

10-28-93



September 24, 1993
Project 5000-557

Ms Jana E. Murphy
Flambeau Mining Company
N4100 Highway 27
Ladysmith, WI 54848

Dear Jana:

Enclosed please find the final report on the outfall 001 whole effluent toxicity tests we performed on behalf of Flambeau Mining Company during the period September 15-19, 1993. The acute Ceriodaphnia test result was toxicity positive (i.e., < 50% survival in 100% effluent) according to the WPDES Permit compliance criterion; other test results were toxicity negative (i.e., ≥ 50% acute survival in 100% effluent).

Please call if you have any questions or comments.

Best regards.

Sincerely,

David F. Sanders
Manager
Environmental Bioassessment

Enclosure

Copy w/ enclosure:

Mr. William M. West
Foth & Van Dyke
2737 S. Ridge Road
P.O. Box 19012
Green Bay, Wisconsin 54307-9012



IPS

Environmental and Analytical Services

**Flambeau Mining Company
Ladysmith, Wisconsin
September 23, 1993**

(IPS Project 5000-557)

Integrated Paper Services, Inc.

101 West Edison Avenue, Suite 250
P.O. Box 446
Appleton, WI 54912-0446
(414) 749-3040 FAX: (414) 749-3046

September 23, 1993

Effluent Bioassays For
Flambeau Mining Company
Ladysmith, Wisconsin

(IPS Project 5000-557)

INTRODUCTION

This report presents the results of a biological assessment of treatment plant effluent quality conducted by Integrated Paper Services, Inc. (IPS). This study was conducted on behalf of Flambeau Mining Company (Flambeau) during the period September 15-19, 1993.

An acute test format bioassessment was implemented to estimate the acute toxicity of 50% and 100% (v:v) outfall 001 effluent to the cladocerans, Ceriodaphnia dubia and Daphnia magna, and the fish, Pimephales promelas, using an abbreviated format of the U. S. Environmental Protection Agency (EPA) acute test protocols (1).

Acute toxicity in these tests is defined as greater than fifty percent mortality to C. dubia or D. magna at 48 hours exposure, or to P. promelas at 96 hours exposure. A positive test result is defined, by WPDES Permit, as acute toxicity in 100% effluent.

METHODS

IPS methods, including test organism culture, quality assurance, sample handling, test procedures, and data analyses were in accordance with EPA and Wisconsin Department of Natural Resources (WDNR) procedures (1-2). These tests were undertaken as described in the QA/QC plan submitted pursuant to Flambeau's current WPDES Permit No. WI-00047376-1 and approved by the WDNR (changes from the original plan are in accordance with the December, 1992 modified permit).

SAMPLE COLLECTION AND PREPARATION

Effluent for the tests consisted of two 16-hr composite samples; control/dilution water was a Flambeau River grab sample. These samples were collected as described in Table 1 by Flambeau personnel, kept cool and delivered to IPS within 35 hours of collection.

Sample temperatures were measured and recorded upon receipt; total residual chlorine was measured on and a NH₃-N sample taken [and preserved (3) if necessary] from effluent samples upon receipt.

Samples not used immediately for test initiation or solution renewal were placed in cold storage (4° C) until needed. All samples were filtered through a 63 μ mesh sieve to remove interfering organisms prior to test use.

Table 1. Sample collection schedule for Project 5000-557.

Sample	Type	Collection Date	Test Use Days
Effluent	Comp.	9/13 ^a	Acute(1-2)
Effluent	Comp.	9/15 ^a	Acute(3-4)
Flambeau River	Grab	9/14	Acute(1-4)

a = composite from 8:00 A.M. to 11:50 P.M.

LABORATORY ANALYSIS

Bioassay test procedures followed acute bioassay protocols and special requirements (1,2); chemical parameter measurements followed the equipment manufacturer's instructions or A.P.H.A. methods (3). Test conditions are summarized in Tables 2-4.

Dissolved oxygen, pH, and conductivity were measured initially and after 24-hours exposure on all test solutions. Total hardness and total alkalinity were measured daily on the control and 100% effluent concentration renewal solutions. Test temperature was monitored hourly by thermocouple thermometry in all exposure areas.

Acute tests were concluded by counting the surviving organisms in each test chamber. In addition, the surviving secondary control fish were sacrificed (exposed to 70% ethanol) and total length and wet weight measurements were made to determine the loading rate.

TEST VALIDATION AND RESULTS

PHYSICOCHEMICAL PARAMETERS

Effluent temperature upon receipt at the laboratory was $\leq 0.2^{\circ}$ C. Dechlorination of effluent samples was not necessary (total residual chlorine < 0.02 ppm). Physicochemical parameters measured as part of the bioassays satisfied requirements for aquatic life and the bioassays (1,2). Test temperatures were within protocol specified ranges (Table 5). Chain-of-custody forms with sample collection information, chemical data sheets, and laboratory bench sheets are appended to this report.

BIOLOGICAL PARAMETERS

Loading rate for the P. promelas acute test satisfied the ≤ 0.65 g/L range criterion for 20° C acute tests (Table 6). Except for the D. magna primary control (85% survival), primary and secondary controls for all acute tests met or exceeded the 90% survival criterion for an acceptable test (Tables 7-9).

Table 2. Summary of test conditions for the acute toxicity screen with Ceriodaphnia dubia.

1. Test organism:	<u>Ceriodaphnia dubia</u> (Crustacea:Cladocera)
2. Test type:	Static renewal
3. Age of test organisms:	Less than 24 hours
4. Test chamber size:	30 mL
5. Test solution volume:	15 mL
6. Renewal of test solutions:	Daily
7. Replicate chambers/treatment:	4
8. Test organisms/chamber:	5
9. Control/dilution water:	Primary - Flambeau River Secondary - Flow-through culture water
10. Effluent test concentrations:	50% & 100% (v:v)
11. Temperature:	20 +/- 2° C
12. Feeding regime:	None
13. Aeration:	Effluent initially to reduce DO supersaturation
14. pH adjustment:	None
15. Test duration:	48 hours
16. Effects measured:	Mortality (immobilization)

Table 3. Summary of test conditions for the acute toxicity screen with Daphnia magna.

1. Test organism:	<u>Daphnia magna</u> (Crustacea:Cladocera)
2. Test type:	Static renewal
3. Age of test organisms:	Less than 24 hours
4. Test chamber size:	100 mL
5. Test solution volume:	50 mL
6. Renewal of test solutions:	Daily
7. Replicate chambers/treatment:	2
8. Test organisms/chamber:	10
9. Control/dilution water:	Primary - Flambeau River Secondary - Flow-through culture water
10. Effluent test concentrations:	50% & 100% (v:v)
11. Temperature:	20 +/- 2° C
12. Feeding regime:	None
13. Aeration:	Effluent initially to reduce DO supersaturation
14. pH adjustment:	None
15. Test duration:	48 hours
16. Effects measured:	Mortality (immobilization)

Table 4. Summary of test conditions for the acute toxicity screen with Pimephales promelas.

1. Test organism	<u>Pimephales promelas</u> (Osteichthyes: Cyprinidae)
2. Test type:	Static renewal
3. Age of test organisms:	Juvenile, 29 days
4. Test chamber size:	1 L
5. Test solution volume:	750 mL
6. Renewal of test solutions:	Daily
7. Replicate chambers/treatment:	2
8. Test organisms/chamber:	10
9. Control/dilution water:	Primary - Flambeau River Secondary - Dechlorinated tap water
10. Effluent test concentrations:	50% & 100% (v:v)
11. Temperature:	20 +/- 2° C
12. Feeding regime:	None
13. Aeration:	Effluent (days 1, 2 and 4) initially to reduce DO supersaturation
14. pH adjustment:	None
15. Test duration:	96 hours
16. Effects measured:	Mortality

Table 5. A summary of temperature data (date is start of 1200 hr to 1200 hr recording period) for Project 5000-557.

<u>Date</u>	<u>Mean</u>	<u>Max.</u>	<u>Min.</u>
9/15	19.9	20.1	19.7
9/16	19.8	20.1	19.7
9/17	20.0	20.3	19.6
9/18	20.0	20.2	19.5

Table 6. Mean length and weight of juvenile fathead minnows used for the September 15-19, 1993 acute test.

Mean length = 17.30 mm
 Mean weight = 36.38 mg
 Loading factor = 0.49 g/L

Table 7. Ceriodaphnia dubia survival data for the September 15-17, 1993 acute toxicity test.

<u>Test Solution</u>	<u>Rep</u>	<u>Fatalities/Expos. Per. (HRS.)</u>		<u>Mean % Survival</u>
		<u>24</u>	<u>48</u>	
Secondary Control	A/B/C/D	0/0/0/0	0/0/0/0	100
Primary Control	A/B/C/D	0/0/0/0	0/0/0/0	100
50% Effluent	A/B/C/D	0/0/0/0	0/0/0/0	100
100% Effluent	A/B/C/D	0/0/1/0	4/2/4/2	35

Table 8. Daphnia magna survival data for the September 15-17, 1993 acute toxicity test.

Test Solution	Rep	Fatalities/Expos. Per. (HRS.)		Mean % Survival
		<u>24</u>	<u>48</u>	
Secondary Control	A/B	0/0	0/0	100
Primary Control	A/B	0/0	3/0	85
50% Effluent	A/B	0/0	1/0	94
100% Effluent	A/B	0/1	0/2	84

Table 9. Pimephales promelas survival data for the September 15-19, 1993 acute toxicity test.

Test Solution	Rep	Fatalities/Expos. Per. (HRS.)				Mean % Survival
		<u>24</u>	<u>48</u>	<u>72</u>	<u>96</u>	
Secondary Control	A/B	0/0	0/0	0/0	0/0	100
Primary Control	A/B	0/0	0/0	0/0	0/0	100
50% Effluent	A/B	0/0	0/0	0/0	0/0	100
100% Effluent	A/B	1/0	0/0	0/0	0/0	95

REFERENCES

1. Weber C. I. (ed.). 1991. Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms (fourth edition). EPA/600/4-90/027. U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory., Cincinnati, OH. 293 p.
2. Quality Assurance/Quality Control Plan for whole effluent toxicity monitoring of Flambeau Mining Company's effluent in accordance with WPDES Permit requirements.
3. A.P.H.A. 1989. Standard Methods for the Examination of Water and Wastewater (17th edition). American Public Health Association, Washington, DC.

INTEGRATED PAPER SERVICES, INC.

Laboratory Analysis:

David Christel
Tom Perzentka

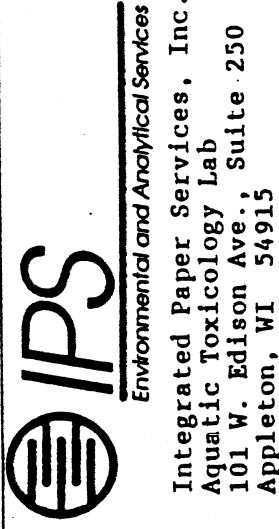
Laboratory Supervisor:

David Christel
David Christel
Aquatic Toxicologist
Environmental Bioassessment

Quality Assurance Review:

David F Sanders
David F. Sanders
Manager
Environmental Bioassessment

Chain-of-Custody Record



Integrated Paper Services, Inc.
 Aquatic Toxicology Lab
 101 W. Edison Ave., Suite 250
 Appleton, WI 54915

Client Jana E Murphy
Flambeau Mining Co
N4100 Hwy 27
Lady Smith, WI 54848
 Sampled by: [Signature]
 (signature)

Return Samples To:

Sample Identification	# Containers	Grab Date/Time	Composite		Collection				Receipt					
			Start Date/Time	End Date/Time	Temp. (°C)	pH	NH ₃ -N	Cl ₂	Ice	Temp. (°C)	pH	DO	Cl ₂	NH ₃ -N
① Outfall,ool Disch	1	—	9-13-93 8:00 AM	9-13-93 11:50 PM	8.9	8.12			Y	0.1°C	6.6	8.9	<0.01	N.D
② Flambeau River	1	9-14-93/10:38A	—	—	16.2	7.39			Y	0.1°C	7.0	7.6	<0.01	—
③														
④														
⑤														

Remarks: -16 hr composite

Laboratory ID: ③
① AC 1-2 16h
② AC 1-4
⑤

Relinquished by: [Signature] 9-14-93 5:15 PM Date/Time
 (to carrier)

Received by: _____ Date/Time

Relinquished by: _____ Date/Time
 Carrier Identification (UPS, Fed-Ex, etc.): FE EX

Received for lab: David N. Havel 9-15-93 1035 Date/Time

Chain-of-Custody Record

Client Jana E Murphy
Flambeau Mining Co
14400 Hwy 27
Lady Smith WI 54848

Sampled by: Jana E Murphy
 (signature)

IPS
 Environmental and Analytical Services

Return Samples To:
 Integrated Paper Services, Inc.
 Aquatic Toxicology Lab
 101 W. Edison Ave., Suite 250
 Appleton, WI 54915

Sample Identification	# Containers	Grab		Composite		Collection				Receipt				
		Date/Time	Start Date/Time	End Date/Time	Temp. (°C)	pH	NH ₃ -N	Cl ₂	Ice	Temp. (°C)	pH	DO	Cl ₂	NH ₃ -N
① Outfall-00/Disch		—	9-15-93 8:00 AM	9-15-93 11:50 PM	9.5	7.57			Y	0.2	6.3	8.7	CO.01	<1.4
②														
③														
④														
⑤														

Remarks: -16 hr composite

Laboratory ID: Ac 3.4 ③ _____
 ④ _____
 ⑤ _____

Custody Seal: OK / Broken

Received by: Jana E Murphy Date/Time: 9-16-93 4:00 PM

Relinquished by: _____ Date/Time: _____

Received for lab: Dave Christel Date/Time: 9-17-93 10:30

Carrier Identification (UPS, Fed-Ex, etc.): UPS

Four Day Bioassay Chemical Data - Initial

Project No. 5000-557 Start Date 9/15/93

Client Flambeau Mining

Test Organism C. dubia / D. magna / P. promelas

Test Solution	Parameter	Exposure Day				Comments
		1	2	3	4	
Control (Dechlor) ①	DO	7.7	8.2	7.5	7.6	
	pH	8.0	7.9	7.4	7.7	
	Cond.	158	161	163	163	
	Alk.	33	39	36	34	
	Hard.	95	60	60	60	
Control (Flow thru) ②	DO	7.7	8.1	X	X	
	pH	7.9	7.8			
	Cond.	169	171			
	Alk.	20	26			
	Hard.	100	60			
River ③	DO	8.5	9.1	8.4	9.0	
	pH	7.2	7.5	7.5	7.5	
	Cond.	117	121	115	114	
	Alk.	46	48	50	46	
	Hard.	50	50	50	50	
50% ④	DO	8.7	9.0	9.0	8.8	
	pH	7.1	7.2	7.5	7.4	
	Cond.	160	162	171	172	
	Alk.					
	Hard.					
100% ⑤	DO	9.0 ↓	9.2 ↓	9.1	8.8 ↓	E ↓ d 1, 2, 4 ✓
	pH	7.0	7.2	7.3	7.3	
	Cond.	200	207	225	227	
	Alk.	30	32	32	34	
	Hard.	105	100	100	100	
	DO					
	pH					
	Cond.					
	Alk.					
	Hard.					
	DO					
	pH					
	Cond.					
	Alk.					
	Hard.					
	Initials	DC	DC	JP	JP	

Two Day Bioassay Chemical Data - Final

Project No. 5000-557

Start Date 9-15-93

Client Flambeau Mine

Test Organism Ceriodaphnia dubia

Test Solution	Parameter	Exposure Day		Comments
		1	2	
Control ①	DC	7.8	7.7	✓
	pH	7.6	7.4	
	Cond.	164	176	
	Alk. Hard.			
River ②	DC	7.7	7.7	✓
	pH	7.8	7.8	
	Cond.	116	122	
	Alk. Hard.			
50% ③	DC	7.7	7.4	✓
	pH	7.9	7.8	
	Cond.	160	166	
	Alk. Hard.			
100% ③	DC	8.0	7.4	✓
	pH	7.8	7.8	
	Cond.	209	225	
	Alk. Hard.			
	DC			
	pH			
	Cond.			
	Alk. Hard.			
	DC			
	pH			
	Cond.			
	Alk. Hard.			
	DC			
	pH			
	Cond.			
	Alk. Hard.			
Initials		DC	DC	

48 HOUR ACUTE BIOASSAY SURVIVAL DATA SHEET

PROJECT: 5000-557 COMPANY: Flambeau Mine

TEST ORGANISM: Ceriodaphnia dubia AGE: 24hr

START DATE/TIME: 9-15-73 1325 FINISH DATE/TIME: 9-17-73 1315

SET BY: DJC

TEST SOLUTION	REP.	FAT/SURV. PER EXPOSURE PERIOD (HRS)		TOTAL		PERCENT SURVIVAL	MEAN SURVIVAL	COMMENTS
		24	48	FAT.	SUR.			
Control ①	A	0/5	0/5	0	5	100	100	
	B	0/5	0/5	0	5	100	100	
	C	0/5	0/5	0	5	100		
	D	0/5	0/5	0	5	100		
River ①	A	0/5	0/5	0	5	100	100	
	B	0/5	0/5	0	5	100	100	
	C	0/5	0/5	0	5	100	100	
	D	0/5	0/5	0	5	100	100	
50% ②	A	0/5	0/5	0	5	100	100	
	B	0/5	0/5	0	5	100	100	
	C	0/5	0/5	0	5	100	100	
	D	0/5	0/5	0	5	100	100	
100% ②	A	0/5	4/1	4	1	20	35	
	B	0/5	2/3	2	3	60		
	C	1/4	4/0	5	0	0		
	D	0/5	2/3	2	3	60		
	A							
	B							
	C							
	D							
	A							
	B							
	C							
	D							
	A							
	B							
	C							
	D							

DETERMINED

DJC

DC

DATA CHECK DC/11/73

Two Day Bioassay Chemical Data - Final

Project No. 5000-557 Start Date 9-15-93

Client Flambeau Mine

Test Organism Daphnia magna

Test Solution	Parameter	Exposure Day		Comments
		1	2	
Control ①	DC	7.7	7.1	-
	pH	7.5	7.0	
	Cond.	177	178	
	Alk.			
	Hard.			
River ①	DC	7.7	7.2	✓
	pH	7.6	7.8	
	Cond.	123	133	
	Alk.			
	Hard.			
50% ②	DC	7.7	6.9	✓
	pH	7.6	7.2	
	Cond.	165	177	
	Alk.			
	Hard.			
100% ③	DC	7.8	7.3	✓
	pH	7.5	7.2	
	Cond.	208	226	
	Alk.			
	Hard.			
	DC			
	pH			
	Cond.			
	Alk.			
	Hard.			
	DC			
	pH			
	Cond.			
	Alk.			
	Hard.			
	DC			
	pH			
	Cond.			
	Alk.			
	Hard.			
Initials		DC	DC	

48 HOUR ACUTE BIOASSAY SURVIVAL DATA SHEET

PROJECT: 5000-557 COMPANY: Flambeau Mining
 TEST ORGANISM: Daphnia magna AGE: c. 24 hr
 START DATE/TIME: 9-15-93 1:1335 FINISH DATE/TIME: 9-17-93 1:1325
 SET BY: DTC

TEST SOLUTION	REP.	FAT./SURV. PER EXPOSURE PERIOD (HRS)			TOTAL		PERCENT SURVIVAL	MEAN SURVIVAL	COMMENTS
		24	48		FAT.	SUR.			
Control ①	A	0/10	0/10		0	10	100	100	
	B	0/10	0/10		0	10	100		
	C								
	D								
River ②	A	0/10 ^A	3/7	A. 5 on screen - alive 2 attached to air bubbles on bottom - alive	3	7	70	85	
	B	0/10 ^B	0/8 ^C	B. 2 on screen - alive 1 attached to bubbles on bottom - alive	0	8	100		
	C			C. 2 on screen - dead					
	D								
50% ③	A	0/8 ^A	1/7	A. two on screen - dead	1	7	89	94	
	B	0/9 ^B	0/9	B. 3 on screen - dead 2 on bottom - alive	0	9	100		
	C								
	D								
100% ④	A	0/7 ^A	0/7	A. 3 dead on screen	0	7	100	84	
	B	1/8 ^B	2/6	B. 5 on screen - 1 dead	3	6	67		
	C								
	D								
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								
	A								
	B								
	C								
	D								

DETERMINED BY: DC DC DATA CHECK DC/RS

Four Day Bioassay Chemical Data - Final

Project No. 5000-557 Start Date 9-15-93

Client Flambeau Mine

Test Organism Dimephales promelas

Test Solution	Parameter	Exposure Day				Comments
		1	2	3	4	
Control ①	DO	6.7	7.2	7.4	7.6	✓
	pH	7.2	7.3	7.3	7.5	
	Cond.	163	162	163	158	
	Alk.					
	Hard.					
River ②	DO	7.0	7.1	7.3	7.5	✓
	pH	7.4	7.3	7.2	7.2	
	Cond.	122	118	118	117	
	Alk.					
	Hard.					
50% ③	DO	7.2	7.1	7.3	7.5	✓
	pH	7.3	7.2	7.2	7.2	
	Cond.	165	165	169	168	
	Alk.					
	Hard.					
100% ④	DO	7.4	7.2	7.3	7.4	✓
	pH	7.2	7.1	7.1	7.1	
	Cond.	211	210	221	220	
	Alk.					
	Hard.					
	DO					
	pH					
	Cond.					
	Alk.					
	Hard.					
	DO					
	pH					
	Cond.					
	Alk.					
	Hard.					
Initials		DC	JP	JP	JP	

96 HOUR ACUTE BIOASSAY SURVIVAL DATA SHEET

PROJECT: 5000-557 COMPANY: Flambeau Mine

TEST ORGANISM: Pimephales promelas AGE: 29d

START DATE/TIME: 9-15-93 1 1255 FINISH DATE/TIME: 9-19-93 1 1255

SET BY: DJC

TEST SOLUTION	REP.	FAT/SURV. PER EXPOSURE PERIOD (HRS)				TOTAL		PERCENT SURVIVAL	MEAN SURVIVAL	COMMENTS
		24	48	72	96	FAT.	SUR.			
Control ⊙	A	0/10	0/10	0/10	0/10	0	10	100	100	
	B	0/10	0/10	0/10	0/10	0	10	100		
	C									
	D									
River ⊙	A	0/10	0/10	0/10	0/10	0	10	100	100	
	B	0/10	0/10	0/10	0/10	0	10	100		
	C									
	D									
50% ⊙	A	0/10	0/10	0/10	0/10	0	10	100	100	
	B	0/10	0/10	0/10	0/10	0	10	100		
	C									
	D									
100% ⊙	A	1/9	0/9	0/9	0/9	1	9	90	95	
	B	0/10	0/10	0/10	0/10	0	10	100		
	C									
	D									
	A									
	B									
	C									
	D									
	A									
	B									
	C									
	D									
	A									
	B									
	C									
	D									

DETERMINED BY:

DJC JF JF to

DATA CHECK DC/11/93

ACUTE BIOASSAY LENGTH, WEIGHT AND LOADING RATE DATA

Project: 5000-557 Company: Flambeau Mine
 Test Organism: Pimephales promelas Age: 29 days
 Analysis Date: 9-19-93 Completed By: JP

Mean Length (mm):

	<u>Rep A</u>	Rep B	<u>Rep C</u>	Rep D
1.	<u>17</u>	<u>19</u>	<u>23</u>	<u>17</u>
2.	<u>15</u>	<u>16</u>	<u>20</u>	<u>15</u>
3.	<u>16</u>	<u>18</u>	<u>17</u>	<u>19</u>
4.	<u>18</u>	<u>17</u>	<u>20</u>	<u>18</u>
5.	<u>16</u>	<u>17</u>	<u>16</u>	<u>12</u>
Total		<u>169</u>		<u>177</u>

$$\text{Mean Length} = \frac{\text{Total of Reps A + B + C + D}}{\text{Total No. Organisms}}$$

$$= \frac{346}{20} = 17.30 \text{ mm}$$

Mean Weight (mg):

	<u>Rep A</u>	Rep B	<u>Rep C</u>	Rep D
Tare+Fish	<u>1904.67</u>		<u>1958.65</u>	
- Tare	<u>1583.65</u>		<u>1552.11</u>	
= Fish	<u>321.02</u>		<u>406.54</u>	

$$\text{Mean Weight} = \frac{\text{Total of Reps A + B + C + D}}{\text{Total No. Organisms}}$$

$$= \frac{727.56}{20} = 36.38 \text{ mg}$$

Loading Rate (g/L):

$$= \frac{\text{Mean Weight (mg)} \times \text{Number of Organisms per Replicate}}{\text{Volume of Test Solution per Replicate (mL)}}$$

$$= \frac{36.38 \times 10}{100} = 0.48 \text{ g/L}$$

REFERENCE TOXICANT DATA SUMMARY

**Integrated Paper Services, Incorporated
Aquatic Toxicology Laboratory**

Through August, 1993

Sodium Chloride Reference Toxicant LC50 Data

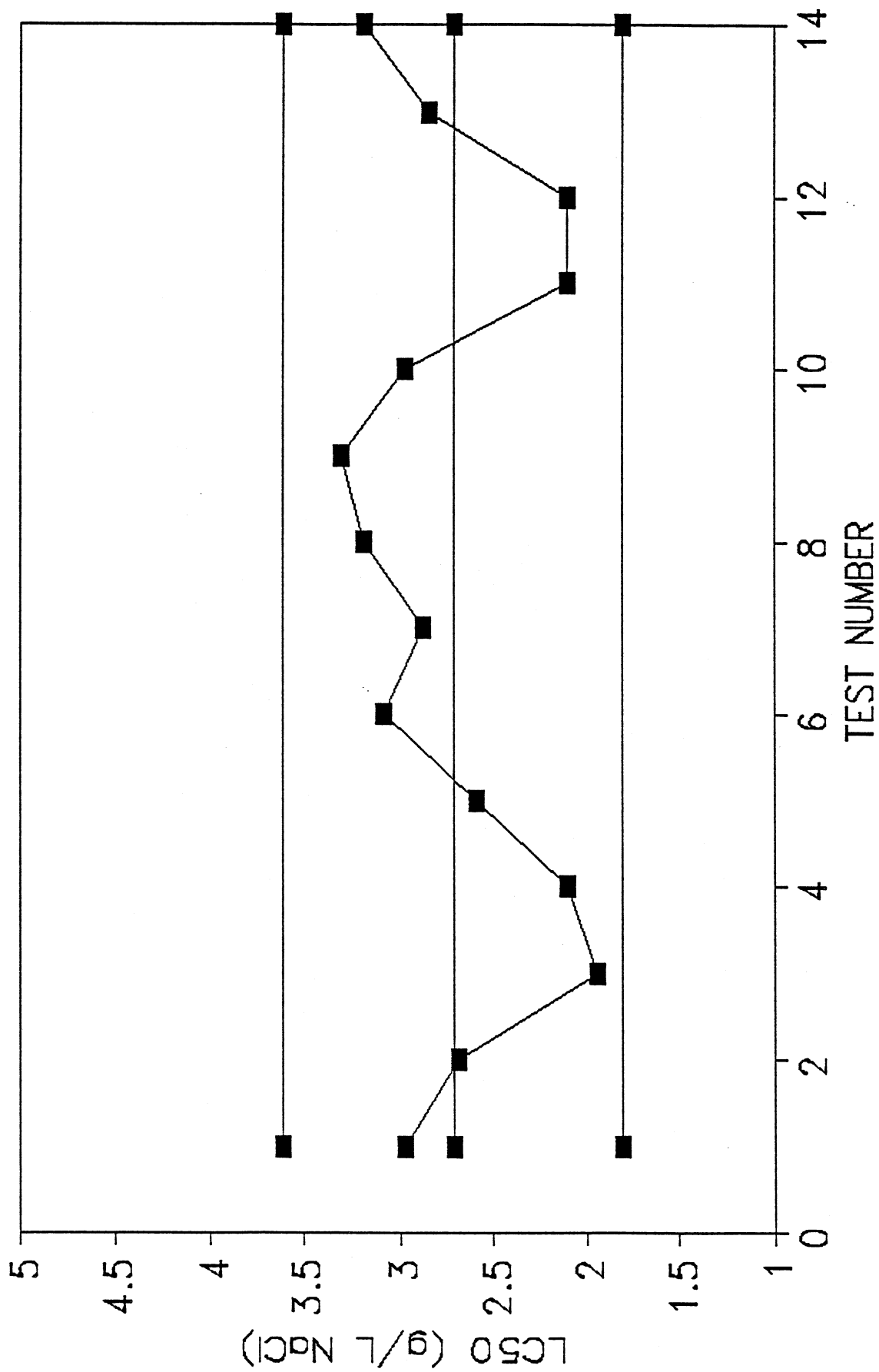
Test Duration: 48 hrs

Species: Ceriodaphnia dubia

Test No.	Test Date	LC50	
1	July 23, 92	2.97	
2	Aug. 27, 92	2.68	
3	Sept 17, 92	1.94	Mean = 2.71
4	Oct. 15, 92	2.10	-----
5	Nov. 03, 92	2.59	
6	Dec. 22, 92	3.08	
7	Jan. 29, 93	2.87	Mean + 2 Std = 3.61
8	Feb. 18, 93	3.19	-----
9	Mar. 11, 93	3.30	
10	Apr. 06, 93	2.97	
11	May 13, 93	2.10	Mean - 2 Std = 1.81
12	June 01, 93	2.10	-----
13	July 06, 93	2.84	
14	Aug. 10, 93	3.19	

NaCl 48 Hour LC50 Data

Species: *Ceriodaphnia dubia*



Sodium Chloride Reference Toxicant LC50 Data

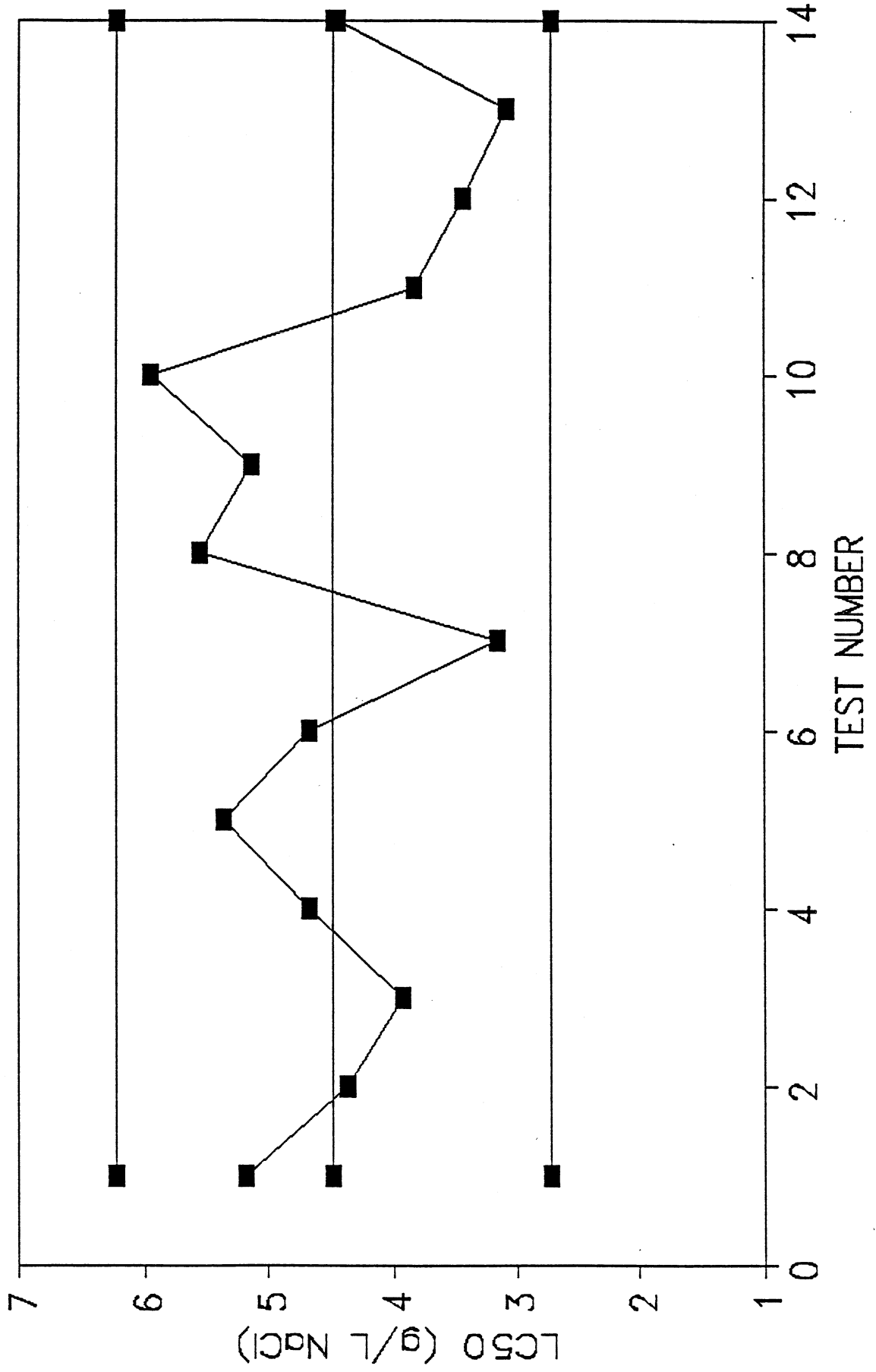
Test Duration: 48 hrs

Species: Daphnia magna

Test No.	Test Date	LC50	
1	July 23, 92	5.18	
2	Aug. 27, 92	4.35	
3	Sept 17, 92	3.92	Mean = 4.48
4	Oct. 15, 92	4.67	-----
5	Nov. 03, 92	5.36	
6	Dec. 22, 92	4.67	
7	Jan. 28, 93	3.15	Mean + 2 Std = 6.23
8	Feb. 19, 93	5.55	-----
9	Mar. 11, 93	5.14	
10	Apr. 06, 93	5.95	
11	May 13, 93	3.82	Mean - 2 Std = 2.73
12	June 01, 93	3.42	-----
13	July 06, 93	3.08	
14	Aug. 10, 93	4.44	

NaCl 48 Hour LC50 Data

Species: *Daphnia magna*



Sodium Chloride Reference Toxicant LC50 Data

Species: Fathead Minnow

Test Duration: 96 Hours

Test No.	Test Date	LC50	
1	July 23, 92	14.14	
2	Aug. 27, 92	7.07	
3	Sept 17, 92	7.07	Mean = 8.88
4	Oct. 15, 92	8.71	-----
5	Nov. 03, 92	7.07	
6	Dec. 20, 92	10.00	
7	Jan. 26, 93	13.66	Mean + 2 Std = 13.70
8	Feb. 19, 93	11.49	-----
9	Mar. 11, 93	7.58	
10	Apr. 06, 93	8.71	
11	May 13, 93	7.07	Mean - 2 Std = 4.05
12	June 01, 93	7.32	-----
13	July 06, 93	7.07	
14	Aug. 10, 93	7.32	

NaCl 96 Hour LC50 Data

Species: Fathead Minnow

