Laboratory

Test Date: 8/08/96
Sample Date: 8/07/96
Species: Pimephales promelas
Test Type: Acute - 48 hours

Test Number: REFTOX552
Test Material: Potassium chloride g/l
Source: REF
Reference Toxicant

SUMMARY

End Point	Day	Transformation		Conc		#Reps	Mean	StDev	% Surv
Proportion Alive	2	Arc sine sqrt w/ adj.							
			X	0.000	D	2	1.35	0.000	
			X	.125	D	2	1.35	0.000	
			X	.250	D	2	1.23	.168	
			X	.500	D	2	1.23	.168	
				1.000	D	2	.23	0.000	
				2.000	D	2	.23	0.000	
Proportion Alive	2	No transformation							
				0.000	D	2	1.00	0.000	
				.125	D	2	1.00	0.000	
				.250	D	2	.90	.141	
				.500	D	2	.90	.141	
				1.000	D	2	0.00	0.000	
				2.000	D	2	0.00	0.000	

X = indicates concentrations used in calculations

- HYPOTHESIS TEST -

End Point	Day	Transformation/Analysis	NOEC	LOEC	TU	MSE	MSD
Proportion Alive	2	Arc sine sqrt w/ adj. Dunnett + t-test				.009	

- PROPORTION POINT ESTIMATE -

End Point	Day	Method	P	Conc	95% CI		TU
Proportion Alive	2	Probit					
			EC 50	.589	.44 -	.79	

'sh Larvae

Lab	Species	Test Date	Test Material	Permit	Protocol	Test Number
WAPTL	PP	8/08/96	KCL (g/l)	REF	EPAA 91	REFTOX552

Statistics Parameters

PROPORTION

End Point:	PA Proportion Alive		
Analysis:	EPA Flowchart (Chronic and Acute)		1 control
Transform:	Arc sine square root w/ Bartlett adj.		
Tail:	One–tailed, decreasing		
Constant:	–.01	Variance:	.01
Root:	–1.00	Alpha Normality:	.01
		NOEC:	.05

EC/LC Method: F (P,S,G,L,N) Superdunnet: 4000

GROWTH

End Point:	GW Weight		
Analysis:	No Analysis		
Transform:			
Tail:			
Constant:	.01	Variance:	.01
Root:		Alpha Normality:	.01
		NOEC:	.05

Calculate IC? N (Y,N) IC resamples: 120

Errors/Warnings

Type	Number	
EC/LC	0	Analysis completed with no errors
PROP	44	Not enough replication for Steel test

Probit Analysis For EC/LC

Parametrix Toxicology Laboratory

Species: Pimephales promelas
Test Material: Potassium chloride (g/l)
Endpoint: Prop

Test Number: REFTOX552
Test Date: 8/08/96

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls	Predicted Proportion Responding
0.1250	10	0	0.0000	0.0000	0.0001
0.2500	10	1	0.1000	0.1000	0.0186
0.5000	10	1	0.1000	0.1000	0.3456
1.0000	10	10	1.0000	1.0000	0.9013
2.0000	10	10	1.0000	1.0000	0.9985

Chi-square for heterogeneity (calculated) = 7.409
Probability(Chi-square > 7.409) = 0.05995

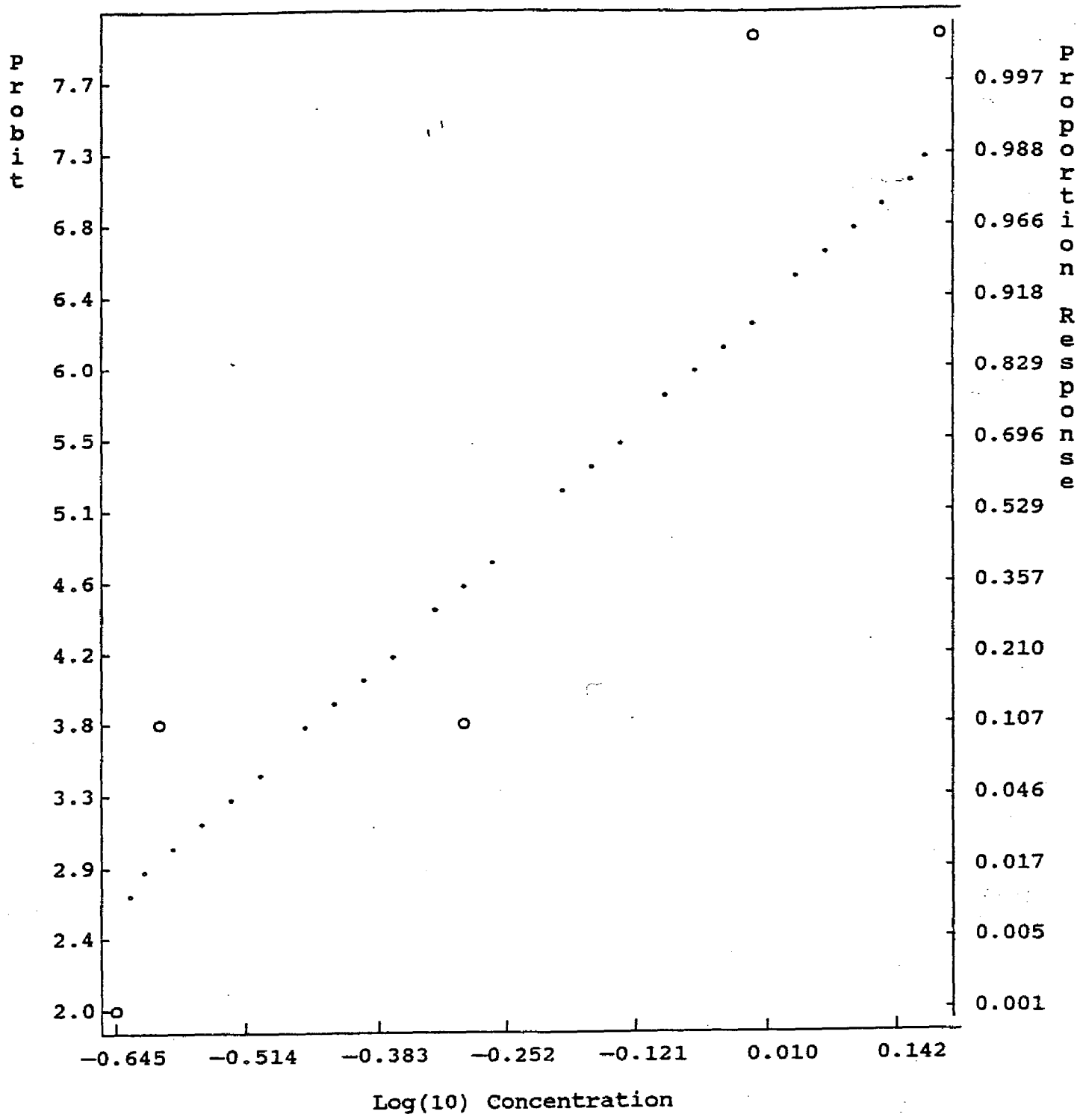
Parameter	Estimate	Std. Err.	95% Confidence Limits Lower	Upper
Intercept	6.289101	0.468646	5.370554	7.207648
Slope	5.602219	1.548665	2.566837	8.637602

Theoretical spontaneous response rate = 0.0000

Estimated LC/EC values

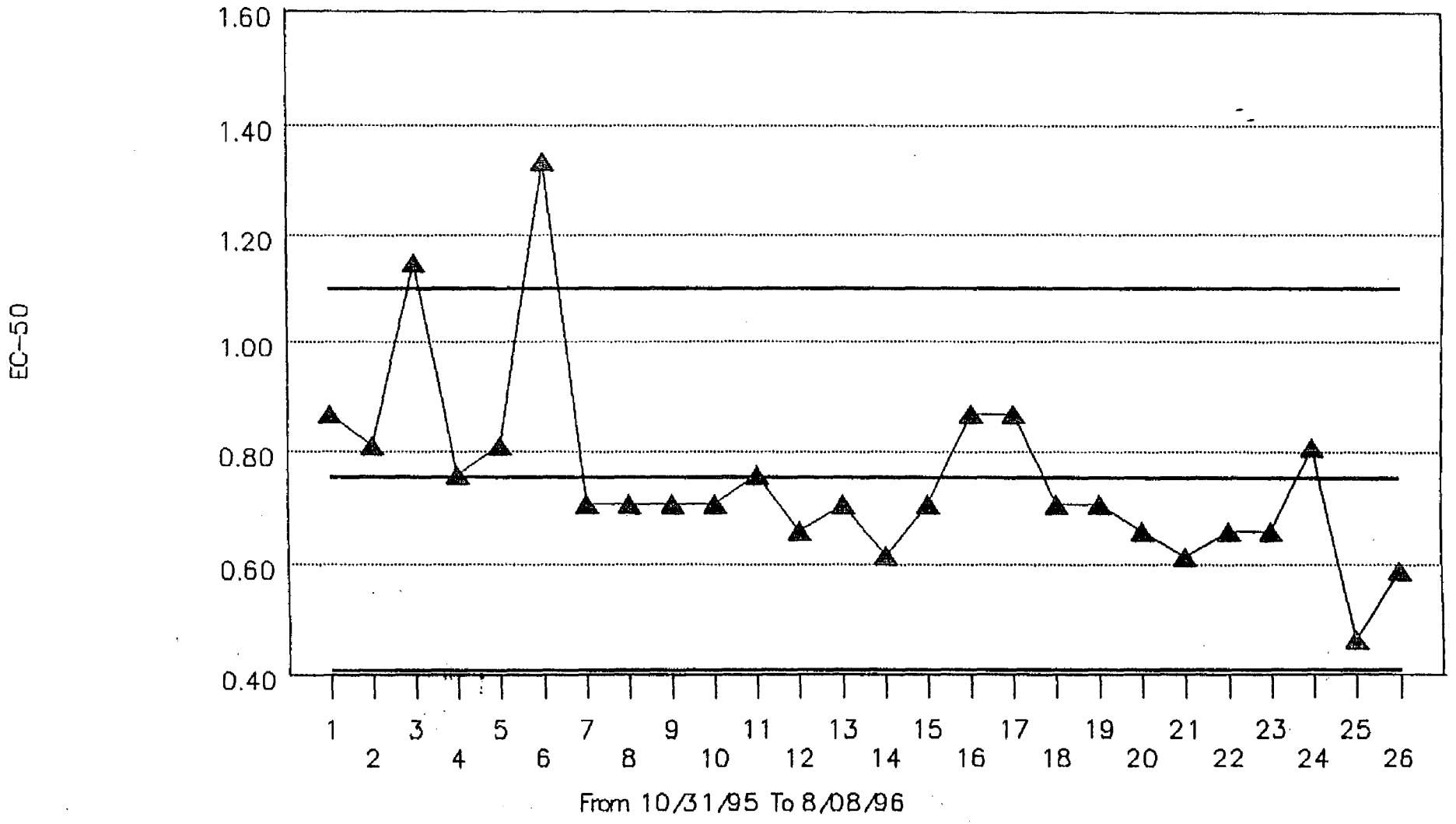
Point	Exposure Conc.	95% Confidence Limits Lower	Upper
50.00	0.589	0.439	0.789

Plot of adjusted probits and predicted regression line



CONTROL CHART

Chronic P. promelas/Potassium chloride



SCOEPA00028112

Appendix D

APPENDIX D

CHAIN OF CUSTODY FORMS AND INITIAL WATER QUALITY PARAMETERS

NORTH CREEK ANALYTICAL

SAMPLES ORIGINATING FROM:

18939 [illegible]th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX [illegible]2992
East [illegible].15 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX [illegible]9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

SUBCONTRACTING CHAIN OF CUSTODY REPORT

SUBCONTRACTOR: Parametrix

ADDRESS:

PHONE: FAX:

NCA PROJECT NUMBER: P608111

REPORT RESULTS ATTN. TO: Joy Chang

INVOICE IN DUPLICATE WITH CHAIN TO:
NCA BOTHELL, ATTN: ACCOUNTS PAYABLE

P.O. NUMBER:

DATE RESULTS DUE NORTH CREEK:

NEXT BUSINESS DAY RUSH	
2 BUSINESS DAY RUSH	
3 BUSINESS DAY RUSH	
5 BUSINESS DAY RUSH	
10 BUSINESS DAY STANDARD	

Analysis Request: BIOASSAY (1)

NORTH CREEK SAMPLE NUMBER	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONT.	COMMENTS & PRESERVATIVES USED	SUBCONTRACTOR SAMPLE NUMBER
1. P608111 - 1	8-7-96 0830	W	1		
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

RELINQUISHED BY: Kevin L. Shirley DATE: 8-7-96
FIRM: NORTH CREEK ANALYTICAL Inc. TIME: 1400

RECEIVED BY: Justin Kaplan DATE: 8/8/96
FIRM: PMX TIME: 1000

RELINQUISHED BY: DATE:
FIRM: TIME:

RECEIVED BY: DATE:
FIRM: TIME:

ADDITIONAL REMARKS: (1) Dual End-Point-Acute and chronic

NORTH CREEK ANALYTICAL

SAMPLES ORIGINATING FROM:

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 481-0992
East 1... Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202 X

SUBCONTRACTING CHAIN OF CUSTODY REPORT

SUBCONTRACTOR: Parametrix

ADDRESS:

PHONE: FAX:

NCA PROJECT NUMBER: P608168

REPORT RESULTS ATTN. TO: Joy Chang

INVOICE IN DUPLICATE WITH CHAIN TO:
NCA BOTHELL, ATTN: ACCOUNTS PAYABLE

P.O. NUMBER:

DATE RESULTS DUE NORTH CREEK:

NEXT BUSINESS DAY RUSH	
2 BUSINESS DAY RUSH	
3 BUSINESS DAY RUSH	
5 BUSINESS DAY RUSH	
10 BUSINESS DAY STANDARD	

NORTH CREEK SAMPLE NUMBER	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONT.	Analysis Request: Biossay	COMMENTS & PRESERVATIVES USED	SUBCONTRACTOR SAMPLE NUMBER
1. P608168-1	8-9-96 @ 0810	W	1	X		
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

RELINQUISHED BY: Sara McClurg DATE: 8-9-96
FIRM: NORTH CREEK ANALYTICAL Inc. TIME: 1325

RECEIVED BY: Melisa Dashnell DATE: 8/10/96
FIRM: Parametrix, Inc. TIME: 1100

RELINQUISHED BY: DATE:
FIRM: TIME:

RECEIVED BY: DATE:
FIRM: TIME:

ADDITIONAL REMARKS:

SCOEPA00028115

NORTH CREEK ANALYTICAL

SAMPLES ORIGINATING FROM:
18939 h Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 2992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

SUBCONTRACTING CHAIN OF CUSTODY REPORT

SUBCONTRACTOR: Parametrix

ADDRESS:

PHONE: FAX:

NCA PROJECT NUMBER: P608211

REPORT RESULTS ATTN. TO: Joy Chang

INVOICE IN DUPLICATE WITH CHAIN TO:
NCA BOTHELL, ATTN: ACCOUNTS PAYABLE

P.O. NUMBER:

DATE RESULTS DUE NORTH CREEK:

NEXT BUSINESS DAY RUSH	
2 BUSINESS DAY RUSH	
3 BUSINESS DAY RUSH	
5 BUSINESS DAY RUSH	
10 BUSINESS DAY STANDARD	

NORTH CREEK SAMPLE NUMBER	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONT.	Analysis Request: Biossay	COMMENTS & PRESERVATIVES USED	SUBCONTRACTOR SAMPLE NUMBER
1. P608211-1	8-12-96 0800	W	1	X		
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

RELINQUISHED BY: Karin L. Sterling DATE: 8-12-96
FIRM: NORTH CREEK ANALYTICAL Inc. TIME: 1205

RECEIVED BY: Justin Kyles DATE: 8/13/96
FIRM: PMX TIME: 1030

RELINQUISHED BY: DATE:
FIRM: TIME:

RECEIVED BY: DATE:
FIRM: TIME:

ADDITIONAL REMARKS:

NORTH CREEK ANALYTICAL Parametrix

SAMPLES ORIGINATING FROM:
18939 Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

SUBCONTRACTING CHAIN OF CUSTODY REPORT

SUBCONTRACTOR: NCA - P
ADDRESS:
PHONE: FAX:

REPORT RESULTS ATTN. TO: Jay Chang
INVOICE IN DUPLICATE WITH CHAIN TO:
NCA BOTHELL, ATTN: ACCOUNTS PAYABLE
P.O. NUMBER:

DATE RESULTS DUE NORTH CREEK:
- NEXT BUSINESS DAY RUSH
- 2 BUSINESS DAY RUSH
- 3 BUSINESS DAY RUSH
- 5 BUSINESS DAY RUSH
- 10 BUSINESS DAY STANDARD

NCA PROJECT NUMBER: P608273

NORTH CREEK SAMPLE NUMBER	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONT.	Analysis Request: BIOASAY (1)	COMMENTS & PRESERVATIVES USED	SUBCONTRACTOR SAMPLE NUMBER
1. P608273 - 1	8.14.96	W	1	X		
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

RELINQUISHED BY: DATE:
FIRM: NORTH CREEK ANALYTICAL Inc. TIME:

RECEIVED BY: [signature] DATE: 8/15/96
FIRM: PMK TIME: 1030

RELINQUISHED BY: DATE:
FIRM: TIME:

RECEIVED BY: DATE:
FIRM: TIME:

ADDITIONAL REMARKS: (1) Dual Endpoint - acute and chronic EPA/600/4-89/001

PAGE 1 OF 1

SCOEPA00028117

NORTH CREEK ANALYTICAL

SAMPLES ORIGINATING FROM:

18939 [illegible]h Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX [illegible]992
East [illegible]5 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202 X

SUBCONTRACTING CHAIN OF CUSTODY REPORT

SUBCONTRACTOR: Parametrix

ADDRESS:

PHONE: FAX:

NCA PROJECT NUMBER: P608317

REPORT RESULTS ATTN. TO: Joy Chang

INVOICE IN DUPLICATE WITH CHAIN TO: NCA BOTHELL, ATTN: ACCOUNTS PAYABLE

P.O. NUMBER:

DATE RESULTS DUE NORTH CREEK:

NEXT BUSINESS DAY RUSH	
2 BUSINESS DAY RUSH	
3 BUSINESS DAY RUSH	
5 BUSINESS DAY RUSH	
10 BUSINESS DAY STANDARD	

NORTH CREEK SAMPLE NUMBER	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONT.	Analysis Request: Biossay	COMMENTS & PRESERVATIVES USED	SUBCONTRACTOR SAMPLE NUMBER
1. P608317-1	8-16-96	W	1	X		
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

RELINQUISHED BY: Sara McClurg	DATE: 8-16-96	RECEIVED BY:	DATE: 8/17/96
FIRM: NORTH CREEK ANALYTICAL Inc.	TIME: 1230	FIRM: PMX, INC	TIME: 1100
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
FIRM:	TIME:	FIRM:	TIME:

ADDITIONAL REMARKS:

SCOEPA00028118

Parametrix Environmental Toxicology Laboratory
5808 Lake Washington Boulevard NE, Suite 200
Kirkland, WA 98033

INITIAL WATER QUALITY PARAMETERS

(111)

SOURCE: Outfall **CLIENT:** NCH - Portland **CLIENT NO:**

	SAMPLE #1 P608111-1	SAMPLE #2 P608168-1	SAMPLE #3 P608211-1
Date Sample Collected:	8/7/96	8/9/96	8/12/96
Date Sample Received:	8/8/96	8/10/96	8/13/96
Temperature (°C):	20	17	15
Salinity (ppt):	0	0	0
Dissolved Oxygen (mg/L):	7.0	7.0	8.0
pH:	7.0	6.5	7.6
Conductivity (µS):	900	1025	900
Hardness (mg/L $CaCO_3$):	262	316	320
Alkalinity (mg/L $CaCO_3$):	14	14	16
Residual Chlorine (mg/L):	.18 adj to <0.01	Residual Chlorine (mg/L): 0.03 adj <0.01	Residual Chlorine (mg/L): .034 adjusted to <.01
Ammonia (mg/L):	1	Ammonia (mg/L): 1	Ammonia (mg/L): <1
Initials:	JK	Initials: MD	Initials: JK

NT= Not Taken

Rev. 2/20/96

Parametrix Environmental Toxicology Laboratory
5808 Lake Washington Boulevard NE, Suite 200
Kirkland, WA 98033

INITIAL WATER QUALITY PARAMETERS

SOURCE: Wacker Siltronic # 96.80 **CLIENT:** NCA - Portland **CLIENT NO:**

	SAMPLE #1 P608211-1	SAMPLE #2 P608273-1	SAMPLE #3 P608317-1
Date Sample Collected:	8/12/96	8/14/96	8/16/96
Date Sample Received:	8/13/96	8/15/96	8/17/96
Temperature (°C):	15	20	17
Salinity (ppt):	0	0	0
Dissolved Oxygen (mg/L):	8.0	6.6	7.4
pH:	7.6	6.7	6.9
Conductivity (µS):	900	800	1200
Hardness (mg/L $CaCO_3$):	320	280	480
Alkalinity (mg/L $CaCO_3$):	16	10	20
Residual Chlorine (mg/L):	.034 adjusted to < .01	< .01	< .01
Ammonia (mg/L):	< 1	< 1	< 1 PPM
Initials:	JK	DH	JK

NT = Not Taken

Rev. 2/20/96

MEMORANDUM

CH2M HILL

TO: Tom McCue/Wacker
Sandra Archer/Wacker

COPIES: Mike Stanaway/CH2M HILL/CVO

FROM: Gary Hickman/CH2M HILL/CVO

DATE: June 2, 1995

SUBJECT: Wacker Siltronic Corporation
Wastewater Toxicity Study
Project Approach and Progress Report

PROJECT: OPE40202.A0

Background

This memo summarizes the study approach, work completed, and test results, for the wastewater toxicity study performed for the Wacker Siltronic Corporation facility in Portland, Oregon.

Unless otherwise stated, use of the terms "effluent" and "whole effluent" in this memo refers to Effluent 001, which is discharged to the Willamette River under Wacker's NPDES discharge permit[1]. This effluent consists primarily of three waste streams: concentrated acid drain (CAD), weak acid drain (WAD) and (RO/DI water concentrate, boiler, and cooling water) blow down (BD). Wastewater treatment includes fluoride precipitation of CAD and neutralization of combined CAD and WAD.

The NPDES discharge permit[1] defines, for Wacker's effluent discharge to the Willamette River, a zone of initial dilution (ZID) having a 5-foot radius from the point of discharge at Outfall 003, and mixing zone having a 50-foot radius from the point of discharge at Outfall 003. A mixing zone dilution study conducted for the Wacker facility[2] identified worst-case (0 current velocity) dilutions at distances of 5 and 50 feet from the discharge point of 2:1 and 6:1 ($Q_{total}/Q_{effluent}$), respectively. These dilutions are equivalent to 50% effluent at the edge of the ZID and 17% effluent at the edge of the mixing zone. According to the discharge permit, the effluent is considered to be acutely toxic if an acute test No-Observable-Effects-Concentration (NOEC) is less than 50% effluent, and the effluent is considered to be chronically toxic if a chronic test NOEC is less than 17% effluent. Conversely, the effluent is considered to be in compliance for toxicity if the acute test NOEC≥50% effluent and the chronic test NOEC≥17% effluent.

[1] Oregon Department of Environmental Quality. National Pollutant Discharge Elimination System, Waste Discharge Permit Number 101128, Issued to Wacker Siltronic Corporation, July 14, 1993.
[2] Raymond, Richard/CH2M HILL. Mixing Zone Effluent Dilution Evaluation, prepared for Wacker Siltronic Corporation, February 4, 1994.

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Approach

The stepwise approach initially proposed for this study was as follows:

1. **Site visit, kickoff meeting, and initial data gathering**. Visit the site to review processes and wastewater sources, and meet with Wacker staff to discuss toxicity issues and initiate data gathering.

Purpose: To gain familiarity with the facility and staff, develop mutual understanding of problem and the project objectives, and kickoff the project.

2. **Existing data review**. Compile and review existing data on effluent toxicity and physical chemical characteristics, as well as known and potential constituents of the waste streams comprising the final effluent.

Purpose: To obtain, to the extent possible, a preliminary indication of wastewater characteristics and potential toxic constituents, and to evaluate the toxicity history of the facility's effluent.

3. **Current effluent toxicity evaluation and toxicity data base expansion.** Conduct fathead minnow and *Ceriodaphnia* dual endpoint acute/chronic tests on whole effluent samples.

Purpose: To enlarge the very limited existing toxicity data base (only one test per year is required by the discharge permit) to obtain a better picture of the variation and magnitude of wastewater toxicity. Also, to allow a more confident identification of the more sensitive test species (if one is in fact significantly more sensitive) and the appropriate bioassay endpoint (acute versus chronic) for use in Toxicity Identification Evaluation (TIE) testing.

4. **Toxicity source investigation**. At the same time as Step 3, collect samples of the CAD (after treatment but before combining with WAD), WAD, and BD streams for toxicity testing. To reduce cost, this testing could involve only *Ceriodaphnia* acute screening tests. There is some risk that existing toxicity will not show up without doing chronic tests or without testing fatheads, but the *Ceriodaphnia* acute screen seems to be the single best, low-cost choice based on the available data.

Purpose: To help focus in on the source(s) of toxicity, and narrow the list of possible toxicity-causing constituents, if appropriate.

5. **Chemical characterization**. Characterize the whole effluent samples used in bioassay testing under Step 3 for the following parameters (based on preliminary review of waste stream constituents): pH, oxidation-reduction potential (ORP), alkalinity, hardness, conductivity, chlorine residual, ammonia-nitrogen (NH_3-N), total Kjeldahl nitrogen (TKN), anionic surfactants as MBAS, total suspended solids (TSS), total dissolved solids (TDS), Total and hexavalent chromium, hydrogen peroxide (measured at time of bioassay testing), sulfide, sulfite, fluoride, COD.

Purpose: To provide a more thorough chemical characterization of Wacker's effluent and to potentially identify possible causes of any toxicity measured.

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6. Housekeeping and chemical use information gathering.
(A) Continue to maintain thorough records of any production changes, atypical batch operations, process upsets, known spills, etc. during the period of sample collection for bioassay and chemical testing.
(B) Continue efforts to estimate usage rates of vendor-supplied products (such as polymers, surfactants, biocides, and defoamers), and request product toxicity data from the suppliers.

Purpose: (A) To identify any occurrences at the facility that might influence the measured toxicity. (B) To try to assess the potential toxicity related to use of products which are difficult to measure directly.

7. Phase I TIE testing. Conduct Phase I Toxicity Identification Evaluation (TIE) testing, involving a array of sample manipulations followed by toxicity testing, either after the above steps are completed or concurrently with that testing. The conditions employed in this testing will be selected based on the results of steps 3 through 6. TIE testing is contingent on obtaining bioassay results indicating that the effluent is toxic at the edge of the ZID or mixing zone.

Purpose: To identify the class(es) of toxic constituents in whole effluent, and provide direction for Phase II and III TIE testing, if necessary.

8. Phase II and III TIE testing (if needed). Conduct Phase II and III TIE testing, if necessary, to confirm the findings of Phase I and identify specific toxic constituents.

Purpose: To identify the cause(s) of effluent toxicity and provide a basis for evaluating mitigation methods.

9. Investigate methods for controlling toxicity (if needed). If effluent is found to be toxic, and after the toxic constituent(s) is(are) identified, investigate one or more methods for controlling toxicity, such as product substitution, process modification, wastewater treatment, source treatment or removal, or outfall/dilution improvement.

10 Control method selection and implementation and follow-up confirmation monitoring (if needed).

Work Performed To-Date

Project work performed to-date includes:

- Site visit, kickoff meeting, and initial data gathering (Step 1) -- 13 January 1995.
- Review of waste streams and constituents (Step 2) -- memo dated 6 February 1995.
- Review of existing effluent toxicity and chemical data (Step 2) -- memo dated 15 February 1995.
- Re-analysis of historical effluent toxicity data considering zone of initial dilution (ZID) and mixing zone dilutions -- results presented at project meeting on 13 April 1995.

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- Evaluation of current effluent toxicity and chemical characteristics (Steps 3 and 5) -- 6 and 21 March, 3 and 21 April, and 12 May 1995. Results of first three test dates presented at project meeting on 13 April 1995; results from all samples summarized in this memo.

- Toxicity source evaluation (Step 4) -- 6 March 1995.

- Test plan for Phase I TIE (Step 7) -- memo dated 17 March 1995.

- Housekeeping and chemical use information (Step 6) -- performed by Wacker staff and presented in memo dated 15 February and at project meeting on 13 April 1995.

- Phase I TIE trials (Step 7) -- 21 March, 3 and 21 April, and 12 May 1995. TIE testing not completed because of low effluent toxicity.

- Project status meeting -- 13 April 1995.

- Draft progress report memo -- 2 May 1995.

- Final progress report memo -- 2 June 1995.

Test Results

Toxicity Data

Table 1 summarizes Wacker's historical effluent toxicity data for 1993 and 1994, and 1995 effluent toxicity data generated under this study. Pertinent observations are summarized below:

- Wacker staff reported that their effluent was nontoxic prior to 1993.

- The historical toxicity data base was quite limited; it consisted of three fathead minnow bioassay tests and four *Ceriodaphnia* tests conducted during 1993 and 1994. The historical data did not provide a good indication of toxicity variability or frequency of pass/fail.

- **Effluent toxicity to fathead minnows**. The August 1993 sample failed to meet the fathead minnow acute toxicity guideline based on 100% effluent and the raw data were not available to determine whether the sample would have passed or failed at 50% effluent. All three subsequent fathead minnow acute tests conducted (September 1993, August 1994, and March 1995) passed the acute toxicity guideline at 50% effluent. All four fathead minnow chronic tests conducted in 1993-95 passed the chronic toxicity guideline at 17% effluent.

SCOEPA00028124

- **Effluent toxicity to *Ceriodaphnia*..**

  ***Ceriodaphnia* acute tests**

  - 1993: both tests passed the acute toxicity guideline of 50% effluent (actually passed at 100% effluent)
  - 1994: one test failed and one passed the acute toxicity guideline of 50% effluent
  - 1995: two test failed and five tests (including the last four) passed the acute toxicity guideline of 50% effluent

  ***Ceriodaphnia* chronic tests**

  - 1993: both tests passed the chronic toxicity guideline of 17% effluent
  - 1994: both tests failed the chronic toxicity guideline of 17% effluent
  - 1995: one test failed and the last two tests passed the chronic toxicity guideline of 17% effluent

- Except for August 1993 sample, effluent toxicity to *Ceriodaphnia* was equal to or greater than the toxicity to fathead minnows (i.e., *Ceriodaphnia* was generally the more sensitive species to Wacker effluent).

- *Ceriodaphnia* acute toxicity single-dilution screening tests performed on CAD, WAD, and BD samples from 6 March 1995 indicated that the CAD and WAD samples were acutely toxic at less than 33% effluent (the only dilution tested), but that the BD sample was not acutely toxic at 33%.

- Based on the 6 March 1995 toxicity testing results, Phase I TIE testing using *Ceriodaphnia* acute tests was planned for effluent samples collected on 20 March and 3 April, but the TIE testing was canceled because of low acute toxicity. Phase I TIE testing using *Ceriodaphnia* chronic tests was planned for effluent samples collected on 21 April and 12 May 1995, but again the TIE testing was canceled when the samples were found to have low toxicity (i.e., they were within compliance toxicity guidelines).

Chemical Data

Table 2 summarizes effluent characterization data for 1995. Comparison of the chemical data between the acutely- and chronically-toxic 6 March sample and the acutely-nontoxic 21 March sample yields mostly negative conclusions with respect to toxicity:

- Ammonia-nitrogen, chlorine residual, and fluoride concentrations were low in both samples, although NH3-N was slightly higher in the toxic sample.

- H2O2 concentrations were high in both samples but not higher in the toxic sample.

- MBAS (indicative of anionic surfactants) concentrations were low in both samples, although somewhat higher in the toxic sample.

- COD was somewhat higher in the toxic sample, possibly indicating the presence of more organic compounds.

SCOEPA00028125

- TDS and conductivity levels were not indicative of osmotic problems in either sample.

- Chromium concentrations were low in both samples.

- Wacker staff have reported that there is no specific reason to suspect the presence of elevated levels of other metals in their wastewater.

Summary and Recommendations

Wacker's effluent toxicity appears to be transient. Since measuring both acute and chronic *Ceriodaphnia* toxicity in the 6 March 1995 sample, a total of five acute tests and two chronic tests have passed the toxicity guidelines, and only one acute test has failed. The last two, and three out of the last four, samples collected for the purpose of conducting Phase I TIE testing turned out to be nontoxic by the regulatory definition, and so TIE testing was canceled (the fourth sample was actually toxic according to the regulatory definition but only marginally so). Consequently, to avoid unnecessary and unproductive effort and expense, we do not recommend further attempts at TIE testing at this time. Instead, we recommend that you share these study results with the DEQ to demonstrate that a considerable effort has been made to investigate the source of toxicity, but that several recent samples have been nontoxic according to the effluent toxicity guidelines.

SCOEPA00028126

Table 1
Effluent Toxicity Data

Date	Lab	Sample ID	Toxicity [% Effluent]										Comments
			Fathead minnow, *Pimephales promelas*					Water flea, *Ceriodaphnia dubia*					
			ACUTE		CHRONIC			ACUTE		CHRONIC			
			Survival NOEC	Pass/ Fail	Survival NOEC	Growth NOEC	Pass/ Fail	Survival NOEC	Pass/ Fail	Survival NOEC	Repro NOEC	Pass/ Fail	
18-Aug-93	NAS	93-?		F?	25	25	P	100	P	50	25	P	FH acute failed @ 100%; no data
													available for other dilutions.
27-Sep-93	NAS	93-?	100	P	50	25	P	100	P	50	50	P	
15-Aug-94	NAS	94-50	100	P	50	50	P	25	F	25	<6.25	F	
12-Oct-94	NAS	94-61						50	P	6.25	<6.25	F	Cerio acute NOEC=50% (Steel's test),
													NOEC=25% (Wilcoxon test)
12-Oct-94	CAS	94-62								6.25		F	This was a split sample (duplicate) test
6-Mar-95	CH2M	95-4	100	P	33	33	P	17	F	10	3	F	
20-Mar-95	CH2M	95-19						66	P				
3-Apr-95	CH2M	95-20						33	F				
21-Apr-95	CH2M	95-24						50	P	50	17	P	
24-Apr-95	CH2M	95-25						50	P				
12-May-95	CH2M	95-29						50	P	50	17	P	
15-May-95	CH2M	95-30						50	P				

Notes:

NAS = Northwestern Aquatic Sciences, Newport, OR; CAS = Columbia Aquatic Sciences, Carlsbad, CA; CH2M = CH2M HILL, Corvallis, OR

Pass/Fail criteria - Oregon DEQ toxicity guidelines with a 1:1 ZID dilution (acute limit=50% effluent) and a 5:1 mixing zone dilution (chronic limit=17% effluent).

SCOEPA00028127

Table 2

Effluent Characterization Data

Parameter	Units	Sample ID and Date Collected 95-4 6-Mar-95	95-19 20-Mar-95	95-20 3-Apr-95	95-24 21-Apr-95	95-29 15-May-95
Bioassay						
Fathead Acute NOEC	%	100	-	-	-	-
Fathead Chronic NOEC	%	33	-	-	-	-
Cerio Acute NOEC	%	17	66	33	50	50
Cerio Chronic NOEC	%	3	-	-	17	17
Chemical						
pH	pH units	7.1	6.7	6.7	6.4	6.9
Alkalinity	mg/L as CaCO3	5	20	12	10	U 10
Hardness	mg/L as CaCO3	300	244	184	288	218
Conductivity	µmhos/cm	868	690	710	1,013	870
TDS	mg/L	604	554	-	-	-
TSS	mg/L	7	8	-	-	-
COD	mg/L	14	5	-	-	-
NH3-N	mg/L	1.68	0.31	-	-	-
TKN	mg/L	1.81	0.36	-	-	-
Chlorine Residual	mg/L	0.05	0.08	0.06	0.04	0.02
H2O2	mg/L	17	20	-	-	-
Ox-Red Potential	mV	170	-	-	-	-
Fluoride	mg/L	4.4	2.8	-	-	-
Sulfide	mg/L	U 1	-	-	-	-
Sulfite	mg/L	U 0.5	-	-	-	-
MBAS	mg/L	0.25	0.1	-	-	-
Chromium, Total	µg/L	1	1.1	-	-	-
Chromium (VI)	µg/L	U 20	U 8	U 8	-	-
Notes:						
U = Less than specified method detection limit (MDL)						

SCOEPA00028128

Engineers
Planners
Economists
Scientists

05/24/95

Sandra Archer
Wacker Siltronic Corp.
7200 N.W. Front Ave.
P.O. Box 83180
Portland, OR 97210

RE: Toxicity Data for Wacker Siltronic Corp., Laboratory I.D. No. 1401

Dear Sandra Archer:

On 5/12/95, the CH2M HILL Corvallis Applied Sciences Laboratory received samples with a request for bioassay testing.

The toxicity test results and associated quality control data are enclosed. Any unusual difficulties encountered during the analyses of these samples are discussed in the case narratives.

If you should have any questions concerning the data, or if you need additional information, please call me at (503) 758-0235 ext. 3161.

Sincerely,

Michael J. Stanaway
Bioassay Laboratory Manager

Enclosures

Corvallis Office
2300 NW Walnut Blvd., Corvallis, OR 97330-3538
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BIOASSAY REPORT
CHRONIC
DEFINITIVE BIOASSAY
Conducted May 12 through 19, 1995

Prepared for

WACKER SILTRONICS
PORTLAND, OREGON

Prepared by

CH2M HILL
2300 NW Walnut Boulevard
Corvallis, Oregon 97330

May 23, 1995
Lab ID No. C01401

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INTRODUCTION

CH2M HILL conducted one chronic definitive test using the water flea (*Ceriodaphnia dubia*) on samples provided by Wacker Siltronics, Portland, Oregon. The test was conducted from May 12 through 19, 1995. The test was conducted as part of a Toxicity Investigation Evaluation (TIE). An extra test was set up on the initial and second samples only with a 17 percent concentration to assess whether or not the initial sample was acutely or chronically toxic.

METHODS AND MATERIALS

TEST METHODS

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Weber, C. et al. (1989); EPA/600/4-89/001.

TEST ORGANISMS

The *Ceriodaphnia dubia* used in the chronic test were obtained from CH2M HILL's in-house cultures and were less than 24 hours old and within an eight hour age at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (1989). All test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used in the *Ceriodaphnia* tests was moderately hard well water (EPA, 1989), with a total hardness and alkalinity of 104 and 82 mg/l as $CaCO_3$, respectively, and a pH of 8.0.

TEST CONCENTRATIONS

The concentrations tested in the chronic test were 3, 10, 17, 50, and 100 percent effluent with dilution water for the control. For the *Ceriodaphnia* chronic test, 1 organism per chamber with ten chambers per concentration for a total of 10 organisms per concentration were used.

SAMPLE COLLECTION

The samples were collected by Wacker personnel on May 12, 15, and 17, 1995 and delivered to CH2M HILL's Corvallis Aquatic Toxicology Laboratory by bus. The samples were stored in the dark at 4°C until test solutions were prepared and tested. Chain of Custody for sample collection is provided in Appendix C. The samples ID's were 95-29, 95-30, and 95-34.

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SAMPLE PREPARATION

Samples used during these tests were filtered through a 60 µm net and temperature adjusted prior to each daily renewal.

MONITORING OF BIOASSAY

For the chronic test, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in the control, low, middle, and high concentrations. Conductivity, ammonia, alkalinity, and hardness were measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was measured daily in the chronic tests. According to EPA (1989), *Ceriodaphnia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia* in the controls have produced their third brood and at least 15 neonates per adult are produced. Temperature was monitored continuously throughout the testing periods.

DATA ANALYSIS

The effects measured during the *Ceriodaphnia dubia* chronic test included survival and reproduction over the 7-day exposure period. The statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-89/001, using Toxcalc version 5. Dunnett's Procedure, Bonferroni's T-Test or Fisher's Exact Test was used to compare the survival data and Dunnett's Procedure or Bonferroni's T-Test was used to compare the reproduction or growth data between the control and each effluent treatment. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-test with Bonferroni Adjustment could not be met, Steel's Many-One Rank Test or Wilcoxon Rank Sum with Bonferroni Adjustment was used to analyze the data.

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RESULTS AND DISCUSSION

CHRONIC BIOASSAYS

Table 1 summarizes the survival and reproduction data for the *Ceriodaphnia dubia* test conducted.

Table 1
***Ceriodaphnia Dubia* Results**

Concentration (%)	Percent Survival	No. Young Per Adult
Control	100	19.0
3	100	21.0
10	90	19.1
17	100	18.8
50	100	14.0[b]
100	20[a]	0.2[b]

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Fisher's Exact Test.
[b] Indicates a statistically significant reduction from control at p less than 0.05 using Steel's Many-One Rank Test.

The *Ceriodaphnia dubia* showed a statistically significant reduction in reproduction at the 50 and 100 percent effluent concentrations when compared to the control and a statistically significant reduction in survival at the 100 percent effluent concentration when compared to the control. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) for survival and reproduction were 17 and 50 percent effluent, respectively. Control survival was 100 percent.

The IC_{25} values (the concentration of effluent causing a 25 percent reduction in biological measurement, e.g. growth) calculated for *Ceriodaphnia dubia* survival and reproduction were 64.1 and 43.1 percent effluent, respectively.

ACUTE DUAL-END POINT

The results of the 48-hour *Ceriodaphnia dubia* dual end-point tests resulted in no statistically significant reduction in survival at the 50 percent effluent concentration, in either the 1st or 2nd samples. The allowable acute Zone of Initial Dilution (ZID) for Wacker Siltronic is 50 percent effluent. The results indicate the effluent discharge is in compliance with the Oregon DEQ water quality criteria for toxic substances.

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REFERENCE TOXICANT TESTS

The results of monthly reference toxicant tests with sodium chloride conducted in May indicate that the test organisms were within their respective sensitivity range based on EPA guidelines (EPA 1989). The LC_{50} values, IC_{25} values, and Control Chart limits are listed in the tables below. The data sheets for the reference toxicant tests are provided in Appendix B.

Table 2
Acute Reference Toxicant Test (g/L)

Species	LC_{50}	Control chart limits
Ceriodaphnia dubia	1.9	1.4 to 2.1

Table 3
Chronic Reference Toxicant Tests with Sodium Chloride (g/L)

Species (test)	IC_{25}	Control chart limits
Ceriodaphnia dubia (survival)	1.5	1.0 to 2.6
Ceriodaphnia dubia (reproduction)	1.3	0.2 to 1.7

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APPENDIX A
RAW DATA SHEETS

CH2MHILL TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Wacker Siltronic Corp
Address 7200 NW Front Ave
Portland, OR 97210
Contact Sandra Archer

Test Initiation: Date 5-12-95 Time 1630 Test Termination: Date 5-19-95 Time 1100
Technician Schut, Winn
Test Species/ID Ceriodaphnia dubia / Cd 479 / /

Sample Information

Sample ID Number	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Tested	Dechlorinated (Yes or No)	~~Sample~~ Salinity (ppt)	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
CO1401-01	5-12-95	0800	0.02/0.02	NO	95-29	216	<20 MS
-02	5-15-95	0815	0.06/0.06	NO	95-30	236	<20 MS
-03	5-17-95	0800	0.05/0.05	No	95-34	204	<20 MS
			/				
			/				
			/				
			/				
			/				
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			/				
			/				
			/				

Dilution Water Source	ID #	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
MH Well H_2O	935	104	82

Test Species Information

	ID # Cd 479	ID #	ID #	ID #
Age or Size	<24 hr. within			
Loading Rate	8 hr. of each other			
Test Container Size	30 ml			
Test Volume	15 ml.			
Feeding: Type	0.1 ml algae			
Amount	+ YCT daily			
Aeration: Began	None			
Amount	—			
Dilution Water ID #	935			
Acclimation Period	< 24 hr.			
Test Location	#6			
Condition of Survivors				

Comments

Water Quality Meters Used/ID #

Dissolved Oxygen #1 pH #1 Temperature _____

Conductivity #1 Refractometer _____ Other _____

CH2M HILL

Ceriodaphnia dubia Survival and Reproduction
Test Data Summary

Client Wacker Siltronic Test Start Date 5-12-95

Sample Description 95-29 Sample ID # C01401-01

Ceriodaphnia Lot # 479 Statistician Schut

(Percent) or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	19	20	20	19	19	19	20	18	20	16	10	190
3	21	20	21	22	27	24	21	24	22	8	10	210
10	8	21	20	24	19	23	10	19	22	25	9	191
17	22	17	23	20	20	23	8	23	8	24	10	188
50	18	15	17	13	10	9	18	15	15	10	10	140
100	0	0	0	0	0	0	0	0	2	0	2	2

CH2MHILL **CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA**

Client Wacker Siltronic Test Beginning: Date 5-12-95 Time 1500

Sample Description 95-29 Test Ending: Date 5-19-95 Time 1100

Ceriodaphnia Lot# cd 479 Dilution Water MH well ID# 935

Technician Day 1 DW Day 2 DW Day 3 DW Day 4 DW Day 5 DW Day 6 DW Day 7 JS

Time Day 1 0915 Day 2 0900 Day 3 1630 Day 4 1145 Day 5 1700 Day 6 1345 Day 7 1100

~~Percent~~ or Concentration	Day	Replicate										No. Live Adults	Total Live Young
		A	B	C	D	E	F	G	H	I	J		
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	4	4	4	4	4	4	4	4	5	10	41
	5	5	0	5	4	5	5	5	4	4	4	10	41
	6	0	4	0	0	0	0	0	0	0	0	10	4
	7	10	12	11	11	10	10	11	10	12	7	10	104
3	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	4	4	4	6	4	5	4	4	4	10	43
	5	7	4	3	7	0	7	0	7	8	0	10	43
	6	0	0	0	0	8	0	6	0	0	4	10	18
	7	10	12	14	11	13	13	10	13	10	0	10	106
10	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	4	4	4	4	4	5	4	4	4	10	41
	5	4 AD	4	5	7	6	4	0	4	7	0	9	41
	6	—	0	0	0	0	0	5	0	0	5	9	10
	7	—	13	11	13	9	15	0	11	11	16	9	99
17	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0 ~~20w~~	0	0	0	0	0	10	0
	4	4	3	4	4	4	4	4	4	4	4	10	39
	5	6	5	6	5	7	5	0	6	0	5	10	45
	6	0	0	0	0	0	0	4	0	4	0	10	8
	7	12	9	13	11	9	14	0	13	D	15	10	96
50	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	4	4	0	4	4	4	4	3	3	10	34
	5	5	5	4	4	2	0	4	~~D~~ 4	3	3	10	~~30~~ 34
	6	0	0	0	9	0	5	0	0	0	0	10	14
	7	9	6	9	0	4	0	10	7	9	4	10	58
100	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	AD	0	0	9	0
	3	0	0	0	AD	0	AD	AD	—	0	0	6	0
	4	AD	0	0	—	0	—	—	—	0	0	5	0
	5	—	AD	0	—	AD	—	—	—	0	AD	2	0
	6	—	—	0	—	—	—	—	—	0	—	2	0
	7	—	—	0	—	—	—	—	—	2	—	2	2

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	12 May-95 00:00	Test ID:	140101cdc	Sample ID:	WACKER-SILTRONICS
End Date:	19 May-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	12 May-95 00:00	Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia

Comments:

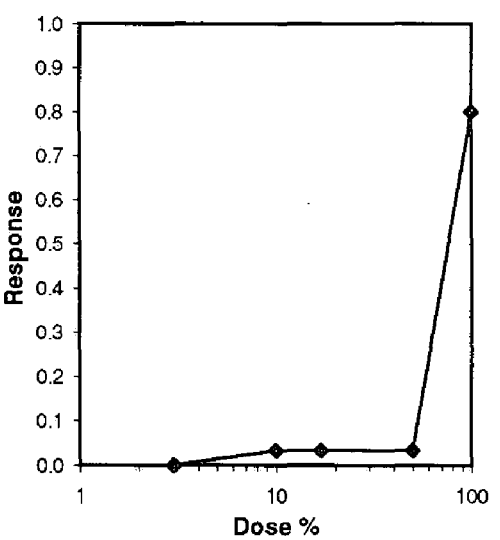
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
17	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
D-Control	1.0000	1.0000	0	10	10	10			1.0000	1.0000
3	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
10	0.9000	0.9000	1	9	10	10	0.5000	0.0500	0.9667	0.9667
17	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0.9667	0.9667
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0.9667	0.9667
*100	0.2000	0.2000	8	2	10	10	0.0004	0.0500	0.2000	0.2000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	50	100	70.7107	2

Linear Interpolation (80 Resamples)

Point	%	SE	95% CL		Skew
IC05	51.087	18.402	6.478	54.167	-1.4221
IC10	54.348	7.698	48.956	58.333	-5.5075
IC15	57.609	6.030	52.732	62.500	-6.6009
IC20	60.870	3.143	55.513	67.857	0.7068
IC25	64.130	3.628	58.293	73.214	1.1236
IC40	73.913				
IC50	80.435				



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Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12 May-95 00:00	Test ID:	140101cdc	Sample ID:	WACKER-SILTRONICS
End Date:	19 May-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	12 May-95 00:00	Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia

Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	19.000	20.000	20.000	19.000	19.000	19.000	20.000	18.000	20.000	16.000
3	21.000	20.000	21.000	22.000	27.000	24.000	21.000	24.000	22.000	8.000
10	8.000	21.000	20.000	24.000	19.000	23.000	10.000	19.000	22.000	25.000
17	22.000	17.000	23.000	20.000	20.000	23.000	8.000	23.000	8.000	24.000
50	18.000	15.000	17.000	13.000	10.000	9.000	18.000	15.000	15.000	10.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000

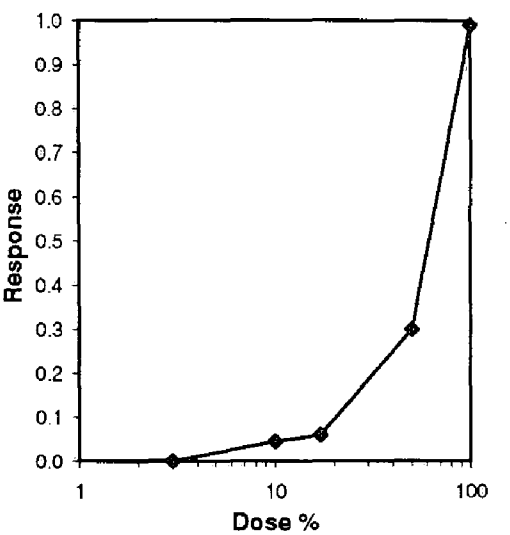
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	19.000	1.0000	19.000	16.000	20.000	6.564	10			20.000	1.0000
3	21.000	1.1053	21.000	8.000	27.000	23.862	10	143.00	75.00	20.000	1.0000
10	19.100	1.0053	19.100	8.000	25.000	29.868	10	121.00	75.00	19.100	0.9550
17	18.800	0.9895	18.800	8.000	24.000	32.190	10	122.00	75.00	18.800	0.9400
*50	14.000	0.7368	14.000	9.000	18.000	24.046	10	59.00	75.00	14.000	0.7000
*100	0.200	0.0105	0.200	0.000	2.000	316.228	10	55.00	75.00	0.200	0.0100

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	2.06847	1.035	-1.5494	2.76432
Bartlett's Test indicates unequal variances (p = 2.74E-08)	43.6386	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	17	50	29.1548	5.88235

Linear Interpolation (80 Resamples)

Point	%	SE	95% CL		Skew
IC05	12.333	6.299	4.873	24.195	0.0488
IC10	22.500	7.258	7.231	31.497	-0.1525
IC15	29.375	8.108	9.534	39.538	-0.3046
IC20	36.250	8.858	15.022	50.340	-0.3097
IC25	43.125	8.501	16.379	53.525	-0.8877
IC40	57.246	4.126	47.449	63.078	-0.6276
IC50	64.493	3.335	57.021	69.446	-0.4567



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CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client Wacker Siltronic Initiated: Date 5-12-95 Time 1640 Adults Isolated Date 5-11-95 Time 0730

Sample Description 95-29 Terminated: Date 5-19-95 Time 1100 Neonates Collected Date 5-11-95 Time 1430

Technician Day 0 JS Day 1 DW Day 2 DW Day 3 DW Day 4 DW Day 5 DW Day 6 DW Day 7 DW/JS

Time Day 0 1640 Day 1 0930 Day 2 0920 Day 3 1645 Day 4 1330 Day 5 1700 Day 6 1430 Day 7 1530

Percent or Concentration	Dissolved Oxygen (mg/l)								pH								Conductivity (µmhos/cm)							
	Day								Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
control	7.8	8.1/8.0	8.0/8.0	8.1/8.0	8.1/8.4	8.0/8.4	8.2/8.4	8.6	7.0	8.2/8.0	8.1/8.0	8.1/7.9	8.2/8.0	8.1/8.2	8.2/8.0	8.0	240			260		270		
3	7.8	8.1/8.2	8.0/8.0	8.2/8.4	8.1/8.4	8.4/8.1	8.1/8.4	8.6	8.0	8.2/7.9	8.1/8.0	8.3/8.0	8.1/8.0	8.3/8.2	8.2/8.0	8.0								
10																								
17	7.8	8.0/8.2	8.0/8.2	8.2/8.2	8.2/8.4	8.3/8.3	8.0/8.4	8.8	8.0	8.1/7.8	8.0/7.8	8.2/7.8	8.1/7.8	8.2/8.0	8.1/7.9	8.0								
50																								
100	8.2	8.4/8.4	8.0/8.5	8.4/8.4	7.8/8.3	8.2/8.5	8.1/8.1	8.7	6.6	7.5/6.6	7.2/6.6	7.3/6.6	7.0/6.7	7.4/7.0	7.7/7.0	7.5	885			830		955		

Percent or Concentration	Total Hardness (mg/l $CaCO_3$)								Alkalinity (mg/l $CaCO_3$)							
	Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

Comments:

CHMHILL CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Wacker Siltronic Test Beginning: Date 5-12-95 Time 1500

Sample Description Initial Sample only Test Ending: Date 5-19-95 Time 1100

Ceriodaphnia Lot# Cd 479 Dilution Water MH well ID# 935

Technician Day 1 DW Day 2 DW Day 3 DW Day 4 DW Day 5 DW Day 6 DW Day 7 JS

Time Day 1 0915 Day 2 0900 Day 3 1630 Day 4 1145 Day 5 1700 Day 6 1345 Day 7 ~~1100~~

Percent or Concentration	Day	Replicate										No. Live Adults	Total Live Young
		A	B	C	D	E	F	G	H	I	J		
17%	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	2	0	0	0	0	0	10	PE 2
	4	4	4	4	4	0	4	4	4	4	5	10	33
	5	6	0	0	7	6	5	6	0	6	6	10	42
	6	0	5	5	0	10	0	0	8	0	0	10	28
	7	14	16	AD	11	0	~~3~~	12	0	14	11	10	91
	1												
	2												
	3												
	4												
	5												
	6												
	7												
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CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client Wacker Siltronic Initiated: Date 5-12-95 Time 1640 Adults Isolated Date 5-11-95 Time 0730

Sample Description Initial Sample only Terminated: Date _____ Time _____ Neonates Collected Date 5-11-95 Time 1430

Technician Day 0 JS Day 1 DW Day 2 DW Day 3 DW Day 4 DW Day 5 DW Day 6 DW Day 7 DW/JS

Time Day 0 ~~1145~~ 1640 Day 1 0930 Day 2 0920 Day 3 1645 Day 4 1330 Day 5 1700 Day 6 1430 Day 7 1530

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	1	2	3	4	5	6	7	pH Day 0	1	2	3	4	5	6	7	Conductivity (µmhos/cm) Day 0	1	2	3	4	5	6	7
17%	7.8	8.0 / 8.2	8.0 / 8.2	8.2 / 8.2	8.2 / 8.4	8.3 / 8.5	8.1 / 8.4	8.7	8.0	8.1 / 7.8	8.0 / 7.8	8.2 / 7.8	8.1 / 7.9	8.3 / 8.0	8.1 / 7.8	8.0								

Percent or Concentration	Total Hardness (mg/l $CaCO_3$) Day 0	1	2	3	4	5	6	7	Alkalinity (mg/l $CaCO_3$) Day 0	1	2	3	4	5	6	7

Comments: _____

CH2M HILL **CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA**

Client Wacker Siltronic Test Beginning: Date 5-15-95 Time 1600

Sample Description Second Sample Only Test Ending: Date _____ Time _____

Ceriodaphnia Lot# Cd 481 Dilution Water MH Well H_2O ID# 935

Technician Day 1 DW Day 2 DW Day 3 DW Day 4 JS Day 5 _____ Day 6 _____ Day 7 _____

Time Day 1 1130 Day 2 1500 Day 3 1345 Day 4 1120 Day 5 _____ Day 6 _____ Day 7 _____

(Percent) or Concentration	Day	Replicate										No. Live Adults	Total Live Young
		A	B	C	D	E	F	G	H	I	J		
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	5	0	4	0	0	4	3	3	3	0	10	22
	5												
	6												
	7												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
17	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	4	0	0	4	4	6	0	3	0	10	21
	5												
	6												
	7												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	1												
	2												
	3												
	4												
	5												
	6												
	7												

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client Wacker Siltronic Initiated: Date 5-15-95 Time 1600 Adults Isolated Date 5-15-95 Time 0900

Sample Description Second Sample only Terminated: Date _____ Time _____ Neonates Collected Date 5-15-95 Time 1530

Technician Day 0 DW Day 1 DW Day 2 DW Day 3 DW Day 4 _____ Day 5 _____ Day 6 _____ Day 7 _____

Time Day 0 1600 Day 1 1330 Day 2 1530 Day 3 1430 Day 4 _____ Day 5 _____ Day 6 _____ Day 7 _____

Percent or Concentration	Dissolved Oxygen (mg/l)								pH								Conductivity (µmhos/cm)							
									Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Control	8.4	8.2 / 8.4	8.3 / 8.4	8.2 / 8.4					8.1	8.2 / 8.0	8.3 / 8.2	8.2 / 8.0												
17	8.4	8.2 / 8.4	8.1 / 8.4	8.1 / 8.4					7.9	8.1 / 7.8	8.2 / 8.0	8.1 / 7.8												

Percent or Concentration	Total Hardness (mg/l $CaCO_3$)								Alkalinity (mg/l $CaCO_3$)							
	Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

Comments: _____

SCOEPA00028146

APPENDIX B
REFERENCE TOXICANT DATA SHEETS

CH2M HILL

Ceriodaphnia dubia Survival and Reproduction
Test Data Summary

Client May Ref. Tox Test Start Date 5-5-95

Sample Description NaCl Sample ID #

Ceriodaphnia Lot # 476 Statistician SCHMIT

Percent or Concentration	Total Young Rer Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
control	22	21	4	20	26	25	21	21	11	17	10	188
0.5	14	22	21	22	22	20	23	3	23	27	10	197
1.0	18	19	18	15	4	24	14	19	24	19	9	174
1.5	10	16	15	22	13	0	12	12	16	9	8	125
2.0	8	0	0	0	0	0	0	8	0	0	2	16
4.0	0	0	0	0	0	0	0	0	0	0	0	0

CH2M HILL

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Ref Tox - May '95 Test Beginning : Date 5-5-95 Time 1610

Sample Description NaCl Test Ending : Date 5-12-95 Time 1415

Ceriodaphnia Lot# 476 Dilution Water MH well ID# 931

Technician Day 1 JS Day 2 JS Day 3 JS Day 4 JS Day 5 JS Day 6 DW Day 7 JS

Time Day 1 1100 Day 2 1015 Day 3 1430 Day 4 1515 Day 5 1300 Day 6 1325 Day 7 1415

Percent or Concentration	Day	Replicate A	B	C	D	E	F	G	H	I	J	No. Live Adults	Total Live Young
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	3	0	4	6	6	3	3	4	4	10	37
	5	7	0	0	~~0~~ 7 JS	0 ~~7~~ JS	0	6	8	4	0	10	32
	6	0	6	4	0	7	7	0	0	0	5	10	29
	7	11	12	0	9	13	12	12	10	3	8	10	90
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	4	4	4	4	3	5	0	4	6	10	38
	5	3	5	0	0	7	6	6	1	1	0	10	29
	6	7	0	6	7	0	0	0	0	7	10	10	37
	7	0	13	11	11	11	11	12	2	11	11	10	93
1.0	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	3	3	4	2	4	4	2	4	4	3	10	33
	5	7	0	6	5	AD	0	4	5	0	6	~~10~~ 9 JS	33
	6	0	8	0	0	–	9	0	0	9	0	9	26
	7	8	8	8	8	–	11	8	10	11	10	9	82
1.5	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	AD	0	0	0	0	9	0
	3	0	0	0	0	0	–	0	0	0	0	9	0
	4	0	2	3	4	1	–	0	2	3	1	9	16
	5	4	5	0	0	4	–	6	0	6	0	9	25
	6	6	0	5	7	0	–	6	6	0	5	9	35
	7	AD 0	9	7	11	8	–	0	4	7	3	8	49
2.0	1	0	0	AD	AD	0	0	0	0	0	AD	7	0
	2	0	0	–	–	AD	AD	AD	0	AD	–	3	0
	3	0	AD	–	–	–	–	–	0	–	–	2	0
	4	0	–	–	–	–	–	–	0	–	–	2	0
	5	1	–	–	–	–	–	–	3	–	–	2	4
	6	0	–	–	–	–	–	–	0	–	–	2	0
	7	7	–	–	–	–	–	–	5	–	–	2	12
4.0	1	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	0	0
	2												
	3												
	4												
	5												
	6												
	7												

AD = Adult Dead

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client Ref Tox - May 95 | Initiated Date 5-5-95 Time 1610 | Adults Isolated Date 5-9-95 Time 1615
Sample Description | Terminated Date 5-12-95 Time 1415 | Neonates Collected Date 5-9-95 Time 2100

Technician: Day 0 BM | Day 1 JS | Day 2 JS | Day 3 JS | Day 4 JS | Day 5 DW | Day 6 DW | Day 7 JS

Time: Day 0 1615 | Day 1 1130 | Day 2 ~~1050~~ 0958 | Day 3 1538 | Day 4 1630 | Day 5 1600 | Day 6 1400 | Day 7 1440

Percent or Concentration	Dissolved Oxygen (mg/l) Day 0	1	2	3	4	5	6	7
Control	8.0	8.0 / 8.2	8.0 / 8.0	8.1 / 8.1	8.0 / 8.5	7.8 / 7.8	7.7 / 7.7	7.6
0.5	7.8	8.0 / 8.2	8.0 / 8.0	8.1 / 8.1	8.0 / 8.5	7.8 / 7.7	7.6 / 7.8	7.6
1.0								
1.5	8.0	8.0 / 8.2	8.0 / 8.0	8.1 / 8.1	8.0 / 8.4	7.8 / 7.7	7.6 / 7.6	7.7
2.0	-	- / 8.2	8.0 / 8.0	8.1 / 8.1	8.0 / 8.4	8.0 / 7.5	7.6 / 7.5	7.7
4.0	8.0	8.0 / -	~~8.0~~					

Percent or Concentration	pH Day 0	1	2	3	4	5	6	7
Control	7.8	8.2 / 8.1	8.0 / 8.0	8.2 / 8.1	8.1 / 8.1	8.3 / 8.1	8.3 / 8.0	8.1
0.5	7.9	8.2 / 8.1	8.0 / 8.2	8.2 / 8.0	8.0 / 8.1	8.2 / 8.0	8.2 / 8.4	8.1
1.0								
1.5	7.9	8.1 / 8.0	8.1 / 8.0	8.2 / 7.9	8.0 / 8.1	8.1 / 7.9	8.2 / 8.0	8.1
2.0	-	- / 7.9	8.1 / 8.0	8.2 / 7.9	8.1 / 7.9	8.1 / 7.8	8.2 / 8.0	8.0
4.0	7.9	7.9 / -						

Percent or Concentration	Conductivity (µmhos/cm) Day 0	1	2	3	4	5	6	7
Control	263					280		
0.5								
1.0								
1.5								
2.0						3760		
4.0	7050							

COMMENTS:

SCOEPA00028150

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	05 May-95 00:00	Test ID:	rcdc476	Sample ID:	REF-Ref Toxicant
End Date:	12 May-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:	05 May-95 00:00	Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia

Comments:

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	22.000	21.000	4.000	20.000	26.000	25.000	21.000	21.000	11.000	17.000
0.5	14.000	22.000	21.000	22.000	22.000	20.000	23.000	3.000	23.000	27.000
1	18.000	19.000	18.000	15.000	4.000	24.000	14.000	19.000	24.000	19.000
1.5	10.000	16.000	15.000	22.000	13.000	0.000	12.000	12.000	16.000	9.000
2	8.000	0.000	0.000	0.000	0.000	0.000	0.000	8.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

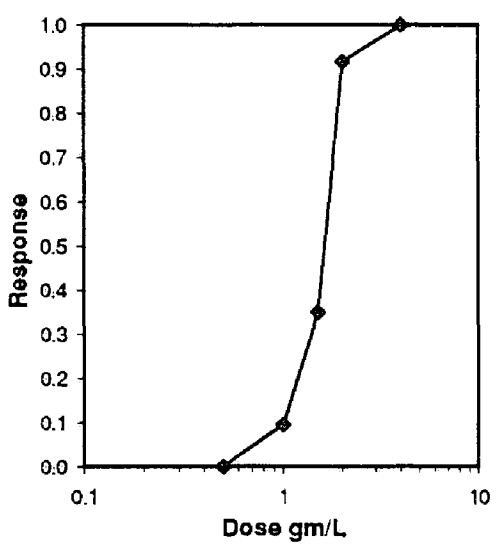
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	18.800	1.0000	18.8000	4.0000	26.0000	35.443	10			19.250	1.0000
0.5	19.700	1.0479	19.7000	3.0000	27.0000	34.014	10	114.50	75.00	19.250	1.0000
1	17.400	0.9255	17.4000	4.0000	24.0000	32.758	10	90.50	75.00	17.400	0.9039
1.5	12.500	0.6649	12.5000	0.0000	22.0000	45.918	10	76.50	75.00	12.500	0.6494
*2	1.600	0.0851	1.6000	0.0000	8.0000	210.819	10	57.00	75.00	1.600	0.0831
*4	0.000	0.0000	0.0000	0.0000	0.0000	0.000	10	55.00	75.00	0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.5194	1.035	-1.3499	3.00029
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	1.5	2	1.73205	

Linear Interpolation (80 Resamples)

Point	gm/L	SE	95% CL		Skew
IC05	0.7601	0.2893	0.1921	1.1245	-0.0717
IC10	1.0077	0.2606	0.3842	1.2508	-0.3112
IC15	1.1059	0.2250	0.5963	1.5006	-0.1756
IC20	1.2041	0.1914	0.8197	1.5322	0.0062
IC25	1.3023	0.1818	0.8996	1.5637	-0.2521
IC40	1.5436	0.0950	1.2645	1.6581	-1.3585
IC50	1.6319	0.0701	1.4592	1.7210	-1.1247



SCOEPA00028151

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	05 May-95 00:00	Test ID:	rcdc476	Sample ID:	REF-Ref Toxicant
End Date:	12 May-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:	05 May-95 00:00	Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia

Comments:

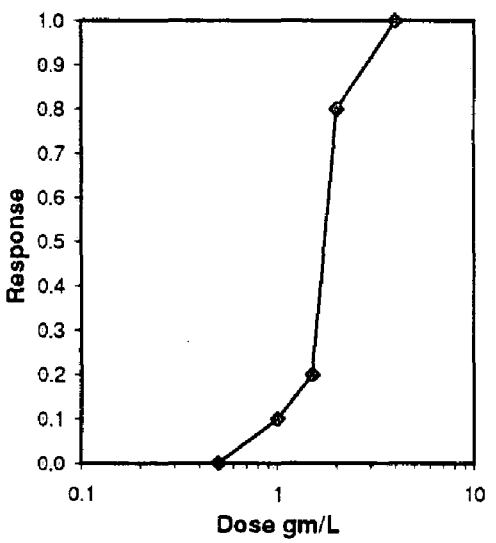
Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
2	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-gm/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic Mean	Isotonic N-Mean
D-Control	1.0000	1.0000	0	10	10	10			1.0000	1.0000
0.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
1	0.9000	0.9000	1	9	10	10	0.5000	0.0500	0.9000	0.9000
1.5	0.8000	0.8000	2	8	10	10	0.2368	0.0500	0.8000	0.8000
*2	0.2000	0.2000	8	2	10	10	0.0004	0.0500	0.2000	0.2000
*4	0.0000	0.0000	10	0	10	10	0.0000	0.0500	0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	1.5	2	1.73205	

Linear Interpolation (80 Resamples)

Point	gm/L	SE	95% CL		Skew
IC05	0.7500	0.2845	0.6244	1.5314	1.3285
IC10	1.0000	0.3076	0.7488	1.5627	0.2521
IC15	1.2500	0.2612	0.8731	1.5941	-0.5460
IC20	1.5000	0.1879	0.9975	1.6365	-1.6334
IC25	1.5417	0.1217	1.2500	1.6786	-1.3258
IC40	1.6667	0.0777	1.5000	1.8005	-0.8314
IC50	1.7500	0.0782	1.6250	1.9114	0.5300



SCOEPA00028152

APPENDIX C
CHAIN OF CUSTODY

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic Corp.
Address 7200 N.W. Front Avenue
Portland, Oregon 97210

Contact Person: Sandra Archer
Phone: 503-243-2020
CH2M HILL Project # ASE-14431

NPDES# _____
Composite Sample Information _____

Samples/Hour 0.5 Volume/Sample 3.5 gal.
Total Hours 24 Total Volume 42 gallons
Initiated: Date 05-11-95 Time 0800
Ended: Date 5-12-95 Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (503) 752-4271 Ext. 3160
Message: (503) 758-0235 Ext. 3160

P. O.#

Check Chlorine (Y/N) ~~N~~ Y
Temp. Upon Arrival (°C) 10
Check Ammonia (Y/N) _____ Dechlorinate (Y/N) N

Analysis Required/Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste	Bioassay			Concentrations and/or Comments
95-29	12 May 1995	0800	X		3	60345															X			
						60140-01																		

Sampled By & Title (Please sign and print name) Thomas J. Rothschild	Date/Time 12 May 95/0800	Relinquished By (Please sign and print name) Thomas J. Rothschild	Date/Time 12 May 95/ 0900
Received By (Please sign and print name) Dianne Mullan	Date/Time 5/12/95 0900	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Doug Winn (LAB)	Date/Time 5-12-95 1500	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ✓ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks Initial pH = 6.9 Initial D.O. = 9.2 mg/L Initial Conductivity = 870		

Rev. 2/94

SCOEPA00028154

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic Corp.
Address 7200 N.W. Front Ave.
Portland, Oregon 97210

Contact Person: Saundra Archer
Phone: 503-243-2020
CH2M HILL Project # ASE 14431

NPDES# _____
Composite Sample Information _____

Samples/Hour 0.5 Volume/Sample 3.5 gal.
Total Hours 24 Total Volume 42 gallons
Initiated: Date 5-14-95 Time 0800
Ended: Date 5-15-95 Time 0815
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
P.O.# Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (503) 752-4271 Ext. 3160
Message: (503) 758-0235 Ext. 3160

Check Chlorine (Y/N) Y
Temp. Upon Arrival (°C) 4°C
Check Ammonia (Y/N) _____ Dechlorinate (Y/N) Y

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste	Biossay			Concentrations and/or Comments
95-3C	15 May 1995	0815	X		3	C01461-02															X			

Sampled By & Title (Please sign and print name) Thomas J. Rothschild, Facilities Chem.	Date/Time 15 May 95/0815	Relinquished By (Please sign and print name) Thomas J. Rothschild	Date/Time 15 May 95/0850
Received By (Please sign and print name) Dianne E Muller	Date/Time 15 May 95/0850	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time 15 May 95/1400	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus X Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks Initial Cl = 0.06 pH = 6.8 DO = 9.0 cond. = 735 see back sheet for Alkalinity and Hardness		

SCOEPA00028155

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic Corp
Address 7200 N.W. Front Ave
Portland, Oregon 97210

Contact Person: Sandra Archer
Phone: (503) 243 2020 x4684
CH2M HILL Project # ASE-14431

NPDES# _____
Composite Sample Information _____

Samples/Hour 0.5 Volume/Sample 3.5 gal
Total Hours 24 Total Volume 42 gallons
Initiated: Date 5-16-95 Time 0800
Ended: Date 5-17-95 Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (503) 752-4271 Ext. 3160
Message: (503) 758-0235 Ext. 3160

P.O.# 31302

Check Chlorine (Y/N) Y
Temp. Upon Arrival (°C) 9°C
Check Ammonia (Y/N) _____ Dechlorinate (Y/N) N

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste	Bioassay			Concentrations and/or Comments
95-34	5-17-95	0800	X			C01401-03															X			

Sampled By & Title (Please sign and print name) Dianne E Mullen Dianne E Mullen	Date/Time 5-17-95 0800	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Doug Wilson (LAB)	Date/Time 5-17-95 1630	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks Initial pH = 7.5 Initial D.O. = 8.7		

SCOEPA00028156

PREPARED FOR: Wacker Siltronic, Inc., Portland, OR

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DATE: April 18, 1995

SUBJECT: Mixing Zone Effluent Dilution Evaluation

PROJECT: OPE40520.A0

Scope

This memorandum addresses the anticipated dilution of increased effluent flows from Wacker Siltronic's outfall in the Willamette River, and assesses the potential for water quality criteria compliance within a defined mixing zone.

Conclusion

Conditions near the outfall of the Wacker Siltronic plant are highly variable, especially near the time of tidally induced current reversals in the Willamette River. Based on the probable dilution predicted by the computer model UDKHDEN, Wacker Siltronic will meet the ambient water quality criteria for chromium, fluoride, and temperature at the proposed average and maximum plant flow (2.49 mgd and 4.64 mgd respectively) under the conditions specified in NPDES Permit No. 101128 (DEQ file 93450). Sufficient dilution occurs at critical conditions of river flow to meet applicable ambient water quality standards.

Based on the most recent chronic bioassay tests, Wacker Siltronic would meet the whole effluent chronic toxicity criteria under some, but not all, of the combinations of discharge volume and river velocity modeled during this study.

Approach

Effluent dilution was predicted using the hydrodynamic model UDKHDEN (Muellenhoff et al., 1985). UDKHDEN is a fully three-dimensional model that uses a fourth-order integration routine along the centerline of the effluent plume to trace its position, centerline concentration, and average dilution over time for submerged plumes from a single port or a single row of multiple diffuser ports in either stagnant or flowing water. The model was run in the "image" mode to enable continued simulation after the point at which the effluent plume reached the river surface.

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Field data for use in the models was collected in the Willamette River in the vicinity of the present outfall. Data were collected through one 12-hour tidal cycle. Data on effluent quantity and quality was obtained from current records of Wacker Siltronic plant.

Results

Effluent Quality

Data on effluent quality was obtained from Wacker Siltronic Discharge Monitoring Reports for November, 1994. Data relevant to ambient water quality criteria are summarized in Table 1.

Table 1
Wacker Siltronic Effluent Water Quality[a]

	Process Wastewater				Outfall Discharge		
	Flow	**Cr (VI)**	**Cr (total)**	**Fluoride**	**Flow**	**Temp**	**pH**
Average	1,730	<0.01	0.02	6.4	599,000	68	>6.5
Maximum	3,225	<0.01	0.03	9.4	707,000	75	<9.0
Permit[b]		0.02	0.3	17.4			<6.5
Limits		0.05	1.0	32		85	>9.0
Water		0.016	1.7				
Quality Criteria[f]		0.011	0.210[c]	4[d]			9.0[e]

[a] All values in mg/L except flow, gallons per minute; pH, units; temperature, °F.
[b] Top value is the monthly average limit, bottom value is the daily maximum limit except for pH which must be between 6.5 and 9.0.
[c] Criterion depends on hardness; value is based on hardness of 100 mg/L as $CaCO_3$.
[d] Based on drinking water standard.
[e] Must be between 6.5 and 9.0.
[f] Top value is the acute criterion, bottom value is the chronic criterion.

Recent bioassay test results are shown in Table 2. Wacker effluent showed acute toxicity at 100 percent concentration to fathead minnows in August, 1993 and to *Ceriodaphnia* in August and October, 1994. In tests of chronic toxicity, the effluent showed no observable effect (NOEC) at 6.25 percent effluent or less to *Ceriodaphnia* in August and October, 1994.

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Table 2 Effluent Toxicity (percent effluent)										
	Fathead Minnows					*Ceriodaphnia*				
		7-day Growth					7-day Survival		Reproduction	
Date	48 hr survival	NOEC	LC50	NOEC	IC25	48 hr survival	NOEC	LC5O	NOEC	IC25
19 Aug 93	F	25	42.4	25	63.9	P	50	79.6	25	45.5
28 Sep 93	P	50	70.7	25	49.3	P	50	70.7	50	43.5
16 Aug 94	P	50	70.7	50	55.5	F	25	28.6	f <6.25	2.64
13 Oct 94						F	f 6.25	15.1	f <6.25	1.89
13 Oct 94							f 6.25	15.2		

Note: P = Passed DEQ acute toxicity guidelines based on 100 percent effluent.
F = Failed DEQ acute toxicity guidelines based on 100 percent effluent.
f = Failed DEQ chronic toxicity guidelines based on 5:1 dilution in a mixing zone.

Field Measurements

Fieldwork for the mixing zone study took place on August 10, 1992, in conjunction with a study performed for Elf Atochem, Inc. River current velocity readings were collected throughout one 12-hour tidal cycle. Results of the velocity measurements are summarized in Attachment 1. Flow in the Willamette River (measured at Salem) was 5,800 cubic feet per second (cfs) on August 10, 1992. Typical summertime low flow in the Willamette is approximately 6,000 cfs. River stage at Portland varied during the time of sampling from 2.6 feet at 7:00 a.m. (high stage was 4.1 feet at 4:00 a.m.) to a low stage of 0.3 feet at 3:00 p.m. and returned to 3.3 feet at 7:00 p.m. Results of the flow velocity measurements were used as input values for the computer model UDKHDEN.

Current velocity, temperature, and conductivity were measured at several depths at intervals throughout the tidal cycle. Data collected in the field are summarized in Attachment 2.

Model Results

Details of the model runs are presented in graphical and tabular format in Attachment 3. Model input conditions were as follows:

- Effluent discharge — 2.49 mgd, 4.64 mgd
- Number of ports — 1
- Port diameter — 24 inches
- Port angle to flow — 90° (perpendicular)
- Effluent temperature — 25°C
- Water depth — 11 meters (36 ft)
- Current velocity — 0, 0.1, 0.5, and 0.8 fps

Available Dilution. The plume from Wacker Siltronic reaches the surface relatively quickly because it is warmer than the receiving water. The model UDKHDEN does not ordinarily predict dilution beyond the point that the plume surfaces. However, by using the "image"

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method the model can be used to predict dilution beyond the point of plume surfacing. In this method the surface and bottom of the receiving stream are treated as adjacent ports discharging a volume equivalent to that from the modeled outfall. This basically tips the model on its side so that when the plume surfaces, it is treated as adjacent plumes merging. The model then continues to predict dilution downstream.

It is our experience that dilution predicted by UDKHDEN using the image solution corresponds closely to dilution measured using dye studies (Davis, 1989). Because of this we have chosen an intermediate value predicted by UDKHDEN as most representative of the probable dilution that occurs in the mixing zone at the Wacker Siltronic plant outfall.

The conditions for modeling were chosen to provide the most conservative realistic boundary conditions for the outfall. Four cases were modeled based on the field data; river current velocity of 0, 0.1, 0.5, and 0.8 fps. Model results are summarized in Table 3.

Table 3
Summary of Model Dilution Results at Various Distances Downstream from Discharge Port

	Dilution (Q/Q_o)							
	2.49 mgd				4.64 mgd			
Current Velocity	5 ft[a]	10 ft	50 ft[b]	100 ft	5 ft	10 ft	50 ft	100 ft
0 fps	1.4	2	26	27	1.5	2	27	28
0.1 fps	5.7	12	65	78	6.7	12	69	82
0.5 fps	4.5	10.5	39	75	3	14	40	78
0.8 fps	4.8	25	35	65	4	10	36	68

[a]Edge of zone of initial dilution for mixing zone.
[b]Edge of mixing zone.

For purposes of interpretation in bioassay test results, the dilution values in Table 3 are presented in Table 4 as percent effluent.

Table 4
Summary of Dilution Results as Percent Effluent

	Dilution (Percent Effluent)							
	2.49 mgd				4.64 mgd			
Current Velocity	5 ft	10 ft	50 ft	100 ft	5 ft	10 ft	50 ft	100 ft
0 fps	70	50	4	4	67	50	4	4
0.1 fps	18	8	2	1	15	8	2	1
0.5 fps	22	9	3	1	33	7	2	1
0.8 fps	21	4	3	2	25	10	3	1

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Water Quality Criteria

Water quality standards applicable to the Willamette River at Portland are described in OAR 340-41-442 (a copy is included in Attachment 4). The water quality constituents most likely to be affected by the Wacker Siltronic effluent include fluoride, chromium, temperature, and chronic toxicity.

Fluoride. There is no ambient water quality criterion for fluoride. For this analysis the safe drinking water maximum contaminant level was used.

Chromium. The freshwater ambient criterion for exposure to chromium varies with the oxidation state of the element. For chromium VI the chronic limit is 0.011 mg/L and the acute limit is 0.016 mg/L. For chromium III the chronic limit is 0.210 mg/L and the acute limit is 1.7 mg/L at a hardness of 100 mg/L measured as $CaC0_3$. This value was used for the determination of total chromium concentration compliance for this analysis.

Temperature. The current standard for the Willamette River at Portland allows for no increase in temperature outside the mixing zone when the river temperature is greater than 70°F (21°C), a condition that usually exists during the period of critical river flow. The temperature standard is currently under review as part of the triennial review process and will probably be modified in the near future. It is not possible to know exactly what the new standard will be.

Water Quality Criteria Compliance Evaluation

Required Dilution. The dilution of the effluent required within the mixing zone to meet current ambient water quality criteria for chronic effects is presented in Table 5.

The greatest dilution of Wacker Siltronic effluent required to meet chemical specific water quality criteria at the edge of the current mixing zone is 25 percent effluent (Q/Q_0=4) while the least dilution available at the edge of the mixing zone under the conditions modeled was 4 percent (Q/Q_0=26). Wacker Siltronic effluent at the proposed flow rates and critical river flow will meet the ambient water quality criteria for chromium and fluoride.

Toxicity. Based on the most recent bioassay tests (October, 1994) Wacker Siltronic would require a dilution of 52 (1.89 percent effluent) at the edge of the mixing zone to meet the chronic toxicity criterion. This dilution is achieved in the current mixing zone at the projected effluent flows only at river velocity of 0.1 fps. At lower velocity insufficient dilution occurs, and at higher velocity the plume moves beyond the mixing zone too rapidly for adequate dilution to occur. Based on earlier toxicity results, a dilution of only 2.4 (43 percent effluent) would be required. This dilution is met for all conditions.

To meet acute toxicity criteria in the current ZID under the most stringent conditions (0.0 fps river velocity) would require no toxicity in 70 percent effluent. The bioassay data are not complete enough to establish if this condition can be met.

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Temperature. Oregon Administrative Rules permit no measurable increase in temperature outside the mixing zone when the Willamette River temperature is greater than 70°F in the Portland Harbor.

The instantaneous excess plume centerline temperature (DTCL) can be calculated as

$$DTCL = \frac{T_{cl}-T_{ao}}{T_o-T_{ao}}$$

Where T_o is the initial discharge temperature, DTCL is the excess temperature at the plume centerline, T_{ao} is the initial ambient temperature, and T_{cl} is the instantaneous plume centerline temperature. For a discharge temperature of 25°C and an ambient temperature of 20°C, the excess temperature at the plume centerline at the edge of the mixing zone is predicted by the model to be between 0.13 and 0.65°C depending on effluent flow and river velocity. Averaged over the entire plume this would be approximately 0.07 to 0.32°C. At 100 feet from the outfall, the predicted change is less than 0.1°C. This is a small increase that probably could not be reliably detected in the field, and thus would not violate the temperature standard.

Table 5
Dilution Required to Meet Chronic Ambient Water Quality Criteria

		Required Dilution at Maximum Value	
Parameter	**Water Quality Criteria (mg/L)**	**At 1994 Value**	**At 1993 Value**
Chromium (VI)			
Chronic	0.011	0	4
Acute	0.16	0	-
Chromium (total)			
Chronic	0.210[a]	0	0
Acute	1.7	0	-
Fluoride	4[b]	2.3	0
Toxicity			
Chronic	None outside Zone	52[c]	2.3[c]

[a]Value depends on hardness, 100 mg/L as $CaCO_3$ is used.
[b]Based on drinking water standard.
[c]Based on IC_{25} value.

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References

Baumgartner, D.J., W.E. Frick, P.J.W. Roberts, and C.A. Bodeen, 1992. Dilution Models for Effluent Discharges. Document No. N210a. U. S. Environmental Protection Agency, Pacific Ecosystems Branch, ERL-N. Newport, Oregon.

Davis, L.R., 1989. "Application of EPA Computer Models in Buoyant Plume Prediction." ASME Symposium Volume, Heat transfer in Convective Flows, HTD-Vol. 107.

Muellenhoff, W.P. et al., 1985. Initial Mixing Characteristics of Municipal Ocean Discharges. Volume 1, Procedures and Applications. EPA 600/3-85-073a. U.S. Environmental Protection Agency, Office of Research and Development.

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Attachment 1

Current Direction and Velocity Data for the Willamette River

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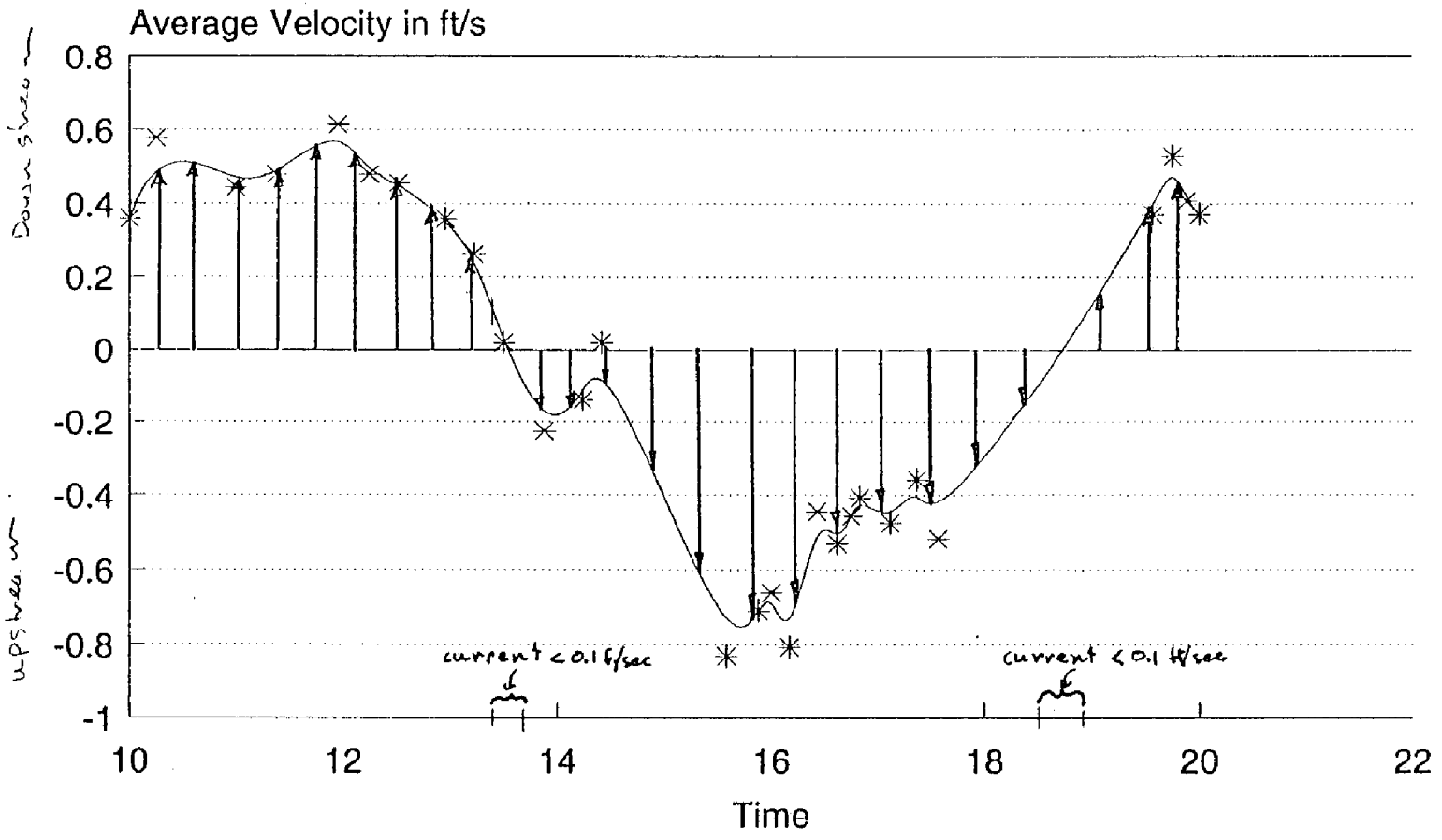
River Velocities



Average Velocity
10 AUG 1992
WILLAMETTE RIVER
R.M. 7.4

Attachment 2

Field Data from Willamette River near Wacker Siltronic Discharge

Willamette River Data

10-Aug-93

Site 1, 10:15			Site 5, 11:57			Site 8, 12:56			Site 13, 14:25		
Depth	Cond	Temp	Depth	Cond	Temp	Depth	Cond	Temp	Depth	Cond	Temp
0	160	23.2	0	132	23.5	0	158	24.2	0	128	24.8
3	175	23.2	3	132	23.5	5	151	24.0	6	140	24.5
6	195	23.2	6	130	23.2	10	140	23.8	12	120	24.0
9	200	23.0	9	124	23.2	15	130	23.5	18	135	23.9
12	210	23.2	12	120	23.0	20	130	23.5	24	160	23.5
15	210	23.2	15	118	23.0						
18	200	23.0									

Site 1, 15:35			Site 5, 16:26			Site 8, 16:50			Site 13, 17:34		
Depth	Cond	Temp	Depth	Cond	Temp	Depth	Cond	Temp	Depth	Cond	Temp
0	130	24.5	0	145	24.2	0	190	24.8	0	140	24.2
4	135	24.5	4	140	24.2	5	150	24.2	5	138	24.2
8	134	24.0	8	140	24.0	10	145	23.8	10	138	24.0
12	135	23.9	12	165	24.0	15	130	23.2	15	155	23.5
16	138	23.8	16	170	24.0	20	125	23.0	20	160	23.5
									25	135	23.5

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Attachment 3

UDKHDEN Model Output

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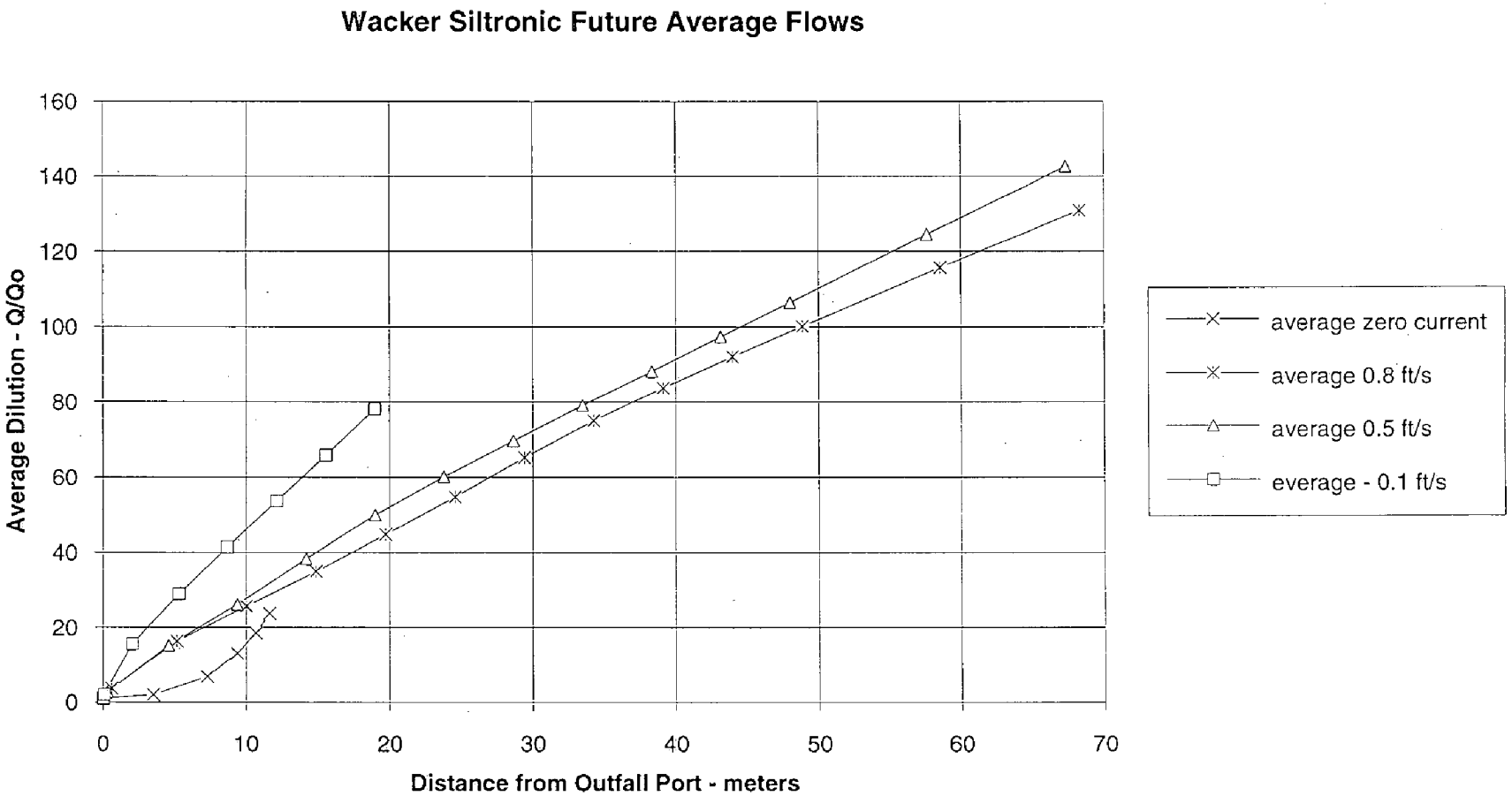
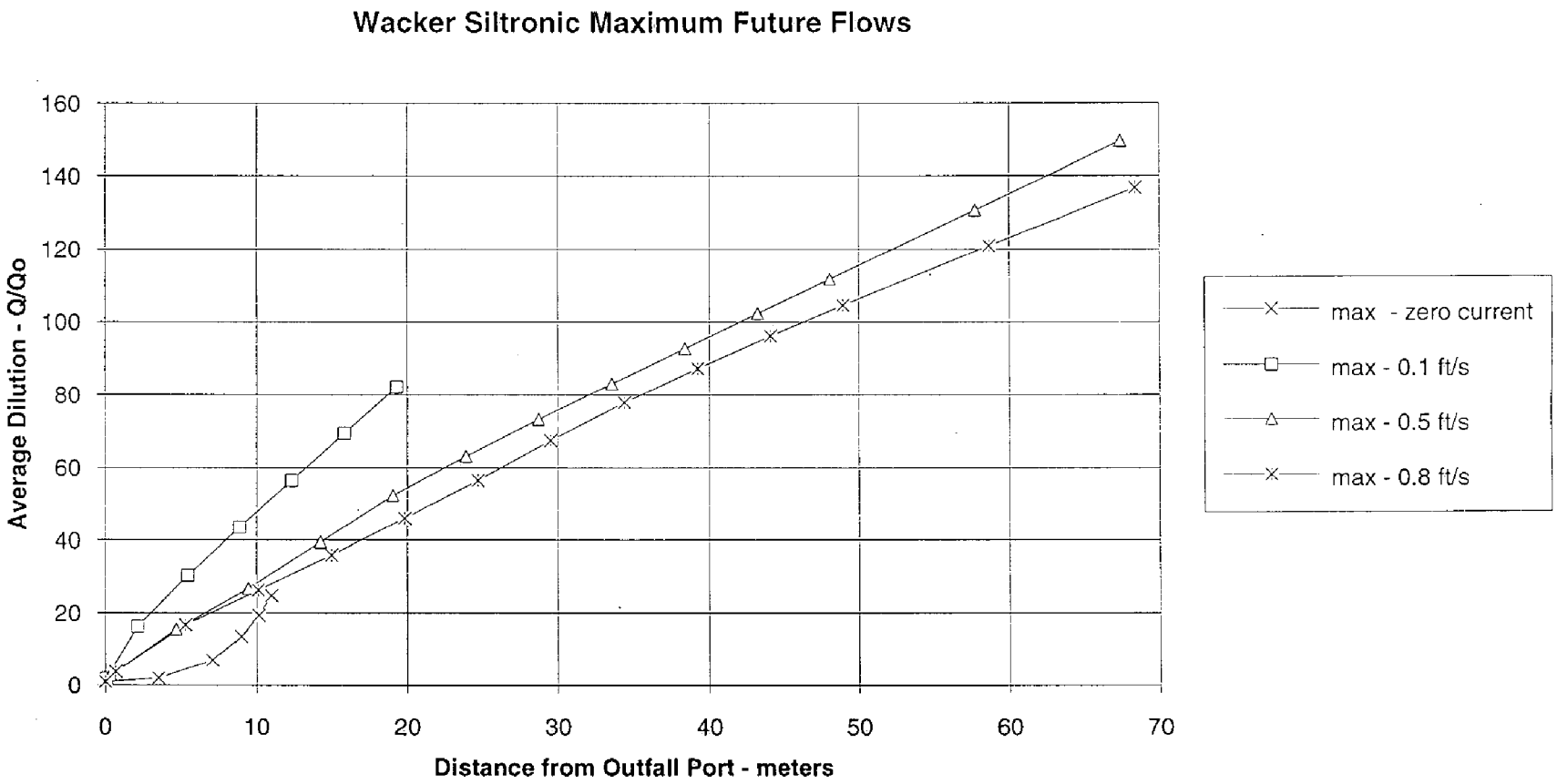
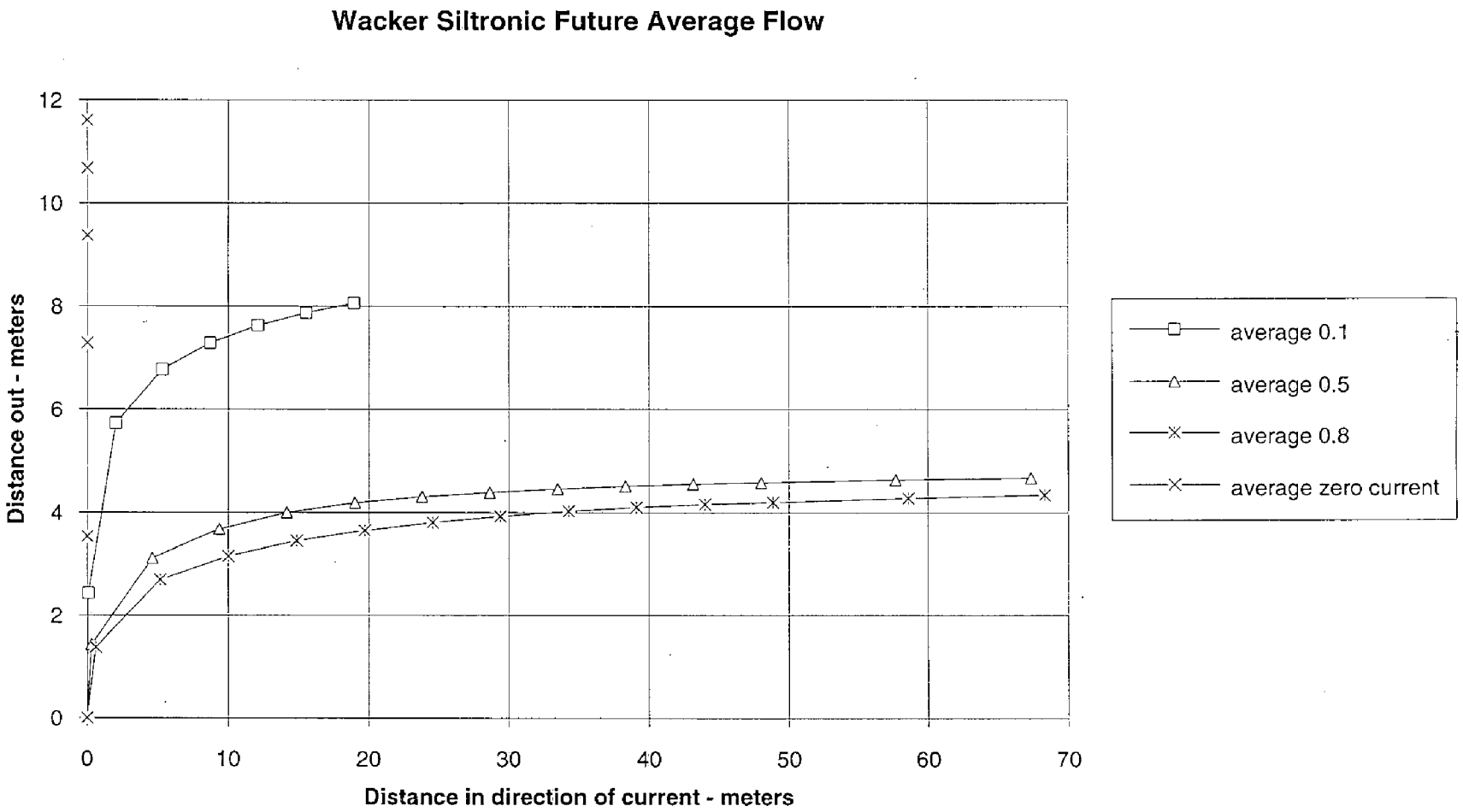

Wacker Siltronic Future Average Flows
Average Dilution - Q/Qo
160
140
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
Distance from Outfall Port - meters
average zero current
average 0.8 ft/s
average 0.5 ft/s
everage - 0.1 ft/s

DILUTION

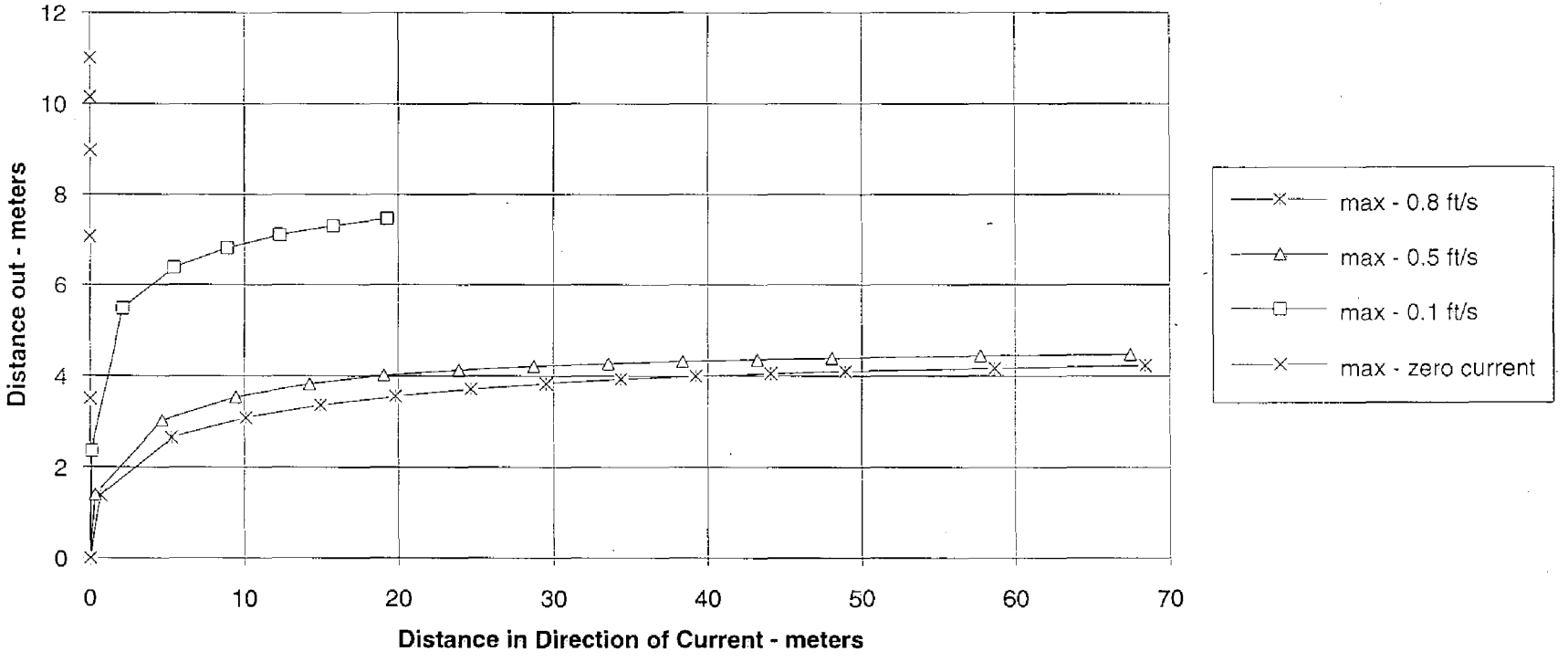

Wacker Siltronic Maximum Future Flows
Average Dilution - Q/Qo
160
140
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
Distance from Outfall Port - meters
max - zero current
max - 0.1 ft/s
max - 0.5 ft/s
max - 0.8 ft/s

DILUTION


Wacker Siltronic Future Average Flow
Distance out - meters
0
2
4
6
8
10
12
0
10
20
30
40
50
60
70
Distance in direction of current - meters
average 0.1
average 0.5
average 0.8
average zero current

TRAJECTORY

Wacker Siltronic Maximum Future Flows



TRAJECTORY

Attachment 4

OAR 340-41-442

(B) Avoid overlap with any other mixing zones to the extent possible and be less than the total stream width as necessary to allow passage of fish and other aquatic organisms;

(C) Minimize adverse effects on the indigenous biological community especially when species are present that warrant special protection for their economic importance, tribal significance, ecological uniqueness, or for other similar reasons as determined by the Department and does not block the free passage of aquatic life;

(D) Not threaten public health;

(E) Minimize adverse effects on other designated beneficial uses outside the mixing zone.

(d) The Department may request the applicant of a permitted discharge for which a mixing zone is required, to submit all information necessary to define a mixing zone, such as:

(A) Type of operation to be conducted;

(B) Characteristics of effluent flow rates and composition;

(C) Characteristics of low flows of receiving waters;

(D) Description of potential environmental effects;

(E) Proposed design for outfall structures.

(e) The Department may, as necessary, require mixing zone monitoring studies and/or bioassays to be conducted to evaluate water quality or biological status within and outside the mixing zone boundary;

(f) The Department may change mixing zone limits or require the relocation of an outfall if it determines that the water quality within the mixing zone adversely affects any existing beneficial uses in the receiving waters.

(5) Testing methods: The analytical testing methods for determining compliance with the water quality standards contained in this rule shall be in accordance with the most recent edition of **Standard Methods for the Examination of Water and Waste Water published jointly by the American Public Health Association, American Water Works Association, and Water Pollution Control Federation**, unless the Department has published an applicable superseding method, in which case testing shall be in accordance with the superseding method; provided, however, that testing in accordance with an alternative method shall comply with this rule if the Department has published the method or has approved the method in writing.

[**Publications:** The publication(s) referred to or incorporated by reference in this rule are available from the Department of Environmental Quality.]

Stat. Auth.: ORS 468B.035 & 468.735
Hist.: DEQ 128, f. & ef. 1-21-77; DEQ 1-1980, f. & ef. 1-9-80; DEQ 18-1987, f. & ef. 9-4-87; DEQ 14-1991, f. & cert. ef. 8-13-91; DEQ 17-1992, f. & cert. ef. 8-7-92 (and corrected 8-13-92)

Minimum Design Criteria for Treatment and Control of Wastes

340-41-375 Subject to the implementation program set forth in OAR 340-41-120, prior to discharge of any waste from any new or modified facility to any waters of the Rogue River Basin, such wastes shall be treated and controlled in facilities designed in accordance with the following minimum criteria. (In designing treatment facilities, average conditions and a normal range of variability are generally used in establishing design criteria. A facility once completed and placed in operation should operate at or near the design limit most of the time but may operate below the design criteria limit at times due to variables which are unpredictable or uncontrollable. This is particularly true for biological treatment facilities. The actual operating limits are intended to be established by permit pursuant to ORS 468.740 and recognize that the actual performance level may at times be less than the design criteria.):

(1) Sewage wastes:

(a) During periods of low stream flows (approximately May 1 to October 31): Treatment resulting in monthly average effluent concentrations not to exceed 10 mg/l of BOD and 10 mg/l of SS or equivalent control;

(b) During the period of high stream flows (approximately November 1 to April 30): A minimum of secondary treatment or equivalent control and unless otherwise specifically authorized by the Department, operation of all waste treatment and control facilities at maximum practicable efficiency and effectiveness so as to minimize waste discharges to public waters;

(c) Effluent BOD concentrations in mg/l, divided by the dilution factor (ratio of receiving stream flow to effluent flow) shall not exceed one unless otherwise approved by the EQC;

(d) Sewage wastes shall be disinfected, after treatment, equivalent to thorough mixing with sufficient chlorine to provide a residual of at least 1 part per million after 60 minutes of contact time unless otherwise specifically authorized by permit;

(e) Positive protection shall be provided to prevent bypassing raw or inadequately treated sewage to public waters unless otherwise approved by the Department where elimination of inflow and infiltration would be necessary but not presently practicable;

(f) More stringent waste treatment and control requirements may be imposed where special conditions may require.

(2) Industrial wastes:

(a) After maximum practicable inplant control, a minimum of secondary treatment or equivalent control (reduction of suspended solids and organic material where present in significant quantities, effective disinfection where bacterial organisms of public health significance are present, and control of toxic or other deleterious substances);

(b) Specific industrial waste treatment requirements shall be determined on an individual basis in accordance with the provisions of this plan, applicable federal requirements, and the following:

(A) The uses which are or may likely be made of the receiving stream;

(B) The size and nature of flow of the receiving stream;

(C) The quantity and quality of wastes to be treated; and

(D) The presence or absence of other sources of pollution on the same watershed.

(c) Where industrial, commercial, or agricultural effluents contain significant quantities of potentially toxic elements, treatment requirements shall be determined utilizing appropriate bioassays;

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(d) Industrial cooling waters containing significant heat loads shall be subjected to offstream cooling or heat recovery prior to discharge to public waters;

(e) Positive protection shall be provided to prevent bypassing of raw or inadequately treated industrial wastes to any public waters;

(f) Facilities shall be provided to prevent and contain spills of potentially toxic or hazardous materials and a positive program for containment and cleanup of such spills should they occur shall be developed and maintained.

Stat. Auth.: ORS Ch. 468
Hist.: DEQ 128, f. & ef. 1-21-77

Special Policies and Guidelines

340-41-385 In order to improve water quality within the Bear Creek subbasin to meet existing water quality standards for dissolved oxygen and pH, the following special rules for total maximum daily loads, waste load allocations, load allocations, and program plans are established.

(1) After the completion of wastewater control facilities and program plans approved by the Commission under this rule and no later than December 31, 1994, unless otherwise modified by program plans no activities shall be allowed and no wastewater shall be discharged to Bear Creek or its tributaries without the authorization of the Commission that cause the following parameters to be exceeded in Bear Creek:

Low-Flow Season
Approximately
May 1 through November 30*

Ammonia Nitrogen Nitrogen as N (mg/l)	Instream Five-Day Biochemical Oxygen (Demand (mg/l)[1]	Total Phosphorus as P (mg/l)
0.25	3.0	0.08

High Flow Season
Approximately
December 1 through April 30*

Ammonia Nitrogen Nitrogen as N (mg/l)	Instream Five-Day Biochemical Oxygen Demand (mg/l)[2]
1.0	2.5

[1]As measured at the Valley View Road Sampling Site. For the purposes of waste load allocations, the biochemical oxygen demand is calculated as the ammonia concentration multiplied by 4.35 and added to the measured effluent biochemical oxygen demand.
[2]Median value as measured at the Kirtland Road sampling site.
*Precise dates for complying with this rule may be conditioned on physical conditions, such as flow and temperature, of the receiving stream and shall be specified in individual permits or memorandums of understanding issued by the Department.

(2) The Department shall before September 30, 1990 distribute initial waste load and load allocations to point and nonpoint sources in the basin. These loads are interim and may be redistributed upon conclusion of the approved program plans;

(3) Before October 21, 1989, the City of Ashland shall submit to the Department a program plan and time schedule describing how and when they will modify their sewerage facility to comply with this rule and all other applicable rules regulating waste discharges;

(4) Before May 25, 1991, the industries permitted for log pond discharge, Boise Cascade Corporation, Kogap Manufacturing Company, and Medford Corporation shall submit program plans to the Department describing how and when they will modify their operations to comply with this rule and all other applicable rules regulating waste discharge;

(5) Before June 1, 1992, Jackson County and the incorporated cities within the Bear Creek subbasin shall submit to the Department a program plan for controlling urban runoff within their respective jurisdictions to comply with these rules;

(6) Before June 1, 1992, the Departments of Forestry and Agriculture shall submit to the Department program plans for achieving specified load allocations of state and private forest lands and agricultural lands respectively;

(7) Program plans shall be reviewed and approved by the Commission. All proposed final program plans shall be subject to public comment and hearing prior to consideration for approval by the Commission.

Stat. Auth.: ORS 468.710 & 468.735
Hist.: DEQ 17-1989, f. & cert. ef. 7-31-89; DEQ 40-1990, f. & cert. ef. 11-15-90

Willamette Basin

Beneficial Water Uses to be Protected

340-41-442 Water quality in the Willamette River Basin (see **Figures** 1 and 7) shall be managed to protect the recognized beneficial uses as indicated in **Table 6.**

Stat. Auth.: ORS Ch. 468
Hist.: DEQ 128, f. & ef. 1-21-77

Water Quality Standards Not to be Exceeded (To be Adopted Pursuant to ORS 468.735 and Enforceable Pursuant to ORS 468.720, 468.990, and 468.992)

340-41-445 (1) Notwithstanding the water quality standards contained below, the highest and best practicable treatment and/or control of wastes, activities, and flows shall in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels.

(2) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the Willamette River Basin:

(a) Dissolved oxygen (DO):

(A) Multnomah Channel and main stem

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Willamette River from mouth to the Willamette Falls at Oregon City, river mile 26.6: The DO concentrations shall not be less than 5 mg/l;

(B) Main stem Willamette River from the Willamette Falls to Newberg, river mile 50: The DO concentrations shall not be less than 6 mg/l;

(C) Main stem Willamette River from Newberg to Salem, river mile 85: The DO concentrations shall not be less than 7 mg/l;

(D) Main stem Willamette River from Salem to confluence of Coast and Middle Forks, river mile 187: The DO concentrations shall not be less than 90 percent of saturation;

(E) All other Willamette Basin streams:

(i) Salmonid fish producing waters: The DO concentration shall not be less than 90 percent of saturation at seasonal low or less than 95 percent of saturation in spawning areas during spawning, incubation, hatching, and fry stages of salmonid fishes;

(ii) Non-Salmonid fish producing waters: The DO concentration shall not be less than 6 mg/l.

(F) Columbia River (river mile 86 to 120): The DO concentration shall not be less than 90 percent of saturation.

(b) Temperature:

(A) Multnomah Channel and the main stem Willamette River from mouth to Newberg, river mile 50: No measurable increases shall be allowed outside of the assigned mixing zone, as measured relative to a control point immediately upstream from a discharge when stream temperatures are 70° F. or greater; or more than 0.5° F. increase due to a single-source discharge when receiving water temperatures are 69.5° F. or less; or more than 2° F. increase due to all sources combined when stream temperatures are 68° F. or less, except for specifically limited duration activities which may be authorized by DEQ under such conditions as DEQ and the Department of Fish and Wildlife may prescribe and which are necessary to accommodate legitimate uses or activities where temperatures in excess of this standard are unavoidable and all practical preventive techniques have been applied to minimize temperature rises. The Director shall hold a public hearing when a request for an exception to the temperature standard for a planned activity or discharge will in all probability adversely affect the beneficial uses;

(B) Willamette River from Newberg to confluence of Coast and Middle Forks, river mile 187: No measurable increases shall be allowed outside of the assigned mixing zone, as measured relative to a control point immediately upstream from a discharge when stream temperatures are 64° F. or greater; or more than 0.5° F. increase due to a single-source discharge when receiving water temperatures are 63.5° F. or less; or more than 2° F. increase due to all sources combined when stream temperatures are 62° F. or less, except for specifically limited duration activities which may be authorized by DEQ under such conditions as DEQ and the Department of Fish and Wildlife may prescribe and which are necessary to accommodate legitimate uses or activities where temperatures in excess of this standard are unavoidable and all practical preventive techniques have been applied to minimize temperature rises. The Director shall hold a public hearing when a request for an exception to the temperature standard for a planned activity or discharge will in all probability adversely affect the beneficial uses;

(C) All other Willamette Basin streams:

(i) Salmonid fish producing waters: No measurable increases shall be allowed outside of the assigned mixing zone, as measured relative to a control point immediately upstream from a discharge when stream temperatures are 58° F. or greater; or more than 0.5° F. increase due to a single-source discharge when receiving water temperatures are 57.5° F. or less; or more than 2° F. increase due to all sources combined when stream temperatures are 56° F. or less, except for specifically limited duration activities which may be authorized by DEQ under such conditions as DEQ and the Department of Fish and Wildlife may prescribe and which are necessary to accommodate legitimate uses or activities where temperatures in excess of this standard are unavoidable and all practical preventive techniques have been applied to minimize temperature rises. The Director shall hold a public hearing when a request for an exception to the temperature standard for a planned activity or discharge will in all probability adversely affect the beneficial uses;

(ii) Non-Salmonid fish producing waters: No measurable increases shall be allowed outside of the assigned mixing zone, as measured relative to a control point immediately upstream from a discharge when stream temperatures are 64° F. or greater; or more than 0.5° F. increase due to a single-source discharge when receiving water temperatures are 63.5° F. or less; or more than 2° F. increase due to all sources combined when stream temperatures are 62° F. or less, except for specifically limited duration activities which may be authorized by DEQ under such conditions as DEQ and the Department of Fish and Wildlife may prescribe and which are necessary to accommodate legitimate uses or activities where temperatures in excess of this standard are unavoidable and all practical preventive techniques have been applied to minimize temperature rises. The Director shall hold a public hearing when a request for an exception to the temperature standard for a planned activity or discharge will in all probability adversely affect the beneficial uses.

(D) Columbia River: No measurable increases shall be allowed outside of the assigned mixing zone, as measured relative to a control point immediately upstream from a discharge when stream temperatures are 68° F. or greater; or more than 0.5° F. increase due to a single-source discharge when receiving water temperatures are 67.5° F. or less; or more than 2° F. increase due to all sources combined when stream temperatures are 66° F. or less, except for specifically limited duration activities which may be authorized by DEQ under such conditions as DEQ and the Department of Fish and Wildlife may prescribe and which are necessary to accommodate legitimate uses or activities where temperatures in excess of this standard are unavoidable and all practical preventive techniques have been applied to minimize temperature rises. The Director shall hold a public hearing when a request for an exception to the temperature standard for a planned activity or discharge will in all probability adversely affect the beneficial uses.

(c) Turbidity (Nephelometric Turbidity Units,

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NTU): No more than a ten percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied and one of the following has been granted:

(A) Emergency activities: Approval coordinated by DEQ with the Department of Fish and Wildlife under conditions they may prescribe to accommodate response to emergencies or to protect public health and welfare;

(B) Dredging, Construction or other Legitimate Activities: Permit or certification authorized under terms of Section 401 or 404 (Permits and Licenses, Federal Water Pollution Control Act) or OAR 141-85-100 et seq. (Removal and Fill Permits, Division of State Lands), with limitations and conditions governing the activity set forth in the permit or certificate.

(d) pH (hydrogen ion concentration): pH values shall not fall outside the following ranges:

(A) Columbia River: 7.0 - 8.5;

(B) All other basin waters: 6.5 - 8.5.

(e) Bacteria Standards:

(A) Effective upon filing and through June 30, 1995. Organisms of the coliform group where associated with fecal sources (MPN or equivalent MF using a representative number of samples). Freshwaters: A log mean of 200 fecal coliform per 100 milliliters based on a minimum of five samples in a 30-day period with no more than ten percent of the samples in the 30-day period exceeding 400 per 100 ml.

(B) Effective July 1, 1995. Bacteria of the coliform group associated with fecal sources and bacteria of the enterococci group (MPN or equivalent membrane filtration using a representative number of samples) shall not exceed the criteria values described in this paragraph. However, the Department may designate site-specific bacteria criteria on a case-by-case basis to protect beneficial uses. Site specific values shall be described in and included as part of a water quality management plan. Freshwaters: A geometric mean of 33 enterococci per 100 milliliters based on no fewer than five samples, representative of seasonal conditions, collected over a period of at least 30 days. No single sample should exceed 61 enterococci per 100 ml.

(f) Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health shall not be allowed;

(g) The liberation of dissolved gases, such as carbon dioxide, hydrogen sulfide, or other gases, in sufficient quantities to cause objectionable odors or to be deleterious to fish or other aquatic life, navigation, recreation, or other reasonable uses made of such waters shall not be allowed;

(h) The development of fungi or other growths having a deleterious effect on stream bottoms, fish or other aquatic life, or which are injurious to health, recreation, or industry shall not be allowed;

(i) The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed;

(j) The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry shall not be allowed;

(k) Objectionable discoloration, scum, oily sleek or floating solids, or coating of aquatic life with oil films shall not be allowed;

(l) Aesthetic conditions offensive to the human senses of sight, taste, smell, or touch shall not be allowed;

(m) Radioisotope concentrations shall not exceed maximum permissible concentrations (MPC's) in drinking water, edible fishes or shellfishes, wildlife, irrigated crops, livestock and dairy products, or pose an external radiation hazard;

(n) The concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 110 percent of saturation, except when stream flow exceeds the ten-year, seven-day average flood. However, for Hatchery receiving waters and waters of less than two feet in depth, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 105 percent of saturation;

(o) Total Dissolved Solids: Guide concentrations listed below shall not be exceeded unless otherwise specifically authorized by DEQ upon such conditions as it may deem necessary to carry out the general intent of this plan and to protect the beneficial uses set forth in OAR 340-41-442:

(A) Columbia River.....500.0 mg/l;

(B) Willamette River and Tributaries.100.0 mg/l.

(p) Toxic Substances:

(A) Toxic substances shall not be introduced above natural background levels in the waters of the state in amounts, concentrations, or combinations which may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses;

(B) Levels of toxic substances shall not exceed the criteria listed in Table 20 which were based on criteria established by EPA and published in **Quality Criteria for Water (1986)**, unless otherwise noted;

(C) The criteria in paragraph (B) of this subsection shall apply unless data from scientifically valid studies demonstrate that the most sensitive designated beneficial uses will not be adversely affected by exceeding a criterion or that a more restrictive criterion is warranted to protect beneficial uses, as accepted by the Department on a site specific basis. Where no published EPA criteria exist for a toxic substance, public health advisories and other published scientific literature may be considered and used, if appropriate, to set guidance values;

(D) Bio-assessment studies such as laboratory bioassays or instream measurements of indigenous biological communities, shall be conducted, as the Department deems necessary, to monitor the toxicity of complex effluents, other suspected

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discharges or chemical substances without numeric criteria, to aquatic life. These studies, properly conducted in accordance with standard testing procedures, may be considered as scientifically valid data for the purposes of paragraph (C) of this subsection. If toxicity occurs, the Department shall evaluate and implement measures necessary to reduce toxicity on a case-by-case basis.

(3) Where the natural quality parameters of waters of the Willamette River Basin are outside the numerical limits of the above assigned water quality standards, the natural water quality shall be the standard.

(4) Mixing zones:

(a) The Department may allow a designated portion of a receiving water to serve as a zone of dilution for wastewaters and receiving waters to mix thoroughly and this zone will be defined as a mixing zone;

(b) The Department may suspend all or part of the water quality standards, or set less restrictive standards, in the defined mixing zone, provided that the following conditions are met:

(A) The water within the mixing zone shall be free of:

(i) Materials in concentrations that will cause acute toxicity to aquatic life as measured by a Department approved bioassay method. Acute toxicity is lethality to aquatic life as measured by a significant difference in lethal concentration between the control and 100 percent effluent in an acute bioassay test. Lethality in 100 percent effluent may be allowed due to ammonia and chlorine only when it is demonstrated on a case-by-case basis that immediate dilution of the effluent within the mixing zone reduces toxicity below lethal concentrations. The Department may on a case-by-case basis establish a zone of immediate dilution if appropriate for other parameters;

(ii) Materials that will settle to form objectionable deposits;

(iii) Floating debris, oil, scum, or other materials that cause nuisance conditions;

(iv) Substances in concentrations that produce deleterious amounts of fungal or bacterial growths.

(B) The water outside the boundary of the mixing zone shall:

(i) Be free of materials in concentrations that will cause chronic (sublethal) toxicity. Chronic toxicity is measured as the concentration that causes long-term sublethal effects, such as significantly impaired growth or reproduction in aquatic organisms, during a testing period based on test species life cycle. Procedures and end points will be specified by the Department in wastewater discharge permits;

(ii) Meet all other water quality standards under normal annual low flow conditions.

(c) The limits of the mixing zone shall be described in the wastewater discharge permit. In determining the location, surface area, and volume of a mixing zone area, the Department may use appropriate mixing zone guidelines to assess the biological, physical, and chemical character of receiving waters, and effluent, and the most appropriate placement of the outfall, to protect instream water quality, public health, and other beneficial uses. Based on receiving water and effluent characteristics, the Department shall define a mixing zone in the immediate area of a wastewater discharge to:

(A) Be as small as feasible;

(B) Avoid overlap with any other mixing zones to the extent possible and be less than the total stream width as necessary to allow passage of fish and other aquatic organisms;

(C) Minimize adverse effects on the indigenous biological community especially when species are present that warrant special protection for their economic importance, tribal significance, ecological uniqueness, or for other similar reasons as determined by the Department and does not block the free passage of aquatic life;

(D) Not threaten public health;

(E) Minimize adverse effects on other designated beneficial uses outside the mixing zone.

(d) The Department may request the applicant of a permitted discharge for which a mixing zone is required, to submit all information necessary to define a mixing zone, such as:

(A) Type of operation to be conducted;

(B) Characteristics of effluent flow rates and composition;

(C) Characteristics of low flows of receiving waters;

(D) Description of potential environmental effects;

(E) Proposed design for outfall structures.

(e) The Department may, as necessary, require mixing zone monitoring studies and/or bioassays to be conducted to evaluate water quality or biological status within and outside the mixing zone boundary;

(f) The Department may change mixing zone limits or require the relocation of an outfall if it determines that the water quality within the mixing zone adversely affects any existing beneficial uses in the receiving waters.

(5) Testing methods: The analytical testing methods for determining compliance with the water quality standards contained in this rule shall be in accordance with the most recent edition of **Standard Methods for the Examination of Water and Waste Water published jointly by the American Public Health Association, American Water Works Association, and Water Pollution Control Federation**, unless the Department has published an applicable superseding method, in which case testing shall be in accordance with the superseding method; provided, however, that testing in accordance with an alternative method shall comply with this rule if the Department has published the method or has approved the method in writing.

[**Publications:** The publication(s) referred to or incorporated by reference in this rule are available from the Department of Environmental Quality.]

Stat. Auth.: ORS 468B.035 & 468.735
Hist.: DEQ 128, f. & ef. 1-21-77; DEQ 1-1980, f. & ef. 1-9-80; DEQ 18-1987, f. & ef. 9-4-87; DEQ 14-1991, f. & cert. ef. 8-13-91; DEQ 17-1992, f. & cert. ef. 8-7-92 (and corrected 8-13-92)

Minimum Design Criteria for Treatment and Control of Wastes

340-41-455 Subject to the implementation

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program set forth in OAR 340-41-120, prior to discharge of any wastes from any new or modified facility to any waters of the Willamette River Basin, such wastes shall be treated and controlled in facilities designed in accordance with the following minimum criteria. (In designing treatment facilities, average conditions and a normal range of variability are generally used in establishing design criteria. A facility once completed and placed in operation should operate at or near the design limit most of the time but may operate below the design criteria limit at times due to variables which are unpredictable or uncontrollable. This is particularly true for biological treatment facilities. The actual operating limits are intended to be established by permit pursuant to ORS 468.740 and recognize that the actual performance level may at times be less than the design criteria).

(1) Sewage wastes:

(a) Willamette River and tributaries except Tualatin River Subbasin:

(A) During periods of low stream flows (approximately May 1 to October 31): Treatment resulting in monthly average effluent concentra-tions not to exceed 10 mg/l of BOD and 10 mg/l of SS or equivalent control;

(B) During the period of high stream flows (approximately November 1 to April 30): A minimum of secondary treatment or equivalent control and unless otherwise specifically authorized by the Department, operation of all waste treatment and control facilities at maximum practical efficiency and effectiveness so as to minimize waste discharges to public waters.

(b) Main stem Tualatin River from mouth to Gaston (river mile 0 to 65):

(A) During periods of low stream flows (approximately May 1 to October 31): Treatment resulting in monthly average effluent concentrations not to exceed 10 mg/l of BOD and 10 mg/l of SS or equivalent control;

(B) During the period of high stream flows (approximately November 1 to April 30): Treatment resulting in monthly average effluent concentrations not to exceed 20 mg/l of BOD and 20 mg/l of SS or equivalent control.

(c) Main stem Tualatin River above Gaston (river mile 65) and all tributaries to the Tualatin River: Treatment resulting in monthly average effluent concentrations not to exceed 5 mg/l of BOD and 5 mg/l of SS or equivalent control;

(d) Tualatin River Subbasin: The dissolved oxygen level in the discharged effluents shall not be less than 6 mg/l;

(e) Main stem Columbia River:

(A) During summer (May 1 to October 31): Treatment resulting in monthly average effluent concentrations not to exceed 20 mg/l of BOD and 20 mg/l of SS or equivalent control;

(B) During winter (November 1 to April 30): A minimum of secondary treatment or equivalent control and unless otherwise specifically authorized by the Department, operation of all waste treatment and control facilities at maximum practicable efficiency and effectiveness so as to minimize waste discharges to public waters.

(f) Effluent BOD concentrations in mg/l, divided by the dilution factor (ratio of receiving stream flow to effluent flow) shall not exceed one unless otherwise specifically approved by the Environmental Quality Commission;

(g) Sewage wastes shall be disinfected, after treatment, equivalent to thorough mixing with sufficient chlorine to provide a residual of at least one part per million after 60 minutes of contact time unless otherwise specifically authorized by permit;

(h) Positive protection shall be provided to prevent bypassing raw or inadequately treated sewage to public waters unless otherwise approved by the Department where elimination of inflow and infiltration would be necessary but not presently practicable;

(i) More stringent waste treatment and control requirements may be imposed where special conditions may require.

(2) Industrial wastes:

(a) After maximum practicable inplant control, a minimum of secondary treatment or equivalent control (reduction of suspended solids and organic material where present in significant quantities, effective disinfection where bacterial organisms of public health significance are present, and control of toxic or other deleterious substances);

(b) Specific industrial waste treatment requirements shall be determined on an individual basis in accordance with the provisions of this plan, applicable federal requirements, and the following:

(A) The uses which are or may likely be made of the receiving stream;

(B) The size and nature of flow of the receiving stream;

(C) The quantity and quality of wastes to be treated; and

(D) The presence or absence of other sources of pollution on the same watershed.

(c) Where industrial, commercial, or agricultural effluents contain significant quantities of potentially toxic elements, treatment requirements shall be determined utilizing appropriate bioassays;

(d) Industrial cooling waters containing significant heat loads shall be subjected to offstream cooling or heat recovery prior to discharge to public waters;

(e) Positive protection shall be provided to prevent bypassing of raw or inadequately treated industrial wastes to any public waters;

(f) Facilities shall be provided to prevent and contain spills of potentially toxic or hazardous materials and a positive program for containment and cleanup of such spills should they occur shall be developed and maintained.

(3) Nonpoint source pollution control in the Tualatin River subbasin and lands draining to Oswego Lake:

(a) Subsection (3)(b) of this rule shall apply to any new land development within the Tualatin River and Oswego Lake subbasins, except those developments with application dates prior to January 1, 1990. The application date shall be the date on which a complete application for development approval is received by the local jurisdiction in accordance with the regulations of the local jurisdiction;

(b) For land development, no preliminary plat, site plan, permit or public works project shall be approved by any jurisdiction in these subbasins unless the conditions of the plat permit or plan approval includes an erosion control plan

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PROGRAM UDKHDEN - V:2.7
SOLUTION TO MULTIPLE BUOYANT DISCHARGE PROBLEM WITH
AMBIENT CURRENTS AND VERTICAL GRADIENTS. MAY 1994

UDKHDEN Version 2.7 (5-14-94)
UNIVERSAL DATA FILE: wacker.in
CASE I.D. Wacker Siltronics - average future flow - image method- zero current
DISCHARGE= 0.3330CU-M/S * TEMPERATURE= 25.00-C * SALINITY= 0.000-PPT
DIA-M= 0.6090 * NO. OF PORTS= 3 * SPACING= 6.10-M * DEPTH= 20.00-M
VERTICAL ANGLE = -5.00 * HORIZONTAL ANGLE = 0.00

AMBIENT STRATIFICATION PROFILE

DEPTH (M)	TEMP (C)	SALINITY (PPT)	DENSITY (G/CM3)	VELOCITY (M/S)
0.00	20.00	0.00	0:99827	0.000
30.00	20.00	0.00	0.99827	0.000

FROUDE NO= 4.57, PORT SPACING/PORT DIA= 10.01
STARTING LENGTH= 3.519

ALL LENGTHS ARE IN METERS. FIRST LINE ARE INITIAL CONDITIONS.

X	Y	Z	DIAM.	DRHO	DTCL	DSCL	DILUTION
0.00	0.00	0.00	0.61	1.000	1.000	1.000	1.00
3.53	0.00	0.30	1.70	0.957	0.961	0.961	2.00
7.29	0.00	3.22	4.44	0.261	0.283	0.283	6.81
PLUMES MERGING							
9.37	0.00	7.60	6.48	0.134	0.147	0.147	13.08
10.67	0.00	12.30	7.60	0.094	0.104	0.104	18.55
11.61	0.00	17.08	8.54	0.072	0.080	0.080	23.72

DILUTION= 26.63

PROGRAM UDKHDEN - V:2.7
SOLUTION TO MULTIPLE BUOYANT DISCHARGE PROBLEM WITH
AMBIENT CURRENTS AND VERTICAL GRADIENTS. MAY 1994

UDKHDEN Version 2.7 (5-14-94)
UNIVERSAL DATA FILE: wacker.in
CASE I.D. Wacker Siltronics - average future flow - image method- .1 ft/s
DISCHARGE= 0.3330CU-M/S * TEMPERATURE= 25.00-C * SALINITY= 0.000-PPT
DIA-M= 0.6090 * NO. OF PORTS= 3 * SPACING= 6.10-M * DEPTH= 20.00-M
VERTICAL ANGLE = -5.00 * HORIZONTAL ANGLE = 0.00

AMBIENT STRATIFICATION PROFILE

DEPTH (M)	TEMP (C)	SALINITY (PPT)	DENSITY (G/CM3)	VELOCITY (M/S)
0.00	20.00	0.00	0.99827	0.030
30.00	20.00	0.00	0.99827	0.030

FROUDE NO= 4.57, PORT SPACING/PORT DIA= 10.01
STARTING LENGTH= 2.431

ALL LENGTHS ARE IN METERS. FIRST LINE ARE INITIAL CONDITIONS.

X	Y	Z	DIAM.	DRHO	DTCL	DSCL	DILUTION
0.00	0.00	0.00	0.61	1.000	1.000	1.000	1.00
2.43	0.08	0.07	1.67	0.987	0.989	0.989	1.98
PLUMES MERGING							
5.73	2.04	2.64	7.22	0.141	0.155	0.155	15.58
6.78	5.33	6.06	10.99	0.062	0.069	0.069	28.94
7.29	8.71	9.52	15.10	0.036	0.041	0.041	41.41
7.63	12.11	13.00	19.18	0.028	0.031	0.031	53.68
7.87	15.52	16.46	23.30	0.023	0.025	0.025	65.90
8.06	18.95	19.93	27.44	0.019	0.021	0.021	78.10

DILUTION= 78.36

PROGRAM UDKHDEN - V:2.7
SOLUTION TO MULTIPLE BUOYANT DISCHARGE PROBLEM WITH
AMBIENT CURRENTS AND VERTICAL GRADIENTS. MAY 1994

UDKHDEN Version 2.7 (5-14-94)
UNIVERSAL DATA FILE: wacker.in
CASE I.D. Wacker Siltronics - average future flow - image method - .5 ft/s
DISCHARGE= 0.3330CU-M/S * TEMPERATURE= 25.00-C * SALINITY= 0.000-PPT
DIA-M= 0.6090 * NO. OF PORTS= 3 * SPACING= 6.10-M * DEPTH= 20.00-M
VERTICAL ANGLE = -5.00 * HORIZONTAL ANGLE = 0.00

AMBIENT STRATIFICATION PROFILE

DEPTH (M)	TEMP (C)	SALINITY (PPT)	DENSITY (G/CM3)	VELOCITY (M/S)
0.00	20.00	0.00	0.99827	0.152
30.00	20.00	0.00	0.99827	0.152

FROUDE NO= 4.57, PORT SPACING/PORT DIA= 10.01
STARTING LENGTH= 1.475

ALL LENGTHS ARE IN METERS. FIRST LINE ARE INITIAL CONDITIONS.

X	Y	Z	DIAM.	DRHO	DTCL	DSCL	DILUTION
0.00	0.00	0.00	0.61	1.000	1.000	1.000	1.00
1.43	0.31	-0.02	1.61	0.998	0.998	0.998	2.71
3.12	4.62	0.60	3.81	0.253	0.275	0.275	15.24
3.68	9.38	1.44	4.95	0.144	0.159	0.159	26.11
4.00	14.17	2.26	5.97	0.097	0.108	0.108	38.33
PLUMES MERGING							
4.19	18.99	2.99	6.99	0.071	0.079	0.079	49.96
4.31	23.81	3.64	8.00	0.054	0.060	0.060	60.13
4.39	28.65	4.25	9.00	0.042	0.047	0.047	69.71
4.46	33.48	4.85	10.01	0.034	0.038	0.038	79.04
4.51	38.32	5.45	11.02	0.028	0.031	0.031	88.24
4.55	43.15	6.04	12.03	0.023	0.026	0.026	97.37
4.58	47.99	6.63	13.04	0.020	0.022	0.022	106.44
4.63	57.66	7.80	15.09	0.017	0.019	0.019	124.52
4.67	67.33	8.97	17.15	0.015	0.017	0.017	142.55

PROGRAM UDKHDEN - V:2.7
SOLUTION TO MULTIPLE BUOYANT DISCHARGE PROBLEM WITH
AMBIENT CURRENTS AND VERTICAL GRADIENTS. MAY 1994

UDKHDEN Version 2.7 (5-14-94)
UNIVERSAL DATA FILE: wacker.in
CASE I.D. Wacker Siltronics - average future flow - image method - .8 ft/s
DISCHARGE= 0.3330CU-M/S * TEMPERATURE= 25.00-C * SALINITY= 0.000-PPT
DIA-M= 0.6090 * NO. OF PORTS= 3 * SPACING= 6.10-M * DEPTH= 20.00-M
VERTICAL ANGLE = -5.00 * HORIZONTAL ANGLE = 0.00

AMBIENT STRATIFICATION PROFILE

DEPTH (M)	TEMP (C)	SALINITY (PPT)	DENSITY (G/CM3)	VELOCITY (M/S)
0.00	20.00	0.00	0.99827	0.244
30.00	20.00	0.00	0.99827	0.244

FROUDE NO= 4.57, PORT SPACING/PORT DIA= 10.01
STARTING LENGTH= 1.549

ALL LENGTHS ARE IN METERS. FIRST LINE ARE INITIAL CONDITIONS.

X	Y	Z	DIAM.	DRHO	DTCL	DSCL	DILUTION
0.00	0.00	0.00	0.61	1.000	1.000	1.000	1.00
1.38	0.61	-0.03	1.52	0.998	0.998	0.998	3.64
2.70	5.18	0.27	3.16	0.269	0.291	0.291	16.35
3.16	10.01	0.68	3.92	0.166	0.183	0.183	25.61
3.45	14.86	1.11	4.55	0.120	0.132	0.132	34.98
3.65	19.71	1.55	5.13	0.093	0.103	0.103	44.68
3.81	24.56	1.97	5.67	0.075	0.084	0.084	54.79
PLUMES MERGING							
3.93	29.41	2.39	6.19	0.063	0.070	0.070	65.29
4.03	34.27	2.77	6.73	0.053	0.059	0.059	74.97
4.10	39.12	3.12	7.27	0.045	0.050	0.050	83.77
4.16	43.98	3.46	7.80	0.039	0.044	0.044	92.10
4.20	48.85	3.78	8.32	0.034	0.038	0.038	100.13
4.28	58.57	4.42	9.36	0.027	0.030	0.030	115.68
4.34	68.29	5.04	10.40	0.021	0.024	0.024	130.87

PROGRAM UDKHDEN - V:2.7
SOLUTION TO MULTIPLE BUOYANT DISCHARGE PROBLEM WITH
AMBIENT CURRENTS AND VERTICAL GRADIENTS. MAY 1994

UDKHDEN Version 2.7 (5-14-94)
UNIVERSAL DATA FILE: wacker.in
CASE I.D. Wacker Siltronics max future flow - image method - zero current
DISCHARGE= 0.3100CU-M/S * TEMPERATURE= 25.00-C * SALINITY= 0.000-PPT
DIA-M= 0.6090 * NO. OF PORTS= 3 * SPACING= 6.10-M * DEPTH= 20.00-M
VERTICAL ANGLE = -5.00 * HORIZONTAL ANGLE = 0.00

AMBIENT STRATIFICATION PROFILE

DEPTH (M)	TEMP (C)	SALINITY (PPT)	DENSITY (G/CM3)	VELOCITY (M/S)
0.00	20.00	0.00	0.99827	0.000
30.00	20.00	0.00	0.99827	0.000

FROUDE NO= 4.26, PORT SPACING/PORT DIA= 10.01
STARTING LENGTH= 3.485

ALL LENGTHS ARE IN METERS. FIRST LINE ARE INITIAL CONDITIONS.

X	Y	Z	DIAM.	DRHO	DTCL	DSCL	DILUTION
0.00	0.00	0.00	0.61	1.000	1.000	1.000	1.00
3.50	0.00	0.38	1.71	0.939	0.945	0.945	2.04
7.07	0.00	3.53	4.37	0.254	0.276	0.276	6.99

PLUMES MERGING

8.97	0.00	8.01	6.41	0.129	0.142	0.142	13.55
10.15	0.00	12.73	7.57	0.090	0.099	0.099	19.34
11.01	0.00	17.53	8.51	0.069	0.077	0.077	24.77

DILUTION= 27.46

PROGRAM UDKHDEN - V:2.7
SOLUTION TO MULTIPLE BUOYANT DISCHARGE PROBLEM WITH
AMBIENT CURRENTS AND VERTICAL GRADIENTS. MAY 1994

UDKHDEN Version 2.7 (5-14-94)
UNIVERSAL DATA FILE: wacker.in
CASE I.D. Wacker Siltronics max future flow - image method - .1 ft/s
DISCHARGE= 0.3100CU-M/S * TEMPERATURE= 25.00-C * SALINITY= 0.000-PPT
DIA-M= 0.6090 * NO. OF PORTS= 3 * SPACING= 6.10-M * DEPTH= 20.00-M
VERTICAL ANGLE = -5.00 * HORIZONTAL ANGLE = 0.00

AMBIENT STRATIFICATION PROFILE

DEPTH (M)	TEMP (C)	SALINITY (PPT)	DENSITY (G/CM3)	VELOCITY (M/S)
0.00	20.00	0.00	0.99827	0.030
30.00	20.00	0.00	0.99827	0.030

FROUDE NO= 4.26, PORT SPACING/PORT DIA= 10.01
STARTING LENGTH= 2.357

ALL LENGTHS ARE IN METERS. FIRST LINE ARE INITIAL CONDITIONS.

X	Y	Z	DIAM.	DRHO	DTCL	DSCL	DILUTION
0.00	0.00	0.00	0.61	1.000	1.000	1.000	1.00
2.36	0.08	0.10	1.68	0.981	0.983	0.983	1.99
PLUMES MERGING							
5.48	2.12	2.82	7.16	0.136	0.150	0.150	16.27
6.39	5.45	6.23	10.93	0.059	0.066	0.066	30.40
6.82	8.89	9.66	15.02	0.035	0.039	0.039	43.55
7.11	12.34	13.09	19.10	0.027	0.030	0.030	56.49
7.31	15.81	16.50	23.21	0.022	0.024	0.024	69.38
7.47	19.29	19.91	27.34	0.018	0.021	0.021	82.23

DILUTION= 82.57

PROGRAM UDKHDEN - V:2.7
SOLUTION TO MULTIPLE BUOYANT DISCHARGE PROBLEM WITH
AMBIENT CURRENTS AND VERTICAL GRADIENTS. MAY 1994

UDKHDEN Version 2.7 (5-14-94)
UNIVERSAL DATA FILE: wacker.in
CASE I.D. Wacker Siltronics max future flow - image method - .5 ft/s
DISCHARGE= 0.3100CU-M/S * TEMPERATURE= 25.00-C * SALINITY= 0.000-PPT
DIA-M= 0.6090 * NO. OF PORTS= 3 * SPACING= 6.10-M * DEPTH= 20.00-M
VERTICAL ANGLE = -5.00 * HORIZONTAL ANGLE = 0.00

AMBIENT STRATIFICATION PROFILE

DEPTH (M)	TEMP (C)	SALINITY (PPT)	DENSITY (G/CM3)	VELOCITY (M/S)
0.00	20.00	0.00	0.99827	0.152
30.00	20.00	0.00	0.99827	0.152

FROUDE NO= 4.26, PORT SPACING/PORT DIA= 10.01
STARTING LENGTH= 1.460

ALL LENGTHS ARE IN METERS. FIRST LINE ARE INITIAL CONDITIONS.

X	Y	Z	DIAM.	DRHO	DTCL	DSCL	DILUTION
0.00	0.00	0.00	0.61	1.000	1.000	1.000	1.00
1.40	0.33	-0.01	1.60	0.999	1.000	1.000	2.82
3.02	4.68	0.66	3.72	0.252	0.273	0.273	15.54
3.54	9.45	1.50	4.84	0.142	0.157	0.157	26.80
3.83	14.24	2.33	5.85	0.096	0.106	0.106	39.49
PLUMES MERGING							
4.02	19.05	3.08	6.87	0.069	0.077	0.077	52.34
4.13	23.88	3.72	7.87	0.052	0.058	0.058	63.13
4.21	28.71	4.33	8.85	0.041	0.046	0.046	73.27
4.27	33.55	4.92	9.83	0.033	0.037	0.037	83.10
4.32	38.38	5.50	10.82	0.027	0.030	0.030	92.75
4.36	43.22	6.08	11.80	0.022	0.025	0.025	102.30
4.39	48.06	6.65	12.79	0.019	0.021	0.021	111.79
4.44	57.74	7.79	14.78	0.016	0.018	0.018	130.67
4.47	67.41	8.93	16.78	0.014	0.016	0.016	149.49

PROGRAM UDKHDEN - V:2.7
SOLUTION TO MULTIPLE BUOYANT DISCHARGE PROBLEM WITH
AMBIENT CURRENTS AND VERTICAL GRADIENTS. MAY 1994

UDKHDEN Version 2.7 (5-14-94)
UNIVERSAL DATA FILE: wacker.in
CASE I.D. Wacker Siltronics max future flow - image method - .8 ft/s
DISCHARGE= 0.3100CU-M/S * TEMPERATURE= 25.00-C * SALINITY= 0.000-PPT
DIA-M= 0.6090 * NO. OF PORTS= 3 * SPACING= 6.10-M * DEPTH= 20.00-M
VERTICAL ANGLE = -5.00 * HORIZONTAL ANGLE = 0.00

AMBIENT STRATIFICATION PROFILE

DEPTH (M)	TEMP (C)	SALINITY (PPT)	DENSITY (G/CM3)	VELOCITY (M/S)
0.00	20.00	0.00	0.99827	0.244
30.00	20.00	0.00	0.99827	0.244

FROUDE NO= 4.26, PORT SPACING/PORT DIA= 10.01
STARTING LENGTH= 1.583

ALL LENGTHS ARE IN METERS. FIRST LINE ARE INITIAL CONDITIONS.

X	Y	Z	DIAM.	DRHO	DTCL	DSCL	DILUTION
0.00	0.00	0.00	0.61	1.000	1.000	1.000	1.00
1.38	0.68	-0.02	1.50	0.998	0.998	0.998	3.80
2.64	5.28	0.30	3.08	0.266	0.288	0.288	16.70
3.08	10.11	0.71	3.83	0.164	0.180	0.180	26.29
3.36	14.96	1.15	4.45	0.118	0.130	0.130	35.99
3.56	19.81	1.58	5.02	0.091	0.101	0.101	46.04
3.71	24.66	2.00	5.56	0.074	0.082	0.082	56.52
3.83	29.51	2.41	6.06	0.062	0.069	0.069	67.41
PLUMES MERGING							
3.93	34.37	2.80	6.58	0.052	0.058	0.058	77.87
4.00	39.23	3.15	7.11	0.044	0.050	0.050	87.30
4.05	44.09	3.48	7.62	0.038	0.043	0.043	96.12
4.10	48.95	3.80	8.14	0.034	0.038	0.038	104.59
4.17	58.67	4.42	9.15	0.026	0.029	0.029	120.94
4.23	68.40	5.03	10.16	0.021	0.024	0.024	136.84

Attachment 5

Effluent Data from the Wacker Siltronic Plant

SCOEPA00028188

ADDRESS P.O. Box 83180
Portland, OR 97283-0180

FACILITY 7200 N.W. Front Avenue
LOCATION Portland, OR 97210

101128 PERMIT NUMBER

DISCHARGE NUMBER

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	94	11	01	TO	94	11	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) (46-53) QUANTITY OR LOADING (54-61) AVERAGE	MAXIMUM	UNITS	(4 Card Only) (38-45) QUALITY OR CONCENTRATION (46-53) MINIMUM	AVERAGE	MAXIMUM (54-61)	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
MV-1 TTO	SAMPLE MEASUREMENT	---	---	GPD	---	---	< 0.25	mg/L	0	1/30	Grab
	PERMIT REQUIREMENT	---	---		---	---	---			---	---
MV-3 Flow	SAMPLE MEASUREMENT	124,000	173,000	G/D	---	---	---	---		Continuous	
	PERMIT REQUIREMENT	---	---		---	---	---			---	
MV-3 Total Phosphates	SAMPLE MEASUREMENT	---	---	---	0.2	0.3	0.4	mg/L	0	1/7	Grab
	PERMIT REQUIREMENT	---	---		---	2.0	5.0			---	---
Outfall Flow	SAMPLE MEASUREMENT	599,000	707,000	G/D	---	---	---	---		Continuous	
	PERMIT REQUIREMENT	---	---		---	---	---			---	
Outfall Temperature	SAMPLE MEASUREMENT	---	---	---	59	68	75	F	0	1/7	Grab
	PERMIT REQUIREMENT	---	---		---	---	85			---	---
Outfall pH	SAMPLE MEASUREMENT	---	---	---	6.0 >	Within limits	< 9.0	pH Units	0	Continuous	
	PERMIT REQUIREMENT	---	---		6.0	---	9.0			---	
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
Murray M. Tilson/Director Manufacturing Support
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 USC § 1001 AND 33 USC. § 1319. *(Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)*

WACKER SILTRONIC CORP.
BY:
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 503 NUMBER 243-2020

DATE: YEAR 94 MO 12 DAY 05

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

Previous editions may be used. (REPLACES EPA FORM T-40 WHICH MAY NOT BE USED)

WACKER - PROCESS TEL:503-241-7599 Mar 30 95 17:10 No.012 P.06

SCOEPA00028189

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if different)
NAME Wacker Siltronic Corporation
ADDRESS P.O. Box 83180
Portland, OR 97283-0180
FACILITY 7200 N.W. Front Avenue
LOCATION Portland, OR 97210

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

(2-16) 101128 PERMIT NUMBER
(17-19) DISCHARGE NUMBER

Form Approved.
OMB No. 2040-0004
Approval expires 10-31-94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	94	11	01	TO	94	11	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
Process Waste Water Flow MV-1	SAMPLE MEASUREMENT	476,000	578,000	G/D	---	---	---	---	Continuous Totalizing Recorder		
	PERMIT REQUIREMENT	---	---		---	---	---				
MV-1 BOD	SAMPLE MEASUREMENT	26.8	49.7	#/D	4.9	6.8	10.3	mg/L	0	1/7	24 HC
	PERMIT REQUIREMENT	81	162		---	23	30		---	---	---
MV-1 TSS	SAMPLE MEASUREMENT	27.2	45.8	#/D	5.0	6.9	9.5	mg/L	0	1/7	24 HC
	PERMIT REQUIREMENT	81	162		---	23	60		---	---	---
MV-1 Cr^{+6}	SAMPLE MEASUREMENT	<0.01	<0.01	#/D	<0.01	<0.01	<0.01	mg/L	0	1/7	24 HC
	PERMIT REQUIREMENT	0.11	0.27		---	0.02	0.05		---	---	---
MV-1 Cr^{Total}	SAMPLE MEASUREMENT	0.07	0.14	#/D	0.01	0.02	0.03	mg/L	0	1/7	24 HC
	PERMIT REQUIREMENT	1.5	3.4		---	1.0	1.0		---	---	---
MV-1 Fluoride	SAMPLE MEASUREMENT	25.5	45.3	#/D	2.6	6.4	9.4	mg/L	0	1/7	24 HC
	PERMIT REQUIREMENT	53	65		---	17.4	32		---	---	---
MV-1 Total Phosphate	SAMPLE MEASUREMENT	2.1	2.9	#/D	0.4	0.5	0.6	mg/L	0	1/7	24 HC
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
Murray M. Tilson/Director, Manufacturing Support

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(Penalties under these statutes may include fines up to $10,000 and or conditional imprisonment of between 6 months and 5 years.)*

WACKER SILTRONIC CORP.
BY:
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 503, NUMBER 243-2020

DATE: YEAR 94, MO 12, DAY 09

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

WACKER - PKULESS TEL:503-241-7599 Mar 30 95 17:11 No.012 P.07

SCOEPA00028190

Wacker Siltronic - OPE37086.A0

Effluent Water Quality Data (mg/L), max. values

		Process Wastewater							TTO		Outfall		
No.	Date	Flow	BOD	TSS	Cr - 6	Cr -tot	Fluoride	PO4 - tot	Flow	PO4 -tot	Flow	Temp	pH
1	9/1/93	416000	4.3	21.8	0.03	0.05	2	.6	343000	.8	751000	75	8.0
2	10/1/93	466000	8.9	23.8	0.04	0.09	3	.8	342000	.3	749000	73	7.7
AVG		441000	6.6	22.8	0.04	0.07	3	.7	342500	.6	750000	74	
Outfall	9/1/93		2.4	12.1	0.02	0.03	1	.3		.4		75	8.0
Concentr	10/1/93		5.5	14.8	0.02	0.06	2	.5		.1		73	7.7
AVG			4.0	13.4	0.02	0.04	1	.4		.3		74	
Permit Limits			30.0	61.0	0.04	0.09	3	61.0		5.0		85	9.0
W.Q. Stds.					0.01	0.21	4	---		---		no chng	6.5-9.0

Bioassay

Acute Toxicity			Ceriodaphnia					Fathead Minnow				
Date	Cerio.	Fathead	Date		NOEC	IC25	LOEC	NOEC	IC25	LOEC		
Aug-93	No	Yes	Aug-93	Survival	50%	79.6%	100%	---	---	---		
Sep-93	No	No	Aug-93	Growth	25%	45.5%	50%	---	---	---		
			Sep-93	Survival	50%	70.7%	100%	50%	70.7%	10000%		
			Sep-93	Growth	50%	43.5%	50%	25%	49.2%	5000%		

SCOEPA00028191

Table 1
Effluent Toxicity Data

Date	Lab	Sample ID	Toxicity [% Effluent]									Comments
			Fathead minnow, *Pimephales promelas*					Water flea, *Ceriodaphnia dubia*				
			ACUTE		CHRONIC			ACUTE		CHRONIC		
			Survival NOEC	Pass/ Fail	Survival NOEC	Growth NOEC	Pass/ Fail	Survival NOEC	Pass/ Fail	Survival NOEC	Repro NOEC	Pass/ Fail	
18-Aug-93	NAS	93-?		F?	25	25	P	100	P	50	25	P	FH acute failed @ 100%; no data available for other dilutions.
27-Sep-93	NAS	93-?	100	P	50	25	P	100	P	50	50	P	
15-Aug-94	NAS	94-50	100	P	50	50	P	25	F	25	<6.25	F	Cerio acute IC25=21.3%
12-Oct-94	NAS	94-61						50	P	6.25	<6.25	F	Cerio acute NOEC=50% (Steel's test),= 25% (Wilcoxon test), IC10=33.33%
12-Oct-94	CAS	94-62								6.25		F	This was a split sample (duplicate) test
6-Mar-95	CH2M	95-4	100	P	33	33	P	17	F	10	3	F	
20-Mar-95	CH2M	95-19						66	P				
3-Apr-95	CH2M	95-20						33	P				

Notes:

NAS = Northwestern Aquatic Sciences, Newport, OR; CAS = Columbia Aquatic Sciences, Carlsbad, CA; CH2M = CH2M HILL, Corvallis, OR

Pass/Fail - passed or failed Oregon DEQ toxicity guidelines with a 2:1 ZID dilution and a 5:1 mixing zone dilution (acute threshold = 33%; chronic threshold = 17%).

SCOEPA00028192

Table 2

Effluent Characterization Data

Parameter	Units	Sample ID and Date Collected: 95-4 (FAILED) 6-Mar-95	95-19 (PASSED) 21-Mar-95	95-20 3-Apr-95
Bioassay				
Fathead Acute NOEC	%	100	-	-
Fathead Chronic NOEC	%	33	-	-
Cerio Acute NOEC	%	17	66	33
Cerio Chronic NOEC	%	3	-	-
Chemical				
pH	pH units	7.1	6.7	6.7
Alkalinity	mg/L as CaCO3	5	20	12
Hardness	mg/L as CaCO3	300	244	184
Conductivity	µmhos/cm	868	690	710
TDS	mg/L	604	554	-
TSS	mg/L	7	8	-
COD	mg/L	14	5	-
NH3-N	mg/L	1.68	0.31	-
TKN	mg/L	1.81	0.36	-
Chlorine Residual	mg/L	0.05	0.08	0.06
H2O2	mg/L	17	20	-
Ox-Red Potential	mV	170	-	-
Fluoride	mg/L	4.4	-	-
Sulfide	mg/L	U 1	-	-
Sulfite	mg/L	U 0.5	-	-
MBAS	mg/L	0.25	0.1	-
Chromium, Total	µg/L	1	1.1	-
Chromium (VI)	µg/L	U 20	U 8	U 8

U = less than specified method detection limit (MDL)

NH3-N – Toxic at 20 mg/L

TKN (TMAH)

MBAS ANIONIC SURFACTANTS INDICATOR

COD ? NOT A PROBLEM AT 14 mg/L BUT MAY INDICATE INCL. USE OF ORGANIC CHEMICALS

SCOEPA00028193

WACKER
Wacker Siltronic Corpora

April 11, 2001

Dr. Elliot Zais
Water Quality Source Control
Dept. of Environmental Quality
State of Oregon, NW Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

ER:014TM

RE: Annual Bioassay Results

Dear Dr. Zais:

Previously reported evaluations of bioassay test results submitted in our October 2000 DMR were over-reported and did not take into account the correct dilution data to describe the effluent concentration within the zone of immediate dilution and the dilution at the edge of the mixing zone. This effected the test results and the percent of effluent used to determine the no observable effect concentration (NOEC). Using actual dilution data from three mixing zone studies, Wacker Siltronic Corporation is currently in compliance with all NPDES permit conditions in Schedule D, Section 6, Bioassay requirements.

The error occurred when we failed to take into account the effluent dilution data produced by the mixing zone studies when conducting the bioassay testing. Data used for effluent dilution determination up to this point were early estimated dilution values suggested in 1994 before the ZID was established in the permit.

A total of three mixing zone studies have been performed at the outfall in the years 1994, 1995, and 1999. These studies have been submitted to DEQ in the past. Each of these studies model the dilution conditions within the mixing zone and at the edge of the mixing zone. This data is used to define the pass/fail criteria for bioassay tests.

All mixing zone data that is valid for the existing permit has been used to calculate the average dilution a 5 foot radius for the ZID and at a 50 foot radius for the edge of the mixing zone. All dilution data points are based on 7Q10 worst case low flow conditions at 0.1 feet per second current velocity during both average and maximum permitted discharge volumes. Under these conditions the NOEC test criteria is:

Acute: NOEC $\geq$13.4% effluent (10-17.5% based on ZID dilutions of 5.7-10)

Chronic: NOEC $\geq$1.8% effluent (1.5-3.0% based on mixing zone dilutions of 33-72)

Test results have been re-evaluated based on the above average effluent dilutions:

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

WACKER

Wacker Siltronic Corpora

Test Date (2000)	Test	Ceriodaphnia dubia Survival (% Effluent)	Pimephales promelas Survival (% Effluent)
Aug 8-15	Acute NOEC	17%	100%
	Chronic NOEC	<3%	<3%
Oct 10-17	Acute NOEC	50%	100%
	Chronic NOEC	3%	100%
Dec 5-12	Acute NOEC	50%	100%
	Chronic NOEC	<6.25	100%

The bioassay tests conducted in October and December pass under all mixing zone conditions. The August bioassay test appears to pass but a lack of data at the lower concentration make the results questionable. Future bioassay tests will be conducted at lower effluent concentrations to bracket the test criteria.

A Toxicity Identification Evaluation study has been conducted on the total effluent and upstream from the discharge point to determine the cause for periodic test failures. Testing is ongoing and it is hoped that it will assist in the design of long term solutions.

If you have any questions, please contact me at 503-219-7532

Very truly yours,

Wacker Siltronic Corporation;

Thomas C McCue

Thomas C. McCue
Environmental Manager

Wacker Siltronic Corporation
7200 NW Front Avenue
Portland, OR 97210-3676
Phone (503) 243-2020
TDD (503) 241-7519

Engineers
Planners
Economists
Scientists

April 4, 1995

OPE40202.A0

Attention: Gary Hickman/CH2M HILL/CVO

RE: Analytical Data for Wacker Siltronic Corp.
CVO Laboratory Reference No. 8338

On March 21, 1994, the CH2M HILL Corvallis Applied Sciences Laboratory received one sample with a request for analysis of selected parameters.

The analytical results and associated quality control data are enclosed. Any unusual difficulties encountered during the analysis of your samples are discussed in the case narrative. The analyses for MBAS was performed by QAL/LRD, their report is attached.

Under CH2M HILL policy, your samples will be stored for up to 30 days after reporting. If you have not given us prior instructions for disposal, we will contact you if any samples require disposal as hazardous waste.

The CH2M HILL Applied Sciences Laboratory appreciates your business and looks forward to serving your analytical needs again. If you should have any questions concerning the data, or if you need additional information, please call Ms. Kathy McKinley at (503)752-4271, extension 3144.

Sincerely,

Lynn White

Lynn White
Senior Data Package Specialist

Enclosures

Corvallis Office
2300 NW Walnut Blvd., Corvallis, OR 97330-3538
P.O. Box 428, Corvallis, OR 97339-0428
503 752-4271
Fax No. 503 752-0276

CASE NARRATIVE
General Chemistry

Lab Reference No.: 8338

Client/Project: Wacker Siltronic Corp.

I. Holding Time:
All holding times were met.

II. Digestion Exceptions:
None

III. Analysis:

A. Calibration:
All acceptance criteria were met.

B. Blanks:
All acceptance criteria were met.

C. Matrix Spike Sample(s):
All acceptance criteria were met.

D. Duplicate Sample(s):
All acceptance criteria were met.

E. Lab Control Sample(s):
All acceptance criteria were met.

F. Other:
Not applicable.

III. Documentation Exceptions:
None.

IV. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

SIGNED: Laura E Stone for DATE: 4-3-95
Helen VanNice
General Chemistry Supervisor

SCOEPA00028197

CASE NARRATIVE
Metals

Lab Reference No.: 8338

Client/Project: Wacker Siltronic Corp.

I. Holding Time:
All holding times were met.

II. Digestion Exceptions:
None

III. Analysis:

A. Calibration:
All acceptance criteria were met.

B. Blanks:
All acceptance criteria were met.

C. ICP Interference Check Sample:
All acceptance criteria were met.

D. Spike Sample(s):
All acceptance criteria were met.

E. Duplicate Sample(s):
All acceptance criteria were met.

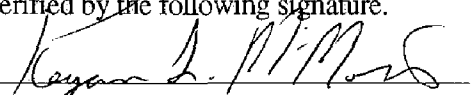
F. Laboratory Control Sample(s):
All acceptance criteria were met.

G. ICP Serial Dilution:
Not required for this level QC.

H. Other:
None

IV. Documentation Exceptions:
None

V. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

SIGNED:  DATE: 3 Apr 95

Regan McMorris
Metals Supervisor

SCOEPA00028198

Corvallis Applied Sciences Laboratory

Client Information		Lab Information	
Project Name:	Wacker Siltronic Corp.	Date Rec'd:	03/21/95
Project Manager:	Gary Hickman/CVO	Lab ID:	833801
Sampled By:	T. Rothschild	Report Revision No.:	0
Client Sample ID:	95-19	Reported By:	H. VanNice
Sampling Date:	03/20/95	Reviewed By:	R.M^Morris
Sampling Time:	8:45		
Type:	Composite		
Matrix:	Water		
Basis:	As Rec'd		

Analyte	Reporting Limit	Sample Result	Qualifier	Units	Method	Date Analyzed
General Chemistry						
COD	5	5	U	mg/L	EPA410.1	3/27/95
Ammonia-N	0.05	0.31		mg/L	EPA350.3	3/27/95
Total Kjeldahl-N	0.20	0.36		mg/L	EPA351.4	3/27/95
Total Dissolved Solids	1	554		mg/L	EPA160.1	3/23/95
Total Suspended Solids	1	8		mg/L	EPA160.2	3/22/95
Hydrogen Peroxide	--	20		mg/L		3/21/95
Metals						
Chromium, Hexavalent	0.008	0.008	U	mg/L	EPA7196	3/21/95
Chromium, ICP	0.0006	0.0011		mg/L	EPA200.7	3/27/95

U=Not detected at specified reporting limits

SCOEPA00028199

CH2M HILL OPE 40282.AD

APPLIED SCIENCES LABORATORY

CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # RSF 11431	Purchase Order # 31302
Project Name X	
Company Name/CH2M HILL Office Wacker Siltronic Corporation	
Project Manager & Phone # Mr. [X] Thomas J Rothschild / Ms. [ ] / Dr. [ ]	Report Copy to: Sandie Archer
Requested Completion Date:	Sampling Requirements: SDWA [ ] NPDES [X] RCRA [ ] OTHER ____
	Sample Disposal: Dispose [X] Return [ ]

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	Matrix AIR	CLIENT SAMPLE ID (9 CHARACTERS)	# OF CONTAINERS	LAB TEST CODES	ANALYSES REQUESTED	SHADED AREA – FOR LAB USE ONLY: REMARKS	LAB 1 ID	LAB 2 ID
2CMar95	0845	X		X			95-19	1	X	Toxicity Identification Evaluation; EDD YES NO; Ag, As, Ba, Cd, Cr, Pb, Se, Hg; TPH (MBAS, H2); Cr-T, Cr-Hex; Dissolved & Total Metals		1	

Lab 1 # 8338-1 | Lab 2 # | Quote # | Kit Request # | Project # | No. of Samples 1 | Page 1 of 1 | Login | LIMS Ver

Sampled By & Title (Please sign and print name) Thomas J. Rothschild / Facilities Chem.	Date/Time 2CMar95/0845	Relinquished By (Please sign and print name) Thomas J. Rothschild	Date/Time 2CMar95/1020
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via: (UPS) BUS Fed-Ex Hand Other ____	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

QC Level: 1 2 3 Other: ____ | COC Rec | ICE | Ana Req | TEMP 7°C | Cust Seal | Ph

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client

REV 3/94 FORM 340

SCOEPA00028200

QUALITY ANALYTICAL
LABORATORIES, INC.

March 24, 1995

Ms. Lynn White
CH2M Hill/CVO
2300 N.W. Walnut Blvd.
Corvallis, OR 97330

RE: Analytical Data for: **Wacker Siltronic Corporation**
Laboratory Reference Number: **R9678**

Dear Ms. White:

On **March 22, 1995**, QAL, Inc. received samples with a request for analysis. The analytical results and associated quality control data are enclosed.

It is our policy to store your samples for 30 days from the date of this letter. If extended storage is required, special arrangements can be accommodated upon early notification. The disposition of samples identified as hazardous will require special handling and you will be contacted if necessary.

QAL, Inc. appreciates your business and looks forward to serving you again. If you have any questions concerning your report or need any additional information, please call me at **(916) 244-5227.**

Sincerely,

Cindy Barba

Cindy Barba cem
Project Manager/Client Services

SCOEPA00028201

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QAL Reference No. R9678

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Client Sample Cross-Reference	i
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Analytical Sample Results	2
Quality Control Data	
Results of Blank(s)	2
COC Documentation	3

Quality Analytical Laboratories Inc.

5090 Caterpillar Road, Redding, CA 96003-1412

916 244-5227
Fax No. 916 244-4109

Sample ID Cross-reference Table

QAL, Inc. Lab Sample ID		Client Sample ID	Collect Date	Sample Matrix	Additional Description
FS = Field Sample					
R9678001	FS	95-19	03/20/95	Water	

The above lab sample ID's and cross reference information apply to samples as received by the laboratory. Modifiers to the lab sample ID may be added for internal tracking purposes. Any modified sample ID will be reflected in the appropriate case narrative only.

Quality Analytical Laboratories Inc.
5090 Caterpillar Road, Redding, CA 96003-1412
916 244-5227 Fax No. 916 244-4109

SCOEPA00028203

CASE NARRATIVE
Inorganics

Laboratory Reference Number: R9678

Client/Project: WACKER SILTRONIC CORPORATION

I. Holding Time:
All holding times were met.

II. Analysis:

A. Calibration:
All acceptance criteria were met.

B. Blanks:
All acceptance criteria were met.

C. Spike Sample(s):
All acceptance criteria were met.

D. Duplicate Sample(s):
All acceptance criteria were met.

E. Laboratory Control Sample(s):
All acceptance criteria were met.

F. Other:
None.

III. Documentation Exceptions:
None.

IV. I certify that this data package is in compliance with the terms and conditions agreed to by the client and QAL, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

SIGNED: Fred Bickell DATE: 3/24/95

Fred R. Bickell
Inorganics Supervisor

Report of Analytical Results

Parameter: MBAS
Method: EPA425.1

Project Name: Wacker Siltronic Corporation
Date Received: 03/22/95
Lab Reference No: R9678

Lab Sample ID	Client Sample ID	Result	Units	Reporting Level	Date Collected	Date Analyzed	Sample Matrix
R9678001	95-19	0.10	mg/L	0.10	03/20/95	03/22/95	Water
95032W01	METHOD BLANK	< 0.10	mg/L	0.10	None	03/22/95	Water

(2676)

Quality Analytical Laboratories (QAL), Inc. -- Redding

000002 FPO

CH2M HILL
APPLIED SCIENCES LABORATORY

CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project #: ASE134-31
Purchase Order #:
Project Name: Wacker Sutronics
Company Name/CH2M HILL Office:
Project Manager & Phone #: Mr. [ ] Ms. [ ] Dr. [ ] Gary Hickman/CVO
Report Copy to: Lynn White CVO
Requested Completion Date: normal TAT
Sampling Requirements: SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____
Sample Disposal: Dispose ☐ Return ☐

LAB TEST CODES

ANALYSES REQUESTED

SHADED AREA-- FOR LAB USE ONLY
Lab 1 #: 83381
Lab 2 #: R9678
Quote #:
Kit Request #:
Project #:
No. of Samples: 1
Page 1 of 1
Login:
LIMS Ver:

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	Matrix AIR	CLIENT SAMPLE ID (9 CHARACTERS)	# OF CONTAINERS	MBAS	REMARKS	LAB 1 ID	LAB 2 ID
3-20	8:15	X		X			95-19	1	✓		-1	

(*) the sample's holding time will have expired by the time this gets to CVO. Any questions regarding analysis should be directed to Gary Hickman/CVO ext. 3521. JM

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name): Jeri Mattick	Date/Time: 3-21-95 am	Relinquished By (Please sign and print name): Jeri Mattick	Date/Time: 3-21-95 am
Received By (Please sign and print name): Shawn T. Duffy 3/22/95	Date/Time: 1030	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via: UPS BUS Fed-Ex Hand Other ____	Shipping #: 125 426 732 2
Work Authorized By (Please sign and print name)	Remarks		

QC Level 1 2 3 Other: ____
COC Rec Y | ICE Y
Ana Req Y | TEMP 3°C
Cust Seal N | Ph

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client

REV 2/94 FORM 2.10

000003

SCOEPA00028206

QAL SAMPLE RECEIPT EXCEPTION REPORT

Sample Batch Number R9678 Client/Project Wacker Siltronics/CVO

		Comments:
	1. No custody seal as required by project.	9) Sample received outside of holding time for MBAS.
	2. No chain-of-custody provided.	
	3. Analysis, description, date of collection not provided.	
	4. Samples broken or leaking on receipt.	
	5. Temperature of samples inappropriate for analysis requested.	
	6. Container inappropriate for analysis requested.	
	7. Inadequate sample volume.	
	8. Preservation inappropriate for analysis requested.	
X	9. Samples received out of holding time or analysis requested.	
	10. Descrepancies between COC form and container labels.	
	11. Other	

Corrective Actions Taken:

Analyze despite Holding time
Per
Gary Hickman

Notified:
✓ Client Thomas P. Duffy.
__ Division Mgr/Supervisor
__ LQAC
__ Client Services

By:
Sample Custody Supervisor

000004

Engineers
Planners
Economists
Scientists

Corvallis Office

March 23, 1995

OPE40202.A0

Attention: Gary Hickman/CH2M HILL/CVO

RE: Analytical Data for Wacker Siltronic Corp.
CVO Laboratory Reference No. 8279

On March 7, 1995, the CH2M HILL Corvallis Applied Sciences Laboratory received one sample with a request for analysis of selected parameters.

The analytical results and associated quality control data are enclosed. Any unusual difficulties encountered during the analysis of your samples are discussed in the case narrative. The analyses for MBAS were performed by QAL/LRD (Laboratory Reference No. R9604), their report is attached.

Under CH2M HILL policy, your samples will be stored for up to 30 days after reporting. If you have not given us prior instructions for disposal, we will contact you if any samples require disposal as hazardous waste.

The CH2M HILL Applied Sciences Laboratory appreciates your business and looks forward to serving your analytical needs again. If you should have any questions concerning the data, or if you need additional information, please call Ms. Kathy McKinley at (503)752-4271, extension 3144.

Sincerely,

Lynn White

Lynn White
Senior Data Package Specialist

Enclosures

Serving Oregon and Southwest Washington from two locations:

Corvallis Office	***2300 NW Walnut Blvd., Corvallis, OR 97330-3538***	***503.752.4271***	***503.752.0276 FAX***
Portland Office	*825 N.E. Multnomah, Suite 1300, Portland, OR 97232-2146*	*503.235.5000*	*503.235.2445 FAX*

CASE NARRATIVE
General Chemistry

Lab Reference No.: 8279

Client/Project: Wacker Siltronic Corp.

I. Holding Time:
Holding times for Sulfite, Hydrogen Peroxide, and Ox/Red Potential were exceeded when received in the laboratory.

II. Digestion Exceptions:
None

III. Analysis:

A. Calibration:
All acceptance criteria were met.

B. Blanks:
All acceptance criteria were met.

C. Matrix Spike Sample(s):
All acceptance criteria were met.

D. Duplicate Sample(s):
All acceptance criteria were met.

E. Lab Control Sample(s):
All acceptance criteria were met.

F. Other:
Hydrogen peroxide testing was performed using a Hach Kit.

III. Documentation Exceptions:
None.

IV. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

SIGNED: Helen Van Nice DATE: 3/22/95

Helen VanNice
General Chemistry Supervisor

SCOEPA00028209

CASE NARRATIVE
Metals

Lab Reference No.: 8279

Client/Project: Wacker Siltronic Corp.

I. Holding Time:
All holding times were met.

II. Digestion Exceptions:
None

III. Analysis:

A. Calibration:
All acceptance criteria were met.

B. Blanks:
All acceptance criteria were met.

C. ICP Interference Check Sample:
All acceptance criteria were met.

D. Spike Sample(s):
All acceptance criteria were met.

E. Duplicate Sample(s):
All acceptance criteria were met.

F. Laboratory Control Sample(s):
All acceptance criteria were met.

G. ICP Serial Dilution:
Not required for this level QC.

H. Other:
None

IV. Documentation Exceptions:
None

V. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

SIGNED: Regan D. McMorris DATE: 23 Mar 95

Regan McMorris
Metals Supervisor

SCOEPA00028210

Corvallis Applied Sciences Laboratory

Client Information

Project Name: Wacker Siltronic Corp.
Project Manager: Gary Hickman/CVO
Sampled By: T. Rothschild
Client Sample ID: 95-4
Sampling Date: 03/06/95
Sampling Time: 8:30
Type: Composite
Matrix: Water
Basis: As Rec'd

Lab Information

Date Rec'd: 03/07/95
Lab ID: 827901
Report Revision No.: 0
Reported By: H. VanNice
Reviewed By: R. McMorris

Analyte	Reporting Limit	Sample Result	Qualifier	Units	Method	Date Analyzed
General Chemistry						
COD	5	14		mg/L	EPA410.1	3/15/95
Fluoride Free	0.05	4.43		mg/L	EPA340.2	3/14/95
N-Ammonia	0.05	1.68		mg/L	EPA350.3	3/13/95
Total Kjeldahl-N	0.25	1.81		mg/L	EPA351.4	3/13/95
pH	--	7.1		pH units	EPA150.1	3/7/95
Total Dissolved Solids	1	604		mg/L	EPA160.1	3/10/95
Total Suspended Solids	1	7		mg/L	EPA160.2	3/10/95
Sulfide	1	1	U	mg/L	EPA376.1/2	3/14/95
Sulfite	0.5	0.5	U	mg/L	EPA377.1	3/7/95
Hydrogen Peroxide	--	17		mg/L		3/7/95
Ox-Red Potential	--	170		MV		3/7/95
Metals						
Chromium, ICP	0.001	0.001		mg/L	EPA200.7	3/22/95
Chromium, Hexavalent	0.02	0.02	U	mg/L	EPA7196	3/8/95

U=Not detected at specified reporting limits

SCOEPA00028211

CH2MHILL

APPLIED SCIENCES LABORATORY

CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # EP94022.2.1.1 B5G1444.3L.00 — Purchase Order # 31306

Project Name

Company Name/CH2M HILL Office: Wacker Siltronic Corporation

Project Manager & Phone # Mr. [X] Thomas J. Rothschild Ms. [ ] Dr. [ ] 503-246-0702

Report Copy to:

Requested Completion Date:

Sampling Requirements: SDWA [ ] NPDES [X] RCRA [ ] OTHER [ ]

Sample Disposal: Dispose [X] Return [ ]

LAB TEST CODES

SHADED AREA - FOR LAB USE ONLY: Lab 1 # 8279-1 — Lab 2 #

Quote # — Kit Request #

ANALYSES REQUESTED

Project #

No. of Samples 6 — Page 1 of 1

Login — LIMS Ver

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	Matrix AIR	CLIENT SAMPLE ID (9 CHARACTERS)	# OF CONTAINERS	Chrome, Total	CRP	CTAS	Sulfide	Sulfite	MBAS	Chrome Hexavalent	General Chemistry	REMARKS	LAB 1 ID	LAB 2 ID
6 Mar 95	0830	X		X			95-4	8	X	X	X	X	X	X	X	X	Cooled with ice	-1	
		X		X			95-5	1											
		X		X			95-6	1											
		X		X			95-7	1											

Sampled By & Title (Please sign and print name): Thomas J. Rothschild, Facilities Chemist — Date/Time 6 Mar 95/0830

Relinquished By (Please sign and print name): Thomas J. Rothschild — Date/Time 6 Mar 95/1200

Received By (Please sign and print name): Jim Mattick — Date/Time 3-7-95 1602

Relinquished By (Please sign and print name) — Date/Time

Received By (Please sign and print name) — Date/Time

Relinquished By (Please sign and print name) — Date/Time

Received By (Please sign and print name) — Date/Time

Shipped Via: UPS BUS Fed-Ex Hand Other ____ — Shipping #

Work Authorized By (Please sign and print name)

Remarks

QC Level: 1 2 3 Other: ____

COC Rec | ICE

Ana Req | TEMP

Cust Seal | Ph

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client

REV 3/94 FORM 340

SCOEPA00028212

Wacker Siltronic Corporation

WACKER

TO: Murray Tilson, Tom McCue, Tom Rothschild

FROM: Sandee Archer

SUBJECT: Additional Bioassay Testing

DATE: March 15th, 1995

I have attached the lastest information from CH2M Hill. It appears that we still have a bioassay failure even using the 33% mixing zone.

I have spoken with Gary Hickman in depth about starting the Phase I Toxicity Investigation Evaluation (TIE). We both agree that it would be fairly dangerous to stray too far from the EPA recommendations for a Phase 1 TIE.

The following additional tests have been agreed upon by myself and Dr. Hickman.

Using the Chronic Toxicity Characterization Tests, but running Ceriodaphnia definitive acute tests. To reduce cost further four not five dilutions will be ran and Wacker will receive a volume discount so each test will be approximately $250 plus labor time. total costs for all test will be $3,000-$3,200.

1. Untreated Effluent- Baseline toxicity
2. Oxidant Reduction- using Sodium thiosulfate to eliminate peroxide, repeat this test twice.
3. EDTA chelation- eliminates cationic metals
4. Initial pH/ Aeration- eliminates subiatable, oxidizable or strippable compounds
5. Initial pH/Filtration-eliminates suspended solids. During the last bioassay testing period the CE looked somewhat cloudy.
6. Initial pH/Solid-Phase Extraction- eliminates non-polar organics, some metals and some surfactants
7. Xeolite Treatment- removes NH4+, cationic metals and some organics. This test will replace the pH adjustment tests that are meant to look for NH3 and NH4+.
8. Anionic Exchange- removes anions such as chromates and fluoride. Our current chromate level is somewhat close to toxic levels for chromate.
9. Silica Gel- removes polar organics, i.e., surfactants, formaldehyde etc.

I feel this test would give Wacker a very strong indication of possible contaminates in the CE. If we chose to eliminate any of these test there is a chance that we could miss the toxic compounds. Unfortunately, if these tests do not show anything definitive then we may need to do additional testing listed in Dr. Hickman's memo.

CH2MHILL

MEMORANDUM

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 4

To Sandra Archer	From Gary Hickman
Co. Wacker	Co. CH2M HILL
Dept.	Phone #
Fax #	Fax #

TO: Sandra Archer/Wacker
Tom McCue/Wacker
Chip Bloomer/Wacker
Tom Rothschild/Wacker

COPIES: Mike Stanaway/CH2M HILL/CVO

FROM: Gary Hickman/CH2M HILL/CVO

DATE: February 15, 1995

SUBJECT: Wacker Siltronic Corporation Wastewater Toxicity Study
Phase I TIE Approach

PROJECT: OPE40202.A0

This memo provides discussion and recommendations for Phase I Toxicity Identification Evaluation (TIE) effluent testing. Please review and then let's select our approach.

Preliminary Results from Initial Effluent Testing

Only preliminary, qualitative results are available from our first round of toxicity testing of whole effluent and the three individual waste streams, and only some of the physical/chemical characterization analyses have been completed. Nevertheless, the preliminary results provide valuable information relevant to TIE testing. For whole effluent, the acute 48-hour fathead minnow bioassay showed no toxicity at 100% effluent, whereas the acute 48-hour *Ceriodaphnia* test showed complete mortality at 100% and 33% effluent. Consequently, *Ceriodaphnia* was clearly the more sensitive test species for that whole effluent sample, and they exhibited toxicity at the critical dilution relative to discharge limits with the ZID dilution factor. This is bad news with respect to effluent compliance but good news in that we can use the acute *Ceriodaphnia* test to evaluate toxicity (at least acute toxicity) during TIE testing. Preliminary results also show that the samples labeled 95-5 and 95-6 were toxic at the 33% dilution but that the sample labeled 95-7 was nontoxic at 33% (100% survival). The samples did not indicate which numbers corresponded to which waste streams but I am guessing that 95-5 and 95-6 were CAD and WAD and that 95-7 was Blowdown (please confirm with Tom Rothschild).

I urge you to consider the physical/chemical results as preliminary only until they have been QA checked, but available whole effluent data include: H_2O_2 = 17 mg/L, Cr(VI) = 20 µg/L, TDS = 600 mg/L, TSS = 7 mg/L, Sulfite < 0.5 mg/L, and ORP = 170 mV. Ammonia, MBAS, total chromium, and other analyses are pending.

Phase I TIE Approach

The U.S. EPA has developed a systematic stepwise procedure for conducting TIEs, including three phases of testing. Phase I is intended to characterize groups or categories of toxicants, such as oxidants, cationic metals, volatiles, non-polar organics, etc. Phase II is intended to identify specific toxicants, and Phase III is intended to confirm whether or not the identified toxicant(s) is(are) the actual toxicant(s). EPA guidance documents for

conducting Phase I TIEs on acutely and chronically toxic effluents recommend the suites of testing shown in Tables 1 and 2, respectively. These protocols call for a fairly large number of tests and a concomitant relatively high cost, since each manipulation requires some labor for treatment and a toxicity bioassay test to evaluate whether the treatment affected toxicity. It may be that your budget for this project might not allow for this level of effort, and it might seem desirable to reduce the number of tests. Below, I will offer some suggestions for controlling costs; however, I feel compelled to tell you that EPA specifically cautions against reducing the number of tests (see Attachment 1 which is an excerpt from EPA's Phase I acute TIE guidance document). The risk here is in potentially having to repeat tests, leading to wasted effort.

Two possible methods for reducing TIE costs are (1) to eliminate tests from the acute TIE protocol (Table 1), and (2) use a tiered approach similar to the chronic protocol (Table 2). In alternative 1, I suggest that three tests could be eliminated from Table 1: pH 3 Adjustment, pH 11 Adjustment, and pH 7 Adjustment. The first two, I believe, provide little information that is not obtained by pH adjustment followed by filtration, aeration, or solid-phase extraction, and pH 7 is similar to the whole effluent (untreated) sample pH. However, this still leaves 14 tests. Alternative 2 would involve conducting the Tier 1 tests from Table 2 and only performing Tier 2 tests if Tier 1 does not provide sufficient information. Also, I believe the Methanol Eluate test (rinsing the solid phase column with methanol and evaluating toxicity of elutable contaminants) could be deferred or eliminated, leaving eight tests.

Based on the previous whole effluent toxicity results, it appears that we can effectively use *Ceriodaphnia* acute bioassay tests to evaluate toxicity. When conducting the TIE tests, it is important to conduct definitive rather than screening acute tests to allow us to discriminate changes in toxicity. The cost of *Ceriodaphnia* definitive acute tests is $315 after the 10% volume discount (see Brett Mucky's memo dated March 1).

In support of the TIE testing, it is important to repeat the physical/chemical characterization analyses on the sample used for TIE testing. This will help us to interpret the TIE testing results.

Other TIE Tests

Some other TIE tests that might be instructional include:

- Xeolite Treatment - removes NH4+, cationic metals, and some organics
- Anionic Exchange - removes anions such as chromates and fluoride
- Silica Gel - removes polar organics

These could be included in the Phase I array or could be used in Phase II if by Phase I indicated (either positive or negative) results.

Table 1	
EPA Phase I Acute Toxicity Characterization Tests	
Test	**Toxicant Groups Potentially Identified**
Untreated Effluent	Baseline toxicity
Oxidant Reduction	Oxidants, certain other reducible compounds
EDTA chelation	Certain cationic metals
pH 3 Adjustment	Compounds precipitated or otherwise made non-toxic at low pH
pH 3/Aeration	Sublatable, oxidizable, or strippable compounds at low pH
pH 3/Filtration	Suspended solids at low pH
pH 3/Solid-Phase Extraction	Non-polar organics, some metals, some surfactants at low pH
Initial pH/Aeration	Sublatable, oxidizable, or strippable compounds
Initial pH/Filtration	Suspended solids
Initial pH/Solid-Phase Extraction	Non-polar organics, some metals, some surfactants
pH 10 Adjustment	Compounds precipitated or otherwise made non-toxic at high pH
pH 10/Aeration	Sublatable, oxidizable, or strippable compounds at high pH
pH 10/Filtration	Suspended solids at high pH
pH 10/Solid-Phase Extraction	Non-polar organics, some metals, some surfactants at high pH
pH 6 Adjustment	Compounds less or more toxic at lower pH
pH 7 Adjustment	Compounds less or more toxic at neutral pH
pH 8 Adjustment	Compounds less or more toxic at higher pH

Table 2	
EPA Phase I Chronic Toxicity Characterization Tests	
Test	**Toxicant Groups Potentially Identified**
Tier 1	
Untreated Effluent	Baseline toxicity
Oxidant Reduction	Oxidants, certain other reducible compounds
EDTA chelation	Certain cationic metals
Initial pH/Aeration	Sublatable, oxidizable, or strippable compounds
Initial pH/Filtration	Suspended solids
Initial pH/Solid-Phase Extraction	Non-polar organics, some metals, some surfactants
Methanol Eluate	Compounds removed by solid-phase extraction
pH 6.5 Adjustment	Compounds less or more toxic at lower pH
pH 8.5 Adjustment	Compounds less or more toxic at higher pH
Tier 2	
Untreated Effluent	Baseline toxicity
pH 3 Adjustment	Compounds precipitated or otherwise made non-toxic at low pH
pH 3/Aeration	Sublatable, oxidizable, or strippable compounds at low pH
pH 3/Filtration	Suspended solids at low pH
pH 3/Solid-Phase Extraction	Non-polar organics, some metals, some surfactants at low pH
pH 3 SPE Methanol Eluate	Compounds removed by solid-phase extraction at pH 3
pH 10 Adjustment	Compounds precipitated or otherwise made non-toxic at high pH
pH 10/Aeration	Sublatable, oxidizable, or strippable compounds at high pH
pH 10/Filtration	Suspended solids at high pH
pH 10/Solid-Phase Extraction	Non-polar organics, some metals, some surfactants at high pH
pH 10 SPE Methanol Eluate	Compounds removed by solid-phase extraction at pH 11

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Attachment 1

No Phase I characterization test should be dropped from use on the basis that the toxicants it is designed to address are not likely to be present in the effluent. In excluding any Phase I test, the analyst may be limiting the information that can be gained on effluent toxicants. The investigator should approach effluent characterization without a preconceived notion as to the cause of toxicity.

QUALITY ANALYTICAL
LABORATORIES, INC.

March 15, 1995

Ms. Lynn White
CH2M Hill/CVO
2300 N.W. Walnut Blvd.
Corvallis, OR 97330

RE: Analytical Data for: **Wacker Siltronic Corporation**
Laboratory Reference Number: **R9604**

Dear Ms. White:

On **March 8, 1995**, QAL, Inc. received samples with a request for analysis. The analytical results and associated quality control data are enclosed.

It is our policy to store your samples for 30 days from the date of this letter. If extended storage is required, special arrangements can be accommodated upon early notification. The disposition of samples identified as hazardous will require special handling and you will be contacted if necessary.

QAL, Inc. appreciates your business and looks forward to serving you again. If you have any questions concerning your report or need any additional information, please call me at **(916) 244-5227**.

Sincerely,

Cindy Barbacem
Project Manager/Client Services

Quality Analytical
Laboratories Inc.

5090 Caterpillar Road,
Redding, CA 96003-1412

916 244-5227
Fax No. 916 244-4109

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QAL Reference No. R9604

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Quality Analytical Laboratories Inc.

5090 Caterpillar Road, Redding, CA 96003-1412

916 244-5227 Fax No. 916 244-4109

Sample ID Cross-reference Table

QAL, Inc. Lab Sample ID	Client Sample ID	Collect Date	Sample Matrix	Additional Description
FS = Field Sample				
R9604001	FS 95-4	03/06/95	Water	

The above lab sample ID's and cross reference information apply to samples as received by the laboratory. Modifiers to the lab sample ID may be added for internal tracking purposes. Any modified sample ID will be reflected in the appropriate case narrative only.

Quality Analytical Laboratories Inc.
5090 Caterpillar Road, Redding, CA 96003-1412
916 244-5227
Fax No. 916 244-4109

SCOEPA00028220

CASE NARRATIVE
General Chemistry

Laboratory Reference Number: R9604

Client/Project: WACKER SILTRONIC CORP.

I. Holding Time:
All holding times were met.

II. Analysis:

A. Calibration:
All acceptance criteria were met.

B. Blanks:
All acceptance criteria were met.

C. Matrix Spike Sample(s):
All acceptance criteria were met.

D. Duplicate Sample(s):
All acceptance criteria were met.

E. Lab Control Sample(s):
All acceptance criteria were met.

F. Other:
None.

III. Documentation Exceptions:
None.

IV. I certify that this data package is in compliance with the terms and conditions agreed to by the client and QAL, Inc., both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

SIGNED: Fred Bickell DATE: 3/14/95
Fred Bickell
Inorganics Supervisor

Quality Analytical Laboratories Inc.
5090 Caterpillar Road, Redding, CA 96003-1412
916 244-5227
Fax No. 916 244-4109

SCOEPA00028221

Report of Analytical Results

Parameter: MBAS
Method: EPA425.1

Project Name: Wacker Siltronic Corporation
Date Received: 03/08/95
Lab Reference No: R9604

Lab Sample ID	Client Sample ID	Result	Units	Reporting Level	Date Collected	Date Analyzed	Sample Matrix
R9604001	95-4	0.246	mg/L	0.100	03/06/95	03/08/95	Water
950308W01	METHOD BLANK	< 0.100	mg/L	0.100	None	03/08/95	Water

(2605)

Quality Analytical Laboratories (QAL), Inc. -- Redding

000002

QAL COOLER RECEIPT FORM

QAL Reference Number: R9604 QC Level: _____

PROJECT: R9604 CVO/ WACKER CORP Date Received: 3-8-95

A. **Preliminary Examination Phase**: Date cooler was opened: 3-8-95

by(print) KEVIN SAIR (Sign) [signature]

1. Did cooler come with a shipping slip? (YES) NO

   If yes, enter carrier name & air bill No. 125426731 1

2. Were Custody seals Present and in good shape? YES (NO)

   How many? _____ Seal Date? _____ Name on Seal? _____

3. Was COC present (YES) NO
4. Was COC filled out properly (ink,signed, etc.)? (YES) NO
5. Did you sign COC in the appropriate place? (YES) NO
6. Was ice used? (YES) NO

   6A. Cooler Temperature _____ or Temp. Blank 22

7. Type of packing in cooler: BUBBLE WRAP

8. Did Sample containers arrive unbroken and in good condition? (YES) NO
9. Were container labels complete and in good condition? (YES) NO
10. Did all container labels agree with the COC? (YES) NO
11. Were the correct containers used for the analyses indicated? (YES) NO
12. Were the correct preservatives used for the analyses indicated? (YES) NO
13. Was sufficient sample supplied to perform analyses indicated? (YES) NO
14. Were air bubbles present in VOA samples? NA YES (NO)

    If yes, list by client ID. _____

15. Was Exception report Needed? YES (NO) Filled out? YES NO

B. **LOG-IN-PHASE:** Date samples were logged-in: 3-8-95

by(print) KEVIN SAIR (sign) [signature]

000004

WC
CS

LIMS

CH2M HILL
APPLIED SCIENCES LABORATORY

CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # HS8134.36 ~~[illegible]~~

Purchase Order # 31306

Project Name

Company Name/CH2M HILL Office: Wacker Siltronic Corporation

Project Manager & Phone #: Mr. [X] Thomas J. Rothschild; Ms. [ ]; Dr. [ ] 503-246-0702

Report Copy to: Lynn White/CVD

Requested Completion Date:

Sampling Requirements: SDWA [ ] NPDES [X] RCRA [ ] OTHER ____

Sample Disposal: Dispose [X] Return [ ]

LAB TEST CODES: MBAS

ANALYSES REQUESTED: Chrome, Total; ORP; CTAS; Sulfide; Sulfite; MBAS (LRD →); Chrome Hexavalent; General Chemicals

SHADED AREA-- FOR LAB USE ONLY

Lab 1 # 8279-1

Lab 2 # R9604

Quote #

Kit Request #

Project #

No. of Samples

Page of

Login

LIMS Ver

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	Matrix AIR	CLIENT SAMPLE ID (9 CHARACTERS)	# OF CONTAINERS	Chrome, Total	ORP	CTAS	Sulfide	Sulfite	MBAS	Chrome Hexavalent	General Chemicals			REMARKS	LAB 1 ID	LAB 2 ID
6 Mar 95	0830	X		X			95-4	8	X	X	X	X	X	X	X	X			Cooled with ice		
↓	↓	X		X			95-5	1													
↓	↓	X		X			95-6	1													
↓	↓	X		X			95-7	1													

Sampled By & Title (Please sign and print name): Thomas J. Rothschild, Facilities Chemist; Thomas J. Rothschild	Date/Time: 6 Mar 95/0830	Relinquished By (Please sign and print name): Thomas J. Rothschild; Thomas J. Rothschild	Date/Time: 6 Mar 95/1200
Received By (Please sign and print name): [signature] 3-895	Date/Time: 1000	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via: UPS BUS Fed-Ex Hand Other ____	Shipping #
Work Authorized By (Please sign and print name)	Remarks: SEE QAL CRF		

QC Level: 1 2 3 Other: ____

COC Rec Y | ICE Y

Ana Req Y | TEMP 2°C

Cust Seal N | Ph

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client

SCOEPA00028224

Biomonitoring Services

BIOASSAY REPORT
ACUTE AND CHRONIC
DEFINITIVE BIOASSAYS
Conducted March 7 through 14, 1995

CH2M HILL

SCOEPA00028225

BIOASSAY REPORT
ACUTE AND CHRONIC
DEFINITIVE BIOASSAYS
Conducted March 7 through 14, 1995

Prepared for

WACKER SILTRONICS
PORTLAND, OREGON

Prepared by

CH2M HILL
2300 NW Walnut Boulevard
Corvallis, Oregon 97330

April 12, 1995
Lab ID No. C01355

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INTRODUCTION

CH2M HILL conducted acute and chronic definitive tests using the water flea (*Ceriodaphnia dubia*) and the fathead minnow (*Pimephales promelas*) on samples provided by Wacker Siltronics, Portland, Oregon. The tests were conducted from March 7 through 14, 1995.

METHODS AND MATERIALS

TEST METHODS

The acute tests were performed according to: *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms*, Weber C., et. al. (1991); EPA/600/4-90/027F.

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Weber, C. et al. (1989); EPA/600/4-89/001.

TEST ORGANISMS

The *Ceriodaphnia dubia* used in the acute tests were obtained from CH2M HILL's in-house cultures and were less than 24 hours old at test initiation. The *Ceriodaphnia dubia* used in the chronic tests were obtained from CH2M HILL's in-house cultures and were less than 24 hours old and within an eight hour age at test initiation. The fathead minnows used in the chronic tests were obtained from Aquatic Research Organisms, Hampton, New Hampshire and were less than 24 hours old at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (1989). All test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used in the *Ceriodaphnia* tests was moderately hard well water (EPA, 1989), with a total hardness and alkalinity of 102 and 72 mg/l as $CaCO_3$, respectively, and a pH of 7.7. Moderately hard reconstituted water (EPA, 1989) with a hardness of 98 mg/l as $CaCO_3$, alkalinity of 60 mg/l as $CaCO_3$, and pH of 7.7 was used as dilution water for the fathead minnow tests.

TEST CONCENTRATIONS

The concentration tested in the acute tests was 33 percent effluent with dilution water alone for the control. The concentration was run in quadruplicate with 5 organisms per replicate.

The concentrations tested in the chronic tests were 3, 10, 17, 33, and 100 percent effluent with dilution water for the control. For the fathead minnow chronic test, 10 organisms per chamber with four chambers per concentration for a total of 40 organisms per concentration were used.

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For the *Ceriodaphnia* chronic test, 1 organism per chamber with ten chambers per concentration for a total of 10 organisms per concentration were used.

SAMPLE COLLECTION

The samples were collected by Wacker personnel on March 6, 8, and 10, 1995 and delivered to CH2M HILL's Corvallis Aquatic Toxicology Laboratory by courier. The samples were stored in the dark at 4°C until test solutions were prepared and tested. Chain of Custody for sample collection is provided in Appendix C. The samples ID's were 95-5 (CAD), 95-6 (WAD), 95-7 (Blowdown), and 95-4, 10, 13 (Final Effluent).

SAMPLE PREPARATION

Samples used during these tests were filtered through a 60 µm net and temperature adjusted prior to each daily renewal.

MONITORING OF BIOASSAYS

The acute tests were monitored at test initiation for pH, hardness, alkalinity, conductivity, ammonia and dissolved oxygen, and every 24 hours thereafter for mortality, pH, and dissolved oxygen. The chemical data is presented on the raw data sheets in Appendix A. Temperature was monitored continuously throughout the 48- and 96-hour test periods.

For the chronic test, pre- and post-renewal solutions were monitored for dissolved oxygen and pH daily in the control, low, middle, and high concentrations. Conductivity, ammonia, alkalinity, and hardness were measured in each new sample (100 percent effluent) and in the control. *Ceriodaphnia dubia* survival and neonate production was measured daily in the chronic tests. According to EPA (1989), *Ceriodaphnia* tests should be terminated when 60 percent or more of the surviving female *Ceriodaphnia* in the controls have produced their third brood and at least 15 neonates per adult are produced. Fathead minnow mortality was measured daily and fish growth was measured by dry weight analysis at the conclusion of the fathead minnow chronic test. Temperature was monitored continuously throughout the testing periods.

DATA ANALYSIS

The effects measured during the *Ceriodaphnia dubia* acute test included survival over the 48-hour exposure period. The effects measured during the *Ceriodaphnia dubia* chronic test included survival and reproduction over the 7-day exposure period. The effects measured during the fathead minnow chronic test included survival and growth over the 7-day exposure period. The statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/600/4-89/001, using Toxcalc version 5. Dunnett's Procedure, Bonferroni's T-Test or Fisher's Exact Test was used to compare the survival data and Dunnett's Procedure or Bonferroni's T-Test was used to compare the reproduction or growth data between the control and each effluent treatment. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure

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or T-test with Bonferroni Adjustment could not be met, Steel's Many-One Rank Test or Wilcoxon Rank Sum with Bonferroni Adjustment was used to analyze the data.

RESULTS AND DISCUSSION

ACUTE BIOASSAYS

The raw data sheets and ammonia analysis are presented in Appendix A and the results are summarized below.

Table 1
Summary of Results
Ceriodaphnia dubia

Percent Survival			
Concentration	0 hr	24 hr	48 hr
Control	100	100	100
95-5 (CAD)			
33%	100	80	15
95-6 (WAD)			
33%	100	90	60
95-7 (Blowdown)			
33%	100	100	100

Samples 95-5 and 95-6 both showed a statistically significant reduction in survival at 48 hours when compared to the control. Dissolved oxygen concentrations remained at 40 percent saturation or greater throughout the test period. Test temperatures remained in the range of 20±1 °C. The tests proceeded without interruption or incidence that could have affected test results.

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CHRONIC BIOASSAYS

Table 2 summarizes the survival and reproduction data for the *Ceriodaphnia dubia* test conducted.

Table 2
***Ceriodaphnia Dubia* Results**

Concentration (%)	Percent Survival	No. Young Per Adult
Control	90	19.7
3	100	23.3
10	70	12.0[b]
17	0[a]	0.0
33	0[a]	0.0
100	0[a]	0.0

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Fisher's Exact Test.
[b] Indicates a statistically significant reduction from control at p less than 0.05 using Steel's Many-One Rank Test.

The *Ceriodaphnia dubia* showed a statistically significant reduction in survival at the 17, 33, and 100 percent effluent concentrations and in reproduction at the 10 percent effluent concentration when compared to the control. The no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) for survival and reproduction were 3 and 10 percent effluent, respectively. Control survival was 90 percent.

The IC_{25} values calculated for *Ceriodaphnia dubia* survival and reproduction were 9.7 and 7.0 percent effluent, respectively.

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Table 3 summarizes the survival and growth data for the fathead minnow test conducted.

Table 3
Fathead Minnow Chronic Results

Sample Concentration (%)	Percent Survival	Mean Dry Weight Per Fish (mg)
Control	90.0	0.69
3	85.0	0.67
10	85.0	0.63
17	85.0	0.63
33	87.5	0.65
100	47.5[a]	0.33

[a] Indicates a statistically significant reduction from control at p less than 0.05 using Dunnett's T-test.

The fathead minnows showed a statistically significant reduction in survival at the 100 percent effluent concentration when compared to the control. Control survival was 90 percent. The NOEC and LOEC were 33 and 100 percent effluent, respectively.

The IC_{25} value was calculated on the fathead minnow survival and growth. The IC_{25} values for survival and growth were 64.9 and 58.7 percent effluent, respectively.

ACUTE DUAL-END POINT

The dual end-point for the final effluent (deriving of acute mortality results from the chronic tests) resulted in no statistically significant difference between the fathead control survival or any effluent concentration. The acute NOEC was 100 percent effluent.

The results of the Ceriodaphnia dubia test resulted in a statistically significant reduction in survival at the 33 and 100 percent effluent concentrations. The acute NOEC was 17 percent effluent.

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REFERENCE TOXICANT TESTS

The results of monthly reference toxicant tests with sodium chloride (*Ceriodaphnia* and fathead minnow) conducted in March indicate that the test organisms were within their respective sensitivity range based on EPA guidelines (EPA 1989). The LC_{50} values, IC_{25} values, and Control Chart limits are listed in the tables below. The data sheets for the reference toxicant tests are provided in Appendix B.

Table 4
Reference Toxicant Tests

Species	LC_{50} (g/L)	Control chart limits
Pimephales promelas (FHM 413)	7.5	6.3 to 9.3 g/L
Ceriodaphnia dubia	1.8	1.7 to 3.1 g/L

Table 5
Chronic Reference Toxicant Tests with Sodium Chloride

Species (test)	IC_{25} g/L	Control Chart Limits
Pimephales promelas (survival)	1.4	1.4 to 6.2 g/L
Pimephales promelas (growth)	1.5	0.8 to 3.0 g/L
Ceriodaphnia dubia (survival)	1.8	0.9 to 2.6 g/L
Ceriodaphnia dubia (reproduction)	1.1	0.2 to 1.7 g/L

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APPENDIX A
RAW DATA SHEETS

CH2MHILL TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Wacker - Siltronics

Address

Contact Gary Hickman / CH2M, Sandra Archer

Test Initiation: Date 3-7-95 Time 1450 Test Termination: Date 3-14-95 Time 1600

Technician Mackey, Winn, Schut, Topping

Test Species/ID Pimephales promelas / FHM 413 / Ceriodaphnia dubia / Cd 455 / Ceriodaphnia dubia / Cd 454

Sample Information

Sample ID Number	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Tested	Dechlorinated (Yes or No)	~~Salinity (ppt)~~	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
C01355-01			0.05 /	No	95-5	1540	63
-02			0.30 0.16 /	No	95-6	492	11
-03			0.16 /	No	95-7	20	5
-04	3-6-95	0830	0.08 /	No	95-4	300	5
-05	3-8-95	0800	0.05 /	No	95-10	190	5
06	3-12-95	0800	0.06 /	No	95-13	248	5
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				
			/				

Dilution Water Source	ID #	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	996	98	60
MH well H_2O	899	102	72

Test Species Information	ID # FHM 413	ID # Cd 455	ID # Cd 454	ID #
Age or Size	<24 hrs	<24 hrs old	<24 hrs	
Loading Rate	-	8 hr span	-	
Test Container Size	600 ml	30 ml	30 ml	
Test Volume	500 ml	15 ml	25 ml	
Feeding: Type Amount	0.1 ml Artemia	0.1 ml Algae	none	
	2x daily	1x/day	-	
Aeration: Began Amount	none	none	none	
	-	-	-	
Dilution Water ID #	896	899	899	
Acclimation Period	<24hrs	<24hrs	<24hrs	
Test Location	-4	-6	-3	
Condition of Survivors				

Comments Day 5 no food available for ~~pm~~ feeding KR 7/0

Water Quality Meters Used/ID #

Dissolved Oxygen #1 pH #1 Temperature

Conductivity #1 Refractometer Other

CH2MHILL FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client: Wacker - Siltronics

Sample Description: 95-5 95-6 95-7

co1355-01 co1355-02 co1355-03

Test Species: Ceriodaphnia dubia ID#: Cd 954

Beginning, Date: 3-7-95 Time: 1450

Ending, Date: 3-9-95 Time: 1600

Technician: 0 hr BM 24 hr BM 48 hr BM 72 hr ____ 96 hr ____

Time: 0 hr 1450 24 hr 1630 48 hr 1600 72 hr ____ 96 hr ____

Conc or Percent	Test Container Number	Number of Live Organisms					Disolved Oxygen (mg/l)					pH					Temperature(°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
CONTROL	A	5	5	5			8.9	-	8.2			7.7	-	8.1			20	20	20			226	-	294		
	B	5	5	5			8.9	-	8.4																	
	C	5	5	5			8.9	-	8.5																	
	D	5	5	5			8.9	-	8.5																	
95-5 (33%)	A	5	4	0			9.0	-	8.6			8.6	-	7.9			20	20	20			1320	-	1692		
	B	5	4	1			9.0	-	8.6																	
	C	5	4	2			9.0	-	8.6																	
	D	5	4	0			9.0	-	8.6																	
95-6 (33%)	A	5	5	3			9.2	-	8.6			7.9	-	8.0			20	20	20			738	-	844		
	B	5	4	4			9.2	-	8.6																	
	C	5	5	2			9.2	-	8.6																	
	D	5	4	3			9.2	-	8.6																	
95-7 (33%)	A	5	5	5			9.0	-	8.6			7.3	-	8.0			20	20	20			230	-	246		
	B	5	5	5			9.0	-	8.6																	
	C	5	5	5			9.0	-	8.6																	
	D	5	5	5			9.0	-	8.6																	

Acute Test-48 Hr Survival

Start Date:	07 Mar-95 00:00	Test ID:	135501cda	Sample ID:	WACKER-SILTRONICS
End Date:	09 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAA 91-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
33	0.0000	0.2000	0.4000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4		
*33	0.1500	0.1500	0.3998	0.2255	0.6847	55.174	4	10.00	11.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.85469	0.749	0.80811	1.75878
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)				
Wilcoxon Two-Sample Test indicates significant differences				

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Acute Test-48 Hr Survival

Start Date:	07 Mar-95 00:00	Test ID:	135502cda	Sample ID:	WACKER-SILTRONICS
End Date:	09 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAA 91-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
33	0.6000	0.8000	0.4000	0.6000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4		
*33	0.6000	0.6000	0.8910	0.6847	1.1071	19.366	4	10.00	11.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.74565	0.749	0.17433	3.50912
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)				
Wilcoxon Two-Sample Test indicates significant differences				

SCOEPA00028238

Acute Test-48 Hr Survival

Start Date:	07 Mar-95 00:00	Test ID:	135503cda	Sample ID:	WACKER-SILTRONICS
End Date:	09 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAA 91-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
33	1.0000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4		
33	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	11.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	1	0.749		
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)				
Wilcoxon Two-Sample Test indicates no significant differences				

SCOEPA00028239

CH2M HILL

Ceriodaphnia dubia Survival and Reproduction Test Data Summary

Client Wacker - Siltronics Test Start Date 3-7-95

Sample Description Whole Effluent Sample ID # C01355-04

Ceriodaphnia Lot # 455 Statistician BM

Percent or Concentration	Total Young Per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
CONTROL	11	12	24	28	24	26	26	22	21	3 AD	9	197
3%	26	25	13	26	11	24	29	27	27	25	10	233
10%	16	0 AD	0 AD	20	17	17	0 AD	17	15	18	7	120
17%	0	0	0	0	0	0	0	0	0	0	0	0
33%	0	0	0	0	0	0	0	0	0	0	0	0
100%	0	0	0	0	0	0	0	0	0	0	0	0

CH2MHILL CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA

Client Wacker - Siltronics Test Beginning: Date 3-7-95 Time 15:15

Sample Description C01355-04 Test Ending: Date 3-14-95 Time 13:30

Ceriodaphnia Lot# 455 Dilution Water OSW well H2O mA ID# 899

Technician Day 1 Bm Day 2 Bm Day 3 JS Day 4 Bm Day 5 Bm Day 6 Bm Day 7 JS

Time Day 1 1410 Day 2 1510 Day 3 1050 Day 4 1030 Day 5 1405 Day 6 1420 Day 7 13:30

Percent or Concentration	Day	Replicate										No. Live Adults	Total Live Young
		A	B	C	D	E	F	G	H	I	J		
CONTROL	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	3M0	0	3M0	4M0	3M0	3M0	4M0	4M0	3M0	3AD	9	343
	4	3	0	3	4	3	3	4	4	3	-	9	27
	5	0	4	9	0	0	0	9	5	0	-	9	27
	6	8	8	0	9	7	10	0	0	6	-	9	48
	7	0	0	12	15	14	13	13	13	12	-	9	92
3%	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	3M0	4M0	0	3M0	0	3M0	4M0	4M0	3M0	4M0	10	380
	4	5	4	0	5	0	5	4	6	5	4	10	39
	5	0	0	0	0	0	0	0	0	0	0	10	0
	6	9	8	0	7	2	8	10	8	7	7	10	66
	7	12	13	13	14	9	11	15	13	15	14	10	129
10%	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0AD	0	0	0	0	0	0	0	9	0
	3	0	AD	-	0	0	0	AD	0	0	0	7	0
	4	3	-	-	5	1	3	-	2	3	3	7	20
	5	0	-	-	0	0	0	-	0	0	0	7	0
	6	5	-	-	6	6	5	-	6	5	5	7	38
	7	8	-	-	9	10	9	-	9	7	10	7	52 6d
17%	1	0	0	0AD	0	0	0	0	0	0	0	9	0
	2	0	0	-	0	0	0	0AD	0	0	0	8	0
	3	AD	AD	-	AD	AD	AD	-	AD	AD	AD	0	0
	4		-	-				-					
	5		-	-				-					
	6		-	-				-					
	7		-	-				-					
33%	1	0	0AD	0AD	0AD	0	0AD	0	0	0	0AD	5	0
	2	0AD	-	-	-	0AD	-	0AD	0AD	0AD	-	0	0
	3	-	-	-	-	-	-	-	-	-	-	-	-
	4		-	-	-	-	-				-		
	5		-	-	-	-	-				-		
	6		-	-	-	-	-				-		
	7		-	-	-	-	-				-		
100%	1	0AD	0AD	0	0AD	0AD	0AD	0AD	0AD	0AD	0AD	1	0
	2	-	-	0AD	-	-	-	-	-	-	-	0	0
	3	-	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-		
	5	-	-	-	-	-	-	-	-	-	-		
	6	-	-	-	-	-	-	-	-	-	-		
	7	-	-	-	-	-	-	-	-	-	-		

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client Wacker - Siltronics Initiated: Date 3-7-95 Time 1515 Adults Isolated Date 3-6-95 Time 2305

Sample Description C01355-04 Terminated: Date 3-14-95 Time 1520 Neonates Collected Date 3-7-95 Time 0700

Technician Day 0 JS Day 1 Bm Day 2 Bm Day 3 JS Day 4 Bm Day 5 Bm Day 6 JS Day 7 JS

Time Day 0 1600 Day 1 1525 Day 2 1545 Day 3 1120 Day 4 1255 Day 5 1500 Day 6 1420 Day 7 1520

Percent or Concentration	Dissolved Oxygen (mg/l)								pH								Conductivity (µmhos/cm)							
	Day								Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
CONTROL	8.0	8.3 / 8.2	8.1 / 7.9	7.7 / 8.3	8.2 / 7.6	7.8 / 7.6	8.3 / 8.3	7.8	7.7	8.1 / 8.0	8.0 / 7.3	8.0 / 7.3	7.8 / 7.8	8.2 / 8.1	8.0 / 7.7	8.1	234		236		242			
3%	8.1	8.5 / 8.0	8.2 / 8.0	7.7 / 8.0	8.2 / 7.8	7.8 / 7.5	8.6 / 8.3	7.8	7.7	8.1 / 7.9	8.0 / 7.0	8.0 / 7.2	7.9 / 7.9	8.2 / 8.0	7.9 / 7.6	8.1								
10%				– / 7.5	8.2 / 7.9	7.8 / 7.6	8.6 / 8.3	7.8				– / 7.7	7.9 / 7.9	8.1 / 8.0	7.9 / 7.6	8.1					305			
17%	8.4	8.4 / 8.3	8.2 / 8.1	8.0 / 7.5					7.6	8.0 / 7.9	8.0 / 6.9	8.0 / 7.9							321					
33%																								
100%	8.7	8.4 / 8.4	8.6 / –						7.0	7.4 / 7.0	7.2 / –						868							

Percent or Concentration	Total Hardness (mg/l $CaCO_3$)								Alkalinity (mg/l $CaCO_3$)							
	Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

Comments:

SCOEPA00028242

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	07 Mar-95 00:00	Test ID:	135504cdc	Sample ID:	WACKER-SILTRONICS
End Date:	14 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia
Comments:					

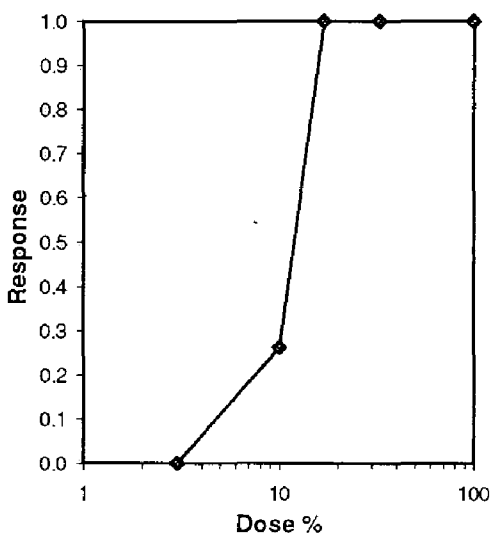
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
33	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

				Not			Fisher's	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Resp	Resp	Total	N	Exact P	Critical	Mean	N-Mean
D-Control	0.9000	1.0000	1	9	10	10			0.9500	1.0000
3	1.0000	1.1111	0	10	10	10	0.5000	0.0500	0.9500	1.0000
10	0.7000	0.7778	3	7	10	10	0.2910	0.0500	0.7000	0.7368
*17	0.0000	0.0000	10	0	10	10	0.0001	0.0500	0.0000	0.0000
33	0.0000	0.0000	10	0	10	10			0.0000	0.0000
100	0.0000	0.0000	10	0	10	10			0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	10	17	13.0384	10

Linear Interpolation (80 Resamples)

Point	%	SE	95% CL		Skew
IC05	4.330	1.964	3.604	10.350	1.8367
IC10	5.660	2.048	4.208	10.700	0.9258
IC15	6.990	2.025	4.812	11.050	0.2510
IC20	8.320	1.951	5.416	11.400	-0.2413
IC25	9.650	1.780	6.020	11.750	-0.5572
IC40	11.300	1.369	7.832	12.800	-1.1111
IC50	12.250	1.202	9.040	13.500	-1.3272



SCOEPA00028243

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	07 Mar-95 00:00	Test ID:	135504cdc	Sample ID:	WACKER-SILTRONICS
End Date:	14 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	11.000	12.000	24.000	28.000	24.000	26.000	26.000	22.000	21.000	3.000
3	26.000	25.000	13.000	26.000	11.000	24.000	29.000	27.000	27.000	25.000
10	16.000	0.000	0.000	20.000	17.000	17.000	0.000	17.000	15.000	18.000
17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
33	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

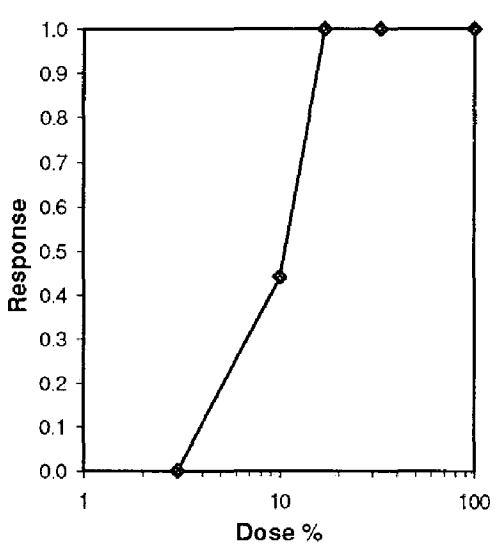
			Transform: Untransformed					Rank	1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical		Mean	N-Mean
D-Control	19.700	1.0000	19.700	3.000	28.000	41.657	10				21.500	1.0000
3	23.300	1.1827	23.300	11.000	29.000	26.305	10	123.50	79.00	6.83011	21.500	1.0000
*10	12.000	0.6091	12.000	0.000	20.000	69.832	10	76.00	79.00	6.83011	12.000	0.5581
17	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000
33	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000
100	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.80592	0.9	-1.0267	-0.449
Bartlett's Test indicates equal variances (p = 0.62)	0.97089	9.21035		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	3	10	5.47723	33.3333

Linear Interpolation (80 Resamples)

Point	%	SE	95% CL		Skew
IC05	3.792	0.801	2.755	4.452	5.8447
IC10	4.584	0.864	3.723	5.903	3.7660
IC15	5.376	1.009	4.347	7.355	2.0480
IC20	6.168	1.195	4.949	8.806	1.2527
IC25	6.961	1.378	5.522	10.082	0.8889
IC40	9.337	1.385	7.080	11.465	-0.0820
IC50	10.729	1.303	8.100	12.388	-0.4197



SCOEPA00028244

Ceriodaphnia Survival and Reproduction Test-48 Hr Survival

Start Date:	07 Mar-95 00:00	Test ID:	135504cdc	Sample ID:	WACKER-SILTRONICS
End Date:	14 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia
Comments:					

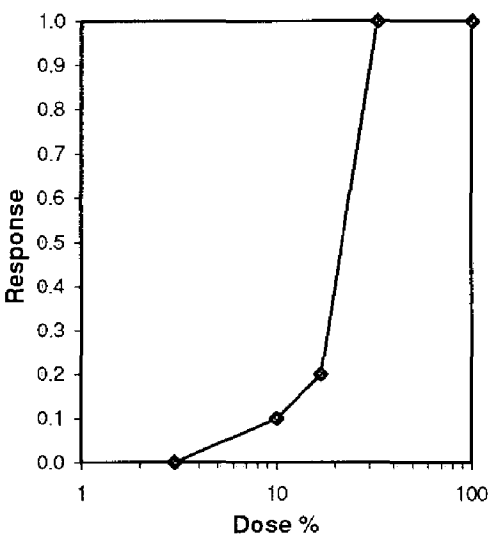
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
17	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
33	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

				Not			Fisher's	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Resp	Resp	Total	N	Exact P	Critical	Mean	N-Mean
D-Control	1.0000	1.0000	0	10	10	10			1.0000	1.0000
3	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
10	0.9000	0.9000	1	9	10	10	0.5000	0.0500	0.9000	0.9000
17	0.8000	0.8000	2	8	10	10	0.2368	0.0500	0.8000	0.8000
33	0.0000	0.0000	10	0	10	10			0.0000	0.0000
100	0.0000	0.0000	10	0	10	10			0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	17	33	23.6854	5.88235

Linear Interpolation (80 Resamples)

Point	%	SE	95% CL		Skew
IC05	6.500	4.196	4.394	17.800	0.5693
IC10	10.000	4.317	5.788	18.600	-0.1878
IC15	13.500	3.889	7.183	19.400	-0.4857
IC20	17.000	3.317	8.577	20.200	-0.9319
IC25	18.000	2.832	11.677	21.000	-0.9976
IC40	21.000	1.959	16.965	23.400	-0.8520
IC50	23.000	1.746	19.600	25.000	-1.1959



SCOEPA00028245

CH2MHILL **FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA**

Client Wacker - Saltrates Date Initiated 3-7-95 Time 1700

Sample Description 001355-04 Date Terminated 3-14-95 Time 1600

Technician: Day 0 DW Day 1 DW Day 2 DW Day 3 JS Day 4 KRTO Day 5 KRTO Day 6 DW Day 7 KT

Time Day 0 1700 Day 1 1530 Day 2 1415 Day 3 1400 Day 4 1345 Day 5 1530 Day 6 1525 Day 7 1600

Concentration or Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
CONTROL	0	10	10	10	8	-	8.4	-	7.7	25	330
	1	10	10	10	8	7.4	8.3	7.8	8.1	25	
	2	10	10	10	8	7.2	8.4	7.7	8.0	25	
	3	9	10	10	8	7.4	8.1	7.6	7.8	25	
	4	8	10	10	8	6.7	8.2	7.6	8.0	25	
	5	8	10	10	8	6.7	8.3	7.6	7.8	25	
	6	8	10	10	8	7.5	8.4	7.7	7.9	25	
	7	8	10	10	8	6.4	-	7.5	-	25	
3%	0	10	10	10	8	-	8.4	-	7.9		
	1	10	9	10	7	7.3	8.4	7.8	8.1		
	2	10	9	10	7	7.0	8.4	7.7	8.0		
	3	10	8	10	7	7.3	8.1	7.6	7.9		
	4	10	8	9	7	6.7	8.3	7.6	8.0		
	5	10	8	9	7	6.6	8.2	7.7	8.0		
	6	10	8	9	7	7.5	8.4	7.7	7.9		
	7	10	8	9	7	6.1	-	7.5	-		
10%	0	10	10	10	8						
	1	10	9	10	8						
	2	10	8	10	7						
	3	9	8	10	7						
	4	9	8	10	7						
	5	9	8	10	7						
	6	9	8	10	7						
	7	9	8	10	7						
17%	0	10	10	10	8	-	8.4	-	7.9		
	1	10	9	10	8	7.4	8.4	7.8	8.0		
	2	10	9	10	8	7.0	8.5	7.6	7.9		
	3	10	7	10	8	7.3	8.3	7.5	7.8		
	4	10	7	10	8	6.7	8.2	7.6	7.9		
	5	10	7	10	8	6.9	8.3	7.7	7.9		
	6	10	7	10	8	7.5	8.5	7.6	7.9		
	7	10	6	10	8	6.3	-	7.5	-		
33%	0	10	10	10	8						
	1	9	9	10	8						
	2	9	9	10	8						
	3	9	8	10	8						
	4	9	8	10	8						
	5	9	8	10	8						
	6	9	8	10	8						
	7	9	8	10	8						
100%	0	10	10	10	8	-	8.6	-	7.1	25	905
	1	10	10	10	8	7.8	8.5	7.1	7.1	25	
	2	10	9	10	8	7.3	8.6	6.9	7.1	25	
	3	8	7	8	6	7.4	8.8	7.6	6.8	25	
	4	8	6	7	5	7.2	8.5	6.7	7.0	25	
	5	8	6	6	5	7.1	8.3	6.4	6.9	25	
	6	4	6	5	5	7.8	8.5	7.0	7.0	25	
	7	3	6	5	5	7.1	-	6.7	-	25	

Fathead Minnow 7-Day Growth Data

Client Wacker Siltronic Corp Species ID # FHM 913

Sample Description _____ Start Date 3-7-95

Concentration or Percent	Replicate	Tare Weight (gm)	Total Weight (gm)	Net Fish Weight (gm)	No. of Fish	Net Weight Per Fish (mg
CONTROL	A	1.0959	1.1009		8	
	B	1.1053	1.1115		10	
	C	1.1270	1.1339		10	
	D	1.1023	1.1089		8	
3	A	1.1143	1.1207		10	
	B	1.1225	1.1274		8	
	C	1.1047	1.1103		9	
	D	1.1023	1.1058		7	
10	A	1.1080	1.1129		9	
	B	1.1065	1.1111		8	
	C	1.1068	1.1137		10	
	D	1.1020	1.1069		7	
17	A	1.1029	1.1086		10	
	B	1.1107	1.1148		6	
	C	1.1054	1.1115		10	
	D	1.1064	1.1118		8	
33	A	1.0954	1.1004		9	
	B	1.1018	1.1073		8	
	C	1.1053	1.1121		10	
	D	1.0999	1.1052		8	
100	A	1.1093	1.1098		3	
	B	1.1029	1.1045		6	
	C	1.1134	1.1144		5	
	D	1.1152	1.1169		5	

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	07 Mar-95 00:00	Test ID:	135504ppc	Sample ID:	WACKER-SILTRONICS
End Date:	14 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAF 91	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.8000	1.0000	1.0000	0.8000
3	1.0000	0.8000	0.9000	0.7000
10	0.9000	0.8000	1.0000	0.7000
17	1.0000	0.6000	1.0000	0.8000
33	0.9000	0.8000	1.0000	0.8000
100	0.3000	0.6000	0.5000	0.5000

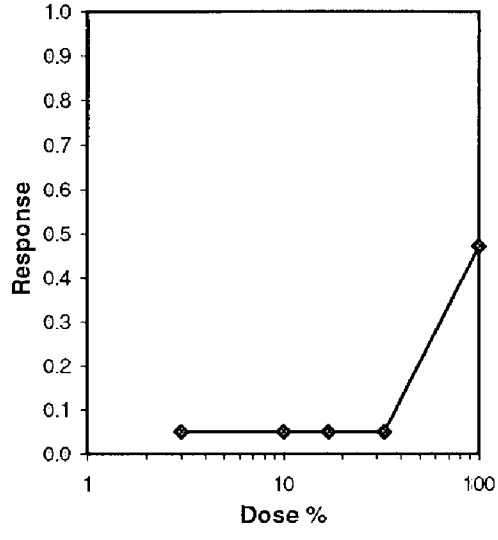
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9000	1.0000	1.2596	1.1071	1.4120	13.974	4				0.9000	1.0000
3	0.8500	0.9444	1.1898	0.9912	1.4120	15.281	4	0.540	2.410	0.3114	0.8563	0.9514
10	0.8500	0.9444	1.1898	0.9912	1.4120	15.281	4	0.540	2.410	0.3114	0.8563	0.9514
17	0.8500	0.9444	1.2043	0.8861	1.4120	21.278	4	0.428	2.410	0.3114	0.8563	0.9514
33	0.8750	0.9722	1.2188	1.1071	1.4120	11.906	4	0.315	2.410	0.3114	0.8563	0.9514
*100	0.4750	0.5278	0.7591	0.5796	0.8861	16.957	4	3.873	2.410	0.3114	0.4750	0.5278

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93184	0.884	-0.1004	-1.1757
Bartlett's Test indicates equal variances (p = 0.91)	1.54469	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSB	MSE	F-Stat	F-Prob	df
Dunnett's Test	33	100	57.4456	3.0303	0.24635	0.1397	0.0334	4.18273	0.01068	5, 18

Linear Interpolation (80 Resamples)

Point	%	SE	95% CL(Exp)		Skew
IC05	33.220	15.683	0.000	47.444	0.3654
IC10	41.128	15.528	0.000	57.276	-0.9605
IC15	49.036	14.286	0.000	67.544	-1.5761
IC20	56.944	9.831	22.266	77.523	-1.3374
IC25	64.852	9.217	32.356	87.501	-0.5172
IC40	88.577				
IC50	>100				



SCOEPA00028248

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	07 Mar-95 00:00	Test ID:	135504ppc	Sample ID:	WACKER-SILTRONICS
End Date:	14 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAF 91	Test Species:	PP-Pimephales promelas
Comments:					

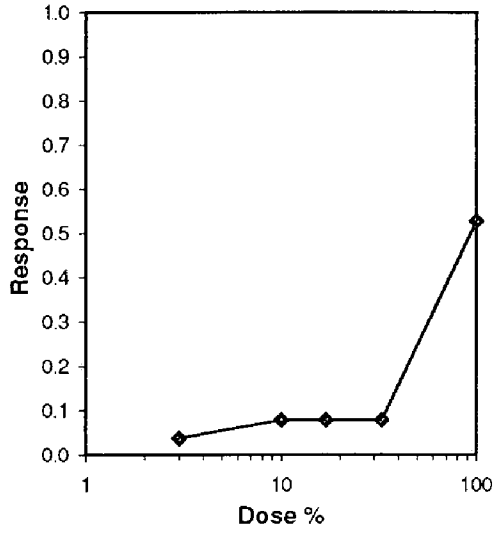
Conc-%	1	2	3	4
D-Control	0.6250	0.6200	0.6900	0.8250
3	0.6400	0.6125	0.6222	0.7857
10	0.5444	0.5750	0.6900	0.7000
17	0.5700	0.6833	0.6100	0.6750
33	0.5556	0.6875	0.6800	0.6625
100	0.5000	0.2667	0.2000	0.3400

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6900	1.0000	0.6900	0.6200	0.8250	13.838	4				0.6900	1.0000
3	0.6651	0.9639	0.6651	0.6125	0.7857	12.209	4	0.465	2.360	0.1264	0.6651	0.9639
10	0.6274	0.9092	0.6274	0.5444	0.7000	12.624	4	1.169	2.360	0.1264	0.6361	0.9219
17	0.6346	0.9197	0.6346	0.5700	0.6833	8.528	4	1.035	2.360	0.1264	0.6361	0.9219
33	0.6464	0.9368	0.6464	0.5556	0.6875	9.507	4	0.814	2.360	0.1264	0.6361	0.9219
100	0.3267	0.4734	0.3267	0.2000	0.5000	39.468	4				0.3267	0.4734

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.93709		0.868		0.48568	-0.7459
Bartlett's Test indicates equal variances (p = 0.90)					1.0575		13.2767			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSB**	**MSE**	**F-Stat**	**F-Prob**	**df**
Dunnett's Test	33	100	57.4456	3.0303	0.12641	0.00256	0.00574	0.44537	0.77412	4, 15

Linear Interpolation (80 Resamples)

Point	%	SE	95% CL(Exp)		Skew
IC05	5.320	13.528	0.000	59.466	1.0579
IC10	36.272	16.955	0.000	52.189	-0.2587
IC15	43.742	15.055	0.000	58.326	-1.2896
IC20	51.211	10.092	17.843	65.942	-1.3174
IC25	58.681	8.713	27.717	75.249	0.0323
IC40	81.091				
IC50	96.031				



SCOEPA00028249

Larval Fish Growth and Survival Test-48 Hr Survival

Start Date:	07 Mar-95 00:00	Test ID:	135504ppc	Sample ID:	WACKER-SILTRONICS
End Date:	14 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	EFF2-Industrial
Sample Date:	06 Mar-95 00:00	Protocol:	EPAF 91	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	0.8000
3	1.0000	0.9000	1.0000	0.7000
10	1.0000	0.8000	1.0000	0.7000
17	1.0000	0.9000	1.0000	0.8000
33	0.9000	0.9000	1.0000	0.8000
100	1.0000	1.0000	1.0000	0.8000

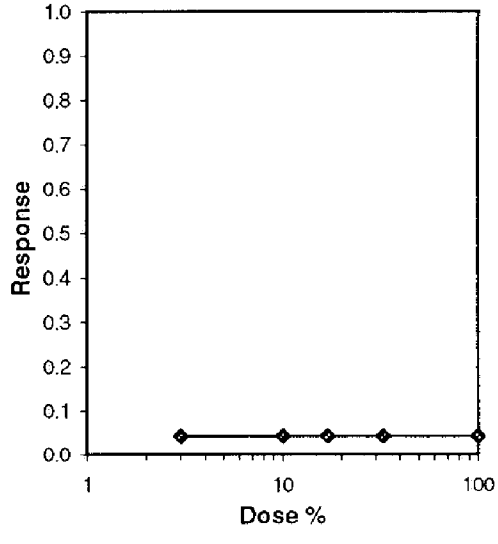
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9500	1.0000	1.3358	1.1071	1.4120	11.411	4				0.9500	1.0000
3	0.9000	0.9474	1.2661	0.9912	1.4120	15.696	4	0.587	2.410	0.2862	0.9100	0.9579
10	0.8750	0.9211	1.2306	0.9912	1.4120	17.454	4	0.886	2.410	0.2862	0.9100	0.9579
17	0.9250	0.9737	1.2951	1.1071	1.4120	11.347	4	0.343	2.410	0.2862	0.9100	0.9579
33	0.9000	0.9474	1.2543	1.1071	1.4120	9.935	4	0.686	2.410	0.2862	0.9100	0.9579
100	0.9500	1.0000	1.3358	1.1071	1.4120	11.411	4	0.000	2.410	0.2862	0.9100	0.9579

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.88679	0.884	-0.6114	-1.0374
Bartlett's Test indicates equal variances (p = 0.95)	1.12197	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSB	MSE	F-Stat	F-Prob	df
Dunnett's Test	100	>100		1	0.1937	0.00761	0.0282	0.26988	0.92369	5, 18

Linear Interpolation (80 Resamples)

Point	%	SE	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



SCOEPA00028250

APPENDIX B
REFERENCE TOXICANT DATA SHEETS

REFERENCE TOXICANT DATA SHEET

Client QA/QC | Reference Toxicant NaCl | Test Begin Date 3-7-95 Time 1650

Test Organism Pimephales promelas | CID# 91 | Stock Solution 20 %c | Test End Date 3-9-95 Time 1600

Source Aquatic Research Organisms | Solvent distilled

ID# Flm 413 | Age <24hrs | *Dilution Water Recon MH | ID# 896

Size — | Total Hardness as CaCO3 98 | Total Alkalinity as CaCO3 60

Conductivity (umhos/cm)/ Salinity (ppt) 296 | Temperature 20±1°C

Technician 0h Bm | 24h Bm | 48h Bm | 72h | 96h

Toxicant Concentration %	Test Chamber Number	Number Surviving					Dissolved Oxygen mg/l					pH					Temperature °C				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
CONTROL		10	9	9			8.2	9.0	8.6			7.5	8.1	7.9			20	20	20		
4		10	10	10			8.3	9.0	8.7			7.7	7.8	7.8			20	20	20		
6		10	10	10			8.4	9.0	8.7			7.7	7.7	7.7			20	20	20		
8		10	10	3			8.4	9.0	8.7			7.6	7.6	7.6			20	20	20		
10		10	5	0			8.4	9.0	8.8			7.6	7.6	7.6			20	20	20		
12		10	0	-			8.4	9.0	-			7.5	7.5	-			20	20	-		

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 7.5

95% conf. int. 7.0 to 8.1

Statistical Method Spearman-Kaber

We verify this data is true and correct.

Task Manager

Project Manager Doug Winn

QA Officer

Signature

SCOEPA00028252

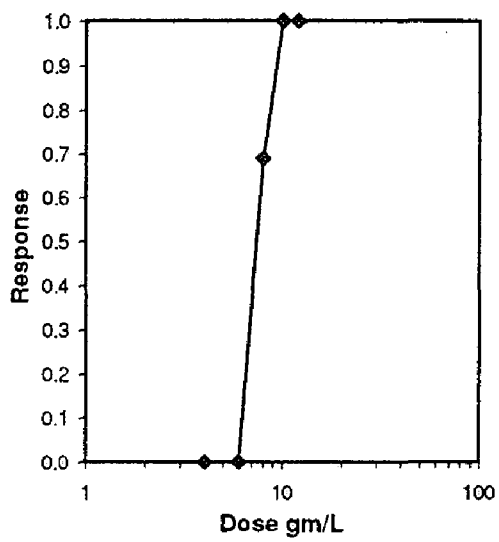
Acute Test-48 Hr Survival

Start Date:	07 Mar-95 00:00	Test ID:	rppa413	Sample ID:	REF-Ref Toxicant
End Date:	09 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1
D-Control	0.9000
4	1.0000
6	1.0000
8	0.3000
10	0.0000
12	0.0000

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%	7.4997	6.9597	8.0817
5.0%	7.4760	6.8851	8.1176
10.0%	7.4534	6.8100	8.1577
20.0%	7.4142	6.6561	8.2586
Auto-0.0%	7.4997	6.9597	8.0817



SCOEPA00028253

REFERENCE TOXICANT DATA SHEET

Client QA/QC | Reference Toxicant NaCl | Test Begin Date 3-7-95 Time 1540

Test Organism Ceriodaphnia dubia | CID# 91 | Stock Solution 20 %/L | Test End Date 3-9-95 Time 1600

Source In house | Solvent distilled

ID# Cd 454 | Age <24hrs | *Dilution Water MH well H_2O | ID# 899

Size — | Total Hardness as CaCO3 102 | Total Alkalinity as CaCO3 72

Conductivity (umhos/cm)/ Salinity (ppt) 228 | Temperature 20±1°C

Technician 0h BM | 24h BM | 48h BM | 72h | 96h

Toxicant Concentration %/L	Test Chamber Number	Number Surviving					Dissolved Oxygen mg/l					pH					Temperature °C				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
control	A	5	5	5			8.8	-	8.5			7.7	-	8.2			20	20	20		
	B	5	5	5			8.8	-	9.6												
1	A	5	5	5			8.8	-	8.5			7.8	-	8.1			20	20	20		
	B	5	5	4			8.3	-	8.6												
2	A	5	5	3			8.9	-	8.6			7.8	-	8.1			20	20	20		
	B	5	5	2			8.9	-	8.6												
2.5	A	5	5	1			8.9	-	8.6			7.8	-	8.0			20	20	20		
	B	5	5	1			8.9	-	8.5												
3	A	5	5	0			9.0	-	8.5			7.8	-	8.0			20	20	20		
	B	5	4	0			8.8	-	8.6												
4	A	5	0	-			8.8	8.5	-			7.8	8.0	-			20	20	-		
	B	5	0	-			8.9	8.5	-												

*Dilution Water Code
Recon. - reconstituted water
VS - very soft
S - soft
MH - moderately hard
H - hard
VH - very hard

48 h LC50 1.8

95% conf. int. 1.3 to 2.1

Statistical Method Probit

We verify this data is true and correct.

Task Manager BM

Project Manager Doug Winn

QA Officer

Signature

SCOEPA00028254

Acute Test-48 Hr Survival

Start Date:	07 Mar-95 00:00	Test ID:	rcda454	Sample ID:	REF-Ref Toxicant
End Date:	09 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAA 91-EPA Acute	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-gm/L	1	2
D-Control	1.0000	1.0000
1	1.0000	0.8000
2	0.6000	0.4000
2.5	0.2000	0.2000
3	0.0000	0.0000
4	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	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	2	0	10
1	0.9000	0.9000	1.2262	1.1071	1.3453	13.732	2	1	10
2	0.5000	0.5000	0.7854	0.6847	0.8861	18.129	2	5	10
2.5	0.2000	0.2000	0.4636	0.4636	0.4636	0.000	2	8	10
3	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	2	10	10
4	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	2	10	10

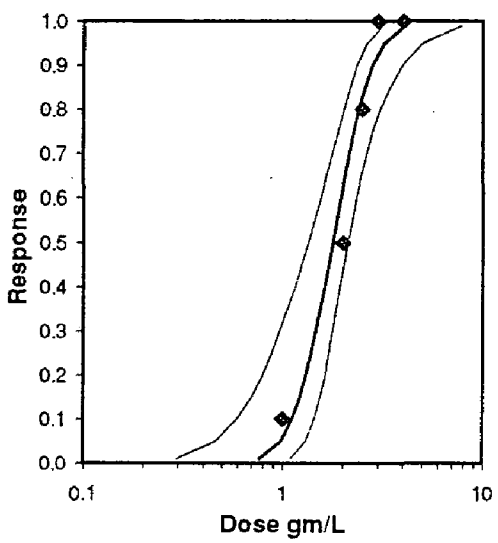
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Normality of the data set cannot be confirmed				
Equality of variance cannot be confirmed				

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	6.43771	1.57378	3.3531	9.52232	0	2.09442	11.3449	0.55	0.24848	0.15533	4
Intercept	3.40039	0.572	2.27927	4.5215							

TSCR

Point	Probits	gm/L	95% Fiducial Limits	
EC01	2.674	0.7711	0.29403	1.10391
EC05	3.355	0.98395	0.46539	1.31314
EC10	3.718	1.12049	0.59307	1.44387
EC15	3.964	1.22316	0.69737	1.54175
EC20	4.158	1.31142	0.79217	1.62635
EC25	4.326	1.39221	0.88263	1.70471
EC40	4.747	1.61853	1.15007	1.93433
EC50	5.000	1.77205	1.33696	2.10522
EC60	5.253	1.94012	1.538	2.31536
EC75	5.674	2.25552	1.87971	2.80099
EC80	5.842	2.39447	2.01136	3.05709
EC85	6.036	2.56726	2.16084	3.40983
EC90	6.282	2.8025	2.34485	3.94533
EC95	6.645	3.19138	2.61676	4.95376
EC99	7.326	4.07229	3.15495	7.73603



SCOEPA00028255

CHMHILL **FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA**

Client QA/QC March Reftox Chron 412 Date Initiated 3-2-95 Time 1500

Sample Description NaCl Date Terminated 3-9-95 Time 1520

Technician: Day 0 DW Day 1 JS Day 2 JS Day 3 JS Day 4 JS Day 5 DW Day 6 DW Day 7 DW

Time Day 0 1500 Day 1 1415 Day 2 1220 Day 3 0945 Day 4 1102 Day 5 1400 Day 6 1445 Day 7 1520

Concentration or Percent	Day	Number of Live Organisms				Dissolved O_2 (mg/l)		pH		Temperature (°C)	Specific Conductivity (µmhos/cm)
		A	B	C	D	Pre	Post	Pre	Post		
CONTROL	0	10	10	10	10	—	8.6	—	8.0	25	348
	1	10	10	10	10	7.1	8.6	7.8	8.0	25	
	2	10	10	10	10	7.2	8.3	7.9	7.9	25	335
	3	10	10	10	10	7.3	~~8.2~~ 8.7	7.9	8.1	25	
	4	10	10	10	10	7.0	8.6	7.8	8.2	25	
	5	9	10	10	10	6.7	8.5	7.7	8.0	25	328
	6	9	10	10	10	6.6	8.4	7.6	7.9	25	
	7	9	10	10	10	7.1	—	7.5	—	25	
0.3 g/L	0	10	10	10	10	—	8.6	—	8.0		
	1	10	10	10	10	7.3	8.6	7.9	8.0		
	2	10	10	10	10	7.2	8.3	7.9	7.9		
	3	10	10	10	10	7.4	~~8.2~~ 8.7	7.8	8.1		
	4	10	10	10	10	7.2	8.6	7.8	8.2		
	5	10	10	10	10	6.7	8.5	7.7	8.2		
	6	10	10	10	10	6.6	8.2	7.5	8.1		
	7	10	10	10	10	7.2	—	7.5	—		
1.0 g/L	0	10	10	10	10						
	1	10	10	10	10						
	2	10	10	10	10						
	3	10	10	10	10						
	4	10	10	10	10						
	5	10	10	10	10						
	6	10	10	10	10						
	7	10	10	10	10						
2.0 g/L	0	10	10	10	10	—	8.5	—	8.0		
	1	10	10	10	10	7.40	8.6	7.8	8.0		
	2	10	10	10	10	7.5	8.3	7.8	7.9		
	3	10	10	10	9	7.4	~~8.4~~ 8.7	7.7	8.0		
	4	9	7	9	9	7.3	8.6	7.7	8.1		
	5	7	6	4	8	7.0	8.5	7.7	8.0		
	6	7	4	3	6	6.6	8.2	7.4	8.0		
	7	5	3	3	6	7.2	—	7.5	—		
4.0 g/L	0	10	10	10	10						
	1	10	10	10	10						
	2	10	10	10	10						
	3	9	9	10	10						
	4	8	7	7	9						
	5	8	5	4	8	7.0	8.5	7.5	8.0	25	7400
	6	~~DW 5~~	3	~~DW 2~~	5	6.4	8.2	7.5	7.9	25	
	7	5	3	2	6	7.3	—	7.5	—	25	
8.0 g/L	0	10	10	10	10	—	8.5	—	7.6	25	12,800
	1	8	8	8	10	7.6	8.6	7.6	7.8	25	
	2	3	1	1	4	7.7	8.7	7.7	7.8	25	12540
	3	0	0	1	1	7.5	~~8.2~~ 8.7	7.5	7.8	25	
	4	—	—	0	0	7.4	8.6	7.5	7.9	25	
	5	—	—	—	—	~~0~~ DW				~~25~~ DW	
	6	—	—	—	—						
	7	—	—	—	—						

Fathead Minnow 7-Day Growth Data

Client QA/QC · March Ref Tox Species ID # FHM 412

Sample Description NaCl Start Date 3-2-95

Concentration or Percent	Replicate	Tare Weight (gm)	Total Weight (gm)	Net Fish Weight (gm)	No. of Fish	Net Weight Per Fish (mg
Control	A	1.1032	1.1111		9	
	B	1.1068	1.1160		10	
	C	1.0961	1.1050		10	
	D	1.1127	1.1207		10	
0.3 g/L	A	1.1037	1.1117		10	
	B	1.1072	1.1158		10	
	C	1.1072	1.1165		10	
	D	1.1054	1.1143		10	
1.0 g/L	A	1.1112	1.1215		10	
	B	1.1211	1.1318		10	
	C	1.1075	1.1191		10	
	D	1.0994	1.1103		10	
2.0 g/L	A	1.1127	1.1155		5	
	B	1.1147	1.1162		3	
	C	1.1026	1.1038		3	
	D	1.0973	1.1000		6	
4.0 g/L	A	1.1105	1.1125		5	
	B	1.1162	1.1170		3	
	C	1.1077	1.1080		2	
	D	1.1086	1.1104		6	

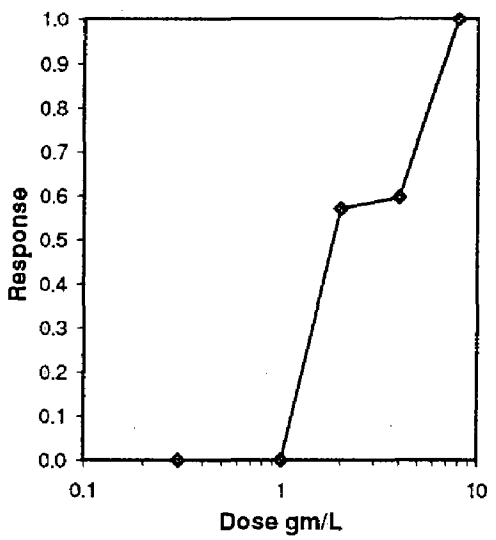
Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	02 Mar-95 00:00	Test ID:	rppc412	Sample ID:	REF-Ref Toxicant
End Date:	09 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 91	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	0.9000	1.0000	1.0000	1.0000
0.3	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	1.0000	1.0000
2	0.5000	0.3000	0.3000	0.6000
4	0.5000	0.3000	0.2000	0.6000
8	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SE	95% CL(Exp)		Skew
IC05	1.0875	0.0098	1.0643	1.1273	0.5448
IC10	1.1750	0.0196	1.1286	1.2547	0.5448
IC15	1.2625	0.0293	1.1929	1.3820	0.5448
IC20	1.3500	0.0391	1.2572	1.5094	0.5448
IC25	1.4375	0.0489	1.3215	1.6367	0.5448
IC40	1.7000	0.0782	1.5144	2.0187	0.5448
IC50	1.8750	0.5422	1.6430	5.3879	3.0936



SCOEPA00028258

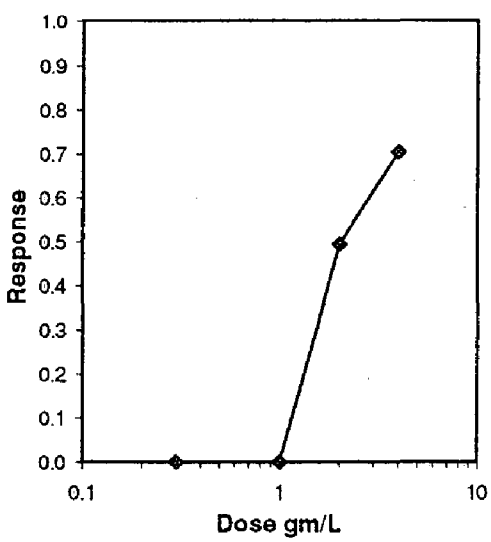
Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	02 Mar-95 00:00	Test ID:	rppc412	Sample ID:	REF-Ref Toxicant
End Date:	09 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 91	Test Species:	PP-Pimephales promelas
Comments:					

Conc-gm/L	1	2	3	4
D-Control	0.8778	0.9200	0.8900	0.8000
0.3	0.8000	0.8600	0.9300	0.8900
1	1.0300	1.0700	1.1600	1.0900
2	0.5600	0.5000	0.4000	0.4500
4	0.4000	0.2667	0.1500	0.3000

Linear Interpolation (80 Resamples)

Point	gm/L	SE	95% CL(Exp)		Skew
IC05	1.1013	0.0058	1.0867	1.1209	0.5770
IC10	1.2025	0.0116	1.1734	1.2419	0.5770
IC15	1.3038	0.0174	1.2602	1.3628	0.5770
IC20	1.4051	0.0232	1.3469	1.4837	0.5770
IC25	1.5064	0.0290	1.4336	1.6047	0.5770
IC40	1.8102	0.0463	1.6937	1.9675	0.5770
IC50	2.0598	0.1579	1.8390	2.6809	0.9662



SCOEPA00028259

CH2M HILL

Ceriodaphnia dubia Survival and Reproduction
Test Data Summary

Client QA/QC Test Start Date 3-7-95

Sample Description NaCl Sample ID # —

Ceriodaphnia Lot # 455 Statistician BR

Percent or Concentration	Total Young Rer Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
CONTROL	20	11	22	12	27	20	20	10	20	4 AD	9	166
0.5 g/L	12	14	12	12	12	11	13	24	12	14	10	136
1.0	17	14	11 AD	16	20	8	12	20	9	10	9	137
1.5	3	7	11	4	5	9	4	9	7	6	10	65
2.0	0 AD	2	0 AD	0	0 AD	3	0 AD	0	0 AD	2	5	7
4.0	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0 AD	0	0

CH2MHILL **CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION DATA**

Client QA/QC march Test Beginning: Date 3-7-95 Time 1445

Sample Description _____ Test Ending: Date 3-14-95 Time 1445

Ceriodaphnia Lot# 4545 Dilution Water MH well H2O ID# 899

Technician Day 1 DM Day 2 BM Day 3 JS Day 4 DM Day 5 DM Day 6 BM Day 7 JS/DO

Time Day 1 1340 Day 2 1425 Day 3 1045 Day 4 0940 Day 5 1335 Day 6 1445 Day 7 1645

Percent or Concentration	Day	Replicate										No. Live Adults	Total Live Young
		A	B	C	D	E	F	G	H	I	J		
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	4	4	4	4	3	3	0	3	4	10	29
	5	5	6	7	0	0	0	6	0	0	0	10	18
	6	5	7	0	8	7	10	0	2	7	0 AD	9	46
	7	10	0	11	0	16	7	11	8	10	-	9	73
0.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	0	0	5	4	0	4	5	4	5	10	27
	5	4 3rd	5	3	0	0	5	0	0	0	0	10	17
	6	8	9	9	7	8	6	9	8	8	9	10	81
	7	0	0	0	0	0	0	0	11	0	0	10	11
1.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	4	4	4	3	4	2	4	5	1	4	10	35
	5	0	0	0	0	0	0	0	3rd	8	0	10	8
	6	5	5	7	6	8	6	8	7	0	0	10	52
	7	8	5	-	7	8	0	0	8	-	6	9	42
1.5 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	0	0	0	0	0	0	0	0	0	10	0
	4	0	2	4	0	2	0	0	4	0	0	10	12
	5	1	0	0	0	0	4	0	0	2	2	10	9
	6	2	5	7	4	3	5	4	5	5	4	10	44
	7	0	0	0	0	0	0	0	0	0	0	10	0
2.0 g/L	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0 AD	0	9	0
	3	0	0	0	0	0	0	AD	0	-	0	8	0
	4	0	0	0	0	0 AD	0	-	0	-	0	7	0
	5	0	0	0	0	-	1	-	0	-	0	7	1
	6	0	0	UND	0	-	0	-	0	-	2	6	2
	7	AD	2	-	0	-	2	-	0	-	0	5	4
4.0 g/L	1	0	0	0	0	0	0	0	0	0	0	0	0
	2	-	-	-	-	-	-	-	-	-	-	-	-
	3												
	4												
	5												
	6												

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client QA/QC - March Initiated: Date 3-2-95 Time 1445 Adults Isolated Date 3-6-95 Time 2305

Sample Description _____ Terminated: Date _____ Time _____ Neonates Collected Date 3-7-95 Time 0700

Technician Day 0 JS Day 1 BM Day 2 BM Day 3 JS Day 4 BM Day 5 BM Day 6 JS Day 7 DW

Time Day 0 1600 Day 1 1525 Day 2 1540 Day 3 1115 Day 4 1100 Day 5 1450 Day 6 1630 Day 7 1200

Percent or Concentration	Dissolved Oxygen (mg/l)								pH								Conductivity (µmhos/cm)							
	Day								Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
control	8.1	8.5 / 8.2	8.4 / 7.9	8.0 / 7.3	8.2 / 7.4	6.3 / 7.6	8.6 / 8.1	7.9	7.7	8.1 / 8.0	8.0 / 7.3	7.9 / 7.3	8.0 / 7.9	8.0 / 8.1	8.0 / 8.0	8.5	234							
0.5	8.5	8.6 / 8.2	8.4 / 8.0	8.1 / 8.3	8.2 / 7.9	8.1 / 7.6	8.6 / 7.8	7.9	7.6	8.0 / 7.9	8.0 / 7.0	8.1 / 7.3	8.0 / 7.9	8.1 / 8.0	8.0 / 7.7	8.3								
1.0																								
1.5	8.3	8.6 / 8.2	8.4 / 8.0	8.1 / 8.3	8.2 / 8.0	8.1 / 7.6	8.6 / 8.0	7.8	7.6	8.0 / 7.8	8.0 / 6.9	8.1 / 7.2	8.0 / 7.9	8.1 / 7.9	8.0 / 7.7	8.2								
2.0		- / 8.3	8.5 / 8.1	8.1 / 8.2	8.2 / 8.0	8.1 / 7.6	8.4 / 8.0	7.7		- / 7.9	8.0 / 6.9	8.1 / 7.1	8.2 / 7.8	8.1 / 7.9	7.9 / 7.7	8.2								
4.0	8.3	8.6 / -							7.5	8.0 / -							6570							

Percent or Concentration	Total Hardness (mg/l $CaCO_3$)								Alkalinity (mg/l $CaCO_3$)							
	Day								Day							
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

Comments: _____

SCOEPA00028262

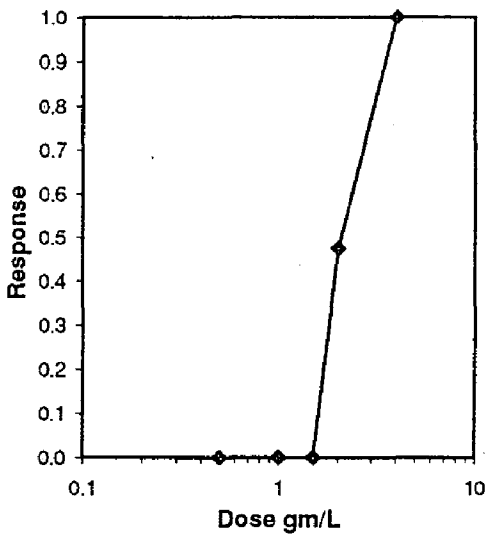
Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date:	07 Mar-95 00:00	Test ID:	rcdc455	Sample ID:	REF-Ref Toxicant
End Date:	14 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
0.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SE	95% CL		Skew
IC05	1.5528	0.3095	0.6667	1.6606	-1.5607
IC10	1.6056	0.1911	0.8333	1.8213	-2.5794
IC15	1.6583	0.1467	1.5000	1.9784	-0.9251
IC20	1.7111	0.1439	1.5556	2.1031	1.6008
IC25	1.7639	0.1675	1.6068	2.2216	1.4914
IC40	1.9222	0.2613	1.7143	2.5773	1.0488
IC50	2.1000	0.3362	1.7857	2.8144	0.6460



SCOEPA00028263

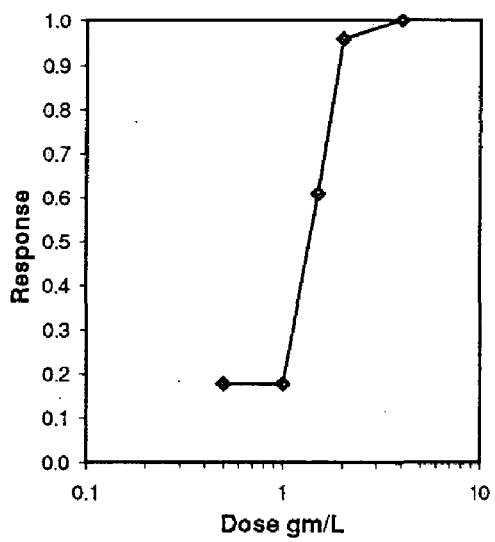
Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	07 Mar-95 00:00	Test ID:	rcdc455	Sample ID:	REF-Ref Toxicant
End Date:	14 Mar-95 00:00	Lab ID:	ORCHM-Corvallis Lab	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 91	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-gm/L	1	2	3	4	5	6	7	8	9	10
D-Control	20.0000	11.0000	22.0000	12.0000	27.0000	20.0000	20.0000	10.0000	20.0000	4.0000
0.5	12.0000	14.0000	12.0000	12.0000	12.0000	11.0000	13.0000	24.0000	12.0000	14.0000
1	17.0000	14.0000	11.0000	16.0000	20.0000	8.0000	12.0000	20.0000	9.0000	10.0000
1.5	3.0000	7.0000	11.0000	4.0000	5.0000	9.0000	4.0000	9.0000	7.0000	6.0000
2	0.0000	2.0000	0.0000	0.0000	0.0000	3.0000	0.0000	0.0000	0.0000	2.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	gm/L	SE	95% CL		Skew
IC05*	0.1407	0.3186	0.0726	1.0456	1.3116
IC10*	0.2814	0.3471	0.1453	1.0912	0.7937
IC15*	0.4220	0.3596	0.2179	1.1369	0.0351
IC20	1.0259	0.3376	0.2906	1.1980	-0.3331
IC25	1.0839	0.3016	0.3632	1.2590	-0.9612
IC40	1.2580	0.1120	1.0159	1.4579	-0.3626
IC50	1.3741	0.0939	1.1943	1.5612	-0.0571



SCOEPA00028264

APPENDIX C
CHAIN OF CUSTODY

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic Corp.
Address 7200 NW Front Avenue
Portland, Oregon 97210

Contact Person: Thomas J. Rothschild
Phone: 503-243-2020
CH2M HILL Project # ASE 14431

NPDES# _____
Composite Sample Information _____

Samples/Hour 0.5 Volume/Sample 2.5 gallons
Total Hours 24 Total Volume 30 gallons
Initiated: Date 9 Mar 95 Time 0800
Ended: Date 10 Mar 95 Time 0800
Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
P. O.# 31306
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (503) 753-9583 Ex 3160

Check Chlorine (Y/N) _____
Temp. Upon Arrival (°C) 7°C
Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
95-13	10 Mar 95	0800	X		1	13557	X	X	X	X														

Sampled By & Title (Please sign and print name) Thomas J. Rothschild, Facilities Thomas J. Rothschild Chemist	Date/Time 10 Mar 95/ 0800	Relinquished By (Please sign and print name) Thomas J. Rothschild	Date/Time 10 Mar 95/ 1130
Received By (Please sign and print name)	Date/Time 3-11-95 1205	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ☒ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

SCOEPA00028266

CHMHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic Corp. NPDES# _____

Address 7200 NW Front Avenue
Portland, Oregon 97210

Composite Sample Information _____

Ship Samples to: CH2M HILL, Inc.
P. O.# 31306
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (503) 753-9583 Ex 3160

Samples/Hour 0.5 Volume/Sample 2.5 gallons
Total Hours 24 Total Volume 30 gallons

Contact Person: Thomas J. Rothschild
Initiated: Date 7 Mar 95 Time 0800
Ended: Date 8 Mar 95 Time 0800

Phone: 503-243-2020
Chilled During Collection Yes ☐ No ☒

Check Chlorine (Y)N) Y - 0.05
Temp. Upon Arrival (°C) 3
Check Ammonia (Y/N) _____ Dechlorinate (Y(N)) N

CH2M HILL Project # ASE 14431

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
95-10	8 Mar 95	0800	X		1		X	X	X	X														

Sampled By & Title (Please sign and print name) Thomas J. Rothschild	Date/Time 8 Mar 95 / 0800	Relinquished By (Please sign and print name) Thomas J. Rothschild	Date/Time 8 Mar 95
Received By (Please sign and print name) Doug Wunn LAB	Date/Time 3-9-95 1115	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

CHM HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Wacker Siltronic Corp. NPDES# _____

Address 7200 NW Front Ave. Portland, Oregon 97210

Composite Sample Information _____

Samples/Hour 0.5 Volume/Sample 2.5 gallons

Total Hours 24 Total Volume 30 gallons

Initiated: Date 5 Mar 95 Time 1600

Ended: Date 6 Mar 95 Time 0800

Chilled During Collection Yes ☐ No ☒

Ship Samples to: CH2M HILL, Inc.
Attention: Aquatic Toxicology Laboratory
2300 NW Walnut Blvd.
Corvallis, OR 97330
Phone: (503) 753-9583 Ex 3160

P.O.# 31306

Contact Person: Thomas J. Rothschild

Phone: 503-243-2020

CH2M HILL Project # ASE 144.31

Check Chlorine (Y/N) _____

Temp. Upon Arrival (°C) 3°C

Check Ammonia (Y/N) _____ Dechlorinate (Y/N) _____

Analysis Required/Comments

Sample ID	Date	Time	Sample Type Comp.	Sample Type Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Daphnia Acute	Trout Acute	SHM Acute	SHM Chronic	MB Acute	MB Chronic	MYS Acute	MYS Chronic	Algae	Haz Waste				Concentrations and/or Comments
95-4	6 Mar 95	0830	X		1	01355-01	X	X	X	X														Cooled with ice.
~~95-5~~ 95-5						01355-01																		
~~95-6~~ 95-6						-02																		
~~9~~ 95-7						-03																		

Sampled By & Title (Please sign and print name) Thomas J. Rothschild	Date/Time 6 Mar 95 / 0830	Relinquished By (Please sign and print name) Thomas J. Rothschild	Date/Time 6 Mar 95 / 1200
Received By (Please sign and print name)	Date/Time 3/7/95 10:40	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name)	Date/Time	Shipped Via UPS X Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

SCOEPA00028268