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APPENDIX B

METHODS FOR ACUTE TOXICITY TESTING WITH FRESHWATER ORGANISMS

METHODS FOR ACUTE TOXICITY TESTING WITH FRESHWATER ORGANISMS

Unless otherwise noted, all test protocols follow those of the U.S. Environmental Protection Agency (USEPA) as specified in Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, 3rd ed. (1985, W.H. Peltier and C.I. Weber, eds., EPA/600/4-85/013) and the 1 July 1990 Biomonitoring Protocols of the USEPA, Region I.

Sample Collection and Handling

Grab or composite samples of receiving water and effluent are collected by personnel at the client's facility, refrigerated at 4°C until pickup, and then transported to the appropriate laboratory for toxicological and chemical analysis. If the effluent contains detectable residual chlorine (> 0.10 mg/L), neutralization is carried out by addition of 10 mg sodium thiosulfate per liter of effluent.

Toxicity Testing

TEST SPECIES:

The test organisms are the daphnids, *Daphnia pulex* and *Ceriodaphnia dubia*, and the fathead minnow, *Pimephales promelas*. All species are reared at New England Bioassay from parental stocks originally obtained from the Connecticut DEP or USEPA. The ages of the daphnids and *P. promelas* are < 24 h and 1 to 14 days, respectively, at the start of testing. Fish from a single day's hatch are used whenever possible.

DILUTION WATER:

Dilution water is receiving water collected upstream of the point of discharge from the client's facility. Laboratory water prepared with either reagent-grade salts or Perrier mineral water is prepared in the New England Bioassay laboratory and used to culture the test organisms. The laboratory water may be used as the test dilution water, if requested.

WATER QUALITY DETERMINATION:

Sample temperature, pH, conductivity, hardness, alkalinity, and concentrations of dissolved oxygen and total residual chlorine (TRC) are measured upon sample receipt. Conductivity is measured with YSI Model 33 S-C-T meter; dissolved oxygen is measured with YSI Model 51B meter; pH and temperature are measured with Beckman Model 12 pH/ISI meter; hardness is determined by the EDTA titrimetric method; alkalinity by potentiometric titration; and TRC by the DPD method.

GENERAL TEST CONDITIONS AND PROCEDURES:

The toxicity tests are static non-renewal tests, in which the test organisms are exposed to the same solution for the entire test period. Test conditions are summarized in Tables 1 and 2. All tests are performed at a temperature of 25 ± 1°C and a photoperiod of 16 h of light and 8 h of darkness. Refrigerated solutions are brought to ambient temperature before testing. Test duration is 48 h for both species. When the initial concentration of dissolved oxygen in the undiluted sample is less than 40% of the saturation value, samples are aerated before the organisms are introduced and subsequently during testing; otherwise no supplemental aeration is provided during testing. The organisms are not fed during testing. The daphnids test concentration are replicated 4 times with 5 animals per replicate. The fish test concentrations are replicated twice with 10 animals per replicate.

The measured effect in each test is death or immobility, evidenced by failure to respond to gentle prodding. At 24-h intervals throughout testing, survival data are collected and recorded, and dead organisms are removed from the test chambers.

REFERENCE TOXICANT

Reagent grade sodium chloride is used as a standard toxicant to authenticate the sensitivity of the laboratory stocks of daphnids and fish. Definitive tests with the reference toxicant are performed at least once per month according to standard protocols.

Specific Toxicity Tests

DEFINITIVE TEST:

In a definitive test, organisms are exposed in replicate chambers to five, dilutions of effluent using a 0.5 dilution factor (e.g. 6.25, 12.5, 25, 50, and 100), plus the permitted effluent concentration. Control organisms are exposed in replicated test chambers to dilution water(s) (0% effluent). A definitive test is used to determine the median lethal concentration (LC_{50}) of an effluent (see "Statistical Analysis of Data" below).

SCREENING ("PASS/FAIL") TEST:

In a screening test, organisms are exposed in replicated test chambers to a single concentration of either effluent or receiving water. Control organisms are exposed in replicate chambers in laboratory-prepared water. Survival of the test animals in the undiluted effluent or receiving water are compared with control survival data to determine toxic impacts.

Statistical Analysis of Acute Toxicity Data

All computer programs for statistical analysis of data were obtained from the Water Compliance Unit of the Connecticut DEP. Mortality data are analyzed statistically by four different methods to determine the "median lethal concentration" (LC_{50}) and the "no observed acute effect level" (NOAEL) of the effluent. The LC_{50} is the concentration that is lethal to 50% of the organisms within the test period. The NOAEL is the highest concentration at which there is no significant difference ($P > 0.05$) in survival of animals in the test concentrations when compared with control survival.

The LC_{50} program estimates a LC_{50} by using one of four methods: binomial, moving-average angle, probit analysis, or trimmed Spearman-Karber. The method selected is based on the shape of the concentration - effects curve and the number of concentrations with partial mortalities (mortality greater than 0% but less than 100%). The moving-average, probit, and trimmed Spearman-Karber methods both estimate the LC_{50} with 95% confidence limits. The bounds placed on the LC_{50} using the binomial test are not 95% confidence limits, but can be used as statistically sound conservative bounds that are always above 95% when the animal sample size per concentration is large enough ($N \geq 6$) (Stephan, 1977). Sample size in all acute toxicity tests ≥ 20 animals per test concentration. The value with the "best fit", i.e. that which best matches the raw data and has the narrowest 95% confidence interval (the range of values within which the true LC_{50} value could occur 95% of the time), is then selected.

For screening tests, Fisher's exact test is used to determine if there is a significant difference ($P < 0.05$) between survival of animals exposed to either effluent or receiving water and control animals exposed to laboratory-prepared water. The statistical software program for the Fisher's exact test is TOXSTAT (Release No. 3.2) developed by Gulley et al. (1989) of the University of Wyoming (Laramie, Wyoming). This package was developed to address the statistical requirements described for analysis of C. dubia and fathead minnow acute and chronic toxicity data.

TABLE 1. EPA REGION I RECOMMENDED EFFLUENT TOXICITY TEST CONDITIONS FOR THE DAPHNIDS (*Ceriodaphnia dubia* and *Daphnia pulex*) 48 HOUR ACUTE TESTS[1]

1.	Test type	Static, non-renewal
2.	Temperature (°C)	25 ± 1°C
3.	Light quality	Ambient laboratory illumination
4.	Photoperiod	16 hr light, 8 hr dark
5.	Test chamber size	Minimum 30 ml
6.	Test solution volume	Minimum 25 ml
7.	Age of test organisms	1-24 hours (neonates)
8.	No. daphnids per test chamber	5
9.	No. of replicate test chambers per treatment	4
10.	Total no. daphnids per test concentration	20
11.	Feeding regime	None
12.	Aeration	None
13.	Dilution water[2]	Receiving water, other surface water, moderately hard synthetic water (prepared using either Millipore Milli-Q® or equivalent deionized water and reagent grade chemicals) or deionized water combined with mineral water.
14.	Dilution factor	0.5
15.	Number of dilutions[3]	5 plus a control. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
16.	Effect measured	Mortality - no movement of body or appendages on gentle prodding

TABLE 1. EPA REGION I RECOMMENDED EFFLUENT TOXICITY TEST CONDITIONS FOR THE DAPHNIDS (*Ceriodaphnia dubia* and *Daphnia pulex*) 48 HOUR ACUTE TESTS[1] (CONTINUED)

17.	Test acceptability	90% or greater survival of test organisms in control solution
18.	Sampling requirements	For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must first be used within 48 hours of collection.
19.	Sample volume required	Minimum 2 liters

Footnotes:

1. Adapted from EPA/600/4-85/013

2. Standard prepared dilution water must have hardness requirements to generally reflect the characteristics of the receiving water.

3. When receiving water is used for dilution, an additional control made up of standard dilution water (0% effluent) is required).

TABLE 2. REGION I RECOMMENDED TEST CONDITIONS FOR THE FATHEAD MINNOW (*Pimephales promelas*) 48 HOUR ACUTE TEST[1]

1.	Test type	Static, non-renewal
2.	Temperature (°C)	25 ± 1°C
3.	Light quality	Ambient laboratory illumination
4.	Photoperiod	16 hr light, 8 hr dark
5.	Size of test vessels	250-1000 ml
6.	Volume of test solution	Minimum 200 ml/replicate
7.	Age of fish	1-14 days
8.	No. of fish per chamber	10 (not to exceed loading limits)
9.	No. of test vessels per treatment	2
10.	Total no. organisms per concentration	20
11.	Feeding regime	None
12.	Aeration	None, unless DO concentration falls below 40% of saturation, at which time gentle single-bubble aeration should be started at a rate of less than 100 bubbles/min. (Routine DO check recommended.)
13.	Dilution water[2]	Receiving water, other surface water, moderately hard synthetic water (prepared using either Millipore Milli-Q® or equivalent deionized and reagent grade chemicals) or deionized water combined with mineral water.
14.	Dilution factor	0.5
15.	Number of dilutions[3]	5 plus a control. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.

TABLE 2. REGION I RECOMMENDED TEST CONDITIONS FOR THE FATHEAD MINNOW (*Pimephales promelas*) 48 HOUR ACUTE TEST[1]

(CONTINUED)

16.	Effect measured	Mortality - no movement of body or appendages on gentle prodding
17.	Test acceptability	90% or greater survival of test organisms in control solution
18.	Sampling requirements	For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must be first used within 48 hours of collection.
19.	Sample volume required	Minimum 4 liters

Footnotes:

1. Adapted from EPA/600/4-85/013. Fathead minnow test may be extended to 96 h, if required.

2. Standard dilution water must have hardness requirements to generally reflect characteristics of the receiving water.

3. When receiving water is used for dilution, an additional control made up of standard dilution water (0% effluent) is required.

APPENDIX C

RAW ACUTE TOXICITY DATA SHEETS FOR SEDIMENT ELUTRIATES TESTS WITH *Ceriodaphnia dubia* AND FATHEAD MINNOWS

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM
COVER SHEET FOR LC50 TESTS

CLIENT: GZA Environmental
ADDRESS: 320 Needham Street
Newton Upper Falls, MA 02164

CONTACT: Mr. Tim Briggs

SAMPLE TYPE: Sediment Elutriate :Sample #21 (1u Filter)
DILUTION WATER SOURCE: NEB Artifical Freshwater

C. dubia TEST ID NO: 93 - 2043
P. promelas TEST ID NO: 93 - 2044
COC NO: 13 - 1836
PROJECT NO: 193-017

Sediment
GRAB SAMPLE COLLECTED ON: 5/12/93 (DATE) AT: 1030 (HOURS)
COMPOSITE SAMPLE COLLECTED FROM: _____ (DATE) AT: _____ (HOURS)
TO: _____ (DATE) AT: _____ (HOURS)

INVERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): MS
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Ceriodaphnia dubia
SOURCE\NEB LOT #: NEB\ CD-93-105-1A
AGE: < 24 HOURS
TEST SOLUTION VOLUME: 30 (mL)
NO. ORGANISMS PER TEST CHAMBER: 5
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~24~~ 30
START DATE: 5/14/93 AT ~~1012A~~ 1010 (hours)
END DATE: 5/16/93 AT 1045 (hours)

VERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): MS
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Fathead Minnows (Pimephales promelas)
SOURCE\NEB LOT #: NEB\ 93 - 115 A+B
AGE: 9 DAYS
TEST SOLUTION VOLUME: 700 (mL)
NO. ORGANISMS PER TEST CHAMBER: 10
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: 5/14/93 AT 1030 (hours)
END DATE: 5/18/93 AT 1130 (hours)

LABORATORY WATER

ARTIFICIAL FW: NEB Batch # 93-062

HARDNESS: 48 (mg/l as $CaCO_3$) ALKALINITY: 30 (mg/l as $CaCO_3$)

INITIAL 100% ELUTRIATE CHEMISTRY — **TECHNICIAN INITIALS:**

HARDNESS (mg/L as $CaCO_3$): 50	ALKALINITY (mg/L as $CaCO_3$): 25				—		
TEMPERATURE (°C): 24.5°	pH (SU): 6.9				TRC (mg/l): —		
DISSOLVED OXYGEN (mg/l): 6.8	CONDITIVITY (µmhos/cm): 171				AMMONIA (mg/l): —		
SAMPLE COLOR:	TECH. INIT.	DAPHNIA	00 H: MS	24 H: MS	48 H: MS		
AERATION REQUIRED: YES [ ] NO [ ]		FISH	00 H: K.Klada	24 H: TH	48 H: TH	72H: MG	96H: K.Klada

RESULTS OF Ceriodaphnia dubia LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:	43.8%	25 - 100%
MOVING AVERAGE-ANGLE:	40.3%	32.8 - 50.6%
PROBIT:	38.0%	30.4 - 48.8%
* TRIMMED SPEARMAN KARBER:	40.4%	32.6 - 50.1%
OTHER:		
NOAEL:	12.5%	

RESULTS OF Pimephales promelas LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:	LC50 > 100%	
NOAEL:	100%	

NOAEL: NO-OBSERVED-ACUTE-EFFECT LEVEL

ANIMAL CONDITION/BEHAVIOR:

COMMENTS: DE = Data Entry Error
(T) = COUNTS IN CONCENTRATIONS W/ HIGH TURBID MADE BY POURING SOLUTION INTO ANOTHER BEAKER TIL FISH COULD BE SEEN TO MAKE COUNTS. SOLUTION WAS GENTLY POURED BACK ONCE COUNT WAS MADE. TH.

REVIEWED BY: John D Conney DATE: 5/19/93

Test ID # 93-2043
COC # 93-1836
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Ceriodaphnia dubia Start Date: 5/14/93 at 1010

Sample: Elutriate: Sample #21 Diluent: Dilute Mineral Water End Date: 5/16/93 at 1045

Concentration or Dilution	No. of Live organisms (see comments)					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW CTL A	5	5	5			7.6		7.3			24.2		24.3			7.6		7.6			116
B	5	5	5					7.2					24.3					7.8			
C	5	5	5					7.4					24.4					7.8			
D	5	5	4					7.3					24.3					7.8			
E	5	5	5					7.6					24.4					7.9			
F	5	5	5					7.4					24.4					7.9			
6.25% A	5	5	4			7.7		7.4			24.2		24.4			7.6		7.9			119
B	5	5	5					7.4					24.3					7.9			
C	5	5	4					7.4					24.3					7.9			
D	5	5	5					7.4					24.4					8.0			
E	5	MC 35	5					7.3					24.3					8.0			
F	5	5	5					7.4					24.4					8.0			
12.5% A	5	5	5			7.8		7.4			24.2		24.1			7.5		7.9			122
B	5	5	4					7.4					24.2					7.9			
C	5	5	5					7.4					24.2					7.9			
D	5	5	4					7.4					24.4					7.9			
E	5	5	5					7.4					24.5					7.9			
F	5	5	4					7.3					24.5					7.9			
Tech Initials	MS	MS	MS																		

MC - Miscount MS

Data Reviewed by: John O Carney Date: 5/17/93

Test ID # 93-2044
COC # 93-1836
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Pimephales promelas Start Date: 5/14/93 at 1030

Sample: Elutriate: Sample #21 Diluent: Dilute Mineral Water End Date: 5/18/93 at 1130

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW CTL A	10	10	10	10	10	7.6	7.4	6.4	6.2	6.9	24.2	24.2	24.5	24.7	24.2	7.6	7.3	7.7	7.4	7.3	116
B	10	9(X)	9	9	9		7.4	6.4	6.5	6.9		24.4	24.5	24.7	24.3		7.5	7.7	7.5	7.4	
C	10	10	10	10	10		7.0	6.4	6.3	6.9		24.7	24.5	24.6	24.4		7.5	7.7	7.5	7.4	
6.25% A	10	10	10	10	10	7.7	7.0	6.4	6.3	6.9	24.2	24.5	24.6	24.7	24.6	7.6	7.3	7.5	7.4	7.2	119
B	10	10	10	10	10		6.8	6.0	6.1	6.9		24.6	24.6	24.6	24.6		7.5	7.6	7.2	7.3	
C	10	DE ~~9~~ 10	9	9	9		7.0	6.2	6.2	7.0		24.6	24.7	24.5	24.6		7.5	7.7	7.2	7.4	
12.5% A	10	DE ~~9~~ 10	9	9	9	7.8	7.4	6.8	6.4	7.3	24.7	24.5	24.7	24.7	24.6	7.5	7.7	7.8	7.4	7.3	122
B	10	10	10	10	10		7.4	6.4	6.0	7.3		24.5	24.8	24.6	24.6		7.7	7.8	7.5	7.6	
C	10	10	10	10	10		7.2	6.0	6.4	7.0		24.7	24.9	24.5	24.6	DE	7.6	7.8	7.6	7.5	
25% A	10	10	10	10	10	7.6	7.4	6.8	6.5	7.3	24.4	24.8	24.6	24.5	24.0	7.4	~~6.9~~ 7.6	7.8	7.7	7.6	128
B	10	10	10	10	10		7.5	7.0	6.6	7.4		24.6	24.5	24.7	24.1		7.7	7.8	7.8	7.7	
C	10	9(X)	9	9	9		7.2	7.0	6.6	7.4		24.1	24.3	24.6	24.0		7.7	7.8	7.7	7.7	
50% A	10	10	10	10	10	7.4	7.4	6.6	7.0	7.1	24.4	24.2	24.5	24.5	24.1	7.2	7.7	7.7	7.8	7.5	142
B	10	10	10	10	10		7.4	6.7	7.0	7.1		24.4	24.7	24.6	24.6		7.6	7.8	7.8	7.6	
C	10	10	10	10	9		7.4	6.6	6.8	7.3		24.2	24.7	24.6	24.5		7.7	7.9	7.8	7.5	
(H) 100% A	10	9(X)	9	9	9	6.8	6.4	6.6	6.9	7.0	24.5	24.5	24.6	24.6	24.6	6.9	7.2	7.7	7.8	7.6	171
B	10	10	10	10	10		7.0	5.8	6.4	6.8		24.7	24.8	24.7	24.7		7.4	7.5	7.8	7.6	
C	10	10	10	10	10		7.2	6.4	6.7	7.0		24.6	24.9	24.7	24.7		7.5	7.7	7.8	7.6	
Tech Initials	KRL	TH	TH	MG	KRL																

DE = Data Entry Error MS

Data Reviewed by: John D Comery Date: 5/19/93

Test ID # 93-2043
COC # 93-1836
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Ceriodaphnia dubia Start Date: 5/14/93 at 1010

Sample: Elutriate: Sample #21 Diluent: Dilute Mineral Water End Date: 5/14/93 at 1045

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
25% A	5	5	3			7.6		7.4			24.4		24.4			7.4		7.9			128
B	5	5	5					7.4					24.5					7.9			
C	5	5	3					7.3					24.3					7.9			
D	5	5	4					7.4					24.3					7.9			
E	5	5	4					7.4					24.3					7.9			
F	5	5	4					7.3					24.4					7.9			
50% A	5	4	3			7.4		7.6			24.4		24.3			7.2		7.9			142
B	5	5	2					7.4					24.4					7.9			
C	5	5	1					7.4					24.4					7.9			
D	5	4	2					7.2					24.3					7.9			
E	5	5	2					7.2					24.3					7.8			
F	5	4	3					7.2					24.3					7.8			
100% A	5	5	1			6.8		7.2			24.5		24.1			6.9		7.7			171
B	5	4	0					7.2					24.2					7.7			
C	5	5	1					7.1					24.2					7.7			
D	5	4	0					7.2					24.3					7.8			
E	5	1	0					7.0					24.1					7.8			
F	5	5	0					7.0					24.0					7.9			
Tech Initials	MS	MS	MS																		

Data Reviewed by: John D Carney Date: 5/19/93

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM:	6.67%
LC50:	40.397
95% LOWER CONFIDENCE:	32.559
95% UPPER CONFIDENCE:	50.122

CONC. %	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
6.25	30.	2.	6.67	.4340D-04
12.50	30.	3.	10.00	.4215D-03
25.00	30.	7.	23.33	.2611D+00
50.00	30.	17.	56.67	.2923D+02
100.00	30.	28.	93.33	.4340D-04

THE BINOMIAL TEST SHOWS THAT 25.00 AND 100.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.7388 PERCENT.
AN APPROXIMATE LC50 FOR THIS DATA SET IS 43.752

RESULTS USING MOVING AVERAGE

SPAN	G	LC50	95% CONFIDENCE LIMIT	
3	.071	40.33	32.78	50.63

****** RESULTS CALCULATED BY PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT
5	.077	1.00	.14

SLOPE = 2.55 95% CONFIDENCE LIMITS: 1.84 AND 3.25

LC50= 38.04 95% CONFIDENCE LIMITS: 30.42 AND 48.77

LC1 = 4.64 95% CONFIDENCE LIMITS: 2.10 AND 7.41

DATE: 5/14-16/93 TEST NUMBER: 93-2043 DURATION: 48 HOURS
SAMPLE: GZA ELUTRIATE 21 SPECIES: Ceriodaphnia dubia

METHOD	LC50	CONFIDENCE LIMITS LOWER	UPPER	SPAN
BINOMIAL	43.752	25.000	100.000	75.000
MAA	40.331	32.778	50.631	17.854
PROBIT	38.041	30.419	48.767	18.348
SPEARMAN	40.397	32.559	50.122	17.563

**** = LIMIT DOES NOT EXIST

GZA ELUTRIATE SAMPLE NO. 21
CERIODAPHNIA DUBIA TEST NO. 93-2043

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
6.25%	28	2	30
TOTAL	57	3	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = .351, PROB.= .5536

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .8814, Upper Tail = .5000

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
12.5%	27	3	30
TOTAL	56	4	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .268, PROB.= .6048

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 1.071, PROB.= .3006

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .9438, Upper Tail = .3060

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
25%	23	7	30
TOTAL	52	8	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 3.606, PROB.= .0576

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 5.192, PROB.= .0227

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .9977, Upper Tail = .0262

GZA ELUTRIATE SAMPLE NO. 21
CERIODAPHNIA DUBIA TEST NO. 93-2043

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
50%	13	17	30
TOTAL	42	18	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 17.857, PROB.= 2.381E-05

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 20.317, PROB.= 6.560E-06

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 3.977E-06

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
100%	2	28	30
TOTAL	31	29	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 45.117, PROB.= 9.417E-11

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 48.654, PROB.= 7.866E-11

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 7.744E-07

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

MINIMUM REQUIRED TRIM IS TOO LARGE: 96.7,SO SK IS NOT CALCULABLE.

SPEARMAN-KARBER

TRIM:	.00%
LC50:	.000
95% LOWER CONFIDENCE:	.000
95% UPPER CONFIDENCE:	.000

CONC. %	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
6.25	30.	1.	3.33	.2887D-05
12.50	30.	1.	3.33	.2887D-05
25.00	30.	1.	3.33	.2887D-05
50.00	30.	1.	3.33	.2887D-05
100.00	30.	1.	3.33	.2887D-05

THE BINOMIAL TEST SHOWS THAT 100.00 AND +INFINITY CAN BE USED AS STATISTICALLY

SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 100.0000 PERCENT.
THE LC50 FOR THIS DATA SET IS GREATER THAN 100.00

THE MOVING AVERAGE METHOD CANNOT BE USED WITH
THIS DATA SET BECAUSE NO SPAN WHICH PRODUCES
AVERAGE ANGLES BRACKETING 45 DEGREES ALSO USES
TWO PERCENT DEAD BETWEEN 0 AND 100 PERCENT.

NO CONVERGENCE IN 25 ITERATIONS. PROBIT METHOD
PROBABLY CAN NOT BE USE WITH THIS SET OF DATA.

DATE: 5/14-18/93 TEST NUMBER: 93-2044 DURATION: 96 HOURS
SAMPLE: GZA ELUTRIATE 21 SPECIES: FATHEAD MINNOWS

METHOD	LC50	CONFIDENCE LIMITS LOWER	UPPER	SPAN
BINOMIAL	*******	100.000	*******	*******
MAA	*******	*******	*******	*******
PROBIT	*******	*******	*******	*******
SPEARMAN	.000	.000	.000	.000

**** = LIMIT DOES NOT EXIST

GZA ELUTRIATE SAMPLE NO. 21
FATHEAD MINNOW TEST NO. 93-2044

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
6.25%	29	1	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .7542, Upper Tail = .7542

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
12.5%	29	1	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .7542, Upper Tail = .7542

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
25%	29	1	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .7542, Upper Tail = .7542

GZA ELUTRIATE SAMPLE NO. 21
FATHEAD MINNOW TEST NO. 93-2044

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
50%	29	1	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .7542, Upper Tail = .7542

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
100%	29	1	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .7542, Upper Tail = .7542

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM
COVER SHEET FOR LC50 TESTS

CLIENT: GZA Environmental
ADDRESS: 320 Needham Street
Newton Upper Falls, MA 02164

CONTACT: Mr. Tim Briggs

C. dubia TEST ID NO: 93 - 2047
P. promelas TEST ID NO: 93 - 2048
COC NO: 93 - 1837
PROJECT NO: 193-017

SAMPLE TYPE: Sediment Elutriate :Sample #24 (1m Filter) Sediment
GRAB SAMPLE COLLECTED ON: 5/12/93 (DATE) AT: 1110 (HOURS)
DILUTION WATER SOURCE: NEB Artifical Freshwater
COMPOSITE SAMPLE COLLECTED FROM: _____ (DATE) AT: _____ (HOURS)
TO: _____ (DATE) AT: _____ (HOURS)

INVERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): MS
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Ceriodaphnia dubia
SOURCE\NEB LOT #: NEB\ #220-236 CD-93-105-109
AGE: < 24 HOURS
TEST SOLUTION VOLUME: 30 (mL)
NO. ORGANISMS PER TEST CHAMBER: 5
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: 5/14/93 AT 1045 (hours)
END DATE: 5/15/93 AT 1115 (hours)

VERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): MS
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Fathead Minnows (Pimephales promelas)
SOURCE\NEB LOT #: NEB\ 93 - 116 A
AGE: 9 DAYS
TEST SOLUTION VOLUME: 700 (mL)
NO. ORGANISMS PER TEST CHAMBER: 10
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: FRI 5/14/93 AT 1040 (hours)
END DATE: Tue 5/18/93 AT 1100 (hours)

LABORATORY WATER

ARTIFICIAL FW: NEB Batch #93-062

HARDNESS: 48 (mg/l as $CaCO_3$) ALKALINITY: 30 (mg/l as $CaCO_3$)

INITIAL 100% ELUTRIATE CHEMISTRY **TECHNICIAN INITIALS:**

HARDNESS (mg/L as $CaCO_3$): 24	ALKALINITY (mg/L as $CaCO_3$): 50				—			
TEMPERATURE (°C): 24.60	pH (SU): 7.3				TRC (mg/l): —			
DISSOLVED OXYGEN (mg/l): 7.0	CONDUCTIVITY (µmhos/cm): 159				AMMONIA (mg/l): —			
SAMPLE COLOR:	TECH. INIT.	DAPHNIA	00 H: MS	24 H: MS	48 H: MS			
AERATION REQUIRED: YES [ ] NO [ ]		FISH	00 H: TH	24 H: TH	48 H: TH	72 H: MG	96 H: K. Bch	

RESULTS OF Ceriodaphnia dubia LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:	60.8%	25 - >100%
MOVING AVERAGE-ANGLE:	58.5%	36.7 - >100%
PROBIT:	57.8%	37.8 - >100%
TRIMMED SPEARMAN KARBER:	58.9%	38.0 - 91.4%
OTHER:		
NOAEL:	12.5%	

RESULTS OF Pimephales promelas LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:	LC50 > 100%	
NOAEL:	100%	

NOAEL: NO-OBSERVED-ACUTE-EFFECT LEVEL

ANIMAL CONDITION/BEHAVIOR:

COMMENTS: (T) = COUNTS IN CONCENTRATIONS W/ HIGH TURBID MADE BY POURING SOLUTION INTO ANOTHER BEAKER TIL FISH COULD BE SEEN TO MADE COUNTS. SOLUTION WAS GENTLY POURED BACK ONCE COUNT WAS MADE (TH)

REVIEWED BY: John D Carney DATE: 5/19/93

Test ID # 93-2047
COC # 93-1837
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Ceriodaphnia dubia Start Date: FRI 5/14/93 at 1045

Sample: Elutriate: Sample #24 Diluent: Dilute Mineral Water End Date: SUN 5/16/93 at 1115

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW CTL A	5	5	5			7.7		7.8			24.1		24.3			7.8		6.7			116
B	5	5	5					7.4					24.5					7.2			
C	5	5	5					7.4					24.5					7.4			
D	5	5	4					7.4					24.5					7.4			
E	5	5	5					7.4					24.5					7.4			
F	5	5	5					7.2					24.5					7.6			
6.25% A	5	4	2			7.7		7.2			24.1		24.5			7.8		7.8			117
B	5	5	5					7.2					24.5					7.8			
C	5	5	5					7.2					24.6					7.8			
D	5	5	5					7.4					24.6					7.8			
E	5	4	4					7.2					24.6					7.8			
F	5	5	4					7.4					24.6					7.8			
12.5% A	5	4	4			7.7		7.4			24.2		24.5			7.7		7.9			119
B	5	5	5					7.3					24.5					7.9			
C	5	5	4					7.4					24.5					7.9			
D	5	5	5					7.4					24.5					7.9			
E	5	5	4					7.4					24.5					7.9			
F	5	4	3					7.3					24.5					7.9			
Tech Initials	MS	MS	MS																		

Data Reviewed by: John O Conney Date: 5/19/93

Test ID # 93-2047

COC # 93-1837

Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Ceriodaphnia dubia Start Date: 5/14/93 at 1045

Sample: Elutriate: Sample #24 Diluent: Dilute Mineral Water End Date: 5/16/93 at 1115

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
25% A	5	5	3			7.6		7.2			24.1		24.5			7.7		7.9			125
B	5	5	4					7.4					24.5					7.9			
C	5	5	5					7.3					24.5					7.9			
D	5	5	3					7.4					24.5					7.9			
E	5	5	2					7.3					24.4					7.9			
F	5	5	4					7.4					24.4					7.9			
50% A	5	4	2			7.4		7.4			24.6		24.4			7.4		7.9			136
B	5	5	4					7.2					24.5					7.8			
C	5	5	2					7.2					24.5					7.8			
D	5	5	2					7.2					24.5					7.8			
E	5	5	4					7.2					24.5					7.8			
F	5	4	3					7.2					24.5					7.8			
100% A	5	4	2			7.0		7.2			24.6		24.5			7.3		7.9			159
B	5	3	1					7.2					24.5					7.8			
C	5	4	1					7.2					24.5					7.8			
D	5	3	1					7.2					24.5					7.8			
E	5	4	2					7.1					24.4					7.8			
F	5	5	3					7.2					24.4					7.8			
Tech Initials	MS	MS	MS																		

Data Reviewed by: John P Carney Date: 5/17/93

Test ID # 93-2048

COC # 93-1837

Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Pimephales promelas Start Date: TRJ 5/14/93 at ~~1045~~ WT 1040

Sample: Elutriate: Sample # 24 Diluent: Dilute Mineral Water End Date: TUCS 5/18/93 at 1100

Concentration or Dilution	No. of Live Organisms (SEE COMMENTS)					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW CTL A	10	10	10	10	10	7.7	7.2	6.6	6.8	7.1	24.1	24.7	24.3	24.6	24.6	7.8	7.4	7.4	7.8	7.3	116
B	10	10	10	10	10		7.4	6.6	6.8	7.2		24.7	24.5	24.6	24.4		7.5	7.6	7.8	7.4	
C	10	10	10	10	10		7.4	6.4	6.9	7.2	24.6	24.7	24.8	24.9	24.6	7.4	7.5	7.7	7.8	7.4	
6.25% A	10	10	10	10	10	7.7	7.4	7.0	7.0	7.3	24.1	24.9	24.6	24.8	24.0	7.8	7.6	7.8	7.8	7.4	117
B	10	9X	9	9	9		7.4	6.8	6.9	7.2		24.8	24.6	24.8	24.1		7.6	7.8	7.8	7.5	
C	10	10	10	10	10		7.4	6.8	6.9	7.3		24.8	24.6	24.8	24.4		7.6	7.8	7.9	7.5	
12.5% A	10	10	10	10	10	↑	7.4	6.8	7.0	7.1	↑	24.7	24.5	24.6	24.1	↑	7.6	7.8	7.9	7.5	
B	10	9X	9	9	9	7.7	7.6	6.8	7.1	7.2	24.2	24.7	24.6	24.6	24.2	7.7	7.6	7.8	7.9	7.5	119
C	10	10	10	10	10		7.4	6.8	6.9	7.2		24.7	24.6	24.6	24.5		7.6	7.8	7.9	7.5	
25% A	10	10	10	10	10	7.6	7.4	6.8	6.8	7.3	24.1	24.5	24.3	24.6	24.0	7.7	7.7	7.9	7.9	7.5	125
B	10	10	10	10	10		7.2	6.8	6.8	7.3		24.7	24.4	24.6	24.0		7.7	7.9	7.9	7.5	
C	10	9 (M)	9	9	8 1X		7.2	6.8	6.8	7.3		24.7	24.5	24.7	24.0		7.7	7.9	7.9	7.5	
50% A	10	10	10	10	10	7.4	7.2	6.8	5.7	7.0	24.6	24.8	24.6	24.8	24.6	7.4	7.7	7.8	7.7	7.5	136
B	10	10	10	10	10		7.2	6.6	6.5	6.9		24.7	24.9	24.7	24.7		7.6	7.8	7.5	7.5	
C	10	9X (A)	9	9	8 1X		7.0	6.8	6.8	7.1		24.8	24.8	24.6	24.6		7.7	7.9	7.9	7.6	
100% A	10	9X (A)	9	9	8 1X	7.0	7.0	6.2	6.9	5.9	24.6	24.8	24.7	24.6	24.6	7.3	7.4	7.8	7.9	7.3	159
B	10	10	10	10	10		6.2	6.4	6.8	6.4		24.6	24.8	24.7	24.6		7.3	7.8	7.9	7.3	
C	10	10	10	10	10		7.0	6.4	6.9	6.8		24.8	24.7	24.6	24.5		7.6	7.9	7.9	7.4	
Tech Initials	TH	TH	TH	M	KRed																

Data Reviewed by: John O Connor Date: 5/19/93

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM:	33.33%
LC50:	58.947
95% LOWER CONFIDENCE:	38.026
95% UPPER CONFIDENCE:	91.379

CONC. %	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
6.25	30.	5.	16.67	.1625D-01
12.50	30.	5.	16.67	.1625D-01
25.00	30.	9.	30.00	.2139D+01
50.00	30.	13.	43.33	.2923D+02
100.00	30.	20.	66.67	.4937D+01

THE BINOMIAL TEST SHOWS THAT 25.00 AND +INFINITY CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 97.8613 PERCENT.
AN APPROXIMATE LC50 FOR THIS DATA SET IS 60.819

RESULTS USING MOVING AVERAGE

SPAN	G	LC50	95% CONFIDENCE LIMIT	
2	.477	58.47	36.66	124.14

****** RESULTS CALCULATED BY PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT
3	.190	1.00	.66

SLOPE = 1.22
95% CONFIDENCE LIMITS: .69 AND 1.76

LC50= 57.79
95% CONFIDENCE LIMITS: 37.84 AND 121.45

LC1 = .72
95% CONFIDENCE LIMITS: .04 AND 2.34

DATE: 5/14-16/93 TEST NUMBER: 93-2047 DURATION: 48 HOURS
SAMPLE: GZA ELUTRIATE 24 SPECIES: Ceriodaphnia dubia

METHOD	LC50	CONFIDENCE LIMITS LOWER	UPPER	SPAN
BINOMIAL	60.819	25.000	*******	*******
MAA	58.470	36.655	124.143	87.487
PROBIT	57.794	37.843	121.453	83.610
SPEARMAN	58.947	38.026	91.379	53.353

**** = LIMIT DOES NOT EXIST

GZA ELUTRIATE SAMPLE NO. 24
CERIODAPHNIA DUBIA TEST NO. 93-2047

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
6.25%	25	5	30
TOTAL	54	6	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 1.667, PROB.= .1967

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 2.963, PROB.= .0852

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .9881, Upper Tail = .0973

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
12.5%	25	5	30
TOTAL	54	6	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 1.667, PROB.= .1967

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 2.963, PROB.= .0852

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .9881, Upper Tail = .0973

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
25%	21	9	30
TOTAL	50	10	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 5.880, PROB.= .0153

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 7.680, PROB.= 5.584E-03

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .9996, Upper Tail = 6.091E-03

GZA ELUTRIATE SAMPLE NO. 24
CERIODAPHNIA DUBIA TEST NO. 93-2047

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
50%	17	13	30
TOTAL	46	14	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 11.273, PROB.= 7.863E-04

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 13.416, PROB.= 2.495E-04

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 2.155E-04

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	29	1	30
100%	10	20	30
TOTAL	39	21	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 23.736, PROB.= 1.105E-06

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 26.447, PROB.= 2.710E-07

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 3.091E-06

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

MINIMUM REQUIRED TRIM IS TOO LARGE: 93.3,SO SK IS NOT CALCULABLE.

SPEARMAN-KARBER

TRIM:	.00%
LC50:	.000
95% LOWER CONFIDENCE:	.000
95% UPPER CONFIDENCE:	.000

CONC. %	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
6.25	30.	1.	3.33	.2887D-05
12.50	30.	1.	3.33	.2887D-05
25.00	30.	2.	6.67	.4340D-04
50.00	30.	2.	6.67	.4340D-04
100.00	30.	2.	6.67	.4340D-04

THE BINOMIAL TEST SHOWS THAT 100.00 AND +INFINITY CAN BE USED AS STATISTICALLY

SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 100.0000 PERCENT.
THE LC50 FOR THIS DATA SET IS GREATER THAN 100.00

THE MOVING AVERAGE METHOD CANNOT BE USED WITH THIS DATA SET BECAUSE NO SPAN WHICH PRODUCES AVERAGE ANGLES BRACKETING 45 DEGREES ALSO USES TWO PERCENT DEAD BETWEEN 0 AND 100 PERCENT.

NO CONVERGENCE IN 25 ITERATIONS. PROBIT METHOD PROBABLY CAN NOT BE USE WITH THIS SET OF DATA.

DATE: 5/14-18/93 TEST NUMBER: 93-2048 DURATION: 96 HOURS
SAMPLE: GZA ELUTRIATE 24 SPECIES: FATHEAD MINNOWS

METHOD	LC50	CONFIDENCE LIMITS LOWER	UPPER	SPAN
BINOMIAL	*******	100.000	*******	*******
MAA	*******	*******	*******	*******
PROBIT	*******	*******	*******	*******
SPEARMAN	.000	.000	.000	.000

**** = LIMIT DOES NOT EXIST

GZA ELUTRIATE SAMPLE NO. 24
FATHEAD MINNOW TEST NO. 93-2048

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
6.25%	29	1	30
TOTAL	59	1	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 1.017, PROB.= .3132

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = .5000

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
12.5%	29	1	30
TOTAL	59	1	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 1.017, PROB.= .3132

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = .5000

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
25%	28	2	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 2.069, PROB.= .1503

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = .2458

GZA ELUTRIATE SAMPLE NO. 24
FATHEAD MINNOW TEST NO. 93-2048

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
50%	28	2	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 2.069, PROB.= .1503

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = .2458

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
100%	28	2	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 2.069, PROB.= .1503

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = .2458

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM
COVER SHEET FOR LC50 TESTS

CLIENT: GZA Environmental

ADDRESS: 320 Needham Street
Newton Upper Falls, MA 02164

CONTACT: Mr. Tim Briggs

SAMPLE TYPE: Sediment Elutriate :Sample #30 (1u Filter)

DILUTION WATER SOURCE: NEB Artifical Freshwater

C. dubia TEST ID NO: 93-2045
P. promelas TEST ID NO: 93-2046
COC NO: 93-1538
PROJECT NO: 193-017

Sediment
GRAB SAMPLE COLLECTED ON: 5/12/93 (DATE) AT: 1145 (HOURS)

COMPOSITE SAMPLE COLLECTED FROM: _____ (DATE) AT: _____ (HOURS)
TO: _____ (DATE) AT: _____ (HOURS)

INVERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): TH
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Ceriodaphnia dubia
SOURCE\NEB LOT #: NEB\ CD-93-105-109
AGE: < 24 HOURS
TEST SOLUTION VOLUME: 30 (mL)
NO. ORGANISMS PER TEST CHAMBER: 5
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: 5/14/93 AT 1115 (hours)
END DATE: 5/18/93 AT 1130 (hours)

VERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): TH
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Fathead Minnows (Pimephales promelas)
SOURCE\NEB LOT #: NEB\ 93-115-A+B
AGE: 9 DAYS
TEST SOLUTION VOLUME: 700 (mL)
NO. ORGANISMS PER TEST CHAMBER: 10
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: 5/14/93 AT 1100 (hours)
END DATE: 5/18/93 AT 1135 (hours)

LABORATORY WATER

ARTIFICIAL FW: NEB Batch # 93-063

HARDNESS: 51 (mg/l as $CaCO_3$) ALKALINITY: 43 (mg/l as $CaCO_3$)

INITIAL 100% ELUTRIATE CHEMISTRY — TECHNICIAN INITIALS:

HARDNESS (mg/L as $CaCO_3$): 32		ALKALINITY (mg/L as $CaCO_3$): 45			—		
TEMPERATURE (°C): 24.5		pH (SU): 7.4			TRC (mg/l): —		
DISSOLVED OXYGEN (mg/l): 6.0		CONDUCTIVITY (µmhos/cm): 161			AMMONIA (mg/l): —		
SAMPLE COLOR:	TECH. INIT.	DAPHNIA	00 H: MS	24 H: MS	48 H: MS		
AERATION REQUIRED: YES [ ] NO [ ]		FISH	00 H: K. Pacla	24 H: TH	48 H: TH	72H: MC	96H: K. Pacla

RESULTS OF Ceriodaphnia dubia LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:	LC50 >100%	
NOAEL:	6.25%	

RESULTS OF Pimephales promelas LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:	LC50 >100%	
NOAEL:	50%	

NOAEL: NO-OBSERVED-ACUTE-EFFECT LEVEL

ANIMAL CONDITION/BEHAVIOR:

COMMENTS: (I) = COUNTS IN CONCENTRATIONS W/ HIGH TURBID MADE BY POURING SOLUTION INTO ANOTHER BEAKER TIL FISH COULD BE SEEN TO MAKE COUNTS. SOLUTION WAS GENTLY POURED BACK ONCE COUNT WAS MADE. TH.

REVIEWED BY: John D Curey DATE: 5/19/93

Test ID # 93-2045
COC # 93-1838
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Ceriodaphnia dubia Start Date: 5/14/93 at 1115

Sample: Elutriate: Sample #30 Diluent: Dilute Mineral Water End Date: 5/16/93 at 1130

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW CTL A	5	5	5			7.7		7.4			24.4		24.0			7.8		7.8			114
B	5	5	5					7.4					23.9					7.8			
C	5	5	5					7.6					23.7					7.9			
D	5	5	5					7.4					23.9					7.9			
E	5	5	5					7.4					23.9					7.9			
F	5	5	5					7.4					23.9					7.9			
6.25% A	5	5	5			7.7		7.4			24.4		24.0			7.8		7.9			118
B	5	5	5					7.4					24.1					7.9			
C	5	5	4					7.4					24.1					8.0			
D	5	5	5					7.3					24.2					8.0			
E	5	5	5					7.3					24.2					8.0			
F	5	5	5					7.4					24.2					8.0			
12.5% A	5	5	5			7.6		7.4			24.6		24.2			7.7		8.0			121
B	5	5	3					7.5					24.2					8.0			
C	5	5	4					7.4					24.2					8.0			
D	5	3	2					7.4					24.2					7.9			
E	5	5	3					7.4					24.2					7.9			
F	5	5	5					7.4					24.1					8.0			
Tech Initials	MS	MS	MS																		

Data Reviewed by: John P Carney Date: 5/19/93

Test ID # 93-2045
COC # 93-1838
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Ceriodaphnia dubia Start Date: 5/14/93 at 1115

Sample: Elutriate: Sample #30 Diluent: Dilute Mineral Water End Date: 5/16/93 at 1130

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
25% A	5	5	3			7.4		7.3			24.5		24.2			7.6		7.9			126
B	5	5	3					7.4					24.2					7.9			
C	5	4	3					7.4					24.1					7.9			
D	5	5	3					7.3					24.1					7.9			
E	5	5	5					7.4					24.1					7.9			
F	5	4	4					7.4					24.0					7.9			
50% A	5	5	5			7.0		7.4			24.5		24.1			7.5		7.9			137
B	5	5	3					7.2					24.1					7.8			
C	5	5	4					7.2					24.2					7.8			
D	5	5	3					7.4					24.1					7.9			
E	5	5	4					7.3					24.1					7.9			
F	5	5	1					7.2					24.1					7.9			
(A) 100% A	5	4	4			6.0		6.6			24.5		24.2			7.4		7.7			161
B	5	5	3					6.8					24.3					7.7			
C	5	5	4					6.5					24.3					7.6			
D	5	5	3					6.6					24.2					7.6			
E	5	5	3					6.6					24.2					7.6			
F	5	5	4					6.8					24.2					7.7			
Tech Initials	MS	MS	MS																		

(A) counts difficult due to cloudiness MS

Data Reviewed by: Jack D Carney Date: 5/19/93

Test ID # 93-2046

COC # 93-1838

Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Pimephales promelas Start Date: 5/14/93 at 1100

Sample: Elutriate: Sample #30 Diluent: Dilute Mineral Water End Date: 5/18/93 at 1135

Concentration or Dilution		No. of Live Organisms (T) 1st Comments					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW CTL	A	10	10	10	10	10	7.7	7.0	6.6	7.2	7.0	24.4	24.4	24.4	24.6	24.6	7.8	7.5	7.0	7.1	7.1	114
	B	10	9X	9	9	9		6.8	6.4	7.3	7.1		24.5	24.6	24.7	24.6		7.5	7.3	7.1	7.1	
	C	10	9X	9	9	9		7.2	6.4	7.1	7.1		24.8	24.8	24.8	24.6		7.6	7.4	7.1	7.2	
6.25%	A	10	10	10	10	10	7.7	7.2	6.6	7.4	7.3	24.4	24.5	24.3	24.7	24.5	7.8	7.6	7.6	7.2	7.3	118
	B	10	10	10	10	10		7.0	6.8	7.7	7.3		24.6	24.4	24.7	24.1		7.6	7.7	7.2	7.3	
	C	10	10	10	10	10		7.0	6.8	7.6	7.3		24.6	24.7	24.7	24.4		7.6	7.7	7.2	7.3	
12.5%	A	10	10	10	10	10	7.6	6.9	6.6	7.5	7.2	24.6	24.7	24.7	24.7	24.3	7.7	7.6	7.7	7.2	7.3	121
	B	10	10	10	10	10		7.0	6.6	7.1	7.0		24.7	24.8	24.7	24.5		7.6	7.7	7.2	7.3	
	C	10	10	10	10	10		6.8	6.4	7.5	7.0		24.7	24.8	24.7	24.5		7.6	7.8	7.2	7.3	
(A) 25%	A	10	10	10	10	10	7.4	6.8	6.8	7.6	7.0	24.5	24.6	24.7	24.6	24.3	7.6	7.6	7.8	7.3	7.3	126
	B	10	10	10	10	10		6.4	6.8	7.6	7.0		24.6	24.8	24.5	24.3		7.5	7.9	7.3	7.3	
	C	10	9X	9	9	9	7.0	6.2	6.8	7.5	7.1		24.8	24.9	24.6	24.4		7.5	7.7	7.3	7.3	
(A) 50%	A	10	10	10	10	10	7.0	6.0	6.2	6.9	6.0	24.5	24.8	24.8	24.7	24.6	7.5	7.4	7.6	7.3	7.0	137
	B	10	10	9X	9	9		6.3	6.4	7.2	6.2		24.8	24.8	24.7	24.6		7.5	7.7	7.3	7.1	
	C	10	10	10	10	10		6.5	6.4	7.5	7.0		24.8	24.8	24.6	24.5		7.5	7.7	7.4	7.3	
(A) 100%	A	10	8 2X	8	8	8	6.0	5.8	5.7	6.2	5.9	24.5	24.7	24.9	24.9	24.6	7.4	6.9	7.1	6.8	6.7	161
	B	10	7 3X	3 (A)	3	3		4.8	6.1	7.2	6.8		24.7	24.7	24.7	24.6		6.6	7.0	6.9	6.8	
	C	10	5 5X	5	5	5		5.4	6.6	7.2	7.2		24.7	24.2	24.6	24.1		6.6	7.1	7.0	6.8	
Tech Initials		KRad	TH	TH	MG	KRad																

Data reviewed by: N. Ralph Cannon Date: 5/19/93

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

MINIMUM REQUIRED TRIM IS TOO LARGE: 68.3,SO SK IS NOT CALCULABLE.

SPEARMAN-KARBER

TRIM:	.00%
LC50:	.000
95% LOWER CONFIDENCE:	.000
95% UPPER CONFIDENCE:	.000

CONC. %	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
6.25	30.	1.	3.33	.2887D-05
12.50	30.	8.	26.67	.8062D+00
25.00	30.	9.	30.00	.2139D+01
50.00	30.	10.	33.33	.4937D+01
100.00	30.	9.	30.00	.2139D+01

THE BINOMIAL TEST SHOWS THAT 25.00 AND +INFINITY CAN BE USED AS STATISTICALLY

SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 97.8613 PERCENT.
THE LC50 FOR THIS DATA SET IS GREATER THAN 100.00

THE MOVING AVERAGE METHOD CANNOT BE USED WITH
THIS DATA SET BECAUSE NO SPAN WHICH PRODUCES
AVERAGE ANGLES BRACKETING 45 DEGREES ALSO USES
TWO PERCENT DEAD BETWEEN 0 AND 100 PERCENT.

NO CONVERGENCE IN 25 ITERATIONS. PROBIT METHOD
PROBABLY CAN NOT BE USE WITH THIS SET OF DATA.

DATE: 5/14-16/93 TEST NUMBER: 93-2045 DURATION: 48 HOURS
SAMPLE: GZA ELUTRIATE 30 SPECIES: Ceriodaphnia dubia

METHOD	LC50	CONFIDENCE LIMITS LOWER	UPPER	SPAN
BINOMIAL	*******	25.000	*******	*******
MAA	*******	*******	*******	*******
PROBIT	*******	*******	*******	*******
SPEARMAN	.000	.000	.000	.000

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

**** = LIMIT DOES NOT EXIST

GZA ELUTRIATE SAMPLE NO. 30
CERIODAPHNIA DUBIA TEST NO. 93-2045

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
6.25%	29	1	30
TOTAL	59	1	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 1.017, PROB.= .3132

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = .5000

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
12.5%	22	8	30
TOTAL	52	8	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 7.067, PROB.= 7.850E-03

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 9.231, PROB.= 2.380E-03

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 2.288E-03

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
25%	21	9	30
TOTAL	51	9	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 8.366, PROB.= 3.823E-03

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 10.588, PROB.= 1.138E-03

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 9.678E-04

GZA ELUTRIATE SAMPLE NO. 30
CERIODAPHNIA DUBIA TEST NO. 93-2045

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
50%	20	10	30
TOTAL	50	10	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 9.720, PROB.= 1.823E-03

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 12.000, PROB.= 5.320E-04

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 3.985E-04

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	30	0	30
100%	21	9	30
TOTAL	51	9	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 8.366, PROB.= 3.823E-03

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 10.588, PROB.= 1.138E-03

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 9.678E-04

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

MINIMUM REQUIRED TRIM IS TOO LARGE: 53.3,SO SK IS NOT CALCULABLE.

SPEARMAN-KARBER

TRIM:	.00%
LC50:	.000
95% LOWER CONFIDENCE:	.000
95% UPPER CONFIDENCE:	.000

CONC. %	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(%)
6.25	30.	0.	.00	.9313D-07
12.50	30.	0.	.00	.9313D-07
25.00	30.	1.	3.33	.2887D-05
50.00	30.	1.	3.33	.2887D-05
100.00	30.	14.	46.67	.4278D+02

THE BINOMIAL TEST SHOWS THAT 50.00 AND +INFINITY CAN BE USED AS STATISTICALLY

SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 100.0000 PERCENT.
THE LC50 FOR THIS DATA SET IS GREATER THAN 100.00

THE MOVING AVERAGE METHOD CANNOT BE USED WITH THIS DATA SET BECAUSE NO SPAN WHICH PRODUCES AVERAGE ANGLES BRACKETING 45 DEGREES ALSO USES TWO PERCENT DEAD BETWEEN 0 AND 100 PERCENT.

NO CONVERGENCE IN 25 ITERATIONS. PROBIT METHOD PROBABLY CAN NOT BE USE WITH THIS SET OF DATA.

DATE: 5/14-18/93 TEST NUMBER: 93-2046 DURATION: 96 HOURS
SAMPLE: GZA ELUTRIATE 30 SPECIES: FATHEAD MINNOWS

METHOD	LC50	CONFIDENCE LIMITS LOWER	UPPER	SPAN
BINOMIAL	*******	50.000	*******	*******
MAA	*******	*******	*******	*******
PROBIT	*******	*******	*******	*******
SPEARMAN	.000	.000	.000	.000

**** = LIMIT DOES NOT EXIST

GZA ELUTRIATE SAMPLE NO. 30
FATHEAD MINNOW TEST NO. 93-2046

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	28	2	30
6.25%	30	0	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 2.069, PROB.= .1503

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .2458, Upper Tail =1.0000

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	28	2	30
12.5%	30	0	30
TOTAL	58	2	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .517, PROB.= .4720

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 2.069, PROB.= .1503

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .2458, Upper Tail =1.0000

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	28	2	30
25%	29	1	30
TOTAL	57	3	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = .351, PROB.= .5536

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .5000, Upper Tail = .8814

GZA ELUTRIATE SAMPLE NO. 30
FATHEAD MINNOW TEST NO. 93-2046

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	28	2	30
50%	29	1	30
TOTAL	57	3	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = .000, PROB.=1.0000

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = .351, PROB.= .5536

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail = .5000, Upper Tail = .8814

---------- CROSSTAB / CHI-SQUARE TESTS ----------
OBSERVED FREQUENCIES

	LIVE	DEAD	TOTAL
CONTROL	28	2	30
100%	16	14	30
TOTAL	44	16	60

CHI-SQUARE WITH CONTINUITY CORRECTION FACTOR = 10.313, PROB.= 1.321E-03

CHI-SQUARE WITHOUT CONTINUITY CORRECTION FACTOR = 12.273, PROB.= 4.596E-04

D.F. = 1

FISHER EXACT PROBABILITY: Lower Tail =1.0000, Upper Tail = 4.549E-04

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM
COVER SHEET FOR LC50 TESTS

CLIENT: GZA Environmental

ADDRESS: 320 Needham Street
Newton Upper Falls, MA 02164

CONTACT: Mr. Tim Briggs

SAMPLE TYPE: Sediment Elutriate Sample #21 (Centrifuged)

DILUTION WATER SOURCE: NEB Artifical Freshwater

C. dubia TEST ID NO: 93-2032
P. promelas TEST ID NO: NA
COC NO: 93-1836
PROJECT NO: 193-017

SEDIMENT
GRAB SAMPLE COLLECTED ON: 5/12/93 (DATE) AT: 1030 (HOURS)

COMPOSITE SAMPLE COLLECTED FROM: _____ (DATE) AT: _____ (HOURS)
TO: _____ (DATE) AT: _____ (HOURS)

INVERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): MG
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Ceriodaphnia dubia
SOURCE\NEB LOT #: NEB\Cd-93-104
AGE: < 24 HOURS
TEST SOLUTION VOLUME: 30 (mL)
NO. ORGANISMS PER TEST CHAMBER: 5
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: Thu. 5/13/93 AT 1625 (hours)
END DATE: Sat 5/15/93 AT 1155 (hours)

VERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): NA
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Fathead Minnows (Pimephales promelas)
SOURCE\NEB LOT #: NEB\
AGE: _____ DAYS
TEST SOLUTION VOLUME: 700 (mL)
NO. ORGANISMS PER TEST CHAMBER: 10
NO. ORGANISMS PER CONCENTRATION: 20
NO. ORGANISMS PER CONTROL: 20
START DATE: _____ AT _____ (hours)
END DATE: _____ AT _____ (hours)

LABORATORY WATER

ARTIFICIAL FW: NEB Batch # CMP 93-063

HARDNESS: 51 (mg/l as $CaCO_3$) ALKALINITY: 43 (mg/l as $CaCO_3$)

INITIAL 100% ELUTRIATE CHEMISTRY

HARDNESS (mg/L as $CaCO_3$): 50		ALKALINITY (mg/L as $CaCO_3$): 25			—		
TEMPERATURE (°C): — 24.1°		pH (SU): 6.6 —			TRC (mg/l): —		
DISSOLVED OXYGEN (mg/l): — 3.7		CONDUCTIVITY (µmhos/cm): 155			AMMONIA (mg/l): —		
SAMPLE COLOR:	TECH. INIT.	DAPHNIA	00 H: MG	24 H: MG	48 H:		
AERATION REQUIRED: YES [ ] NO [X]		FISH	00 H: NA	24 H:	48 H:	72H:	96H:

TECHNICIAN INITIALS:

RESULTS OF Ceriodaphnia dubia LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

RESULTS OF Pimephales promelas LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

NOAEL: NO-OBSERVED-ACUTE-EFFECT LEVEL

ANIMAL CONDITION/BEHAVIOR:

COMMENTS: 83% survival in 100% centrifuged elutriate.

REVIEWED BY: John D Carney DATE: 5/19/93

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Test ID # 93-2032
COC # 93-1836
Proj # 193-017

Client: GZA Environmental
Sample: Elutriate: Sample #21
Test Species: C. dubia
Diluent: Dilute Mineral Water
Start Date: Thu 5/13/93 at DEML 1625
End Date: Sat 5/15/93 at 1655

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW A	5	5	5			7.6		7.2			25.0		24.8			7.7		6.8			115
B	5	5	5					7.6					24.8					7.0			
C	5	5	5					7.6					24.8					7.6			
D	5	5	5					8.0					24.7					7.8			
E	5	5	5					8.0					24.7					7.8			
F	5	5	5					8.0					24.7					7.9			
100% A	5	5	5			3.7		8.0			24.1		24.6			6.6		7.9			155
B	5	5	5					8.0					24.9					7.9			
C	5	5	4					8.1					25.0					7.9			
D	5	5	5					7.6					25.0					8.0			
E	5	5	3					8.0					25.0					8.0			
F	5	5	3					8.0					25.0					8.0			
Tech Initials	MG	MG	MS																		

2 organisms on bottom

2 organisms on bottom

Reviewed by: John P Carney

Date: 5/17/93

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM
COVER SHEET FOR LC50 TESTS

CLIENT: GZA Environmental

ADDRESS: 320 Needham Street
Newton Upper Falls, MA 02164

CONTACT: Mr. Tim Briggs

C. dubia TEST ID NO: 93-2033
P. promelas TEST ID NO: NA
COC NO: 93-1237
PROJECT NO: 193-017

SAMPLE TYPE: Sediment Elutriate :Sample #24 (Centrifuged)

DILUTION WATER SOURCE: NEB Artifical Freshwater

Sediment
GRAB SAMPLE COLLECTED ON: 5/12/93 (DATE) AT: 1110 (HOURS)

COMPOSITE SAMPLE COLLECTED FROM: _____ (DATE) AT: _____ (HOURS)
TO: _____ (DATE) AT: _____ (HOURS)

INVERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): LW
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Ceriodaphnia dubia
SOURCE\NEB LOT #: NEB\
AGE: < 24 HOURS
TEST SOLUTION VOLUME: 30 (mL)
NO. ORGANISMS PER TEST CHAMBER: 5
NO. ORGANISMS PER CONCENTRATION: ~~30~~ 30
NO. ORGANISMS PER CONTROL: ~~30~~ 30
START DATE: Thu. 5/13/93 AT 1625 (hours)
END DATE: Sat 5/15/93 AT 1700 (hours)

VERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): NA
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Fathead Minnows (Pimephales promelas)
SOURCE\NEB LOT #: NEB\
AGE: _____ DAYS
TEST SOLUTION VOLUME: 700 (mL)
NO. ORGANISMS PER TEST CHAMBER: 10
NO. ORGANISMS PER CONCENTRATION: 20
NO. ORGANISMS PER CONTROL: 20
START DATE: _____ AT _____ (hours)
END DATE: _____ AT _____ (hours)

LABORATORY WATER

ARTIFICIAL FW: NEB Batch # CMP 93-063

HARDNESS: 51 (mg/l as $CaCO_3$)
ALKALINITY: 43 (mg/l as $CaCO_3$)

INITIAL 100% ELUTRIATE CHEMISTRY

TECHNICIAN INITIALS:

HARDNESS (mg/L as $CaCO_3$): 24		ALKALINITY (mg/L as $CaCO_3$): 50					
TEMPERATURE (°C): 25.5		pH (SU): 7.0			TRC (mg/l): —		
DISSOLVED OXYGEN (mg/l): 4.3		CONDUCTIVITY (µmhos/cm): 141			AMMONIA (mg/l): —		
SAMPLE COLOR:	TECH. INIT.	DAPHNIA	00 H: LW	24 H: MC	48 H: MC		
AERATION REQUIRED: YES [ ] NO [X]		FISH	00 H: NA	24 H:	48 H:	72H:	96H:

RESULTS OF Ceriodaphnia dubia LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

RESULTS OF Pimephales promelas LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

NOAEL: NO-OBSERVED-ACUTE-EFFECT LEVEL

ANIMAL CONDITION/BEHAVIOR:

COMMENTS: 40% survival in 100% centrifuged elutriate

REVIEWED BY: John O Carey DATE: 5/19/93

Test ID # 93-2033
COC # 93-1837
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: C. dubia Start Date: Thurs 5/13/93 at 1625

Sample: Elutriate: Sample 24 Diluent: Dilute Mineral Water End Date: Sat 5/15/93 at 1700

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW A	5	5	5			7.6		7.2			25.0		24.8			7.7		6.8			115
B	5	5	5					7.6					24.8					7.0			
C	5	5	5					7.6					24.8					7.6			
D	5	5	5					8.0					24.7					7.8			
E	5	5	5					8.0					24.7					7.8			
F	5	5	5					8.0					24.7					7.9			
100% A	5	5	1			4.3		7.8			25.5		26.0			7.0		7.9			141
B	5	5	1					7.8					26.0					7.8			
C	5	5	2					7.9					26.0					7.8			
D	5	5	3					8.0					26.0					7.9			
E	5	5	3					7.8					26.0					7.7			
F	5	5	2					7.8					26.0					7.8			
Tech Initials	LW	MG	MS																		

Reviewed by: John D Carney Date: 5/19/93

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM
COVER SHEET FOR LC50 TESTS

CLIENT: GZA Environmental

ADDRESS: 320 Needham Street
Newton Upper Falls, MA 02164

CONTACT: Mr. Tim Briggs

C. dubia TEST ID NO: 93-2034
P. promelas TEST ID NO: NA
COC NO: 93-1838
PROJECT NO: 193-017

SAMPLE TYPE: Sediment Elutriate :Sample #30 (centrifuged) Sediment

GRAB SAMPLE COLLECTED ON: 5/12/93 (DATE) AT: (HOURS)

DILUTION WATER SOURCE: NEB Artifical Freshwater

COMPOSITE SAMPLE COLLECTED FROM: (DATE) AT: (HOURS)
TO: (DATE) AT: (HOURS)

INVERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): LW
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Ceriodaphnia dubia
SOURCE\NEB LOT #: NEB\ CD-93-104
AGE: < 24 HOURS
TEST SOLUTION VOLUME: 30 (mL)
NO. ORGANISMS PER TEST CHAMBER: 5
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: Thu 5/13/93 AT 1630 (hours)
END DATE: Sat 5/15/93 AT 1710 (hours)

VERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.):
DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Fathead Minnows (Pimephales promelas)
SOURCE\NEB LOT #: NEB\
AGE: DAYS
TEST SOLUTION VOLUME: 700 (mL)
NO. ORGANISMS PER TEST CHAMBER: 10
NO. ORGANISMS PER CONCENTRATION: 20
NO. ORGANISMS PER CONTROL: 20
START DATE: AT (hours)
END DATE: AT (hours)

LABORATORY WATER

ARTIFICIAL FW: NEB Batch # C-MY-93-063

HARDNESS: 51 (mg/l as $CaCO_3$)
ALKALINITY: 43 (mg/l as $CaCO_3$)

INITIAL 100% ELUTRIATE CHEMISTRY

TECHNICIAN INITIALS: PW

HARDNESS (mg/L as $CaCO_3$): 32		ALKALINITY (mg/L as $CaCO_3$): 45			—	
TEMPERATURE (°C): — 24.6		pH (SU): 7.0 —			TRC (mg/l): —	
DISSOLVED OXYGEN (mg/l): — 3.6		CONDUCTIVITY (µmhos/cm): 153			AMMONIA (mg/l): —	
SAMPLE COLOR:	TECH. INIT.	DAPHNIA	00 H: LW	24 H: MG	48 H: MS	
AERATION REQUIRED: YES [ ] NO [ ]		FISH	00 H:	24 H:	48 H:	72H: 96H:

RESULTS OF Ceriodaphnia dubia LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

RESULTS OF Pimephales promelas LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

NOAEL: NO-OBSERVED-ACUTE-EFFECT LEVEL

ANIMAL CONDITION/BEHAVIOR:

COMMENTS: 100% Survival in 100% centrifuged elutriate

REVIEWED BY: John P. Carney DATE: 5/19/93

Test ID # 93-2034
COC # 93-1838
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: C. dubia Start Date: Thurs 5/13/93 at 1630

Sample: Elutriate: Sample 30 Diluent: Dilute Mineral Water End Date: Sat 5/15/93 at 1710

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
DMW A	5	5	5			7.6		7.2			25.0		24.8			7.7		6.8			115
B	5	5	5					7.6					24.8					7.0			
C	5	5	5					7.6					24.8					7.6			
D	5	5	5					8.0					24.7					7.8			
E	5	5	5					8.0					24.7					7.8			
F	5	5	5					8.0					24.7					7.7			
100% 30 A	5	5	5			3.6		7.8			24.6		25.7			7.0		7.9			153
B	5	5	5					7.8					25.7					8.0			
C	5	5	5					8.1					25.9					8.0			
D	5	5	5					8.0					25.9					8.0			
E	5	5	5					8.0					25.8					8.0			
F	5	5	5					7.8					25.8					8.0			
Tech Initials	LW	MG	MS																		

Reviewed by: John D Carney Date: 5/19/93

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM
COVER SHEET FOR LC50 TESTS

CLIENT: GZA Environmental

ADDRESS: 320 Needham Street
Newton Upper Falls, MA 02164

CONTACT: Mr. Tim Briggs

SAMPLE TYPE: Sediment Elutriate Sample. Centrifuged MA Shipping Cont

DILUTION WATER SOURCE: NEB Artifical Freshwater

C. dubia TEST ID NO: 93-2031 A

P. promelas TEST ID NO: NA

COC NO: 93-1823

PROJECT NO: 193-017

Sediment GRAB SAMPLE COLLECTED ON: 5/10/93 (DATE) AT: 1130 1200 (HOURS)

COMPOSITE SAMPLE COLLECTED FROM: _____ (DATE) AT: _____ (HOURS)

TO: _____ (DATE) AT: _____ (HOURS)

INVERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): MG

DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Ceriodaphnia dubia

SOURCE\NEB LOT #: NEB\ CD-93-104

AGE: < 24 HOURS

TEST SOLUTION VOLUME: 30 (mL)

NO. ORGANISMS PER TEST CHAMBER: 5

NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30

NO. ORGANISMS PER CONTROL: ~~20~~ 30

START DATE: Thu 5/13/93 AT 1620 (hours)

END DATE: 5/15/93 AT 1655 (hours)

VERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): _____

DEFINITIVE [X] SCREEN [ ] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Fathead Minnows (Pimephales promelas)

SOURCE\NEB LOT #: NEB\ _____

AGE: _____ DAYS

TEST SOLUTION VOLUME: 700 (mL)

NO. ORGANISMS PER TEST CHAMBER: 10

NO. ORGANISMS PER CONCENTRATION: 20

NO. ORGANISMS PER CONTROL: 20

START DATE: _____ AT _____ (hours)

END DATE: _____ AT _____ (hours)

LABORATORY WATER

ARTIFICIAL FW: NEB Batch # L-MA-93-060 003 MG DZ

HARDNESS: 51 (mg/l as $CaCO_3$) ALKALINITY: 43 (mg/l as $CaCO_3$)

INITIAL 100% ELUTRIATE CHEMISTRY TECHNICIAN INITIALS: RV

HARDNESS (mg/L as $CaCO_3$): 13		ALKALINITY (mg/L as $CaCO_3$): 12						
TEMPERATURE (°C): 24.5°		pH (SU): 7.2				TRC (mg/l): —		
DISSOLVED OXYGEN (mg/l): 5.8		CONDUCTIVITY (µmhos/cm): 74				AMMONIA (mg/l): —		
SAMPLE COLOR: —	TECH. INIT.	DAPHNIA	00 H: MG	24 H: MG	48 H: MS			
AERATION REQUIRED: YES [ ] NO [X]		FISH	00 H: NA	24 H:	48 H:	72H:	96H:	

RESULTS OF Ceriodaphnia dubia LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

RESULTS OF Pimephales promelas LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

NOAEL: NO-OBSERVED-ACUTE-EFFECT LEVEL

ANIMAL CONDITION/BEHAVIOR: _____

COMMENTS: 97% survival in 100% centrifuged elutriate

REVIEWED BY: John D Cooney DATE: 5/19/93

Test ID # 93-2031A
COC # 93-1823
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: C. dubia Start Date: Thu 5/13/93 at 1620

Sample: Effluent Sample Diluent: Dilute Mineral Water End Date: SAT 5/15/93 at 1655

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
Hatchery Cont A	5	5	5			5.8		7.4			24.5		24.5			7.2		7.9			74
B	5	5	5					7.9					24.5					7.8			
C	5	5	4					7.6					24.4					7.8			
D	5	5	5					7.9					24.4					7.8			
E	5	5	5					7.6					24.4					7.8			
F	5	5	5					7.8					24.4					7.7			
Tech Initials			MS																		

Reviewed by: John O Carney Date: 5/19/93

NEW ENGLAND BIOASSAY ACUTE TOXICITY DATA FORM
COVER SHEET FOR LC50 TESTS

CLIENT: GIA Environmental

ADDRESS: 320 Needham Street
Newton Upper Falls, MA 02164

CONTACT: Mr. Tim Briggs

SAMPLE TYPE: Sediment Elutriate 1Sample 1µ Filter MASHapang

DILUTION WATER SOURCE: NEB Artifical Freshwater

C. dubia TEST ID NO: 93-2031B
P. promelas TEST ID NO: 93-2031C
COC NO: 93-1823
PROJECT NO: 193-017

Sediment GRAB/SAMPLE COLLECTED ON: 5/10/93 (DATE) AT: 1200 (HOURS) 1130

COMPOSITE SAMPLE COLLECTED FROM: _____ (DATE) AT: _____ (HOURS)
TO: _____ (DATE) AT: _____ (HOURS)

INVERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): /
DEFINITIVE [X] SCREEN [X] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Ceriodaphnia dubia
SOURCE\NEB LOT #: NEB\ CD-93-105-109
AGE: < 24 HOURS
TEST SOLUTION VOLUME: 30 (mL)
NO. ORGANISMS PER TEST CHAMBER: 5
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: 5/14/93 AT 1040 (hours)
END DATE: 5/16/93 AT 1015 (hours)

VERTEBRATE

TYPE OF TEST TEST SET UP (TECH. INIT.): /
DEFINITIVE [X] SCREEN [X] RANGE [ ] RENEWAL [ ]

TEST SPECIES: Fathead Minnows (Pimephales promelas)
SOURCE\NEB LOT #: NEB\ 93-115 A+B
AGE: 9 DAYS
TEST SOLUTION VOLUME: 700 (mL)
NO. ORGANISMS PER TEST CHAMBER: 10
NO. ORGANISMS PER CONCENTRATION: ~~20~~ 30
NO. ORGANISMS PER CONTROL: ~~20~~ 30
START DATE: 5/14/93 AT 1040 (hours)
END DATE: 5/18/93 AT 1015 (hours)

LABORATORY WATER

ARTIFICIAL FW: NEB Batch # CMP 93-063

HARDNESS: 51 (mg/l as $CaCO_3$)
ALKALINITY: 43 (mg/l as $CaCO_3$)

INITIAL 100% ELUTRIATE CHEMISTRY

TECHNICIAN INITIALS:

HARDNESS (mg/L as $CaCO_3$):	13	ALKALINITY (mg/L as $CaCO_3$):	12			—			
TEMPERATURE (°C):	24.5	pH (SU):	7.2			TRC (mg/l):	—		
DISSOLVED OXYGEN (mg/l):	5.8	CONDUCTIVITY (µmhos/cm):	74			AMMONIA (mg/l):	—		
SAMPLE COLOR:		TECH. INIT.	DAPHNIA	00 H: —	24 H: —	48 H: —			
AERATION REQUIRED: YES [ ] NO [X]			FISH	00 H: —	24 H: —	48 H: —	72H: —	96H: —	

RESULTS OF Ceriodaphnia dubia LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

RESULTS OF Pimephales promelas LC_{50} TEST

METHOD	LC_{50} (%)	95% CONFIDENCE LIMITS (%)
BINOMIAL DISTRIBUTION:		
MOVING AVERAGE-ANGLE:		
PROBIT:		
TRIMMED SPEARMAN KARBER:		
OTHER:		
NOAEL:		

NOAEL: NO-OBSERVED-ACUTE-EFFECT LEVEL

ANIMAL CONDITION/BEHAVIOR: _____

COMMENTS: C. dubia: 77% survival in 100% filtered elutriate
Fathead Minnow: 97% survival in 100% filtered elutriate

REVIEWED BY: John D Carney DATE: 5/19/93

Test ID # 93-2031B
COC # 93-1823
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Ceriodaphnia dubia Start Date: 5/14/93 at 1010
Sample: Mashnpayg Sediment Diluent: Dilute Mineral Water End Date: 5/16/93 at 1015

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
* MASH A	5	5	4			7.7		7.4			24.1		24.3			7.8		7.6			116
B	5	5	3					7.4					24.4					7.4			
C	5	5	4					7.4					24.6					7.5			
D	5	5	4					7.4					24.7					7.5			
E	5	5	4					7.4					24.7					7.5			
F	5	5	4					7.8					24.7					7.5			
Tech Initials	MS	MS	MS																		

* Dead organisms on bottom MS looked at under Microscope

Reviewed by: John O'Leary Date: 5/19/93

Test ID # 93-203K
COC # 93-1823
Proj # 193-017

NEW ENGLAND BIOASSAY
ACUTE TOXICITY DATA

Client: GZA Environmental Test Species: Pimephales promelas Start Date: 5/14/93 at 1040
Sample: Mashapaug Sediment Diluent: Dilute Mineral Water End Date: 5/18/93 at 1015

Concentration or Dilution	No. of Live Organisms					Dissolved Oxygen mg/l					Temperature °C					pH					Cond µmhos
	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	
Mash A	10	10	10	10	10	7.7	6.8	6.0	6.3	6.8	24.1	24.6	24.6	24.7	24.5	7.8	7.4	7.5	7.4	7.0	116
B	10	10	10	10	10		7.0	6.2	6.1	6.9		24.6	24.7	24.6	24.6		7.3	7.4	7.2	6.9	
C	10	9x	9	9	9		6.8	6.2	6.2	6.8		24.6	24.6	24.5	24.6		7.2	7.3	7.2	6.9	
Tech Initials	KRod	TH	TH	MG	KRod																

Reviewed by: John P Carney Date: 5/19/93