AECOM Environment
4303 West LaPorte Avenue, Fort Collins, Colorado, 80521-2154
T 970.416.0916 F 970.490.2963 www.aecom.com

July 12, 2011

Mr. Lucas Walker
Sumitomo Metal Mining Pogo, LLC
P.O. Box 145
Delta Junction, Alaska 99737

RE: Results of WET tests – June 2011

Dear Mr. Walker,

Attached are copies of the reports for the *Ceriodaphnia dubia* (water flea) and *Pimephales promelas* (fathead minnow) toxicity tests conducted in June 2011 with effluent from your facility.

AECOM Environment greatly appreciates this opportunity to provide our services to Sumitomo Metal Mining Pogo. Please do not hesitate to call if you have any questions.

Sincerely,

Gina McNerney
Staff Specialist I
gina.mcnerney@aecom.com

Rami B. Naddy, Ph.D.
Senior Toxicologist / Study Director
rami.naddy@aecom.com

Attachments

60147216-412-011
60147216-412-012

Report of Short-Term Chronic Toxicity Testing using the Water Flea (Ceriodaphnia dubia)

Project ID: 60147216-412-011
June 2011

Sponsor and Laboratory Information

Sponsor	Sumitomo Metal Mining Pogo LLC Pogo Mine Joint Venture P.O. Box 145 Delta Junction, AK 99737
Project Officer	Lucas Walker (907) 895-2860
Testing Facility	AECOM Environment Fort Collins Environmental Toxicology Laboratory 4303 West LaPorte Ave. Fort Collins, CO 80521 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: rami.naddy@aecom.com
Report Author	Gina R. McNerney (970) 416-0916 email: gina.mcnerney@aecom.com

Test Information

Test	Short-Term Chronic under Static-Renewal Conditions
Basis	USEPA (2002), method 1002.0
Test Dates and Time	June 16, 2011 @ 1400 to June 22, 2011 @ 1605
Test Length	6 days
Species	*Ceriodaphnia dubia*
Test Material	Effluent (Grab)
Outfall	Outfall 001
Permit Number	AK-005334-1
Receiving Stream	N/A
Dilution Water	Moderately hard reconstituted water
Concurrent Control Water	None
Test Concentrations	0 (control), 12.5, 25, 50, 75, and 100% effluent
Permit Compliance	__X__ **Pass** ____ Fail

- *Results described in this report apply only to the samples submitted to the laboratory and analyzed, as listed in the report*
- *Test results comply with NELAC standards. Reports are intended to be considered in their entirety; AECOM is not responsible for consequences arising from use of a partial report*
- *This report contains 5 pages plus 2 appendices*

Effluent Collection and Receipt

Sample No.	Field No.	Collection Date & Time	AECOM No.	Date of Receipt	Temp. at Arrival (°C)
1	N/A	06/15/11 @ 0850	24874	06/16/11	5.9
2	N/A	06/17/11 @ 1035	24880	06/18/11	5.3
3	N/A	06/20/11 @ 1015	24890	06/21/11	5.0

Note: See Appendix A for chain of custody records

Effluent Characterization

Sample No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)
1	7.5	58	37	182	<0.02	1.0
2	7.6	54	32	165	<0.02	1.1
3	7.5	52	33	172	<0.02	1.0

[a] As $CaCO_3$
[b] Total residual chlorine

Initial Dilution/Control Water Characterization

Batch No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)[c]
9923	8.1	90	63	313	<0.02	<1.0

[a] As $CaCO_3$
[b] Total residual chlorine
[c] Measured on source water

Test Conditions

Type	Static-Renewal Short-term Chronic			
Test Endpoints	Survival and Reproduction			
Test Chambers	30-ml plastic cups			
Test Solution Volume	15 ml			
Replicates per Treatment	10			
Organisms per Replicate	1			
Test Temperature	25 ± 1°C (≤ 3°C differential)			
Lighting	Fluorescent, 16 hours light:8 hours dark			
Chamber Placement	Random block according to computer-generated chart			
Aeration?	X	No		Yes
Test Solution Renewal	Daily			

Test Organism

Species	*Ceriodaphnia dubia*
Age	<24 hours (all within 8 hours of the same age)
Source	FCETL in-house culture, batch 061511
Acclimation	Test temperature
Feeding	0.2 ml YTC/Algae mixed per test chamber daily during the test
Reference Toxicant Testing	Initiated June 1, 2011 using sodium chloride (NaCl)

TEST RESULTS

Biological Data

Treatment (% Effluent)	Percent Survival of *Ceriodaphnia dubia*							Mean Young per Female[a]	Significant Reduction Relative to Control?	
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7		Surv.	Repr.
0 (Control)	100	100	100	100	100	100	N/A	33.0	N/A	N/A
12.5	100	100	100	100	90	90	N/A	30.2	No	No
25	100	100	100	100	100	100	N/A	33.4	No	No
50	100	100	100	100	100	100	N/A	32.1	No	No
75	100	100	100	100	100	100	N/A	32.5	No	No
100	100	100	100	100	100	100	N/A	29.6	No	No
Percent Minimum Significant Difference (Reproduction)								24.8	Acceptable	

[a] Mean young per original female. If any 4th broods or higher were produced, they were excluded from calculation of mean young per female and statistical analysis of reproduction.
Note: See Appendix B for copies of laboratory data sheets

Data Analysis and Test Endpoints

Biological Endpoint	Statistical Endpoint	Value
Survival	NOEC	100% Effluent
	LOEC	>100% Effluent
	IC_{25}	>100% Effluent
Chronic (Reproduction)	NOEC	100% Effluent
	LOEC	>100% Effluent
	ChV	>100% Effluent
	IC_{25}	>100% Effluent
	TU_c ($100/IC_{25}$)	<1.0

NOEC = No Observed Effect Concentration
LOEC = Lowest Observed Effect Concentration
ChV = Chronic Value
IC_{25} = 25% Inhibition Concentration
TU_c = Chronic Toxic Units
Note: Analyses completed using, where appropriate, USEPA Linear Interpolation Method v 2.0 (Norberg-King 1993) and Toxstat v 3.5 (WEST, Inc. and Gulley 1996)

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Physical and Chemical Data

Treatment (% Effluent)	pH		Dissolved Oxygen (mg/L)		Conductivity (µS/cm)		Temperature (°C)	
	Low	High	Low	High	Low	High	Low	High
0 (Control)	8.0	8.3	6.1	6.9	303	341	24	26
100	7.5	8.0	5.7	6.9	161	200	24	26
All Treatments	7.5	8.3	≥5.7		NA		24[a]	26[a]
							24.6[b]	26.0[b]

[a] Temperature in test solutions
[b] Continuous wet temperature in the environmental chamber

Reference Toxicant Test Results for *C. dubia*

IC_{25}	AECOM/FCETL Historical 95% Control Limits	
	Low	High
460	137	592

Note: Values are expressed as mg/L of chloride.

References

Norberg-King, T. J.. 1993. A linear interpolation method for sublethal toxicity: the inhibition concentration (ICp) approach (version 2.0). National Effluent Toxicity Assessment Center Technical Report 03-93, U.S. Environmental Protection Agency, Environmental Research Laboratory, Duluth, MN.

USEPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. Fourth Edition. EPA-821-R-02-013.

WEST, Inc. and D.D. Gulley. 1996. Toxstat Version 3.5. Western EcoSystems Technology, Inc., Cheyenne, WY.

Statement of Quality Assurance

The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol (if applicable) and standard operating procedures, and that the resulting data and report meet the requirements of the NELAC standards. This report is an accurate reflection of the raw data.

Christina Needham — July 11, 2011
Quality Assurance Unit — Date

Gina McNerney — July 7, 2011
Data Analyst — Date

APPENDIX A

Chain of Custody Records

AECOM

CHAIN OF CUSTODY RECORD

Page 1 of 1

Client/Project Name: Sumitomo Metal Mining Pogo

Project Location: FCEIL

Project Number: 60147216-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation): L. Walker Sum Pogo

Chain of Custody Tape Nos.: 41303 *intact*

Signature:

Send Results/Report to: Lucas Walker

TAT:

Analysis Requested: VOC FC

Container Type: ~~P~~ Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; ~~L~~ – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	VOC	FC	Lab I.D.	Remarks
Eff# 31	6.15.11	0850		X	1 g	L	ICE		X		24874	
" "	6.15.11	0850		X	2.5g	L	ICE		X			

Relinquished by: (Print Name)/(Affiliation)	Date/Time	Received by: (Print Name)/(Affiliation)	Date/Time
Lucas Walker Sum Pogo	Date: 6.15.11 Time: 11:45AM	Joel Turner	Date: 6-15-11 Time: 3:38
~~[illegible]~~ B Barstow	Date: 6-15-11 Time: 3:38	Nancy Tranzow AECOM	Date: 6/16/11 Time: 1045
	Date: Time:		Date: Time:

Analytical Laboratory (Destination): * Rec'd on ice @ 5.9°C D37

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

① 6/16/11 NT
② 6/16/11 Am WD

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft. Collins_10_07.doc

Serial No. № 51256

AECOM

CHAIN OF CUSTODY RECORD

Client/Project Name: Sumitomo Metal Mining Pogo

Project Location: FCETL

Project Number: 60147214-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation): L. Walker Smm pogo

Chain of Custody Tape Nos.: 41774 (intact)

Signature:

Send Results/Report to: Lucas Walker pogo.environmental@smmpogo.com

TAT:

Analysis Requested: CJ FJ

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CJ	FJ	Lab I.D.	Remarks
EFCI#2	6.17.11	1035		X	1 g	L	ICE		X		24880	
" "	6.17.11	1035		X	2.5g	L	ICE		X			

Relinquished by: (Print Name)/(Affiliation)	Date/Time	Received by: (Print Name)/(Affiliation)	Date/Time
L. Walker Signature:	Date: 6.17.11 Time: 1050	Joel Turner Signature:	Date: 6-17-11 Time: 11:00 AM
Joel Turner Signature:	Date: 6-17-11 Time: 2:30 PM	Signature:	Date: 6-17-11 Time: 2:30 PM
Signature:	Date: Time:	Andy Bolt / AECOM Signature:	Date: 6/18/11 Time: 0935

Analytical Laboratory (Destination): Rec via courier on ice @ 5.3° (053)

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx (Courier) Other

Temp blank: Yes (No)

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft. Collins_10_07.doc

Serial No. № 51255

AECOM

CHAIN OF CUSTODY RECORD

Page 1 of 1

Client/Project Name: Sumitomo Metal Mining Pogo

Project Location: FCETL

Project Number: 60147216-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation):

Chain of Custody Tape Nos.: 41303 *used own tape

Signature:

Send Results/Report to: Lucas Walker pogo.environmental@summ.pogo.com

TAT:

Analysis Requested: CC FC

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CC FC									Lab I.D.	Remarks
Eff # 3	6.20.11	1015		X	5g	L	ICE		X									24890	
~~" "~~	~~6.20.11~~			~~X~~	~~2.5g~~	~~L~~	~~ICE~~		~~X~~		(LW)								

Relinquished by: (Print Name)/(Affiliation)	Date	Received by: (Print Name)/(Affiliation)	Date
Stacy Staley – Enviro Coordinator Signature: Stacy Staley	6-20-11 Time: 11:00 AM	Jodi Turner Signature:	6-20-11 Time: 11:00 AM
Relinquished by: (Print Name)/(Affiliation) Jodi Turner Signature:	6-20-11 Time: 2:30 pm	Received by: (Print Name)/(Affiliation) Elaine Main Signature:	6-20-11 Time: 2:30 pm
Relinquished by: (Print Name)/(Affiliation) Signature:	Date: Time:	Received by: (Print Name)/(Affiliation) Andrea Steknenberger (AECOM) Signature: Andrea Steknenberger	Date: 6/21/11 Time: 1450

Analytical Laboratory (Destination): received on ice @ (5.0°C) (DSS)

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

Serial No. № 51256

APPENDIX B

Test Data

FCETL QA Form No. 051
Revision 4
Effective 1/96

GLM 7/6/11
QA: CW 07/11/11

TOXICITY DATA PACKAGE COVER SHEET

Test Type: Chronic

Project Number: 60147216-412-011

Test Substance: Effluent-(Outfall 001)

Species: *Ceriodaphnia dubia*

Dilution Water Type: Mod Hard

Organism Lot or Batch Number: 061511

Concurrent Control Water Type: NA

Age: <24 hr (< 24 hr) Supplier: FCETL

Date and Time Test Began: 6/16/11 @ 1400

Date and Time Test Ended: 6/22/11 @ 1605

Protocol Number: USEPA 2002

Investigator(s): ABJ KR

Background Information

pH control?: Yes No

Type of Test: Static-Renewal

If yes, give % CO_2: N/A

Test Temperature: 25 ± 1 °C

Env. Chmbr/Bath #: 21 Test Chmbrs: 30-ml cups

Test Solution Vol.: 15 ml

Number of Replicates per Treatment: 10

Length of Test: 3 broods

Number of Organisms per Replicate: 1

Type of Food and Quantity per Chamber: 0.2 ml YTC/ALG

Feeding Frequency: 1 x Daily

Photoperiod: 16h light: 8h dark

Light Intensity: 50-100 ft.-c.

Test Substance Characterization Parameters and Frequency:

Hardness: Sx Receipt Alkalinity: Sx Receipt NH_3: Sx. Receipt TRC: Sx Receipt

pH: Daily Conductivity: Daily and Test Termination*

Test Concentrations (Volume:Volume): 0 (MH), 12.5, 25, 50, 75, and 100% effluent

Agency Summary Sheet(s)?: N/A

Reference Toxicant Data: Test Dates: 06/01/11 to 06/07/11 IC_{25}: 460 mgCl/L

Hist. 95% Control Limits: 137 to 592 Method for Determining Ref. Tox. Value: Linear Interp.

Special Procedures and Considerations:

*Conductivity measured in dilution water and 100% effluent at test termination

D.O. maintained ≥ 4.0 mg/L

Study Director Initials: MJN Date: 6/13/11

FCETL QA Form No. 041
Revision 4
Effective 1/96

TEST SUBSTANCE USAGE LOG

Project Number: 60147216-412-011

GWM 7/6/11
QA: AR 06/27/11

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	24874	24880	24890	
Test Substance Collection Date and Time	From: 6/15/11 @ 0880	From: 6/17/11 @ 1035	From: 6/20/11 @ 1015	From: @
	To: @ NA	To: @ NA	To: NA @	To: @
Sample Type (Grab or Comp)	Grab	Grab	Grab	
Date Test Substance Received	6/16/11	6/18/11	6/21/11	
Dilution Water Number RW# or FCETL#, circle one	9938 ① 23	9935	9935	
Concurrent Control Water RW#	NA	NA	NA	
Date(s) Used	6/16/11	6/18/11	6/21/11	
	6/17/11	6/19/11		
		6/20/11		

Preparation of Test Solutions

Test Substance % Conc.	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml) ②	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)
0 (MH)	0	1200	1200	0	200	200			
12.5%	150	1050	1200	25	175	200			
25%	300	900	1200	50	150	200			
50%	600	600	1200	100	100	200			
75%	900	300	1200	150	50	200			
100%	1200	0	1200	200	0	200			
Total	② 3150	4050	7200	525	675	1200			

Initials / Date	AB 6/16/11 mixed CC only	→	
Initials / Date	KB 6/17/11 "	→	
Initials / Date	AR 6/18/11 "	→	
Initials / Date	GM 6/19/11 "	→	
Initials / Date	KB 6/20/11 "	→	
Initials / Date	KB 6/21/11 "	→	
Initials / Date			
Initials / Date			

① Arm 6/16/11 E ② AR 06/27/11 NA, CC mixed alone, so 200 ml dilution scheme used.

CERIODAPHNIA DUBIA
CHRONIC BIOLOGICAL DATA

AM 6/27/11

Project Number: 60147216-412-011

QA: AR 06/27/11

Number of Neonates Produced and Survival of Original Organisms (% Survival)

Conc.	Day	A	B	C	D	E	F	G	H	I	J	Total	Mean	Remarks
0 (MH)	1	0	0	0	0	0	0	0	0	0	0			100%
	2	0	0	0	0	0	0	0	0	0	0			
	3	6/1	5/1	6/1	6/1	6/1	0	6/1	4/1	6/1	6/1	51		
	4	0	0	0	0	0	5/1	0	0	0	0	5		
	5	10/2	12/2	9/2	11/2	11/2	10/2	10/2	10/2	12/2	8/2	103		
	6	20/3	0	~~22~~ 19/3	23/3	18/3	19/3	19/3	16/3	19/3	19/3	171		
	7													
	8													
Total		36	17	33	40	35	34	35	30	37	33	330	33.0	
12.5%	1	0	0	0	0	0	0	0	0	0	0			90%
	2	0	0	0	0	0	0	0	0	0	0			
	3	5/1	4/1	4/1	0	0	6/1	0	0	6/1	0	25		
	4	0	0	0	5/1	7/1	0	4/1	5/1	0	6/1	27		
	5	11/2	10/2	8/2X	10/2	9/2	9/2	11/2	7/2	13/2	11/2	99		
	6	21/3	19/3		20/3	21/3	15/3	0	19/3	19/3	17/3	181		
	7													
	8												30.2	
Total		37	33	12X	35	37	30	15	31	38	34	302	~~33.6~~	②
25%	1	0	0	0	0	0	0	0	0	0	0			100%
	2	0	0	0	0	0	0	0	0	0	0			
	3	0	0	5/1	0	6/1	6/1	0	0	0	0	17		
	4	4/1	5/1	0	5/1	0	0	4/1	6/1	6/1	5/1	35		
	5	8/2	8/2	10/2	10/2	14/2	14/2	10/2	11/2	9/2	12/2	106		
	6	0	20/3	21/3	22/3	20/3	19/3	18/3	19/3	19/3	18/3	176		
	7													
	8													
Total		12	33	36	37	40	39	32	36	34	35	334	33.4	

Day:	1	2	3	4	5	6	7	8
Date:	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11	6/22/11		
Time:	1035	1420	1300	1045	1615	1605		
Initials:	KB	AR	[illegible]	KB	KB	[illegible] AR		

Key to symbols:
X = Original organism died.
M = Male

① 6/22/11 E ② AR for MMR 06/27/11 E

FCETL QA Form No. 057
Revision 1
Effective 2/93

CERIODAPHNIA DUBIA
CHRONIC BIOLOGICAL DATA

AM 6/27/11
QA: AR 06/27/11

Project Number: 60147216-412-011

Number of Neonates Produced and Survival of Original Organisms (% Survival)

Conc.	Day	A	B	C	D	E	F	G	H	I	J	Total	Mean	Remarks
50%	1	0	0	0	0	0	0	0	0	0	0			100%
	2	0	0	0	0	0	0	0	0	0	0			
	3	0	5/1	2/1	0	0	6/1	4/1	0	0	0	17		
	4	6/1	0	0	2/1	5/1	0	0	4/1	4/1	7/1	28		
	5	11/2	10/2	9/2	11/2	8/2	13/2	10/2	11/2	7/2	12/2	102		
	6	17/3	21/3	18/3 22	20/3	16/3	20/3	18/3	22/3	0	18/3	174		
	7													
	8													
Total		34	36	33	33	29	39	32	37	18	37	321	32.1	
75%	1	0	0	0	0	0	0	0	0	0	0			100%
	2	0	0	0	0	0	0	0	0	0	0			
	3	5/1	4/1	4/1	6/1	6/1	4/1	0	0	6/1	0	35		
	4	0	0	0	0	0	0	5/1	6/1	0	7/1	18		
	5	8/2	9/2	11/2	9/2	13/2	10/2	10/2	11/2	10/2	9/2	100		
	6	19/3	20/3	19/3	20/3	22/3	17/3	18/3	17/3	20/3	0	172		
	7													
	8													
Total		32	33	34	35	41	31	33	34	36	16	325	32.5	
100%	1	0	0	0	0	0	0	0	0	0	0			100%
	2	0	0	0	0	0	0	0	0	0	0			
	3	5/1	5/1	0	5/1	5/1	0	5/1	0	5/1	6/1	36		
	4	1/1 *	0	7/1	0	0	7/1	0	6/1	0	0	21		* large neo
	5	11/2	9/2	12/2	11/2	10/2	9/2	12/2	7/2	13/2	8/2	102		
	6	21/3	21/3	0	22/3	20/3	1/2 *	19/3	1/2 *	15/3	17/3	137		* large neo
	7													
	8													
Total		38	35	19	38	35	17	36	14	33	31	296	29.6	

Day:	1	2	3	4	5	6	7	8
Date:	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11	6/22/11		
Time:	1035	1420	1300	1045	1615	1605		
Initials:	KB	AB		KB	KB	AB		

① KB 6/21/11 E
② AB 6/22/11 E
③ AM 6/27/11 E

Key to symbols:
X = Original organism died.
M = Male

FCETL QA Form No. 058
Revision 3
Effective 3/98

CHRONIC CHEMICAL DATA (INITIAL)

GLM 7/12/11

Project Number: 60147216-412-011 QA: CW 07/12/11

Test Species: ***Ceriodaphnia dubia***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 0 (MH)									All Conc.	
pH	8.1	8.2	8.2	8.2	8.0	8.3			16	
D.O. (mg/L)	6.9	6.6	6.6	6.8	6.4	6.4			5	
Temp. (°C)	25	25	25	25	25	25			D62	
Cond. (µS/cm)	313	341	309	303	315	307			15	
Hard. (mg/L) 90	~~86~~ ③		~~84~~ ①			100			Titr	
Alk. (mg/L) 63	~~62~~ ③		~~61~~ ①			61			Titr	
TRC (mg/L) (6/10)	<0.02		<0.02 (6/16)						20	
NH_3 (mg/L) **	<1.0		<1.0						~~HA~~ #1	
Conc.: 12.5%										
pH	8.1	8.2	8.2	8.2	8.1	8.1				
D.O. (mg/L)	6.8	6.7	6.7	6.8	6.3	6.4				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	302	301	296	287	287	295				
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 25%										
pH	8.0	8.2	8.1	8.1	8.1	8.1				
D.O. (mg/L)	6.8	6.8	6.7	6.8	6.4	6.4				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	288	283	277	270	277	280				
Conc.: 50%										
pH	7.9	8.1	8.0	8.0	8.0	7.9				
D.O. (mg/L)	6.8	6.8	6.7	6.8	6.4	6.4				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	256	251	241	235	255	243				
Date:	6/16/11	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11				
Time:	1340	1020	1405	1235	1020	1545				
Initials:	AB	KB	AB	CL	KB	KB				

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log FCETL QA Form No. 084.

*~~Dillution~~ Dilution/control water and effluent were brought to 25°C prior to making the ~~dillution~~ dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

** Measured in source water

① AB 6/20/11 ② AR 06/28/11 CF ③ CW 7/12/11 E

FCETL QA Form No. 058
Revision 3
Effective 3/98

CHRONIC CHEMICAL DATA (INITIAL)

GLM 7/6/11
QA: CS 07/11/11

Project Number: 60147216-412-011

Test Species: ***Ceriodaphnia dubia***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 75%									All Conc.	
pH	7.7	8.0	7.8	7.8	7.8	7.7				
D.O. (mg/L)	6.8	6.7	6.7	6.8	6.4	6.6				
Temp. (°C)	*	*	*	*	*	*				
Cond. (µS/cm)	220	216	202	199	204	207				
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.: 100%										
pH	7.5	7.8	7.6	7.7	7.7	7.5				
D.O. (mg/L)	6.8	6.8	6.8	6.9	6.5	6.8				
Temp. (°C)	①~~*~~ 25	25	25	25	25	25				
Cond. (µS/cm)	182	180	165	161	200	172				
Hard. (mg/L)	58		54			52				
Alk. (mg/L)	37		32			33				
TRC (mg/L)	<0.02		<0.02			<0.02				
NH_3 (mg/L)	1.0		1.1			1.0				
Date:	6/16/11	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11				
Time:	1340	1020	1405	1235	1020	1545				
Initials:	AB	KB	AB	[illegible]	KB	KB				

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log FCETL QA Form No. 084.

②~~Dilution~~ Dilution/control water and effluent were brought to 25°C prior to making the ~~dillution~~ dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

①AB 6/16/11 ② AR 06/28/11 CF

FCETL QA Form No. 059
Revision 2
Effective 1/96

bum 7/6/11
QA:cs 07/11/11

CHRONIC CHEMICAL DATA (FINAL)

Project Number:	60147216-412-011
Test Species:	*Ceriodaphnia dubia*

%	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.: 0 (MH)						318			All Conc.	* conductivity (#15)
pH	8.2	8.2	8.2	8.2	8.1	8.2			16	
D.O. (mg/L)	6.4	6.5	6.6	6.2	6.2	6.1			5	
Temp (°C)	25	25	26	24	24	26			062	
Conc.: 12.5%										
pH	8.2	8.2	8.2	8.2	8.2	8.2				
D.O. (mg/L)	6.4	6.6	6.4	6.2	6.3	6.0				
Temp (°C)	25	25	26	24	25	26				
Conc.: 25%										
pH	8.2	8.2	8.2	8.3	8.2	8.2				
D.O. (mg/L)	6.4	6.6	6.6	6.2	6.3	6.1				
Temp (°C)	24	25	25	24	24	26				
Conc.: 50%										
pH	8.1	8.2	8.1	8.1	8.2	8.0				
D.O. (mg/L)	6.5	6.5	6.6	6.2	6.4	6.0				
Temp (°C)	24	26	25	24	24	25				
Conc.: 75%										
pH	8.1	8.1	8.1	8.0	8.1	7.9				
D.O. (mg/L)	6.3	6.5	6.5	6.2	6.4	5.9				
Temp (°C)	24	25	25	25	24	24				
Conc.: 100%						173				* conductivity
pH	8.0	8.0	8.0	8.0	8.0	7.8				
D.O. (mg/L)	6.4	6.5	6.5	6.2	6.0	5.7				
Temp (°C)	24	26	26	25	25	24				
Conc.:										
pH										
D.O. (mg/L)										
Temp (°C)										
Date:	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11	6/22/11				
Time:	1040	1425	1305	1050	1120	1610				
Initials:	KB	AB	[illegible]	KB	KB	ABB				

FCETL QA Form No. 055
Revision 2
Effective 1/94

GMM 7/6/11
QA: CW 07/11/11

DAILY TOXICITY TEST LOG

Project Number:	60147216-412-011
Test Species:	***Ceriodaphnia dubia***

General Comments	Neonates obtained from 060711 50/50 A+B cerio monoculture board (Green marked cups) Random Chart: Nova		Feeding 0.2 ml YTC/ALG Daily	Initials/Date
Test Day 0	Test Solution Mixed at: 1335 Test Organisms Added at: 1400		Fed @ 1345	AB 6/16/11
Test Day 1	CT= 25.0 °C	Range = 24.6 - 25.4 °C	Fed @ 1015	KB 6/17/11
Test Day 2	CT= 25.4 °C	Range = 25.2 - 26.0 °C	Fed @ 1410	AB 6/18/11
Test Day 3	CT= 25.4 °C	Range = 25.0 - 25.6 °C	Fed @ 1240	6/19/11
Test Day 4	CT= 25.6 °C	Range = 25.2 - 25.6 °C	Fed @ 1015	KB 6/20/11
Test Day 5	CT= 25.6 °C	Range = 25.2 - 26.0 °C	Fed @ 1540	KB 6/21/11
Test Day 6	CT= 25.8 °C	Range = 25.2 - 26.0 °C	Fed @ None	AB 6/22/11
Test Day 7	CT= °C	Range = °C	Fed @	
Test Day 8	CT= °C	Range = °C	NONE	

ToxStat Version 3.5
Study # 60147216-412-011
Ceriodaphnia dubia
Summary Statistics for Reproduction

Rm 6/27/11
QA: AR 06/28/11

Title: 60147216-412-011
File: 412011.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	MH	10	17.0000	40.0000	33.0000
2	12.5	10	12.0000	38.0000	30.2000
3	25	10	12.0000	40.0000	33.4000
4	50	10	11.0000	39.0000	32.1000
5	75	10	16.0000	41.0000	32.5000
6	100	10	14.0000	38.0000	29.6000

Title: 60147216-412-011
File: 412011.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	MH	38.6667	6.2183	1.9664	18.8432
2	12.5	84.6222	9.1990	2.9090	30.4604
3	25	62.7111	7.9190	2.5042	23.7097
4	50	63.4333	7.9645	2.5186	24.8115
5	75	41.1667	6.4161	2.0290	19.7419
6	100	85.3778	9.2400	2.9219	31.2162

ToxStat Version 3.5
Study # 60147216-412-011
Ceriodaphnia dubia
Determination of NOEC and LOEC for Reproduction

AM 6/27/11
QA: AR 06/28/11

Title: 60147216-412-011
File: 412011.dat 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: 60147216-412-011
File: 412011.dat Transform: NO TRANSFORMATION

Bartlett's Test for Homogeneity of Variance

Calculated B1 statistic = 2.4174 (p-value = 0.7889)

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: 60147216-412-011
File: 412011.dat 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	4.0200	14.5200	22.9200	14.5200	4.0200
OBSERVED	7	2	33	18	0

Chi-Square = 22.2917 (p-value = 0.0002)

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.

ToxStat Version 3.5
Study # 60147216-412-011
Ceriodaphnia dubia
Determination of NOEC and LOEC for Reproduction

AM 6/27/11
QA: AR 06/28/11

Title: 60147216-412-011
File: 412011.dat Transform: NO TRANSFORMATION

Steel's Many-One Rank Test - Ho: Control<Treatment

GROUP	IDENTIFICATION	MEAN IN ORIGINAL UNITS	RANK SUM	CRIT. VALUE	DF	SIG 0.05
1	MH	33.0000				
2	12.5	30.2000	98.00	75.00	10.00	
3	25	33.4000	112.50	75.00	10.00	
4	50	32.1000	102.00	75.00	10.00	
5	75	32.5000	97.50	75.00	10.00	
6	100	29.6000	99.00	75.00	10.00	

Critical values are 1 tailed (k = 5)

Title: 60147216-412-011
File: 412011.dat Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	119.8000	23.9600	0.3824
Within (Error)	54	3383.8000	62.6630	
Total	59	3503.6000		

(p-value = 0.8587)

Critical F = 3.3769 (alpha = 0.01, df = 5,54)
= 2.3861 (alpha = 0.05, df = 5,54)

Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)

ToxStat Version 3.5
Study # 60147216-412-011
Ceriodaphnia dubia
Determination of PMSD for Reproduction

QA: AR 06/28/11
AM 6/27/11

Title: 60147216-412-011
File: 412011.dat 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	MH	33.0000	33.0000		
2	12.5	30.2000	30.2000	0.7909	
3	25	33.4000	33.4000	-0.1130	
4	50	32.1000	32.1000	0.2542	
5	75	32.5000	32.5000	0.1412	
6	100	29.6000	29.6000	0.9604	

Dunnett critical value = 2.3100 (1 Tailed, alpha = 0.05, df [used] = 5,40)
(Actual df = 5,54)

Title: 60147216-412-011
File: 412011.dat 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	MH	10			
2	12.5	10	8.1777	24.8	2.8000
3	25	10	8.1777	24.8	-0.4000
4	50	10	8.1777	24.8	0.9000
5	75	10	8.1777	24.8	0.5000
6	100	10	8.1777	24.8	3.4000

↳ PMSD

Report of Short-Term Chronic Toxicity Testing using the Fathead Minnow (Pimephales promelas)

Project ID: 60147216-412-012
June 2011

Sponsor and Laboratory Information

Sponsor	Sumitomo Metal Mining Pogo LLC Pogo Mine Joint Venture P.O. Box 145 Delta Junction, AK 99737
Project Officer	Lucas Walker (907) 895-2860
Testing Facility	AECOM Environment Fort Collins Environmental Toxicology Laboratory 4303 West LaPorte Ave. Fort Collins, CO 80521 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: rami.naddy@aecom.com
Report Author	Gina R. McNerney (970) 416-0916 email: gina.mcnerney@aecom.com

Test Information

Test	Short-Term Chronic under Static-Renewal Conditions
Basis	USEPA (2002), method 1000.0
Test Dates and Time	June 16, 2011 @ 1400 to June 23, 2011 @ 1410
Test Length	7 days
Species	*Pimephales promelas*
Test Material	Effluent (Grab)
Outfall	Outfall 001
Permit Number	AK-005334-1
Receiving Stream	N/A
Dilution Water	Moderately hard reconstituted water
Concurrent Control Water	None
Test Concentrations	0 (control), 12.5, 25, 50, 75, and 100% effluent
Permit Compliance	__X__ **Pass** ____ Fail

- *Results described in this report apply only to the samples submitted to the laboratory and analyzed, as listed in the report*
- *Test results comply with NELAC standards. Reports are intended to be considered in their entirety; AECOM is not responsible for consequences arising from use of a partial report*
- *This report contains 5 pages plus 2 appendices*

Effluent Collection and Receipt

Sample No.	Field No.	Collection Date & Time	AECOM No.	Date of Receipt	Temp. at Arrival (°C)
1	N/A	06/15/11 @ 0850	24874	06/16/11	5.9
2	N/A	06/17/11 @ 1035	24880	06/18/11	5.3
3	N/A	06/20/11 @ 1015	24890	06/21/11	5.0

Note: See Appendix A for chain of custody records

Effluent Characterization

Sample No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)
1	7.5	58	37	183	<0.02	1.0
2	7.7	54	32	163	<0.02	1.1
3	7.6	52	33	172	<0.02	1.0

[a] As $CaCO_3$
[b] Total residual chlorine

Initial Dilution/Control Water Characterization

Batch No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)[c]
9926	8.3	90	63	324	0.03	<1.0

[a] As $CaCO_3$
[b] Total residual chlorine
[c] Measured on source water

Test Conditions

Type	Static-Renewal Short-term Chronic			
Test Endpoints	Survival and Growth			
Test Chambers	500-ml plastic cups			
Test Solution Volume	250 ml			
Replicates per Treatment	4			
Organisms per Replicate	10			
Test Temperature	25 ± 1°C (≤ 3°C differential)			
Lighting	Fluorescent, 16 hours light:8 hours dark			
Chamber Placement	Random according to computer-generated chart			
Aeration?		No	X	Yes[a]
Test Solution Renewal	Daily			

[a] Aeration was initiated after test solution renewal on day 6. Aeration was continued until test termination.
Note: See Appendix B for complete test protocol

Test Organism

Species	*Pimephales promelas*
Age	<24 hours
Source	FCETL, batch 061611
Acclimation	Test temperature
Feeding	0.10 ml concentrated suspension of brine shrimp (*Artemia* sp.) nauplii per test chamber three times daily during the test.
Reference Toxicant Testing	Initiated June 1, 2011 using sodium chloride (NaCl)

TEST RESULTS

Biological Data

Treatment (% Effluent)	Percent Survival of *Pimephales promelas*								Significant Reduction Relative to Control?	
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean Dry Weight (mg)[a]	Surv.	Growth
0 (Control)	100	100	97.5	95	92.5	92.5	92.5	0.366	N/A	N/A
12.5	100	97.5	97.5	95	92.5	92.5	92.5	0.397	No	No
25	100	97.5	95	92.5	87.5	87.5	87.5	0.367	No	No
50	97.5	97.5	97.5	92.5	87.5	87.5	82.5	0.292	No	No
75	100	100	100	92.5	90	90	90	0.335	No	No
100	100	100	95	90	87.5	85	82.5	0.286	No	Yes
Percent Minimum Significant Difference (Growth)								20.8	Acceptable	

[a] Mean dry weight calculated based on the original number of organisms per replicate (mean dry weight per surviving organism in the control treatment was 0.398 mg)
Note: See Appendix B for copies of laboratory data sheets

Data Analysis and Test Endpoints

Biological Endpoint	Statistical Endpoint	Value
Survival	NOEC	100% Effluent
	LOEC	>100% Effluent
	IC_{25}	>100% Effluent
Chronic (Growth)	NOEC	75% Effluent
	LOEC	100% Effluent
	ChV	86.6% Effluent
	IC_{25}	99.83% Effluent
	TU_c ($100/IC_{25}$)	1.00

NOEC = No Observed Effect Concentration
LOEC = Lowest Observed Effect Concentration
ChV = Chronic Value
IC_{25} = 25% Inhibition Concentration
TU_c = Chronic Toxic Units
Note: Analyses completed using, where appropriate, USEPA Linear Interpolation Method v 2.0 (Norberg-King 1993) and Toxstat v 3.5 (WEST, Inc. and Gulley 1996)

Physical and Chemical Data

Treatment (% Effluent)	pH		Dissolved Oxygen (mg/L)		Conductivity (µS/cm)		Temperature (°C)	
	Low	High	Low	High	Low	High	Low	High
0 (Control)	7.6	8.4	4.9	6.8	312	365	25	26
100	7.2	7.8	4.4	7.0	162	183	24	26
All Treatments	7.2	8.5	≥3.4		NA		24[a]	26[a]
							24.6[b]	26.0[b]

[a] Temperature in test solutions
[b] Continuous wet temperature in the environmental chamber

Reference Toxicant Test Results for *Pimephales promelas*

IC_{25}	AECOM/FCETL Historical 95% Control Limits	
	Low	High
1,069	858	1,778

Note: Values are expressed as mg/L of chloride.

References

Norberg-King, T. J.. 1993. A linear interpolation method for sublethal toxicity: the inhibition concentration (ICp) approach (version 2.0). National Effluent Toxicity Assessment Center Technical Report 03-93, U.S. Environmental Protection Agency, Environmental Research Laboratory, Duluth, MN.

USEPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. Fourth Edition. EPA-821-R-02-013.

WEST, Inc. and D.D. Gulley. 1996. Toxstat Version 3.5. Western EcoSystems Technology, Inc., Cheyenne, WY.

Statement of Quality Assurance

The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol (if applicable) and standard operating procedures, and that the resulting data and report meet the requirements of the NELAC standards. This report is an accurate reflection of the raw data.

Christina Needham — July 12, 2011
Quality Assurance Unit — Date

Gina R McNerney — July 12, 2011
Data Analyst — Date

APPENDIX A

Chain of Custody Records

AECOM

CHAIN OF CUSTODY RECORD

Page 1 of 1

Client/Project Name: Sumitomo Metal Mining Pogo

Project Location: FCETL

Project Number: 60147216-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation): L. Walker Sum Pogo

Chain of Custody Tape Nos.: 41303 *intact*

Signature:

Send Results/Report to: Lucas Walker

TAT:

Analysis Requested: CC-FL

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CC-FL	Lab I.D.	Remarks
Eff # 31	6.15.11	0850		X	1 g	L	ICE		X	24874	
" "	6.15.11	0850		X	2.5g	L	ICE		X		

Relinquished by: (Print Name)/(Affiliation)	Date/Time	Received by: (Print Name)/(Affiliation)	Date/Time
Lucas Walker Sum Pogo	Date: 6.15.11 Time: 11:45 AM	Joel Turner	Date: 6-15-11 Time: 3:38
B Barstow	Date: 6-15-11 Time: 3:38	Nancy Tranzow AECOM	Date: 6/16/11 Time: 1045
	Date: Time:		Date: Time:

Analytical Laboratory (Destination): * Rec'd on ice @ 5.9°C D37

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

① 6/16/11 NT
② 6/16/11 AM WP

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft. Collins_10_07.doc

Serial No. № 51256

AECOM

CHAIN OF CUSTODY RECORD

Client/Project Name: Sumitomo Metal Mining Pogo

Project Location: FCETC

Project Number: C0147214-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation): L. Walker Smm pogo

Chain of Custody Tape Nos.: 41774 (intact)

Signature:

Send Results/Report to: Lucas Walker pogo.environmental@smmpogo.com

TAT:

Analysis Requested: CLP

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Drinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CLP	Lab I.D.	Remarks
EFC#2	6.17.11	1035		X	1 g	L	ICE		X	24880	
" "	6.17.11	1035		X	2.5g	L	ICE		X		

Relinquished by: (Print Name)/(Affiliation)	Date/Time	Received by: (Print Name)/(Affiliation)	Date/Time
L. Walker Signature:	Date: 6.17.11 Time: 1050	Jack Turner Signature:	Date: 6-17-11 Time: 11:00 AM
Jack Turner Signature:	Date: 6-17-11 Time: 2300	Signature:	Date: 6-17-11 Time: 2300
Signature:	Date: Time:	Andy Potts / AECOM Signature:	Date: 6/18/11 Time: 0935

Analytical Laboratory (Destination): Rec via courier on ice @ 5.3° (053)

AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

Q:\GRAPHICS\FORMS\Chain of Custody (COC)\Chain-of-Custody_Ft. Collins_10_07.doc

Serial No. № 51255

AECOM

CHAIN OF CUSTODY RECORD

Page 1 of 1

Client/Project Name: Sumitomo Metal Mining Pogo

Project Location: FCETL

Project Number: 60147216-412

Field Logbook No.:

Sampler (Print Name)/(Affiliation):

Chain of Custody Tape Nos.: 41303 *used own tape

Signature:

Send Results/Report to: Lucas Walker pogo.environmental@sumipogo.com

TAT:

Analysis Requested: CC-FC

Container Type: P – Plastic; A – Amber Glass; G – Clear Glass; V – VOA Vial; O – Other; E – Encore

Preservation: 1 – HCl, 4°; 2 – H2SO4, 4°; 3 – HNO3, 4°; 4 – NaOH, 4°; 5 – NaOH/ZnAc, 4°; 6 – Na2S2O3, 4°; 7 – 4°

Matrix Codes: DW – Dinking Water; WW – Wastewater; GW – Groundwater; SW – Surface Water; ST – Storm Water; W – Water; S – Soil; SL – Sludge; SD – Sediment; SO – Solid; A – Air; L – Liquid; P – Product

Field Sample No./Identification	Date	Time	COMP	GRAB	Sample Container (Size/Mat'l)	Matrix	Preserv.	Field Filtered	CC-FC									Lab I.D.	Remarks
Eff #3	6.20.11	1015		X	5g	L	ICE		X									24890	
~~" "~~	~~6.20.11~~			~~X~~	~~2.5g~~	~~L~~	~~ICE~~		~~X~~										

Relinquished by: (Print Name)/(Affiliation) Stacy Staley – Enviro Coordinator
Signature: Stacy Staley
Date: 6-20-11
Time: 11:00 AM

Received by: (Print Name)/(Affiliation) Jack Turner
Signature:
Date: 6-20-11
Time: 11:00 AM

Analytical Laboratory (Destination): received on ice @ (5.0°C) (DSS)
AECOM Toxicology Lab
4303 W. Laporte Avenue
Fort Collins, CO 80521
(970) 416-0916
(970) 490-2963 (FAX)

Relinquished by: (Print Name)/(Affiliation) Jack Turner
Signature:
Date: 6-20-11
Time: 2:30 pm

Received by: (Print Name)/(Affiliation) Elaine Main
Signature:
Date: 6-20-11
Time: 2:30 pm

Relinquished by: (Print Name)/(Affiliation)
Signature:
Date:
Time:

Received by: (Print Name)/(Affiliation) (AECOM) Andrea Stekrenberger
Signature:
Date: 6/21/11
Time: 1450

Sample Shipped Via: UPS FedEx Courier Other

Temp blank: Yes No

Serial No. № 51256

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APPENDIX B

Test Data

FCETL QA Form No. 051
Revision 4
Effective 1/96

TOXICITY DATA PACKAGE COVER SHEET

RLM 7/6/11
QA: cw 07/11/11

Test Type: Chronic

Project Number: 60147216-412-012

Test Substance: Effluent-(Outfall 001)

Species: *Pimephales promelas*

Dilution Water Type: Mod Hard

Organism Lot or Batch Number: 061611

Concurrent Control Water Type: NA

Age: <24hr. (< 24 hr) Supplier: FCETL

Date and Time Test Began: 6/16/11 @ 1400

Date and Time Test Ended: 6/23/11 @ 1410

Protocol Number: USEPA 2002

Investigator(s): JH/DM/AB

Background Information

pH control?: Yes (No)

Type of Test: Static-Renewal

If yes, give % CO_2: N/A

Test Temperature: 25 ± 1 °C

Env. Chmbr/Bath #: 21

Test Chmbrs: 500-ml cups/beakers

Test Solution Vol.: 250 ml

Number of Replicates per Treatment: 4

Length of Test: 7 days

Number of Organisms per Replicate: 10

Type of Food and Quantity per Chamber: 0.1 ml B.S.

Feeding Frequency: 3 x Daily

Photoperiod: 16 h light : 8 h dark

Light Intensity: 50-100 ft.-c.

Test Substance Characterization Parameters and Frequency:

Hardness: Sx Receipt Alkalinity: Sx Receipt NH_3: Sx Receipt TRC: Sx Receipt

pH: Daily Conductivity: Daily

Test Concentrations (Volume:Volume): 0 (MH), 12.5, 25, 50, 75, and 100%

Agency Summary Sheet(s)?: None

Reference Toxicant Data: Test Dates: 06/01/11 to 06/08/11 ① IC_{25}: ~~460~~ 1069 ① mg Cu/L

Hist. 95% Control Limits: ~~137~~ 858 ① to ~~592~~ 1778 ① Method for Determining Ref. Tox. Value: Linear Interp.

Special Procedures and Considerations:

D.O. maintained ≥ 4.0 mg/L

*Conductivity measured in dilution water and 100% effluent at test termination

If survival in any test chamber falls below 50%, reduce feeding in that chamber to 0.05 ml of brine shrimp

Study Director Initials: NJW Date: 6/13/11

①RC 06/28/11 WP

FCETL QA Form No. 041
Revision 4
Effective 1/96

TEST SUBSTANCE USAGE LOG

Project Number: 60147216-412-012

GMM 7/6/11
QA: AR 06/28/11

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	24874	24880	24890	
Test Substance Collection Date and Time	From: 6/15/11 @ 0850	From: 6/17/11 @ 1035	From: 6/20/11 @ 1015	From: @
	To: @ NA	To: @ NA	To: @ NA	To: @
Sample Type (Grab or Comp)	Grab	Grab	Grab	
Date Test Substance Received	6/16/11	6/18/11	6/21/11	
Dilution Water Number RW# or FCETL#, circle one	9926	9926	9936	
Concurrent Control Water RW#	NA	NA	NA	
Date(s) Used	6/16/11	6/18/11	6/21/11	
	6/17/11	① ~~6/20/11~~ 6/19/11	6/22/11	
		6/20/11		

Preparation of Test Solutions

Test Substance Conc. (% Effluent)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml) ③	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)
0 (MH)	0	1200	1200	0	1000	1000			
12.5%	150	1050	1200	125	875	1000			
25%	300	900	1200	250	750	1000			
50%	600	600	1200	500	500	1000			
75%	900	300	1200	750	250	1000			
100%	1200	0	1200	1000	0	1000			
Total	② 3150	4050	7200	2625	3375	6000			
Initials / Date	GM 6/16/11 mixed FC			→					
Initials / Date	GM 6/17/11 Mixed FC			→					
Initials / Date	AB 6/18/11 "			→					
Initials / Date	GM 6/19/11 "			→					
Initials / Date	DM 6/20/11 "			→					
Initials / Date	ABC 6/21/11 "			→					
Initials / Date	AB 6/22/11 "			→					
Initials / Date				← ④					

① DM 6/20/11 ② AR 06/28/11 E ③ AR 06/28/11 NA

FCETL QA Form No. 060
Revision 2
Effective 1/96

FATHEAD MINNOW (*PIMEPHALES PROMELAS*)
CHRONIC BIOLOGICAL DATA

Am 6/27/11
QA: AR 06/28/11

Project Number: 60147216-412-012

%Conc.	Test Replicate	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	(% Survival) Remarks
		Number of Surviving Organisms								
0 (MH)	A	10	10	10	10	9	8	8	8	9® 92.5 %
	B	10	10 *	10	9	~~9~~ 10®	9	9	9	*1 fish siphoned
	C	10	10	10	10	10	10	10	10	
	D	10	10 *	10	10	10	10	10	10	*1 fish siphoned
12.5%	A	10	10	10	10	10	10	10	10	92.5%
	B	10	10	10	10	9	9	9	9	
	C	10	10	9	9	9	9	9	9	
	D	10	10	10	10^	10	9	9	9	^1 siphoned
25%	A	10	10	10	9	9	9	9	9	87.5%
	B	10	10	10*	10	10	9□	9	9	*1 fish siphoned □1 not found
	C	10	10 *	10	10	9	8	8	~~8~~ 7 ④	*1 fish siphoned
	D	10	① ~~9~~ 10	9□	9	9	9	9	9	□1 Not found
50%	A	10	10	10	10	9	8	8	7	82.5%
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	9	9	9	8	7	7	6	
75%	A	10	10	10	10	10	10	10	10	~~87.5%~~ ⑤
	B	10	10	10	10	9	9	9	9	~~92.3%~~ ~~87.7%~~ ⑥
	C	10	10	10	10	10	② ~~10~~ 9	9	~~8~~ 9 ⑦	90% ⑥
	D	10	10	10	10	8	8	8	8	
100%	A	10	10	10	9	9	9	9	9	82.5%
	B	10	10	10	10	10	10	9	9	
	C	10	10	10	9*	8	8	8	8	*1 siphoned
	D	10	10	10	10	9	8	8	7	
	A									
	B									
	C									
	D									
Date:		6/16/11	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11	6/22/11	6/23/11	
Time:		1400	1055	1515	1210	1210	1420	1020	1410	
Initials:		[illegible]	[illegible]	AB	[illegible]	DM	AB	AB	AB	

① AB 6/17/11 E ③ AB 6/21/11 E ⑤ Am 6/27/11 E ⑥ AR for AM 06/28/11
② DM 6/20/11 Wp ④ AB 6/23/11 E ⑦ AB 7/12/11 E ⑧ AR for AR 7/12/11

CHRONIC CHEMICAL DATA (INITIAL)

GWM 7/6/11
QA: CW 07/11/11

Project Number: 60147216-412-012

Test Species: ***Pimephales promelas***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 0 (MH)									All Conc.	
pH	8.3	8.3	8.2	8.3	8.2	8.4	8.4		16	
D.O. (mg/L)	6.8	6.7	6.6	6.8	6.4	6.4	6.7		5/6	
Temp. (°C)	25	25	25	25	25	25	25		Dig	
Cond. (µS/cm)	324	316	312	325	318	352	350		15	
Hard. (mg/L)	90		88			92			titr	
Alk. (mg/L)	63		62			67			titr	
TRC (mg/L) (6/10)	0.03					<0.02			20	
NH_3 (mg/L) **	<1.0					<1.0			HACH	
Conc.: 12.5%										
pH	8.2	8.3	8.2	8.3	8.2	8.5	8.4			
D.O. (mg/L)	6.8	6.7	6.6	6.8	6.4	6.3	6.7			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	309	309	302	302	302	339	338			
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 25%										
pH	8.1	8.2	8.2	8.2	8.1	8.4	8.3			
D.O. (mg/L)	6.8	6.7	6.6	6.8	6.4	6.4	6.7			
Temp. (°C)	① ~~24~~ *	*	*	*	*	*	*			
Cond. (µS/cm)	291	291	280	284	283	317	315			
Conc.: 50%										
pH	7.9	8.0	8.1	8.0	8.0	8.1	8.1			
D.O. (mg/L)	6.8	6.7	6.6	6.9	6.4	6.4	6.7			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	257	254	245	242	244	267	267			
Date:	6/16/11	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11	6/22/11			
Time:	1340	1025	1450	1140	1200	1555	0950			
Initials:			AB		DM	AB	AB			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log FCETL QA Form No. 084.

*~~Dilution~~ control water and effluent were brought to 25°C prior to making the ~~dilution~~ dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C. ②

① 6/16/11 E ** measured in source water ② AR 06/28/11 CF

CHRONIC CHEMICAL DATA (INITIAL)

GM 7/6/11
QA: CW 07/11/11

Project Number: 60147216-412-012

Test Species: ***Pimephales promelas***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 75%									All Conc.	
pH	7.7	7.9	7.9	7.9	7.8	7.8	7.9		16	
D.O. (mg/L)	6.8	6.8	6.6	6.9	6.6	6.4	6.7		5	
Temp. (°C)	*	*	*	*	*	*	*		D61	
Cond. (µS/cm)	221	218	202	204	205	226	220		15	
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.: 100%										
pH	7.5	7.7	7.7	7.6	7.6	7.6	7.6			
D.O. (mg/L)	6.8	6.9	6.7	7.0	6.7	6.7	6.8			
Temp. (°C)	25	25	25	25	25	25	25			
Cond. (µS/cm)	183	182	163	162	163	172	173			
Hard. (mg/L)	58		54			52				
Alk. (mg/L)	37		32			33				
TRC (mg/L)	<0.02		<0.02			<0.02				
NH_3 (mg/L)	1.0		1.1			1.0				
Date:	6/18/11	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11	6/22/11			
Time:	1340	1025	1450	1140	1200	1555	0950			
Initials:	[illegible]	[illegible]	AB	[illegible]	DM	AB	[illegible]			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log FCETL QA Form No. 084.

① *~~Dilution~~ Dilution/control water and effluent were brought to 25°C prior to making the ~~dilution~~ dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

① AR 04/28/11 CF

FCETL QA Form No. 059
Revision 2
Effective 1/96

GWM 7/6/11
QA: CW 07/11/11

CHRONIC CHEMICAL DATA (FINAL)

Project Number:	60147216-412-012
Test Species:	*Pimephales promelas*

%	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.: 0 (MH)							365		All Conc.	* conductivity (15)
pH	8.1	7.9	7.9	7.9	7.6	7.9	7.8		16	
D.O. (mg/L)	6.2	5.9	5.9	5.6	4.9	5.7	5.5		5/6	
Temp (°C)	25	26	26	26	26	25	26		D63	
Conc.: 12.5%										
pH	8.1	7.8	7.7	7.7	7.6	7.7	7.6			
D.O. (mg/L)	6.2	5.7	5.3	5.9	4.4	4.2	5.1			
Temp (°C)	25	26	26	25	25	25	26			
Conc.: 25%										
pH	8.1	7.7	7.6	7.7	7.5	7.6	8.0			
D.O. (mg/L)	6.3	5.2	5.1	4.7	4.4	4.2	5.8			
Temp (°C)	25	26	26	25	24	25	26			
Conc.: 50%										
pH	8.1	7.6	7.6	7.6	7.4	7.6	7.8			
D.O. (mg/L)	6.3	4.7	4.8	4.8	4.5	4.6	5.6			
Temp (°C)	26	26	25	25	25	25	26			
Conc.: 75%										
pH	7.9	7.5	7.5	7.6	7.4	7.5	7.5			
D.O. (mg/L)	6.1	5.1	4.9	4.6	4.2	4.0◊	5.2			
Temp (°C)	26	25	26	25	25	25	26			
Conc.: 100%							176			* conductivity (15)
pH	7.8	7.5	7.5	7.5	7.2	7.3	7.3			
D.O. (mg/L)	6.2	5.3	5.2	4.9	4.4	4.4	4.9			
Temp (°C)	25	25	25	24	25	24	26			
Conc.:										
pH										
D.O. (mg/L)										
Temp (°C)										
Date:	6/17/11	6/18/11	6/19/11	6/20/11	6/21/11	6/22/11	6/23/11			
Time:	1000	1450	1100	1100	1555	0950	1400			
Initials:	AB	AB	[illegible]	DM	AB	AB	AB			

◊ checked all replicates
A = 4.0 B = 3.4 C = 3.4 D = 4.0

FCETL QA Form No. 055
Revision 2
Effective 1/94

GWM 7/6/11

DAILY TOXICITY TEST LOG

Project Number:	60147216-412-012	QA: CW 07/11/11
Test Species:	*Pimephales promelas*	

General Comments	Random Chart: unknown		Feeding 0.1 ml B.S. 3 x Daily	Initials/Date
Test Day 0	Test Solution Mixed at: 1335 Test Organisms Added at: 1400		Fed @ 1700 NLT	6/16/11
Test Day 1	CT= 25.0 °C	Range = 24.6-25.4 °C	Fed @ 0815 NLT ~~1700 NLT~~ 1200 NLT 1630 NLT	6/17/11
Test Day 2	CT=25.4 °C	Range = 25.2-26.0 °C	Fed @ 0830 AB 1200 AB 1750	AB 6/18/11
Test Day 3	CT= 25.4 °C	Range = 25.0-25.6 °C	Fed @ 0830 AB 1200 AB 1655 AB	6/19/11
Test Day 4	CT= 25.6 °C	Range = 25.2-25.6 °C	Fed @ 0840 DM 1210 AB 1715 DM	DM 6/20/11
Test Day 5	CT= 25.6 °C	Range = 25.2-26.0 °C	Fed @ 0810 AB 1200 AB 1650 AB	AB 6/21/11
Test Day 6	CT= 25.8 °C Started aeration	Range = 25.2-26.0 °C	Fed @ 0810 AB 1150 DM 1640 NLT	AB 6/22/11
Test Day 7	CT= 25.8 °C	Range = 25.6-26.0 °C	NONE	AB 6/23/11
Test Day 8				

ONLT 6/17/11 (E)

Purple

FCETL QA Form No. 010
Revision 5
Effective 08/99

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60147216-412-02
Test Substance: Effluent
Species: Pimephales promelas
Analyst Tare: AB/DM Analyst Gross: DM/AB
Date/Time of Tare Wt.: 6/23/11 @ 1345
Date/Time of Gross Wt.: 6/24/11 @ 1200

Comments: Dm 6/27/11 QA: AR 06/28/11
Analytical Balance ID: Sart #1
Dried in Oven # 2 from Date: 6/23/11 Time: 1510
to Date: 6/24/11 Time: 0910

Weight Type (Circle): Wet Blot Dry Dry (>100°C) AFDW (>500°C)
Lot or Batch Number: 06161 1

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	MH	A		0.95507	0.95876	0.00369					8		
		B		0.95555	0.95893	0.00338					9		
		C		0.95466	0.95816	0.00350					10		
		D		0.95055	0.95460	0.00405					10		
	12.5	A		0.94914	0.95301 ⊙	0.00387					10		
		B		0.94933	0.95344	0.00411					9		
		C		0.95190	0.95591	0.00401					9		
		D		0.95340	0.95729	0.00389					9		
	25	A		0.94913	0.95303	0.00390					9		
		B		0.94489	0.94822	0.00333					9		
		C		0.94459	0.94795	0.00336					8		
		D		0.94604	0.95012	0.00408					9		
Blank				0.95436	0.95436	0							
Range													
Mean													

Test Solution Volume:
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

⊙ DM 6/24/11 E

Purple

FCETL QA Form No. 010
Revision 5
Effective 08/99

Am 6/27/11
QA: AR 06/28/11

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60147216-412-02
Test Substance: Effluent
Species: Pimephales promelas
Analyst Tare: AB/DM Analyst Gross: DM/AB
Date/Time of Tare Wt.: 6/23/11 @ 1345
Date/Time of Gross Wt.: 6/24/11 @ 1200

Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 2 from Date: 6/23/11 Time: 1510
to Date: 6/24/11 Time: 0910

Weight Type (Circle): Wet Blot Dry Dry (>100°C) AFDW (>500°C)
Lot or Batch Number: 061611

Boat No.	Treatment	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	50	A		0.94828	0.95157	0.00329					7		
		B		0.94315	0.94602	0.00287					10		
		C		0.94517	0.94858	0.00341					10		
		D		0.94880	0.95093 ③	0.00213					6		
	75	A		0.94709	0.95137	0.00428					10		
		B		0.94347	0.94648	0.00301					9		
		C		0.94639	0.94925	0.00286		② 9			8▲		
		D		0.94441	0.94734	0.00293					8		
	100	A		0.94485	0.94783	0.00298					9		
		B		0.94782	0.95088	0.00306					9		
		C		0.94850	0.95172	0.00322					8		
		D		0.94778	0.94995	0.00217					7		
Blank													
Range													
Mean													

Test Solution Volume:
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

① DM 6/24/11 E ② CW for AMR 7/12/11 E

▲ 1 organism was lost during test termination

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 60147216-412-012 Species: Fathead minnow

Am 6/27/11
QA: AC 06/28/11

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
MH	A		0.95507	0.95876	0.00369	0.00369	10	0.369	0.3655	8	0.461	0.3980
	B		0.95555	0.95893	0.00338	0.00338	10	0.338		9	0.376	
	C		0.95466	0.95816	0.00350	0.00350	10	0.350		10	0.350	
	D		0.95055	0.95460	0.00405	0.00405	10	0.405		10	0.405	
12.5%	A		0.94914	0.95301	0.00387	0.00387	10	0.387	0.3970	10	0.387	0.4304
	B		0.94933	0.95344	0.00411	0.00411	10	0.411		9	0.457	
	C		0.95190	0.95591	0.00401	0.00401	10	0.401		9	0.446	
	D		0.95340	0.95729	0.00389	0.00389	10	0.389		9	0.432	
25%	A		0.94913	0.95303	0.00390	0.00390	10	0.390	0.3667	9	0.433	0.4192
	B		0.94489	0.94822	0.00333	0.00333	10	0.333		9	0.370	
	C		0.94459	0.94795	0.00336	0.00336	10	0.336		8	0.420	
	D		0.94604	0.95012	0.00408	0.00408	10	0.408		9	0.453	
50%	A		0.94828	0.95157	0.00329	0.00329	10	0.329	0.2925	7	0.470	0.3633
	B		0.94315	0.94602	0.00287	0.00287	10	0.287		10	0.287	
	C		0.94517	0.94858	0.00341	0.00341	10	0.341		10	0.341	
	D		0.94880	0.95093	0.00213	0.00213	10	0.213		6	0.355	
75%	A		0.94709	0.95137	0.00428	0.00428	10	0.428	0.3349	10	0.428	0.3715
	B		0.94347	0.94648	0.00301	0.00301	10	0.301		9	0.334	
	C		0.94639	0.94925	0.00286	0.00286	9	0.318		8	0.358	
	D		0.94441	0.94734	0.00293	0.00293	10	0.293		8	0.366	
100%	A		0.94485	0.94783	0.00298	0.00298	10	0.298	0.2857	9	0.331	0.3459
	B		0.94782	0.95088	0.00306	0.00306	10	0.306		9	0.340	
	C		0.94850	0.95172	0.00322	0.00322	10	0.322		8	0.403	
	D		0.94778	0.94995	0.00217	0.00217	10	0.217		7	0.310	
Blank			0.95436	0.95436	0.00000							

Project Number: 60147216-412-012 Species: Fathead minnow

Am 6/27/11
QA: AR 06/28/11

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.8	1.0	0.9250	0.0957	10.351%
12.5%	4	0.9	1.0	0.9250	0.0500	5.405%
25%	4	0.8	0.9	0.8750	0.0500	5.714%
50%	4	0.6	1.0	0.8250	0.2062	24.989%
75%	4	0.8	1.0	0.8972	0.0818	9.121%
100%	4	0.7	0.9	0.8250	0.0957	11.605%

Actual mean survival = 90%. One organism was lost from 75% c after survival observations, but prior to dry weight analysis. In order to have the dry weight calculate correctly, the # of original organisms for 75% c was changed to 9, therefore survival for this replicate, as well as the treatment mean, SD, and CV calculate incorrectly. cw

Summary Statistics for Growth Data (dry wt per original)

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.338	0.405	0.3655	0.0293	8.006%
12.5%	4	0.387	0.411	0.3970	0.0112	2.820%
25%	4	0.333	0.408	0.3667	0.0380	10.355%
50%	4	0.213	0.341	0.2925	0.0578	19.773%
75%	4	0.293	0.428	0.3349	0.0629	18.776%
100%	4	0.217	0.322	0.2857	0.0469	16.415%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.350	0.461	0.3980	0.0478	12.014%
12.5%	4	0.387	0.457	0.4304	0.0306	7.107%
25%	4	0.370	0.453	0.4192	0.0355	8.475%
50%	4	0.287	0.470	0.3633	0.0770	21.189%
75%	4	0.334	0.428	0.3715	0.0400	10.753%
100%	4	0.310	0.403	0.3459	0.0398	11.499%

ToxStat Version 3.5
Study #60147216-412-012
Pimephales promelas
Summary Statistics for Survival

AM 7/12/11
QA: CW 07/12/11

Title: 60147216-412-012
File: 412012s.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	MH	4	0.8000	1.0000	0.9250
2	12.5	4	0.9000	1.0000	0.9250
3	25	4	0.8000	0.9000	0.8750
4	50	4	0.6000	1.0000	0.8250
5	75	4	0.8000	1.0000	0.9000
6	100	4	0.7000	0.9000	0.8250

Title: 60147216-412-012
File: 412012s.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	MH	0.0092	0.0957	0.0479	10.3506
2	12.5	0.0025	0.0500	0.0250	5.4054
3	25	0.0025	0.0500	0.0250	5.7143
4	50	0.0425	0.2062	0.1031	24.9885
5	75	0.0067	0.0816	0.0408	9.0722
6	100	0.0092	0.0957	0.0479	11.6052

QA: cw 07/12/11
7/12/11

Title: 60147216-412-012
File: 412012s.dat Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's Test for Normality

D = 0.4227
W = 0.9734

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: 60147216-412-012
File: 412012s.dat Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's Test for Homogeneity of Variance

Calculated B1 statistic = 6.7211 (p-value = 0.2422)

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)

QA:CW 07/12/11
7/12/11

Title: 60147216-412-012
File: 412012s.dat Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	0.0728	0.0146	0.6201
Within (Error)	18	0.4227	0.0235	
Total	23	0.4955		

(p-value = 0.6863)

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: 60147216-412-012
File: 412012s.dat Transform: ARC SINE(SQUARE ROOT(Y))

Dunnett's Test - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	TRANS T STAT	SIG 0.05
1	MH	1.2951	0.9250		
2	12.5	1.2898	0.9250	0.0486	
3	25	1.2136	0.8750	0.7520	
4	50	1.1753	0.8250	1.1050	
5	75	1.2543	0.9000	0.3760	
6	100	1.1491	0.8250	1.3470	

Dunnett critical value = 2.4100 (1 Tailed, alpha = 0.05, df = 5,18)

Title: 60147216-412-012
File: 412012s.dat Transform: ARC SINE(SQUARE ROOT(Y))

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	MH	4			
2	12.5	4	0.1875	20.2	0.0000
3	25	4	0.1875	20.2	0.0500
4	50	4	0.1875	20.2	0.1000
5	75	4	0.1875	20.2	0.0250
6	100	4	0.1875	20.2	0.1000

ToxStat Version 3.5
Study #60147216-412-012
Pimephales promelas
Summary Statistics for Growth per Original

RM 6/27/11
QA: AK 06/28/11

Title: 60147216-412-012
File: 412012g.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	MH	4	0.3380	0.4050	0.3655
2	12.5	4	0.3870	0.4110	0.3970
3	25	4	0.3330	0.4080	0.3667
4	50	4	0.2130	0.3410	0.2925
5	75	4	0.2930	0.4280	0.3350
6	100	4	0.2170	0.3220	0.2858

Title: 60147216-412-012
File: 412012g.dat Transform: NO TRANSFORMATION

Summary Statistics on Data TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	MH	0.0009	0.0293	0.0146	8.0063
2	12.5	0.0001	0.0112	0.0056	2.8200
3	25	0.0014	0.0380	0.0190	10.3550
4	50	0.0033	0.0578	0.0289	19.7730
5	75	0.0040	0.0629	0.0314	18.7672
6	100	0.0022	0.0469	0.0235	16.4153

ToxStat Version 3.5
Study #60147216-412-012
Pimephales promelas
Determination of NOEC and LOEC for Growth per Original

AM 6/27/11
QA: MC 06/28/11

Title: 60147216-412-012
File: 412012g.dat Transform: NO TRANSFORMATION

Shapiro - Wilk's Test for Normality

D = 0.0358
W = 0.9845

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: 60147216-412-012
File: 412012g.dat Transform: NO TRANSFORMATION

Bartlett's Test for Homogeneity of Variance

Calculated B1 statistic = 6.9445 (p-value = 0.2248)

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)

ToxStat Version 3.5
Study #60147216-412-012
Pimephales promelas
Determination of NOEC, LOEC, and PMSD for Growth per Original

Rm 6/27/11
QA: AR 06/28/11

Title: 60147216-412-012
File: 412012g.dat Transform: NO TRANSFORMATION

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	0.0394	0.0079	3.9610
Within (Error)	18	0.0358	0.0020	
Total	23	0.0751		

(p-value = 0.0134)

Critical F = 4.2479 (alpha = 0.01, df = 5,18)
= 2.7729 (alpha = 0.05, df = 5,18)

Since F > Critical F REJECT Ho: All equal (alpha = 0.05)

Title: 60147216-412-012
File: 412012g.dat 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	MH	0.3655	0.3655		
2	12.5	0.3970	0.3970	-0.9994	
3	25	0.3667	0.3667	-0.0397	
4	50	0.2925	0.2925	2.3160	
5	75	0.3350	0.3350	0.9677	
6	100	0.2858	0.2858	2.5302	*

Dunnett critical value = 2.4100 (1 Tailed, alpha = 0.05, df = 5,18)

File: 412012g.dat 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	MH	4			
2	12.5	4	0.0760	20.8	-0.0315
3	25	4	0.0760	20.8	-0.0012
4	50	4	0.0760	20.8	0.0730
5	75	4	0.0760	20.8	0.0305
6	100	4	0.0760	20.8	0.0798

↳ PMSD

Study #60147216-412-012
Pimephales promelas
IC_{25} for Growth per Original Organism

Am 6/28/11
QA: AR 06/29/11

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	12.5	25	50	75	100
Response 1	0.369	0.387	0.390	0.329	0.428	0.298
Response 2	0.338	0.411	0.333	0.287	0.301	0.306
Response 3	0.350	0.401	0.336	0.341	0.318	0.322
Response 4	0.405	0.389	0.408	0.213	0.293	0.217

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Effluent
Test Start Date: 6/16/11 Test Ending Date: 6/28/11
Test Species: P. promelas
Test Duration: 7 days
DATA FILE: 412012.icp
OUTPUT FILE: 412012.i25

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	4	0.000	0.366	0.029	0.381
2	4	12.500	0.397	0.011	0.381
3	4	25.000	0.367	0.038	0.367
4	4	50.000	0.292	0.058	0.314
5	4	75.000	0.335	0.063	0.314
6	4	100.000	0.286	0.047	0.286

The Linear Interpolation Estimate: 99.8326 Entered P Value: 25

Number of Resamplings: 80Those resamples not used had estimates above the highest concentration/ %Effluent.
Resampling time in Seconds: 0.06 Random_Seed: 10451936

BIOASSAY REPORT
CHRONIC AND ACUTE
BIOASSAYS CONDUCTED
June 16 through 23, 2011

Prepared for

SUMITOMO METAL MINING-POGO MINE
DELTA JUNCTION, ALASKA

Prepared by

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July 13, 2011
Lab I.D. No. B2554

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INTRODUCTION

CH2M HILL conducted chronic bioassays from June 16 through 23, 2011, on samples provided by Sumitomo Metal Mining – Pogo Mine, Delta Junction, Alaska. The tests were conducted using the water flea (*Ceriodaphnia dubia*), the fathead minnow (*Pimephales promelas*), and algae (*Raphidocelis subcapitata*, formerly known as *Selenastrum capricornutum*).

SUMMARY OF TEST RESULTS

Exhibit 1 provides a summary of the final test results.

EXHIBIT 1
Summary of Chronic Test Results

Species	NOEC (%)	LOEC (%)	IC_{25} (%)	TUc
C. dubia	100	> 100	> 100	<1
P. promelas	100	75	> 100	<1

Note: acronyms are as defined below.

Chronic Toxicity: Toxicity is shown if the TUc value (= 100% / IC_{25}) is equal to or greater than 2.

More detailed information is provided in the Chronic Results and Data Interpretation sections.

ACRONYM DEFINITIONS (from EPA guidance):

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).
LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).
IC_{25} = Inhibition Concentration (25%): A point estimate of the test concentration that would cause a 25 percent reduction of a non-quantal biological measurement (i.e. growth, reproduction, etc.) for the test population.
TUc = Toxic Units (Chronic): Calculated as 100% sample divided by the chronic IC_{25} value.

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*, Fourth Edition, (EPA 2002), EPA-821-R-02-013.

DEVIATIONS FROM PROTOCOLS

Deviations from required procedures in the test methods:

- None noted.

Deviations from recommended procedures in the test methods:

- None noted.

TEST ORGANISMS

The *C. dubia* were obtained from CH2M HILL's in-house cultures and were less than 24 hours old for the acute test and less than 24 hours old and within an 8-hour age range for the chronic test. The *P. promelas* were obtained from Aquatox Inc., Hot Springs, Arkansas, and were less than 48 hours old and within a 24-hour age range at test initiation. All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (2002). The test organisms appeared vigorous and in good condition prior to testing.

DILUTION WATER

The dilution water used was reconstituted, moderately hard water with a total hardness of 80 to 100 mg/L as $CaCO_3$ and an alkalinity of 60 to 70 mg/L as $CaCO_3$.

TEST CONCENTRATIONS

The concentrations for the chronic tests were 12.5, 25, 50, 75, and 100 percent sample with dilution water for the control. For the chronic *C. dubia* test, 10 organisms per concentration were used with 10 test vessels per concentration and one organism per vessel. For the *P. promelas* 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 by Sumitomo - Pogo personnel on June 15, 17, and 20, 2011. The samples were accepted as scheduled by CH2M HILL's Aquatic Toxicology Laboratory within the EPA recommended 0 to 6 °C range.

The tests were initiated within 36 hours of sample collection. The samples were stored in the dark at 0 to 6°C until daily test solutions were prepared. Chain of custody forms documenting sample collection and handling 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 test initiation and each daily renewal.

MONITORING OF BIOASSAYS

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

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

DATA ANALYSIS

The effects measured during the *C. dubia* chronic test included survival and reproduction over the exposure period. The effects measured during the *P. promelas* chronic test included survival and growth over the exposure period. The statistical analyses performed were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, (EPA 2002), EPA-821-R-02-013, using CETIS. The chronic NOEC and LOEC values were established by hypothesis testing as follows: Dunnett's Procedure or Bonferroni's T-Test was used to compare the survival, fecundity, or growth data between the control and each sample concentration. 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. The chronic point estimate values (IC_{25} values) were calculated for growth, reproduction, and/or fecundity effects by use of the Linear Interpolation method.

DATA INTERPRETATION

The NPDES discharge permit issued to Sumitomo Metal Mining-Pogo Mine Site (AK0053341) specifies the use of the chronic toxic unit (TUc) as the Toxicity Trigger. TUc values of 2 or higher indicate the need for additional testing.

RESULTS AND DISCUSSION

CHRONIC BIOASSAYS

Table 1 summarizes the survival and reproduction data for the *C. dubia* chronic test.

Table 1
Summary of Chronic Results
C. dubia

Concentration (%)	Percent Survival	Ave. No. Young Per Adult
Control	90	20.5
12.5	80	18.9
25	100	21.5
50	100	24.4
75	100	26.9
100	100	24.6

The *C. dubia* test results indicated no statistically significant reduction in survival or reproduction at any sample concentration tested when compared to the control. By EPA definition, the NOEC and the LOEC were 100 and greater than 100 percent sample, respectively.

The IC_{25} value calculated on *C. dubia* reproduction was greater than 100 percent sample.

The chronic toxic unit ($TU_c = 100/IC_{25}$) was less than 1.

From the NPDES permit: "A target level for chronic toxicity of 2 TUc shall apply for purposes of determining compliance ...". (i.e. a TUc value of greater than 2 shall indicate the need for additional testing.)

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at 25±1°C.

The test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum 15 young produced per surviving control adult. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

Table 2 summarizes the survival and growth data for the *P. promelas* chronic test.

Table 2 **Summary of Chronic Results** ***P. promelas***		
Sample Concentration (%)	**Percent Survival**	**Mean Dry Weight Per Fish (mg)**
Control	87.5	0.939
12.5	85.0	0.821
25	85.0	0.877
50	82.5	0.842
75	72.5	0.700 [a]
100	85.0	0.820
[a] indicates a statistically significant reduction from the control at p = 0.05.		

The *P. promelas* test results no statistically significant reduction in survival at any sample concentration tested and a statistically significant reduction in growth only at the 75 percent sample concentration when compared to the control. By EPA definition, the NOEC and the LOEC were 100 and 75 percent sample, respectively.

The IC_{25} value on *P. promelas* growth was calculated as greater than 100 percent sample.

The chronic toxic unit ($TU_c = 100/IC_{25}$) was less than 1.

From the NPDES permit: "A target level for chronic toxicity of 2 TUc shall apply for purposes of determining compliance ...". (i.e. a TUc value of greater than 2 shall indicate the need for additional testing.)

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at 25±1°C.

The test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum weight of 0.250 mg per surviving control organism. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

REFERENCE TOXICANT TESTS

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox tests conducted using sodium chloride indicate that the test organisms were within their respective cusum chart range based on EPA guidelines.

Note: in accordance with the NPDES permit, the *P. promelas* reftox was conducted concurrently with the client testing.

The data sheets for the reference toxicant tests are provided in Appendix B.

Table 3 summarizes the reference toxicant test results and Cusum chart limits.

Table 3
Chronic Reference Toxicant Tests (g/L)

Species	IC_{25}	Cusum Chart Limits
C. dubia (survival)	1.61	0.73 to 2.13
C. dubia (reproduction)	0.61	0.10 to 0.90
P. promelas (survival)	2.6	1.5 to 4.4
P. promelas (growth)	2.1	1.7 to 3.1

APPENDIX A

RAW DATA SHEETS

CH2M HILL **FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA**

Client: Sumitomo Metal Mining - Pogo | SDG # B 2554 | Test Initiation: Date 6-16-2011

Contact: Stacy Staley 907-425-6631 | Test Termination: Date 6-23-11

Sample ID Number	Field ID	Collected Date (mm/dd/yy)	Collected Time (Pacific Zone)	Date Received	Temp (°C) as Rc'vd	Total Residual Chlorine (mg/l) ☑ Dechlorination allowed: as Rc'vd / after Dechlor.	Ammonia NH_3-N mg/l as Rc'vd	Hardness mg/l as $CaCO_3$ as Rc'vd	Alkalinity mg/l as $CaCO_3$ as Rc'vd	DO (mg/L) as Rc'vd	pH as Rc'vd	Cond. (uS) as Rc'vd	60 um filtered prior to use?
B2554 -01	Outfall 001	6/15/11	08:50	6/16/11	5.4	<0.02 / —	0.92	58	-	-	-	-	☑
B2554 -02	Outfall 001	06/17/2011	10:35	06/18/2011	2.6	<0.02 / —	0.73	62	-	-	-	-	☑
B2554 -03	Outfall 001	06/20/11	10:15	06/21/11	4.6	<0.02 / —	0.89	58	-	-	-	-	☑
						/							
						/							
						/							
						/							
						/							
						/							
						/							
						/							
						/							
			Reporting Limits:		na	0.02 mg/L	0.10 mg/L	4 mg/L	4 mg/L	na	na	na	na

Note: "–" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page.

Dilution Water	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	3487	90	62
↓	3488	90	66

Comments: ☑ Indicates the action was taken, (☐= action not taken): " – " = sample not dechlorinated, or analyte not collected/needed.

Water Quality Meters Used/ID#: Dissolved Oxygen # 3 pH # 4 Conductivity # 2

CH2M HILL **FRESHWATER TOXICITY TEST: TEST ORGANISM INFORMATION**

Client Sumitomo Metal Mining - Pogo Sample Designation (SDG): B 2554

Test Species Information	Cd # 2590 *Ceriodaphnia dubia* Chronic	FHM # 1598 *Pimephales promelas* Chronic			
Organism Age at Initiation	<24 hrs, all within an 8 hr window	<48 hrs, all within a 24 hour window			
Test Container Size	30 ml	800 ml			
Test Volume	15 ml	500 ml			
Feeding: Type and Amount	0.10 ml Algae and 0.10 ml YCT daily	0.15 ml *Artemia*, 2 x Daily			
Aeration: In Test Chambers via Slow Bubble :	☒ None ☐ Prior to use	☒ None ☐ Prior to use ☐ @ _____ hrs			
Acclimation Period	<24 hrs	<24 hrs			
Organism Source	In-House	Aquatox			
Size	-	-			
Loading Rate	-	-			

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): ☐ All ☐ _____

Date:

Comments:

Test Solution Preparation and Dilution Record

Note: ☐ Indicates task not done, ☑ Indicates task was done. Temp adj. = Temperature adjusted to ambient or test temp

Ditto marks (' ') indicate that the same batch of dilution water or food as the previous day's entry was used.

Client: Sumitomo Metal Mining - Pogo

Ceriodaphnia dubia - Chronic

Test Concentration (%)	Sample Volume (mls)		Final Volume (mls)	Test Day	Sample ID Used	Daily Sample Preparation (prior to dilution)	Dilution Water Used	YCT ID Used	Algae ID Used	Date	Time	Initials
				0 (Initiation)	B2554-01	☐ Temp adj, ☐ Aerated	ID # 3487	#917A *	# 910 F	6/16/11	11 :05	DW
Control	0.00	→	200	1	B -01	☐ Temp adj, ☐ Aerated	ID # 3487	#917A	# 910 F	6/17/11	06:30	DW
12.5	25.0	→	200	2	B -02	☐ Temp adj, ☐ Aerated	ID # 3487	~~#917A~~ 910F	~~# 910F~~ 917A	06/18/2011	11 :05	Dwt
25	50.0	→	200	3	B -02	☐ Temp adj, ☐ Aerated	ID # 3488	# 910F	# 917A	06/19/2011	06 :45	Dwt
50	100	→	200	4	B -02	☐ Temp adj, ☐ Aerated	ID # 3488	#917A	# 910F	06/20/2011	11 :00	DW
75	150	→	200	5	B -03	☐ Temp adj, ☐ Aerated	ID # 3489	# 910H	# 917A	6/21/11	13:30	DW
100	200	→	200	6	B -03	☐ Temp adj, ☐ Aerated	ID # 3488	#910H	#917B	6/22/11	07 :40	DW
Total Sample volume needed per day =			0 mls	7	B ✓ -	☐ Temp adj, ☐ Aerated	ID #	#	#	/ /	:	

Fathead minnow - Chronic

Test Concentration (%)	Sample Volume (mls)		Final Volume (mls)	Test Day	Sample ID Used	Daily Sample Preparation (prior to dilution)	Dilution Water Used	Date	Time	Initials
				0 (Initiation)	B2554-01	☐ Temp adj, ☐ Aerated	ID # 3487	6/16/11	11 :10	DW
Control	0.00	→	2000	1	B -01	☐ Temp adj, ☐ Aerated	ID # 3487	6/17/11	06:30	DW
12.5	250	→	2000	2	B -02	☐ Temp adj, ☐ Aerated	ID # 3487	06/18/2011	11 :00	Dwt
25	500	→	2000	3	B -02	☐ Temp adj, ☐ Aerated	ID # 3488	06/19/2011	06 :55	Dwt
50	1,000	→	2000	4	B -02	☐ Temp adj, ☐ Aerated	ID # 3488	06/20/2011	11 :00	DW
75	1,500	→	2000	5	B -03	☐ Temp adj, ☐ Aerated	ID # 3489	6/21/11	13:30	DW
100	2,000	→	2000	6	B ✓ -03	☐ Temp adj, ☐ Aerated	ID # 3488	6/22/11	07:40	DW
Total Sample volume needed per day =			0 mls							

* Algae & YCT IDs reversed on these days! YCT=910F / Algae=917A! D.W. (Days 0, 1, & 4).

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client: Sumitomo Metal Mining - Pogo

Test Start Date: 6-16-2011

Sample Description: Outfall 001

Initial Sample ID#: B 2554-01

Data summarized by: D.W.

Percent or Concentration	Total Live Young Produced in First 3 Broods per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	0	25	26	20	21	20	23	22	22	26	9	205
	AD? ✓	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
12.5 %	17	26	27	17	25	24	3	24	26	0	8	189
	AD?	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD? ✓		
25 %	26	28	21	12	19	20	13	26	23	27	10	215
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
50 %	25	24	21	24	29	23	21	24	26	27	10	244
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
75 %	25	33	24	18	34	31	23	25	27	29	10	269
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
100 %	25	30	24	19	22	AM	25	25	25	26	9/9	221 (24.6)
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		

Test Organism Mortality (Adult dead) = AD? ✓

Test Organism identified as Male = AD? M

Test Organism Injured during test = AD? I

# of Alive Adults = Number of test organism alive at termination

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

AM → Adult Missing; Remove from Stats! D.W.

CH2M HILL

CERIODAPHNIA CHRONIC SURVIVAL AND REPRODUCTION DATA

Neo's obtained from	A	B	C	D	E	F	G	H	I	J
Culture Board ID:	S	S	S	S	S	S	S	S	S	S
Slot #:	3	8	18	19	24	48	49	54	56	58

Incubator Used: # 5

Random Template Used: 6 conc # 17

Client: Sumitomo Metal Mining - Pogo

Test Initiation: Date: 6/16/2011 Time: 14:30

Sample Description: Outfall 001

Initial Sample ID #: B2554-01,02,03

Termination: Date: 6/23/2011 Time: 11:20

Technician: Day 0 MS Day 1 DW Day 2 DW Day 3 DW Day 4 DW Day 5 BM Day 6 DW Day 7 BM Day 8 ____

Time: Day 0 1530 (MS Rob) Day 1 0945 Day 2 1230 Day 3 1030 Day 4 1515 Day 5 1645 Day 6 0930 Day 7 1120 Day 8 ____

Cerio ID: Cd 2590

Percent	Day	A	B	C	D	E	F	G	H	I	J	No. Live Adults	Daily Total Live Young
		Daily Number of Live Young for each Replicate											
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0 AD	0	0	0	0	0	0	0	0	0	9	0
	3		0	0	0	0	0	3	3	0	0	9	6
	4		4	4	3	4	3	0	0	3	4	9	25
	5		7	0	6	7	6	7	7	0	9	9	49
	6		0	10	0	0	0	0	12	6	0	9	28
	7		14	12	11	10	11	13	0	13	13	9	97
	8												
12.5 %	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	3	0	3	0	3	3	0		9	12
	4	0	4	0	3	0	4	0 AD	1/0	4		8	16
	5	6	7	11	5	8	0		7	8		8	52
	6	0	0	13	0	14	10		13	0		8	50
	7	11	15	(13)	9	0	10		0	14		8	59 + (13)
	8												
25 %	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	3	0	4	0	3	0	0	0	10	10
	4	4	4	1	0	0	3	0	3	3	4	10	22
	5	0	9	BM EW 6/21 Ø7	4	4	6	3	10	8	10	10	61
	6	11	0	10	0	0	0	0	0	0	0	10	21
	7	11	15	(14)	8	11	11	7	13	12	13	10	101 + (14)
	8												
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	3	4	5	0	3	3	4	0	10	22
	4	4	4	0	0	0	3	0	0	0	3	10	14
	5	9	7	7	7	9	6	7	9	8	10	10	79
	6	0	0	11	13	0	0	11	12	12	0	10	59
	7	12	13	(10)	0	15	14	0	0	2/0	14	10	70 + (10)
	8												
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	3	0	0	0	0	4	0	0	10	7
	4	3	4	0	0	4	3	3	0	4	4	10	25
	5	8	12	8	7	11	0	8	8	11	12	10	85
	6	0	0	13	11	0	12	0	13	0	0	10	49
	7	14	17	0	0	19	16	12	0	12	13	10	103
	8												
100 %	1	0	0	0	0	0	AM	0	0	0	0	9/9	0
	2	0	0	0	0	0		0	0	0	0	9	0
	3	0	0	4	3	3		5	3	0	0	9	18
	4	3	3	0	0	0		0	0	3	4	9	13
	5	9	10	8	5	7		7	9	9	9	9	72
	6	0	0	12	11	12		13	0	0	0	9	48
	7	14	17	0	0	0		0	13	13	13	9/9	70
	8												

"AD" = Adult Dead, "AY" = Aborted young, "M" = male organism, "F" = Female, "R" = Adult releasing young, " / " = split brood (carry-over brood / current day brood),
"Inj" = Adult Injured during test solution renewal, replicate removed from analysis. "AM" = Adult missing, remove from analysis. A circled neonate count = 4th brood

Footnote: As per EPA, C. dubia tests should be terminated when 60% of the surviving control organisms have produced their third brood, or at eight days, whichever occurs first.

CH2M HILL

CERIODAPHNIA WATER QUALITY DATA

Client: Sumitomo Metal Mining - Pogo
Sample Description: Outfall 001
Initiated Date: 6/16/2011 Time: 14:30
Initial Sample ID #: B 6-16-2011 2554-01, 02, 03
Adults Isolated Date: 6/15/2011 Time: 23:05
Neo's Collected Date: 6/16/2011 Time: 06:45

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Tech:	Bm/MS	DW	Dwt	Dwt	Dwt	Bm	DW	Bm	
Time	14:30	09:45	12:30	18:30	15:15	16:55	09:30	11:30	:
Therm.	# 158	# 159	# 161	# 159	# 146	# 146	# 161	# 162	#

%	Dissolved Oxygen (mg/l) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Control	7.7	8.0 / 7.8	7.4 / 7.9	8.3 / 8.5	7.9 / 8.1	8.0 / 7.9	7.9 / 7.9	7.8	
12.5 %	8.0	8.0 / 7.9	7.5 / 8.0	8.4 / 8.5	8.0 / 8.1	8.1 / 8.0	7.9 / 8.0	7.9	
25 %	8.0	8.0 / 7.9	7.5 / 8.0	8.5 / 8.6	8.0 / 8.2	8.1 / 8.2	7.9 / 8.1	7.9	
50 %	8.2	7.9 / 8.0	7.6 / 8.0	8.5 / 8.6	8.0 / 8.3	8.1 / 8.3	7.9 / 8.2	7.8	
75 %	8.2	7.9 / 8.1	7.8 / 8.1	8.5 / 8.5	8.2 / 8.4	8.1 / 8.3	7.8 / 8.2	7.8	
100 %	8.2	7.9 / 8.3	7.9 / 8.3	8.5 / 8.5	8.2 / 8.5	/ 8.3	7.8 / 8.3	7.8	

%	pH Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Control	7.2	7.5 / 7.4	7.8 / 7.9	7.9 / 7.8	7.8 / 7.9	7.9 / 7.6	7.6 / 7.3	7.8	
12.5 %	7.2	7.6 / 7.5	7.0 / 8.1	7.9 / 7.8	7.9 / 7.9	7.9 / 7.6	7.6 / 7.3	7.8	
25 %	7.2	7.6 / 7.4	7.7 / 8.0	7.9 / 7.7	7.9 / 8.0	7.9 / 7.5	7.7 / 7.2	7.8	
50 %	7.1	7.5 / 7.2	7.7 / 7.8	7.8 / 7.6	7.8 / 7.9	7.8 / 7.4	7.6 / 6.9	7.7	
75 %	7.3	7.5 / 7.0	7.6 / 7.6	7.7 / 7.3	7.7 / 7.7	7.7 / 7.2	7.5 / 6.7	7.6	
100 %	7.1	7.4 / 6.9	7.6 / 7.4	7.7 / 7.2	7.7 / 7.5	/ 7.2	7.3 / 6.6	7.6	

%	Temperature (°C) / Conductivity (µS) (1st use of each sample only) Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Control	24.8 / 300	24.1 /	24.8 / 291	25.5 / 300	25.4 /	25.3 / 298	24.4 /	24.7 /	
12.5 %	24.9 / -	24.6 / -	24.8 / -	25.4 / -	25.5 / -	25.6 / -	25.0 / -	25.3 / -	-
25 %	24.8 / -	24.4 / -	24.7 / -	25.2 / -	25.1 / -	25.2 / -	25.2 / -	24.4 / -	-
50 %	24.8 / -	24.6 / -	24.4 / -	25.3 / -	25.5 / -	25.8 / -	25.3 / -	24.6 / -	-
75 %	24.7 / -	24.6 / -	24.8 / -	25.4 / -	25.4 / -	25.7 / -	25.1 / -	25.0 / -	-
100 %	24.7 / 150	24.9 /	24.8 / 156	25.5 / 165	25.3 /	25.8 / 158	25.4 /	24.5 /	

COMMENTS: Temperatures taken just prior to test solution renewals. DO, pH, and Conductivity taken following organism transfer.

23.8 = Temp out of recom. range

Note: All Day 0 data represents conditions at initiation. All other days: numerator represents pre-renewal conditions, denominator represents post-renewal conditions.

CETIS Summary Report

Report Date: 30 Jun-11 14:56 (p 1 of 2)
Test Code: B255401cdc | 03-4516-1153

Ceriodaphnia 7-d Survival and Reproduction Test — CH2M HILL - ASL

Batch ID:	10-8528-5274	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-11 14:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	23 Jun-11 11:20	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 21h	**Source:**	In-House Culture	**Age:**	

Sample ID:	06-5605-1915	**Code:**	B2554-01	**Client:**	
Sample Date:	15 Jun-11 08:50	**Material:**	Mining Discharge/Runoff	**Project:**	
Receive Date:	16 Jun-11	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (5.4 °C)	**Station:**			

Batch Note: adult missing from rep 100% F. Removed from stats

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
16-5242-7594	7d Survival Rate	100	>100	N/A	N/A	1	Fisher Exact/Bonferroni-Holm Test
09-7622-0704	Reproduction	100	>100	N/A	33.2%	1	Wilcoxon/Bonferroni Adj Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
03-0785-1854	Reproduction	IC25	>100	N/A	N/A	<1	Linear Interpolation (ICPIN)

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
16-5242-7594	7d Survival Rate	Control Resp	0.9	0.8 - NL	Yes	Passes Acceptability Criteria
03-0785-1854	Reproduction	Control Resp	20.5	15 - NL	Yes	Passes Acceptability Criteria
09-7622-0704	Reproduction	Control Resp	20.5	15 - NL	Yes	Passes Acceptability Criteria
09-7622-0704	Reproduction	PMSD	0.3317	0.13 - 0.47	Yes	Passes Acceptability Criteria

7d Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	0.9	0.7819	1	0	1	0.1	0.3162	35.14%	0.0%
12.5		10	0.8	0.6426	0.9574	0	1	0.1333	0.4216	52.7%	11.11%
25		10	1	1	1	1	1	0	0	0.0%	-11.11%
50		10	1	1	1	1	1	0	0	0.0%	-11.11%
75		10	1	1	1	1	1	0	0	0.0%	-11.11%
100		9	1	1	1	1	1	0	0	0.0%	-11.11%

Reproduction Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	20.5	17.68	23.32	0	26	2.386	7.546	36.81%	0.0%
12.5		10	18.9	15.22	22.58	0	27	3.114	9.848	52.11%	7.81%
25		10	21.5	19.39	23.61	12	28	1.784	5.642	26.24%	-4.88%
50		10	24.4	23.47	25.33	21	29	0.7916	2.503	10.26%	-19.02%
75		10	26.9	25.06	28.74	18	34	1.56	4.932	18.33%	-31.22%
100		9	24.56	23.45	25.66	19	30	0.9876	2.963	12.07%	-19.78%

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	0	1	1	1	1	1	1	1	1	1
12.5		1	1	1	1	1	1	0	1	1	0
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
75		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	0	25	26	20	21	20	23	22	22	26
12.5		17	26	27	17	25	24	3	24	26	0
25		26	28	21	12	19	20	13	26	23	27
50		25	24	21	24	29	23	21	24	26	27
75		25	33	24	18	34	31	23	25	27	29
100		25	30	24	19	22	25	25	25	26	

CETIS Analytical Report

Report Date:	30 Jun-11 14:56 (p 1 of 1)
Test Code:	B255401cdc | 03-4516-1153

Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

Analysis ID:	16-5242-7594	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:55	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Batch ID:	10-8528-5274	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-11 14:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	23 Jun-11 11:20	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 21h	**Source:**	In-House Culture	**Age:**	

Sample ID:	06-5605-1915	**Code:**	B2554-01	**Client:**	
Sample Date:	15 Jun-11 08:50	**Material:**	Mining Discharge/Runoff	**Project:**	
Receive Date:	16 Jun-11	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (5.4 °C)	**Station:**			

Batch Note: adult missing from rep 100% F. Removed from stats

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU
Untransformed		C > T	Not Run	100	>100	N/A	1

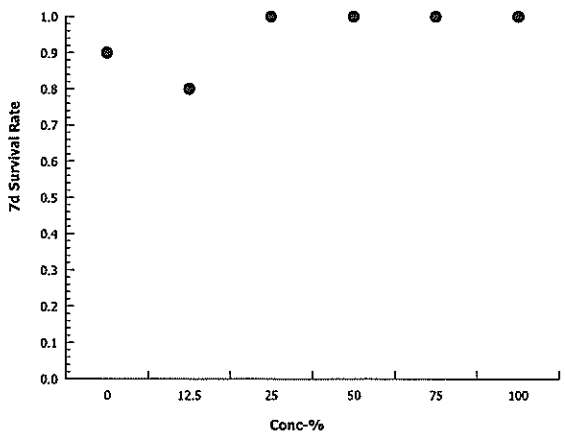
Fisher Exact/Bonferroni-Holm Test

Control	vs	Conc-%	Test Stat	P-Value	Decision(0.05)
Dilution Water		12.5	0.5	1.0000	Non-Significant Effect
		25	1	1.0000	Non-Significant Effect
		50	1	1.0000	Non-Significant Effect
		75	1	1.0000	Non-Significant Effect
		100	1	1.0000	Non-Significant Effect

Data Summary

Conc-%	Control Type	No-Resp	Resp	Total
0	Dilution Water	9	1	10
12.5		8	2	10
25		10	0	10
50		10	0	10
75		10	0	10
100		9	0	9

Graphics



CETIS Analytical Report

Report Date: 30 Jun-11 14:56 (p 1 of 2)
Test Code: B255401cdc | 03-4516-1153

Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

Analysis ID:	09-7622-0704	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:55	**Analysis:**	Nonparametric-Multiple Comparison	**Official Results:**	Yes

Batch ID:	10-8528-5274	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-11 14:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	23 Jun-11 11:20	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 21h	**Source:**	In-House Culture	**Age:**	

Sample ID:	06-5605-1915	**Code:**	B2554-01	**Client:**	
Sample Date:	15 Jun-11 08:50	**Material:**	Mining Discharge/Runoff	**Project:**	
Receive Date:	16 Jun-11	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (5.4 °C)	**Station:**			

Batch Note: adult missing from rep 100% F. Removed from stats

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run	100	>100	N/A	1	33.2%

Wilcoxon/Bonferroni Adj Test

Control	vs	Conc-%	Test Stat	Critical	DF	Ties	P-Value	Decision(α:5%)
Dilution Water		12.5	108		18	4	1.0000	Non-Significant Effect
		25	108		18	5	1.0000	Non-Significant Effect
		50	126		18	5	1.0000	Non-Significant Effect
		75	134.5		18	2	1.0000	Non-Significant Effect
		100	107		17	4	1.0000	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	443.2557	88.65115	5	2.329	0.0551	Non-Significant Effect
Error	2017.422	38.06457	53			
Total	2460.678	126.7157	58			

Distributional Tests

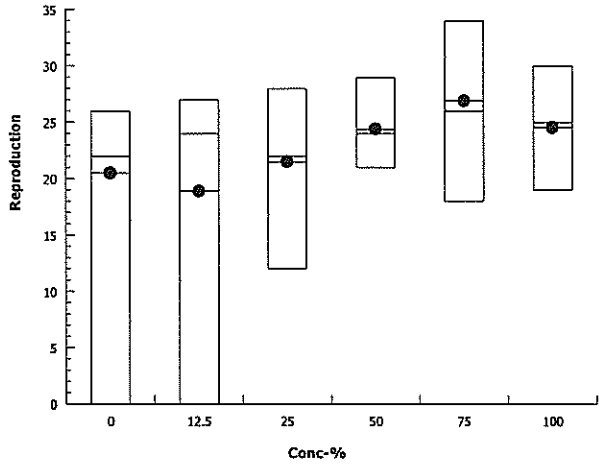
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	20.66	15.09	0.0009	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8613	0.9451	<0.0001	Non-normal Distribution

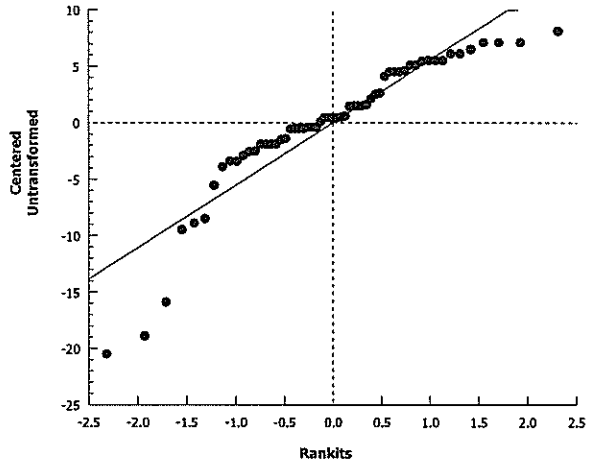
Reproduction Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	20.5	17.63	23.37	0	26	2.386	7.546	36.81%	0.0%
12.5		10	18.9	15.15	22.65	0	27	3.114	9.848	52.11%	7.81%
25		10	21.5	19.35	23.65	12	28	1.784	5.642	26.24%	-4.88%
50		10	24.4	23.45	25.35	21	29	0.7916	2.503	10.26%	-19.02%
75		10	26.9	25.02	28.78	18	34	1.56	4.932	18.33%	-31.22%
100		9	24.56	23.43	25.68	19	30	0.9876	2.963	12.07%	-19.78%

Analysis ID:	09-7622-0704	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:55	**Analysis:**	Nonparametric-Multiple Comparison	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date:	30 Jun-11 14:56 (p 1 of 1)
Test Code:	B255401cdc | 03-4516-1153

Ceriodaphnia 7-d Survival and Reproduction Test — **CH2M HILL - ASL**

Analysis ID:	03-0785-1854	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:55	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	10-8528-5274	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-11 14:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	23 Jun-11 11:20	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d 21h	**Source:**	In-House Culture	**Age:**	

Sample ID:	06-5605-1915	**Code:**	B2554-01	**Client:**	
Sample Date:	15 Jun-11 08:50	**Material:**	Mining Discharge/Runoff	**Project:**	
Receive Date:	16 Jun-11	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (5.4 °C)	**Station:**			

Batch Note: adult missing from rep 100% F. Removed from stats

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	270953223	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	N/A	N/A	<1	N/A	N/A

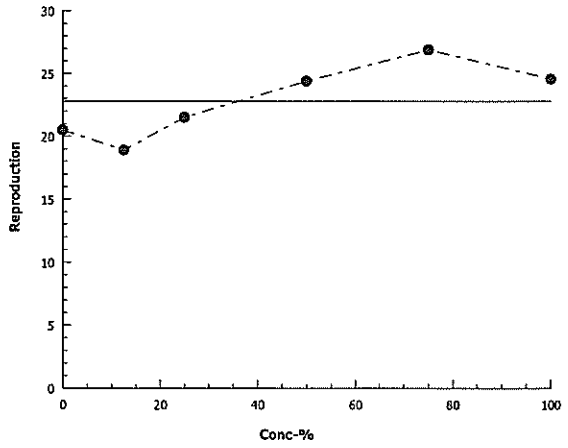
Reproduction Summary

			Calculated Variate						
Conc-%	**Control Type**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	Dilution Water	10	20.5	0	26	2.386	7.546	36.81%	0.0%
12.5		10	18.9	0	27	3.114	9.848	52.11%	7.81%
25		10	21.5	12	28	1.784	5.642	26.24%	-4.88%
50		10	24.4	21	29	0.7916	2.503	10.26%	-19.02%
75		10	26.9	18	34	1.56	4.932	18.33%	-31.22%
100		9	24.56	19	30	0.9876	2.963	12.07%	-19.78%

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	0	25	26	20	21	20	23	22	22	26
12.5		17	26	27	17	25	24	3	24	26	0
25		26	28	21	12	19	20	13	26	23	27
50		25	24	21	24	29	23	21	24	26	27
75		25	33	24	18	34	31	23	25	27	29
100		25	30	24	19	22	25	25	25	26	

Graphics



CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Random Template Used: 6 conc. x 4 reps. # 3 | Waterbath/incubator Used: # 7 | Date Initiated 6/16/2011 Time 12:45

Initial sample ID B2554 - 01 | Date Terminated 6/23/2011 Time 12:40

Client: Sumitomo Metal Mining - Pogo | Sample Description: Outfall 001

Tech: Day 0 DW/Bm Day 1 DW Day 2 DW Day 3 DW Day 4 DW/DW Day 5 CB Day 6 DW Day 7 Bm

Time: Day 0 1245 Day 1 0915 Day 2 1400 Day 3 1600 Day 4 1700 Day 5 1515 Day 6 1240 Day 7 1240

Conc. or Percent	Day	Number of Live Organisms A	B	C	D	Dissolved O_2 (mg/l) Pre	Post	pH Pre	Post	Temp. (°C) Pre	Therm. ID #	Conductivity (µS) Post (1st use)
Control	0	10	10	10	10		8.2		7.7	Post: 24.1	161	292
	1	10	8	10	10	7.7	8.0	7.8	7.9	24.5	161	
	2	10	8	10	9	7.8	8.2	7.2	7.6	24.5	160	286
	3	10	7	10	9	7.8	8.3	7.3	7.5	24.5	161	310
	4	10	7	10	8	7.3	8.4	7.3	7.5	24.5	160	312
	5	10	7	10	8	8.2	7.3	7.8	7.4	24.5	158	286
	6	10	7	10	8	7.6	7.9	7.7	7.9	24.4	162	302
	7	10	7	10	~~8~~ 8	7.3		7.4		24.3	159	
12.5 %	0	10	10	10	10		8.2		7.6	Post: 24.3		
	1	10	10	10	10	7.7	8.1	7.8	7.8	24.6		
	2	10	10	10	8	7.7	8.3	7.3	7.8	24.7		
	3	10	10	10	6F	7.8	8.5	7.4	7.7	24.6		
	4	8F	10	10	6	7.4	8.5	7.4	7.6	24.6		
	5	8	10	10	6	8.5	7.8	8.7	7.4	24.7		
	6	8	10	10	6	7.6	7.9	7.7	7.9	24.5		
	7	8	10	10	6	7.3		7.4		24.3		
25 %	0	10	10	10	10		8.2		7.5	Post: 24.3		
	1	10	10	9	10	7.7	8.1	7.8	7.7	24.6		
	2	10	9	9	10	7.8	8.2	7.3	7.6	24.6		
	3	10	9	8	9F	7.7	8.2	7.3	7.6	24.7		
	4	10	9	8	8	7.3	8.6	7.2	7.6	24.6		
	5	10	9	8	8	8.5	7.9	7.7	7.4	24.7		
	6	10	9	8	7	7.5	8.0	7.7	7.9	24.4		
	7	10	9	8	7	7.4		7.4		24.3		
50 %	0	10	10	10	10		8.2		7.2	Post: 24.2		
	1	10	9	10	9	7.7	8.2	7.7	7.4	24.6		
	2	10	9	10	9	7.7	8.2	7.7	7.5	24.7		
	3	10	8F	10	9	7.9	8.3	7.3	7.6	24.8		
	4	10	7F	10	8F	7.2	8.6	7.1	7.4	24.7		
	5	10	7	9F	8	8.6	7.2	7.4	7.3	24.5		
	6	10	7	9	8	7.3	8.1	7.6	7.7	24.7		
	7	10	7	8F	8	7.6		7.3		24.2		
75 %	0	10	10	10	10		8.2		7.1	Post: 24.2		
	1	10	10	10	9	7.7	8.3	7.6	7.2	24.7		
	2	6F	9	10	9	7.0	8.2	7.4	7.3	24.8		
	3	8	9	10	8	7.6	8.7	7.2	7.3	24.8		
	4	6F	9	8F	8	7.3	8.5	7.0	7.1	24.7		
	5	6	9	7F	7	7.2	7.0	7.2	7.1	24.8		
	6	6	9	7	7	7.0	8.1	7.4	7.4	24.5		
	7	6	9	7	7	7.2		7.1		24.1		
100 %	0	10	10	10	10		8.2		6.9	Post: 24.3		150
	1	10	10	10	10	7.7	8.3	7.4	6.9	24.6		
	2	10	10	10	10	7.3	8.3	7.1	7.0	24.8		161.90
	3	10	10	10	10	7.8	8.9	7.1	7.1	24.8		161
	4	10	10	10	10	7.2	8.7	6.9	6.9	24.5		159.3
	5	9	10	10	7F	7.0	7.1	7.0	7.0	24.6		151.4
	6	8	10	9F	7	6.8	8.2	7.2	7.1	24.4		152.1
	7	8	10	9	7	6.9		7.0		24.2		

✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container.

"M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.

"F" = fungus noted on dead organisms.

☐ Aeration in test chambers begun @ _____ (Note observations on Test Organism Info sheet)

Pre =Pre-renewal solutions. Post =Post-renewal solutions.

Day 0 Temperatures = Post-renewals

Therm ID# = Thermometer ID used for all measurements that day.

(23.8) = Temp. out of recommended range

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: Sumitomo Metal Mining-Pogo Species ID#: FHM 1598

Lab ID: B 2554 Start Date: 6/16/2011

Sample Description:

Technician:	KJ	KJ
Date:	6/24/2011	6/23/2011
Balance Serial #:	50309851	50309851

Concentration or Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A	1193.25	1182.78	10
	B	1173.70	1164.95	7
	C	1184.86	1174.01	10
	D	1182.13	1174.66	8
12.5 %	A	1179.85	1171.95	8
	B	1195.05	1184.67	10
	C	1179.68	1170.38	10
	D	1176.93	1171.69	6
25 %	A	1194.52	1184.68	10
	B	1193.38	1185.27	9
	C	1170.20	1160.40	8
	D	1183.28	1175.95	7
50 %	A	1199.29	1189.74	10
	B	1190.34	1181.88	7
	C	1191.07	1182.89	8
	D	1188.86	1181.37	8
75 %	A	1174.51	1167.43	6
	B	1185.73	1177.71	9
	C	1177.15	1170.36	7
	D	1183.95	1177.86	7
100 %	A	1183.54	1176.66	8
	B	1172.55	1163.67	10
	C	1196.06	1186.95	9
	D	1191.77	1183.84	7
	A			
	B			
	C			
	D			

weigh to 0.01 mg

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: Sumitomo Metal Mining-Pogo Species ID#: FHM 1598

Lab ID: B 2554 Start Date: 6/16/2011

Sample Description:

Technician:		KJ
Date:		6/23/2011
Balance Serial #:	50309851	50309851

Concentration or Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A		1182.78	10
	B		1164.95	7
	C		1174.01	10
	D		1174.66	8
12.5 %	A		1171.95	8
	B		1184.67	10
	C		1170.38	10
	D		1171.69	6
25 %	A		1184.68	10
	B		1185.27	9
	C		1160.40	8
	D		1175.95	7
50 %	A		1189.74	10
	B		1181.88	7
	C		1182.89	8
	D		1181.37	8
75 %	A		1167.43	6
	B		1177.71	9
	C		1170.36	7
	D		1177.86	7
100 %	A		1176.66	8
	B		1163.67	10
	C		1186.95	9
	D		1183.84	7
	A			
	B			
	C			
	D			

weigh to 0.01 mg

CETIS Summary Report

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Batch ID:	08-9573-1221	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-11 12:45	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	23 Jun-11 12:10	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 23h	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	06-5605-1915	**Code:**	B2554-01	**Client:**	
Sample Date:	15 Jun-11 08:50	**Material:**	Mining Discharge/Runoff	**Project:**	
Receive Date:	16 Jun-11	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	28h (5.4 °C)	**Station:**			

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
09-7269-3839	7d Survival Rate	100	>100	N/A	30.5%	1	Dunnett Multiple Comparison Test
10-0653-6607	Mean Dry Biomass-mg	~~50~~ 100	75	61.24	25.0%	2	Dunnett Multiple Comparison Test

Point Estimate Summary 6/30/11

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
02-6878-3586	Mean Dry Biomass-mg	IC25	>100	N/A	N/A	<1	Linear Interpolation (ICPIN)

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
09-7269-3839	7d Survival Rate	Control Resp	0.875	0.8 - NL	Yes	Passes Acceptability Criteria
02-6878-3586	Mean Dry Biomass-mg	Control Resp	0.9385	0.25 - NL	Yes	Passes Acceptability Criteria
10-0653-6607	Mean Dry Biomass-mg	Control Resp	0.9385	0.25 - NL	Yes	Passes Acceptability Criteria
10-0653-6607	Mean Dry Biomass-mg	PMSD	0.2498	0.12 - 0.3	Yes	Passes Acceptability Criteria

7d Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.875	0.819	0.931	0.7	1	0.075	0.15	17.14%	0.0%
12.5		4	0.85	0.7785	0.9215	0.6	1	0.09574	0.1915	22.53%	2.86%
25		4	0.85	0.8018	0.8982	0.7	1	0.06455	0.1291	15.19%	2.86%
50		4	0.825	0.778	0.872	0.7	1	0.06292	0.1258	15.25%	5.71%
75		4	0.725	0.678	0.772	0.6	0.9	0.06292	0.1258	17.36%	17.14%
100		4	0.85	0.8018	0.8982	0.7	1	0.06455	0.1291	15.19%	2.86%

Mean Dry Biomass-mg Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.9385	0.8799	0.9971	0.747	1.085	0.0785	0.157	16.73%	0.0%
12.5		4	0.8205	0.7375	0.9035	0.524	1.038	0.1111	0.2222	27.08%	12.57%
25		4	0.877	0.8302	0.9238	0.733	0.984	0.06268	0.1254	14.29%	6.55%
50		4	0.842	0.81	0.874	0.749	0.955	0.04283	0.08566	10.17%	10.28%
75		4	0.6995	0.6696	0.7294	0.609	0.802	0.03999	0.07998	11.43%	25.47%
100		4	0.82	0.782	0.858	0.688	0.911	0.05088	0.1018	12.41%	12.63%

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.7	1	0.8
12.5		0.8	1	1	0.6
25		1	0.9	0.8	0.7
50		1	0.7	0.8	0.8
75		0.6	0.9	0.7	0.7
100		0.8	1	0.9	0.7

Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1.047	0.875	1.085	0.747
12.5		0.79	1.038	0.93	0.524
25		0.984	0.811	0.98	0.733
50		0.955	0.846	0.818	0.749
75		0.708	0.802	0.679	0.609
100		0.688	0.888	0.911	0.793

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	09-7269-3839	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:57	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	08-9573-1221	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-11 12:45	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	23 Jun-11 12:10	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 23h	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	06-5605-1915	**Code:**	B2554-01	**Client:**	
Sample Date:	15 Jun-11 08:50	**Material:**	Mining Discharge/Runoff	**Project:**	
Receive Date:	16 Jun-11	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	28h (5.4 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run	100	>100	N/A	1	30.5%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	DF	MSD	P-Value	Decision(α:5%)
Dilution Water		12.5	0.188	2.407	6	0.3364	0.7720	Non-Significant Effect
		25	0.2916	2.407	6	0.3364	0.7335	Non-Significant Effect
		50	0.5454	2.407	6	0.3364	0.6276	Non-Significant Effect
		75	1.44	2.407	6	0.3364	0.2478	Non-Significant Effect
		100	0.2916	2.407	6	0.3364	0.7335	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1023248	0.02046495	5	0.524	0.7550	Non-Significant Effect
Error	0.7029448	0.03905249	18			
Total	0.8052695	0.05951744	23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	0.8542	15.09	0.9735	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9192	0.884	0.0561	Normal Distribution

7d Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.875	0.8179	0.9321	0.7	1	0.075	0.15	17.14%	0.0%
12.5		4	0.85	0.7772	0.9228	0.6	1	0.09574	0.1915	22.53%	2.86%
25		4	0.85	0.8009	0.8991	0.7	1	0.06455	0.1291	15.19%	2.86%
50		4	0.825	0.7771	0.8729	0.7	1	0.06292	0.1258	15.25%	5.71%
75		4	0.725	0.6771	0.7729	0.6	0.9	0.06292	0.1258	17.36%	17.14%
100		4	0.85	0.8009	0.8991	0.7	1	0.06455	0.1291	15.19%	2.86%

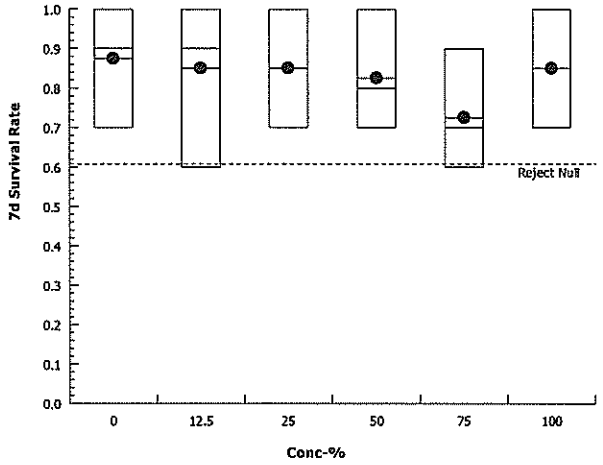
Angular (Corrected) Transformed Summary

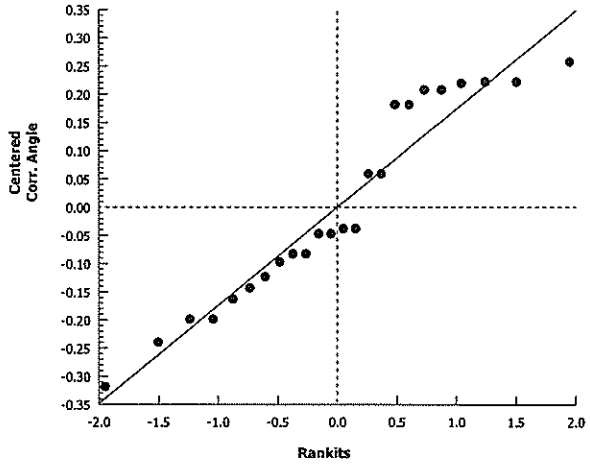
Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	1.231	1.149	1.312	0.9912	1.412	0.1074	0.2148	17.45%	0.0%
12.5		4	1.204	1.107	1.302	0.8861	1.412	0.1281	0.2563	21.28%	2.14%
25		4	1.19	1.121	1.259	0.9912	1.412	0.09091	0.1818	15.28%	3.31%
50		4	1.154	1.086	1.223	0.9912	1.412	0.09013	0.1803	15.62%	6.19%
75		4	1.029	0.9705	1.088	0.8861	1.249	0.0773	0.1546	15.02%	16.35%
100		4	1.19	1.121	1.259	0.9912	1.412	0.09091	0.1818	15.28%	3.31%

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	09-7269-3839	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:57	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date: 30 Jun-11 14:59 (p 1 of 4)
Test Code: B255401ppc | 14-3434-5904

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	10-0653-6607	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:58	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	08-9573-1221	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-11 12:45	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	23 Jun-11 12:10	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 23h	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	06-5605-1915	**Code:**	B2554-01	**Client:**	
Sample Date:	15 Jun-11 08:50	**Material:**	Mining Discharge/Runoff	**Project:**	
Receive Date:	16 Jun-11	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	28h (5.4 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run	50	75	61.24	2	25.0%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	DF	MSD	P-Value	Decision(α:5%)
Dilution Water		12.5	1.212	2.407	6	0.2344	0.3325	Non-Significant Effect
		25	0.6314	2.407	6	0.2344	0.5892	Non-Significant Effect
		50	0.9908	2.407	6	0.2344	0.4259	Non-Significant Effect
		75*	2.454	2.407	6	0.2344	0.0457	Significant Effect
		100	1.217	2.407	6	0.2344	0.3304	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.1251762	0.02503524	5	1.32	0.3001	Non-Significant Effect
Error	0.3414789	0.01897105	18			
Total	0.4666551	0.04400629	23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	4.283	15.09	0.5094	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9603	0.884	0.4450	Normal Distribution

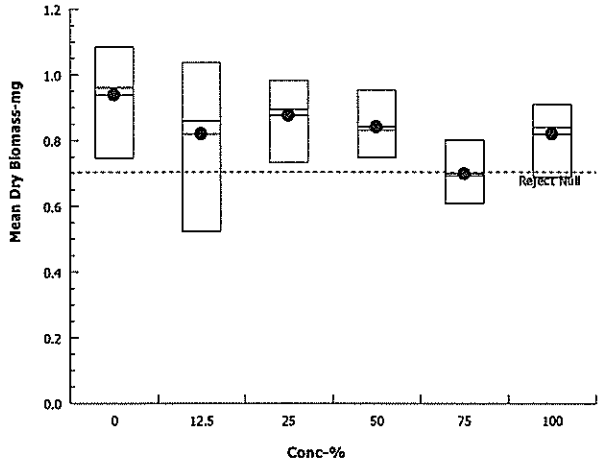
Mean Dry Biomass-mg Summary

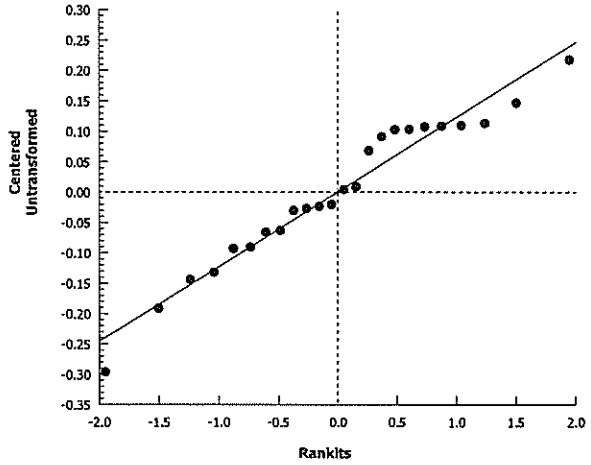
Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.9385	0.8788	0.9982	0.747	1.085	0.0785	0.157	16.73%	0.0%
12.5		4	0.8205	0.736	0.905	0.524	1.038	0.1111	0.2222	27.08%	12.57%
25		4	0.877	0.8293	0.9247	0.733	0.984	0.06268	0.1254	14.29%	6.55%
50		4	0.842	0.8094	0.8746	0.749	0.955	0.04283	0.08566	10.17%	10.28%
75		4	0.6995	0.6691	0.7299	0.609	0.802	0.03999	0.07998	11.43%	25.47%
100		4	0.82	0.7813	0.8587	0.688	0.911	0.05088	0.1018	12.41%	12.63%

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	10-0653-6607	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:58	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Report Date: 30 Jun-11 14:59 (p 1 of 1)
Test Code: B255401ppc | 14-3434-5904

Fathead Minnow 7-d Larval Survival and Growth Test — **CH2M HILL - ASL**

Analysis ID:	02-6878-3586	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	30 Jun-11 14:58	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	08-9573-1221	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	16 Jun-11 12:45	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	23 Jun-11 12:10	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 23h	**Source:**	Aquatox, AR	**Age:**	

Sample ID:	06-5605-1915	**Code:**	B2554-01	**Client:**	
Sample Date:	15 Jun-11 08:50	**Material:**	Mining Discharge/Runoff	**Project:**	
Receive Date:	16 Jun-11	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	28h (5.4 °C)	**Station:**			

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	544319134	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	N/A	N/A	<1	N/A	N/A

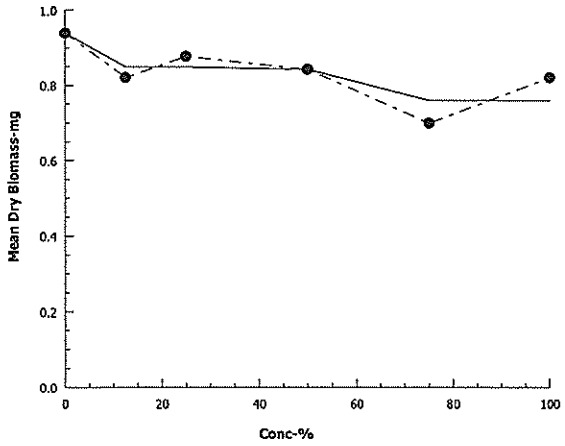
Mean Dry Biomass-mg Summary

			Calculated Variate						
Conc-%	**Control Type**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	Dilution Water	4	0.9385	0.747	1.085	0.0785	0.157	16.73%	0.0%
12.5		4	0.8205	0.524	1.038	0.1111	0.2222	27.08%	12.57%
25		4	0.877	0.733	0.984	0.06268	0.1254	14.29%	6.55%
50		4	0.842	0.749	0.955	0.04283	0.08566	10.17%	10.28%
75		4	0.6995	0.609	0.802	0.03999	0.07998	11.43%	25.47%
100		4	0.82	0.688	0.911	0.05088	0.1018	12.41%	12.63%

Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1.047	0.875	1.085	0.747
12.5		0.79	1.038	0.93	0.524
25		0.984	0.811	0.98	0.733
50		0.955	0.846	0.818	0.749
75		0.708	0.802	0.679	0.609
100		0.688	0.888	0.911	0.793

Graphics



APPENDIX B

REFERENCE TOXICANT DATA SHEETS

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client: QA / QC

Test Start Date: 5-25-2011

Sample Description: NaCl (50 g/L stock)

Reagent ID#: 2B022-01

Ceriodaphnia Lot#: Cd 2583

Statistician: D.W.

Percent or Concentration	Total Live Young Produced in First 3 Broods per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	26	20	20	12	24	20	27	24	25	11	8	209
	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?	AD?	AD?	AD? ✓		
0.25 g/L	25	19	23	4	21	22	23	23	18	21	9	199
	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?	AD?	AD?	AD?		
0.50 g/L	20	10	22	21	9	22	20	AM	14	16	9/9	154
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
1.0 g/L	11	11	14	15	3	14	13	15	14	3	9	113
	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?	AD?	AD?		
1.5 g/L	0	2	4	4	3	3	0	4	6	3	8	29
	AD? ✓	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?		
2.0 g/L	0	0	0	0	0	1	0	0	0	0	2	1
	AD? ✓	AD? ✓	AD? ✓	AD?	AD? ✓	AD?	AD? ✓	AD? ✓	AD? ✓	AD? ✓		
4.0 g/L	0	0	0	0	0	0	0	0	0	0	0	0
	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓		

Test Organism Mortality (Adult dead) = AD? ✓

Test Organism identified as Male = AD? M

Test Organism Injured during test = AD? I

# of Alive Adults = Number of test organism alive at termination (for WDOE only, = Number of test organisms alive at Day 7)

Total Live Young = Total neonates produced in first 3 broods

AM = Adult Missing; remove from stats!

Footnote: As per EPA-821-R-02-013 (13.10.9.1), *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

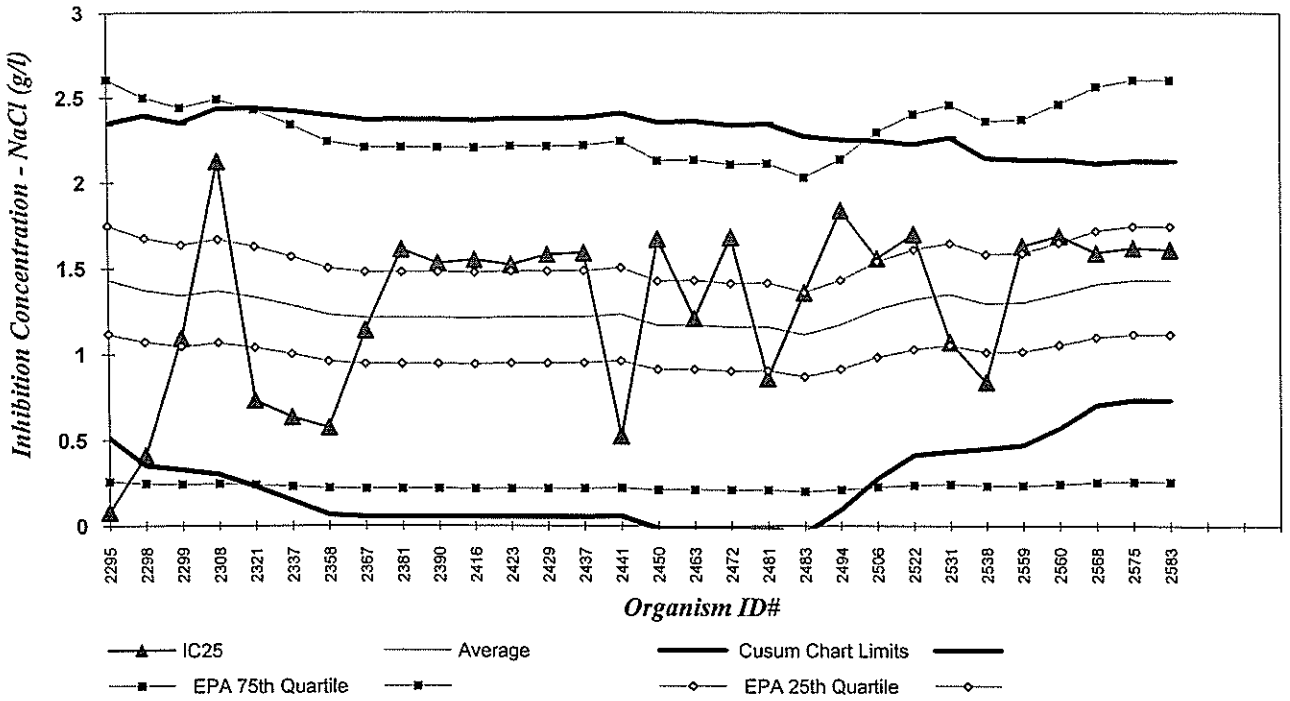
Endpoint	IC25	Cusum Chart Limits
Survival	1.61	0.73 to 2.13
Reproduction	0.61	0.10 to 0.90

Task Manager: [signature]

Project Manager: Doug Winn

QA Officer: Ginger Collins

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Ceriodaphnia dubia Chronic Survival - IC25 Values



***Ceriodaphnia dubia* - Chronic (EPA Test Method 1002.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

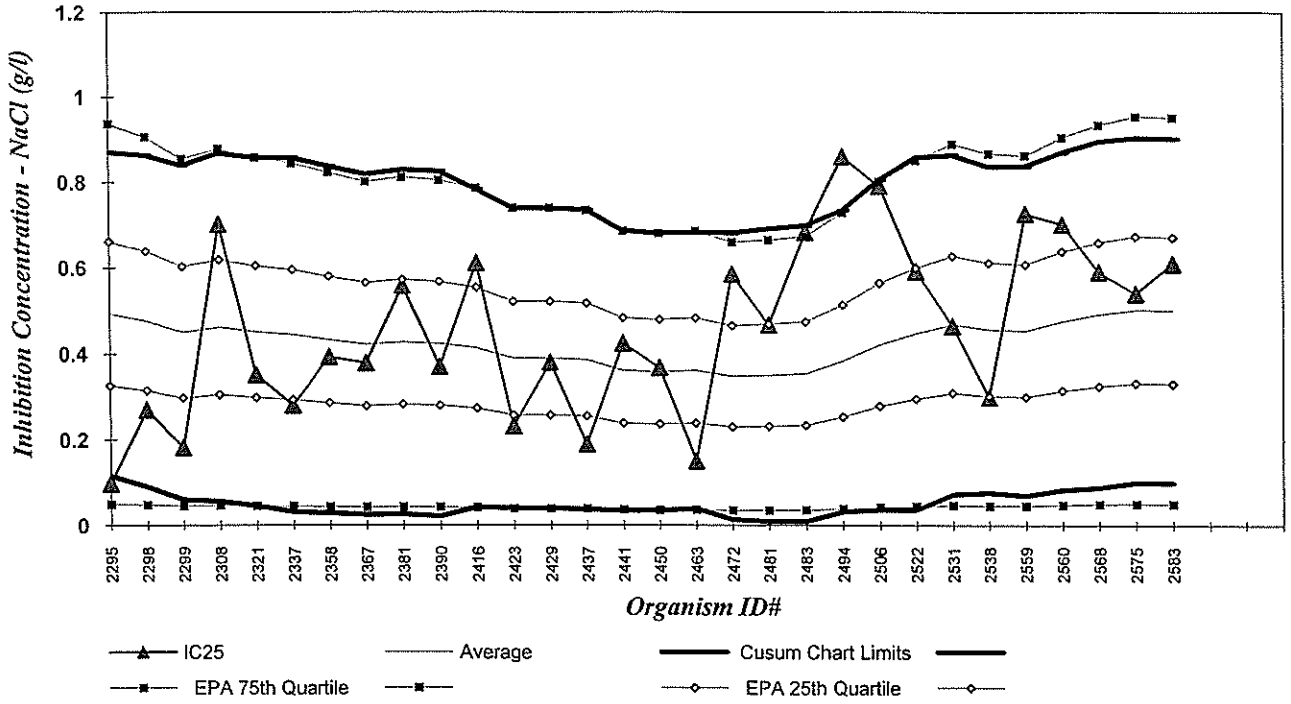
10th Quartile CV (*control limit*) =	0.07
25th Quartile CV (*warning limit*) =	0.11
75th Quartile CV (warning *limit*) =	0.41
90th Quartile CV (*control limit*) =	0.81

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's),*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
223	2463	04/08/10	1.21	1.17	0.59	**-0.02**	**2.36**	0.51
224	2472	05/04/10	1.68	1.16	0.59	**-0.02**	**2.34**	0.51
225	2481	06/15/10	0.86	1.16	0.59	**-0.02**	**2.34**	0.52
226	2483	07/08/10	1.36	1.12	0.58	**-0.04**	**2.27**	0.46
227	2494	08/04/10	1.84	1.17	0.54	**0.10**	**2.25**	0.39
228	2506	09/15/10	1.56	1.26	0.49	**0.28**	**2.25**	0.34
229	2522	10/07/10	1.70	1.32	0.45	**0.41**	**2.23**	0.34
230	2531	11/05/10	1.07	1.35	0.46	**0.43**	**2.26**	0.33
231	2538	12/01/10	0.84	1.30	0.42	**0.45**	**2.14**	0.32
232	2559	01/28/11	1.63	1.30	0.42	**0.47**	**2.13**	0.29
233	2560	02/15/11	1.69	1.35	0.39	**0.57**	**2.13**	0.25
234	2568	03/08/11	1.59	1.41	0.35	**0.70**	**2.11**	0.24
235	2575	04/07/11	1.62	1.43	0.35	**0.73**	**2.13**	0.24

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Ceriodaphnia dubia Chronic Reproduction - IC25 Values



***Ceriodaphnia dubia* - Chronic (EPA Test Method 1002.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Reproduction

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) =	0.08
25th Quartile CV (*warning limit*) =	0.17
75th Quartile CV (warning *limit*) =	0.45
90th Quartile CV (*control limit*) =	0.62

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's),*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
225	2481	6/15/2010	0.47	0.35	0.17	**0.01**	**0.69**	0.49
226	2483	7/8/2010	0.68	0.35	0.17	**0.01**	**0.70**	0.46
227	2494	8/4/2010	**0.86**	0.38	0.18	**0.03**	**0.73**	0.46
228	2506	9/15/2010	0.79	0.42	0.19	**0.04**	**0.81**	0.46
229	2522	10/7/2010	0.59	0.45	0.21	**0.04**	**0.86**	0.42
230	2531	11/5/2010	0.46	0.47	0.20	**0.07**	**0.86**	0.42
231	2538	12/1/2010	0.30	0.46	0.19	**0.08**	**0.84**	0.42
232	2559	1/28/2011	0.73	0.45	0.19	**0.07**	**0.84**	0.41
233	2560	2/15/2011	0.70	0.48	0.20	**0.08**	**0.87**	0.41
234	2568	3/8/2011	0.59	0.49	0.20	**0.09**	**0.89**	0.40
235	2575	4/7/2011	0.54	0.50	0.20	**0.10**	**0.90**	0.40
236	2583	5/25/2011	0.61	0.50	0.20	**0.10**	**0.90**	0.39
237								
238								

CH2M HILL **FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA**

Client: Ref Tox FHM # 1598 Date Initiated: 6-16-11 Time: 1245
Sample Description: NaCl * Reagent Log # ~~2B020-04~~ DW Date Terminated: 6-23-11 Time: 1210
Random Position Template: 6 conc. x 4 rep # 4 Test Container Size: 800 ml Solution Volume / rep: 500 ml
Technician: Day 0 DW/DW Day 1 DW/DW Day 2 CB Day 3 [illegible] Day 4 DW/BW Day 5 BW Day 6 DW Day 7 BW
Time: Day 0 1245 Day 1 0900 Day 2 1300 Day 3 1630 Day 4 1720 Day 5 1600 Day 6 1100 Day 7 1210

Concentration or Percent (g/L)	Day	Number of Live Organisms A	B	C	D	Dissolved O2 (mg/l) Pre	Post	pH Pre	Post	Temp. (°C) Pre	Therm. ID #	Specific Conductivity (µmhos/cm)
Control	0	10	10	10	10		8.2		7.8	Post: 24.3	161	301
	1	9	10	10	10	7.9	8.2	✓7.84	8.1	24.6	161	289
	2	9	9	9	9	7.6	8.3	7.2	8.1	24.7	161	302
	3	9	9	8	9	6.7	7.8	7.1	8.1	24.6	161	369
	4	9	9	8	8	6.7	8.4	7.2	8.2	24.7	160	309
	5	9	9	8	8	6.9	8.2	7.7	8.3	24.8	161	300
	6	9	9	8	8	7.2	8.1	8.0	8.4	24.5	162	297
	7	9	9	8	8	7.2		7.5		24.2	158	
0.3	0	10	10	10	10		8.3		7.8	Post: 24.2		809
	1	10	10	10	10	7.9	8.2	✓7.84	8.1	24.6		806
	2	10	10	8	10	7.7	8.3	7.3	8.0	24.5		786
	3	10	10	8	9	6.7	7.9	7.2	8.0	24.6		849
	4	10	10	8	9	7.0	8.5	7.4	8.2	24.7		817
	5	10	10	8	9	7.2	8.1	7.6	8.2	24.9		840
	6	10	10	8	9	7.2	8.1	7.9	8.4	24.6		881
	7	10	10	8	9	7.3		7.3		24.2		
1.0	0	10	10	10	10		8.3		7.8	Post: 24.2		2110
	1	10	10	10	10	7.9	8.2	7.5	8.0	24.6		2090
	2	10	10	10	10	7.5	8.2	7.4	8.0	24.8		1990
	3	9	10	10	10	6.7	7.9	7.1	8.0	24.8		2050
	4	9	10	10	10	7.2	8.6	7.4	8.1	24.7		2000
	5	9	10	10	10	7.3	8.2	7.5	8.0	24.5		2090
	6	9	10	10	10	7.2	8.1	7.9	8.3	24.5		2070
	7	9	10	10	10	7.2		7.2		24.1		
2.0	0	10	10	10	10		8.4		7.9	Post: 24.4		3730
	1	9	10	10	10	7.9	8.3	7.6	7.9	24.6		3750
	2	8	10	9	10	7.5	8.1	7.3	8.1	24.8		3510
	3	8	10	9	10	6.9	8.0	7.1	7.9	24.8		3640
	4	8	10	9	10	7.3	8.5	7.4	8.0	24.7		3640
	5	8	10	9	9	7.3	8.2	7.4	7.9	24.9		3860
	6	7	9	9	10	7.1	8.2	7.7	8.2	24.5		3750
	7	7	9	9	9	7.3		7.3		24.1		
4.0	0	10	10	10	10		8.4		7.8	Post: 24.1		6960
	1	10	10	9	9	7.8	8.3	7.5	7.8	24.7		6920
	2	10	8	8	8	7.6	8.1	7.4	7.9	24.7		6700
	3	9	7	8	8	7.0	8.0	7.1	7.8	24.9		6400
	4	9	7	7	8	7.5	8.4	7.4	7.9	24.7		6700
	5	9	5	7	7	7.2	8.2	7.4	7.8	24.8		7040
	6	8	4	✓7	✓7	7.2	8.3	7.6	8.2	24.5		6940
	7	7	1	6	2	7.3				24.2		
8.0	0	10	10	10	10		8.4		7.7	Post: 24.3		13020
	1	8	7	7	7	7.7	8.3	7.4	7.7	24.7		13250
	2	2	4	4	4	7.1	8.2	7.7	7.8	24.8		13040
	3	2	1	4	2	7.1	8.0	7.8	7.8	24.8		12500
	4	0	1	3	1	7.5	8.6	7.3	7.8	24.7		12780
	5	1	1	3	1	7.4	8.2	7.3	7.8	24.8		13400
	6	1	0	0	0	7.3	8.3	7.6	8.0	24.6		13300
	7	↓	↓	↓	↓			7.3		24.2		

* NaCl Reagent Stock: 2B023-03

✓ Indicates one FHM inadvertently poured off during solution renewal, FHM replaced into container. Waterbath #7
"F" = fungus noted on dead organisms. "M" = organism missing, start count reduced.

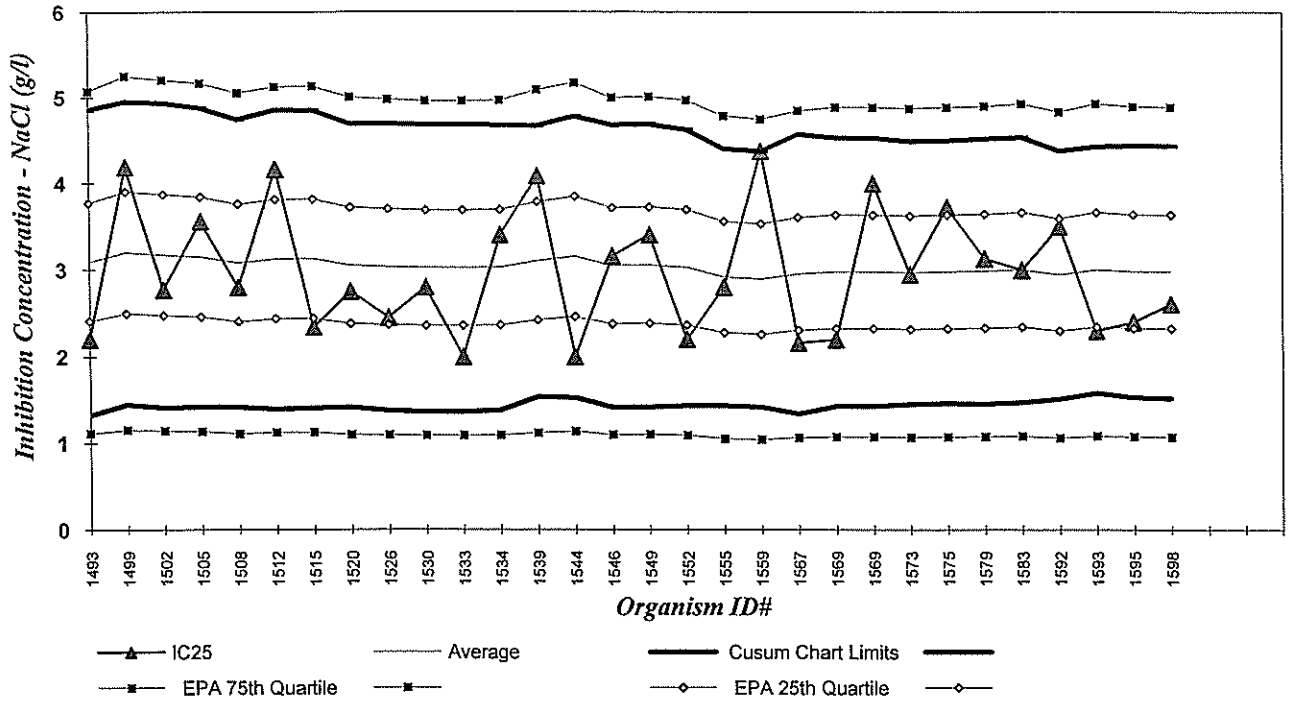
Endpoint	IC25	Cusum Chart Limits
Survival	2.6	1.5 to 4.4
Growth	2.1	1.7 to 3.1

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

* BW 6/23/11, observation switched on Day 6. BW

REFTOX - FHM chronic.XLS

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Pimphales promelas Chronic Survival - IC25 Values



***Pimephales promelas* - Chronic (EPA Test Method 1000.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

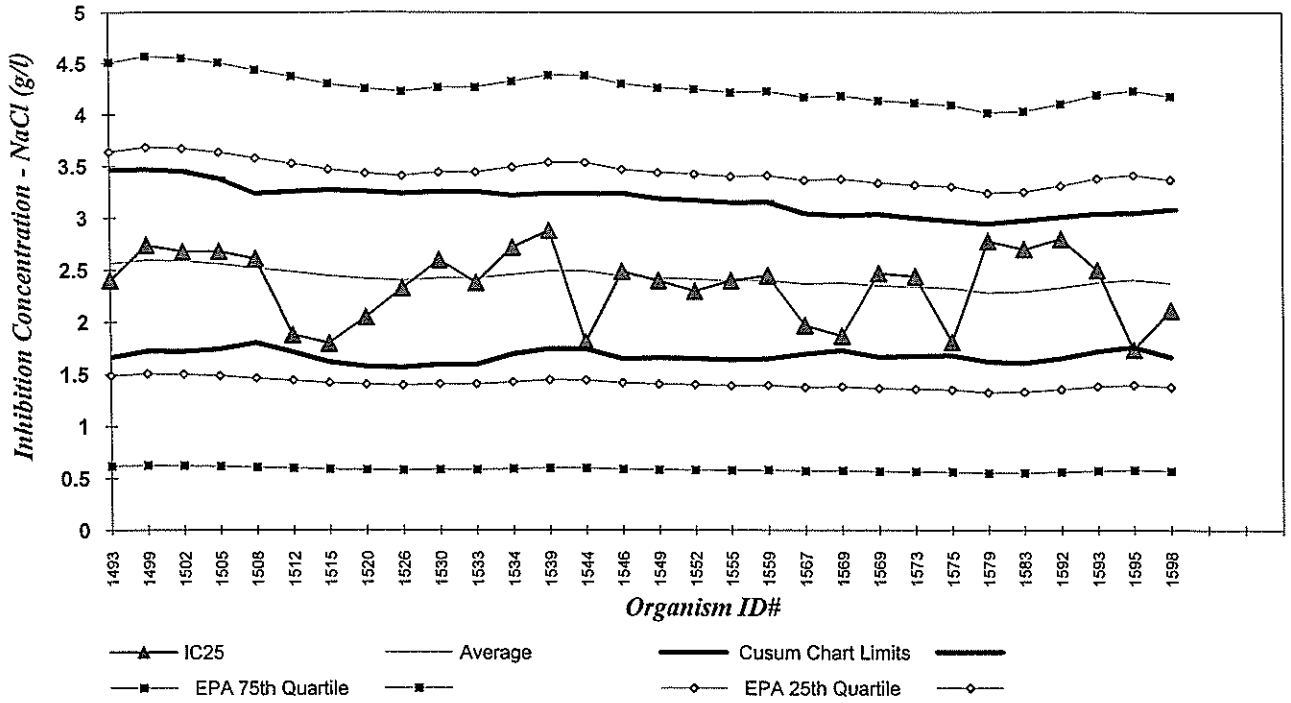
10th Quartile CV (*control limit*) =	0.03
25th Quartile CV (*warning limit*) =	0.11
75th Quartile CV (*warning limit*) =	0.32
90th Quartile CV (*control limit*) =	0.52

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's),*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	FHM ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	AVG+2SD	Intralab CV
253	1569	10/28/10	**4.0**	3.0	0.78	**1.4**	**4.5**	0.26
254	1573	12/07/10	**3.0**	3.0	0.76	**1.4**	**4.5**	0.25
255	1575	01/11/11	**3.7**	3.0	0.76	**1.5**	**4.5**	0.26
256	1579	01/25/11	**3.1**	3.0	0.77	**1.5**	**4.5**	0.25
257	1583	03/01/11	**3.0**	3.0	0.77	**1.5**	**4.5**	0.24
258	1592	04/19/11	**3.5**	2.9	0.72	**1.5**	**4.4**	0.24
259	1593	04/26/11	**2.3**	3.0	0.71	**1.6**	**4.4**	0.24
260	1595	05/24/11	**2.4**	3.0	0.73	**1.5**	**4.4**	0.24
261	1598	06/16/11	**2.6**	3.0	0.73	**1.5**	**4.4**	0.25
262								
263								
264								
265								
266								

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Pimephales promelas Chronic Biomass - IC25 Values



***Pimephales promelas* - Chronic (EPA Test Method 1000.0)**

SODIUM CHLORIDE (g/L) — **From EPA 833-R-00-003:**

Endpoint: Chronic Growth (Biomass) — 10th Quartile CV (*control limit*) = 0.12

Stats Method: Linear Interpolation — 25th Quartile CV (*warning limit*) = 0.21

Test Conditions: Recon MH, 25 oC — 75th Quartile CV (*warning limit*) = 0.38

90th Quartile CV (*control limit*) = 0.45

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's).*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	FHM ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
253	1569	10/28/2010	**2.5**	2.4	0.34	**1.7**	**3.0**	0.14
254	1573	12/7/2010	**2.4**	2.3	0.33	**1.7**	**3.0**	0.14
255	1575	1/11/2011	**1.8**	2.3	0.32	**1.7**	**3.0**	0.15
256	1579	1/25/2011	**2.8**	2.3	0.33	**1.6**	**2.9**	0.15
257	1583	3/1/2011	**2.7**	2.3	0.34	**1.6**	**3.0**	0.15
258	1592	4/19/2011	**2.8**	2.3	0.34	**1.7**	**3.0**	0.14
259	1593	4/26/2011	**2.5**	2.4	0.33	**1.7**	**3.0**	0.13
260	1595	5/24/2011	**1.7**	2.4	0.32	**1.8**	**3.0**	0.15
261	1598	6/16/2011	**2.1**	2.4	0.35	**1.7**	**3.1**	0.15
262								
263								
264								
265								
266								

APPENDIX C

CHAIN OF CUSTODY

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: B2554-1

Client/Project: SMM Pogo

Date received: 6-16-11

Checked by: CB

Checked by: _____

VERIFICATION OF SAMPLE CONDITIONS (verify all items) * HD = Client Hand delivered Samples

Observation	NA	YES	NO
Radiological Screening for DoD	✓		
Were custody seals intact and on the outside of the cooler?		✓	
Type of packing material: Ice Blue Ice Bubble wrap			
Was a Chain of Custody provided?		✓	
Was the Chain of Custody properly filled out? If not document in SRER		✓	
Were the sample containers in good condition (broken or leaking)?		✓	
Containers supplied by ASL?		✓	
Any sample with < 1/2 holding time remaining? If so contact LPM			✓
Samples have multi-phase? If yes, document on SRER			✓
Was there ice in the cooler? Enter temp. If >6°C contact client/SRER 5.4 °C		✓	
All VOCs free of air bubbles? No, document on SRER	✓		
pH of all samples checked and met requirements? No, then document in SRER	✓		
Enough sample volume provided for analysis? No, document in SRER		✓	
Did sample labels agree with COC? No, document in SRER		✓	
Dissolved/Soluble metals filtered in the field?	✓		
Dissolved/Soluble metals have sediment in bottom of container? Document in SRER	✓		

Sample ID	Reagent	Reagent Lot Number	Volume Added	Initials

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: Pogo (B2554-2)

Client/Project: Pogo

Date received: 6-18-11

Checked by: CB

Checked by:

VERIFICATION OF SAMPLE CONDITIONS (verify all items) * HD = Client Hand delivered Samples

Observation	NA	YES	NO
Radiological Screening for DoD	✓		
Were custody seals intact and on the outside of the cooler?	6-18-11 CB Pogo	✓	
Type of packing material: Ice Blue Ice Bubble wrap			
Was a Chain of Custody provided?		✓	
Was the Chain of Custody properly filled out? If not document in SRER		✓	
Were the sample containers in good condition (broken or leaking)?		✓	
Containers supplied by ASL?		✓	
Any sample with < 1/2 holding time remaining? If so contact LPM			✓
Samples have multi-phase? If yes, document on SRER			✓
Was there ice in the cooler? Enter temp. If >6°C contact client/SRER 2.6 °C		✓	
All VOCs free of air bubbles? No, document on SRER	✓		
pH of all samples checked and met requirements? No, then document in SRER	✓		
Enough sample volume provided for analysis? No, document in SRER		✓	
Did sample labels agree with COC? No, document in SRER		✓	
Dissolved/Soluble metals filtered in the field?	✓		
Dissolved/Soluble metals have sediment in bottom of container? Document in SRER	✓		

Sample ID	Reagent	Reagent Lot Number	Volume Added	Initials

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: B2S54-3

Client/Project: SMM Pogo

Date received: 6-21-11

Checked by: CM

Checked by: _____

VERIFICATION OF SAMPLE CONDITIONS (verify all items) * HD = Client Hand delivered Samples

Observation	NA	YES	NO
Radiological Screening for DoD	✓		
Were custody seals intact and on the outside of the cooler?		✓	
Type of packing material: (Ice) Blue Ice Bubble wrap			
Was a Chain of Custody provided?		✓	
Was the Chain of Custody properly filled out? If not document in SRER		✓	
Were the sample containers in good condition (broken or leaking)?		✓	
Containers supplied by ASL?		✓	
Any sample with < 1/2 holding time remaining? If so contact LPM			✓
Samples have multi-phase? If yes, document on SRER			✓
Was there ice in the cooler? Enter temp. If >6°C contact client/SRER 4.6 °C		✓	
All VOCs free of air bubbles? No, document on SRER	✓		
pH of all samples checked and met requirements? No, then document in SRER	✓		
Enough sample volume provided for analysis? No, document in SRER		✓	
Did sample labels agree with COC? No, document in SRER		✓	
Dissolved/Soluble metals filtered in the field?	✓		
Dissolved/Soluble metals have sediment in bottom of container? Document in SRER	✓		

Sample ID	Reagent	Reagent Lot Number	Volume Added	Initials

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client: Smm Pogo llc
Address: PO Box 145
Delta Junction AK 99737

Contact Person: Lucas Walker
Phone: 907. 895. 2860

CH2M HILL Project #

NPDES#
Composite Sample Information
Samples/Hour ____ Volume/Sample ____
Total Hours ____ Total Volume ____
Initiated: Date ____ Time ____
Ended: Date ____ Time ____
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
Outfall 001	6.15.11	0850		x	1	B2554-1	x	x	x	x														

Sampled By & Title (Please sign and print name) Lucas Walker	Date/Time 6.15.11 - 11:15 AM	Relinquished By (Please sign and print name) Jon Farrar	Date/Time 6-15-11 3:38 pm
Received By (Please sign and print name) B Barstow	Date/Time 6-15-11 - 3:36	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Carmen Bell	Date/Time 6/16/11 1000	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) Lucas Walker	Remarks		

Rev. 10/97

CH2M(.L CHAIN OF CUSTODY RECORD FOR NPDES CO(IANCE BIOMONITORING

Client: SMM Pogo
Address: PO Box 145
Delta Junction AK 99737

Contact Person: Lucas Walker
Phone: 907. 895. 2860

CH2M HILL Project #

NPDES#
Composite Sample Information
Samples/Hour ____ Volume/Sample ____
Total Hours ____ Total Volume ____
Initiated: Date ____ Time ____
Ended: Date ____ Time ____
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
Outfall 001	6.17.11	1035		X	1	B2554-2	X	X	X	X														

Sampled By & Title (Please sign and print name) L. Walker	Date/Time 6.17.11 1035	Relinquished By (Please sign and print name) L. Walker	Date/Time 6.17.11 1050
Received By (Please sign and print name)	Date/Time 6-17-11 10.50 AM	Relinquished By (Please sign and print name)	Date/Time 6-17-11 2:30 pm
Received By (Please sign and print name) Owen Legs	Date/Time 6-17-11 2:30 pm	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Carmen Bell	Date/Time 6/18/11 @ 0945	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name) Lucas J Walker	Remarks		

Rev. 10/97

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client: Smm Pogo llc
Address: PO Box 145
Delta Junction AK 99737

Contact Person: Lucas Walker
Phone: 907.895.2860

CH2M HILL Project #

NPDES#
Composite Sample Information
Samples/Hour ____ Volume/Sample ____
Total Hours ____ Total Volume ____
Initiated: Date ____ Time ____
Ended: Date ____ Time ____
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
Outfall 001	6.20.11	1015		x	1	B25543	x	x	x	x														

Sampled By & Title (Please sign and print name) Stacy Staley Stacy Staley	Date/Time 6-20-11 11:00	Relinquished By (Please sign and print name) Joel Turner	Date/Time 6-20-11 2:30pm
Received By (Please sign and print name) Elaine Main Elaine Main	Date/Time 6-20-11 - 2:30pm	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Carmen Bell	Date/Time 6/21/11 1130	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) Lucas Walker	Remarks		

027 FAI 8609 6356

027-8609 6356

Shipper's Name and Address
Sumitomo Metal Mining Po
Mile 50 Pogo Mile Road
Delta Junction, AK 99737
USA
Tel: 9078952841

Shipper's Account Number
27442319143

Customer's ID Number
10659

Not Negotiable

Air Waybill

Issued By

Alaska Air Cargo
ALASKA AIRLINES & HORIZON AIR
P.O. BOX 68900 SEATTLE, WA 98168
800-225-2752 ALASKACARGO.COM

Consignee's Name and Address
LYNDEN TRANSFER
HFPU
PORTLAND, AK 999
USA
Tel: 503 257 0365

Consignee's Account Number

Also notify
Tel:

Issuing Carrier's Agent and City

Accounting Information 10659
Sumitomo Metal Mining Pogo LLC
Mile 50 Pogo Mile Road
Delta Junction, AK 99737
USA

Agent's IATA Code

Account No.

Airport of Departure (Addr. of First Carrier) and Requested Routing
Fairbanks

GoldStreak

To	By First Carrier	To / By		To / By		Currency		WT/VAL		Other		Declared Value For Carriage	Declared Value For Customs
ANC	Alaska Airlines	PDX	AS			USD	PX	X		X		NVD	NCV

Airport of Destination	Flight/Date	Flight/Date	Amount of Insurance
Portland	AS 192/17	AS 132/18	XXX

Handling Information
KEEP COOL

SCI

No of Pieces	Gross Weight	kg lb		Commodity Item No.	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (Incl. Dimensions or Volume)
1	71.0	L	Q		71.0		AS AGREED	WATER SAMPLES Dims: 24 x 13 x14 x 1
1	71.0						AS AGREED	GSX PER Volume: 2.528

Prepaid | **Weight Charge** | **Collect**
AS AGREED

Valuation Charge

Tax

Other Charges
MYC 12.78
SCC 2.00

Total Other Charges Due Agent

Total Other Charges Due Carrier

Shipper certifies that the particulars on the face hereof are correct and that insofar as any part of the consignment contains dangerous goods, such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations. I consent to the inspection of this cargo.

For: Sumitomo Metal Mining Pogo LLC

Signature of Shipper or his Agent

[JT] THIS SHIPMENT DOES NOT CONTAIN DANGEROUS GOODS

[ ] THIS SHIPMENT DOES CONTAIN DANGEROUS GOODS

Total Prepaid
AS AGREED

Total Collect

17 Jun 2011 14:29 — Executed On (Date)
Fairbanks — at (Place)
Alaska Airlines — Signature of Issuing Carrier or its Agent

027-8609 6356

594100

IMAGE PRESSWORKS (503) 231-5659

World Courier Ground

Bill of Lading

Order Tracking Number 2227 06174

Your Internal Billing Reference 48982

SHIPPER'S COPY

1 - From: Date 6-18-11 Sender's WCG Account Number

Sender's Name JANNA Phone ( )

Company LYNDEN AIR TRANSFER

Address

City PDX State OR Zip

2 - Shipper's Signature ★

3 - To: Recipient's Name Phone ( )

Company Chem Hill

Address 1000 NE CIRCLE BLVD 1060

City CORVALLIS State OR Zip 97330

Delivery Signature ★ Deliv.Time 9:46 Driver #: Pickup Time

Roundtrip Signature ★ Deliv.Time Name:

4 - Services:

Vehicle: Direct ☐ (Non-Stop) Rush ☐ (90 Min) Route ☐ (3 Hours)

Bike: Super Rush ☐ (30 Min) Rush ☐ (60 Min) Route ☐ (3 Hours)

☐ *This shipment contains dangerous materials.*

5 - Special Instructions: 86096356

6 - Bill To: ☐ Sender ☐ Recipient ☐ Cash/Check ☐ Credit Card

Credit Card No.

Exp. Date

6a - Total Charges:

Total Packages 1 Total Weight 71.00 Total Declared Value $

Our liability is limited to $150 unless you declare a higher value. See back for details.

7 - Release Signature: *Sign to authorize delivery without obtaining signature.*

By signing you authorize us to deliver this shipment without obtaining a signature and agree to indemnify and hold us harmless from any resulting claims.

ATLANTA 800-487-9669	BOSTON 800-521-2211	CHICAGO 800-420-5717	MIAMI 800-611-0980
PORTLAND 800-254-3334	SAN FRANCISCO 800-345-8702	SANTA ROSA 888-882-7500	SEATTLE 1-866-959-9924

Visit our Web Site: http://www.wcground.com

Pogo B2554-01
Rcd JW
6/16/2011

608833

IMAGE PRESSWORKS (503) 231-5659

World Courier Ground

Bill of Lading

Order Tracking Number 366 06 1675

Your Internal Billing Reference 46818-78

SHIPPER'S COPY

1 - From: Date 6-16-11 Sender's WCG Account Number

Sender's Name Phone ( )

Company AS

Address

City Port State OR Zip

2 - Shipper's Signature ★

3 - To: Recipient's Name Phone ( )

Company Ch2m Hill

Address 1000 NE Circle blvd 10650

City Corvallis State OR Zip 97330

Delivery Signature ★ Deliv. Time 9:51 Driver #: 2613 Pickup Time 1:48

Roundtrip Signature ★ Deliv. Time Name: Barry

Visit our Web Site: http://www.wcground.com

4 - Services:

Vehicle		Bike	
Direct ☐	(Non-Stop)	Super Rush ☐	(30 Min)
Rush ☒	(90 Min)	Rush ☐	(60 Min)
Route ☐	(3 Hours)	Route ☐	(3 Hours)

☐ *This shipment contains dangerous materials.*

5 - Special Instructions:

6 - Bill To: ☐ Sender ☐ Recipient ☐ Cash/Check ☐ Credit Card

Credit Card No.

Exp. Date

6a - Total Charges: $

Total Packages 1 Total Weight 75 Total Declared Value $

Our liability is limited to $150 unless you declare a higher value. See back for details.

7 - Release Signature: *Sign to authorize delivery without obtaining signature.*

By signing you authorize us to deliver this shipment without obtaining a signature and agree to indemnify and hold us harmless from any resulting claims.

ATLANTA 800-487-9669	BOSTON 800-521-2211	CHICAGO 800-420-5717	MIAMI 800-611-0980
PORTLAND 800-254-3334	SAN FRANCISCO 800-345-8702	SANTA ROSA 888-882-7500	SEATTLE 1-866-959-9924

CH2M HILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client: Sum Pogo LLC
Address: PO Box 145
Delta Junction AK 99737

Contact Person: Luke Walker
Phone: 907-895-2860

CH2M HILL Project #

NPDES#
Composite Sample Information
Samples/Hour ____ Volume/Sample ____
Total Hours ____ Total Volume ____
Initiated: Date ____ Time ____
Ended: Date ____ Time ____
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) 5.8
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
~~Effluent~~																								
Outfall 001	6.13.11	1030		X	2		X	X	X	X														

Sampled By & Title (Please sign and print name) Leonard Hansen	Date/Time 6.13.11 1030	Relinquished By (Please sign and print name) Leonard Hansen	Date/Time 6/13/11 14:30
Received By (Please sign and print name) Carmen Bell	Date/Time 6/15/11 1030	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 * PAST HOLDING TIME → NOT USED. BN 6/15/11		

Rev. 10/97

FedEx Express NEW Package US Airbill

FedEx Tracking Number 8757 0782 3007 0200

FedEx Retrieval Copy

1 From

Date 6/12/2011 Sender's FedEx Account Number 2343-5627-5

Sender's Name Sam POGO Phone 907 895-2960

Company Leonard Z Hansen

Address P.O. Box 145

Dept./Floor/Suite/Room

City Delta Jct State AK ZIP 99737

2 Your Internal Billing Reference

3 To

Recipient's Name Phone 541 768-3120

Company CH2M Hill

Address 1000 NE Circle Blvd

Dept./Floor/Suite/Room

Address Corvallis

City Corvallis State OR ZIP 97330

HOLD Weekday FedEx location address REQUIRED. NOT available for FedEx First Overnight. 01

HOLD Saturday FedEx location address REQUIRED. Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations. 31

4 Express Package Service

NOTE: Service order has changed. Please select carefully

Packages up to 150 lbs.

NEW Business Day

06 FedEx First Overnight

01 X FedEx Priority Overnight

05 FedEx Standard Overnight

Last Day

49 NEW FedEx 2Day A.M.

03 FedEx 2Day

20 FedEx Express Saver

5 Packaging

06 FedEx Envelope 02 FedEx Pak 03 FedEx Box 04 FedEx Tube 05 X Other

6 Special Handling and Delivery Signature Options

SATURDAY DELIVERY

No Signature Required 10 Direct Signature 34 Indirect Signature

Does this shipment contain dangerous goods?

One box must be checked

No 04 Yes Shipper's Declaration Yes 06 Dry Ice

Cargo Aircraft Only

7 Payment Bill to:

Enter FedEx Acct. No. or Credit Card No. below

1 X Sender 2 Recipient 3 Third Party 4 Credit Card 5 Cash/Check

[redacted]

Total Packages 1 Total Weight 7#

612

8757 0782 3007

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→ delayed in Fairbanks, LATE Delivery,

not used due to expired holding time

6-16-11