APPENDIX 2

2005 3rd Quarter

Garrow Lake Effluent Discharge Monitoring

by

Azimuth Consulting Group Inc.

Bruce J. Donald
Reclamation Manager

November 10, 2005

Prairie & Northern Region
Environment Canada
Room 200, 4999 98th Ave.
Edmonton, AB, T6B 2X3

Attention: Peter Blackall, Regional Director of Environmental Protection

Dear Peter Blackall;

Re: Polaris Mine 2005 3rd Quarter MMER Report

Please find attached the Metal Mining Effluent Regulation (MMER) Report for Polaris Mine for the 3rd Quarter of 2005. As Polaris is a remote mine and operations on the site have ceased, collection of MMER and Environmental Effects Monitoring (EEM) data for this year was conducted by small field crews stationed onsite for the first part of the season, and then by flying scientists/ technicians to site on a weekly basis for the latter part of the season. Field crews were onsite when flow initiated in Garrow Creek on approximately June 25, 2005. Flow continued through July and August, and Garrow Creek was observed to be frozen on September 13, 2005.

The MMER effluent characterization monitoring, bioassay testing, and environmental effects monitoring were conducted throughout the quarter. Due to the short season of flow, two sets of acute and sublethal toxicity tests were conducted within the quarter on July 16 and August 9, 2005, corresponding to the dates of EEM quarterly water quality monitoring samples collected at effluent, exposure and reference stations. A quarterly effluent sample plus acute and sublethal toxicity samples were also collected on July 6, 2005, but due to fog conditions at the mine, the toxicity samples did not make it to the labs within holding times are were discarded. The effluent sample was analyzed for the MMER and EEM parameters. No exposure or reference samples were collected on July 6, 2005, since Garrow Bay was still ice-covered.

MMER water quality monitoring was conducted on a weekly basis throughout most of the season. Between August 20 – 23 and after August 27, 2005, access to the site was not possible due to weather conditions. Ken Russell and Jenny Ferone were informed of failed sampling attempts and were updated with weather and safety conditions at the site on a regular basis. On September 13, 2005, a quarterly event with acute toxicity testing was planned. However, upon arrival onsite, it was observed that Garrow Creek (final discharge point) was frozen. A chronology of the 2005 sampling season is presented in Appendix I.

There were no exceedances of MMER Schedule 4 Limits for the 2005 season, and there was no acute toxicity in Rainbow trout and *Daphnia* tests. Holding times for nitrate and alkalinity were exceeded in the July 6, 2005 sample due to an oversight by the ALS lab. This situation is explained in a letter from ALS provided in Appendix J, and is not likely to influence the results.

The following information is included in our 2005 3rd Quarter MMER Report:

- Table 1a – Concentrations Of Effluent For MMER Schedule 4 Sampled Weekly
- Table 1b – Monthly Mean Concentrations Of Effluent For MMER Schedule 4
- Table 1c – Mass Loading Of Deleterious Substance For Each Day Sampled
- Table 1d – Mass Loading Per Calendar Month For Each Deleterious Substance
- Table 2 – Results of Acute Lethality Tests and Daphnia Magna Monitoring Tests
- Table 3 – Effluent Characterization Water Quality Results (studies conducted under Part 1, Section 4) (Effluent Characterization) (Table 3, Table 5)
- Table 4 – Water Quality Monitoring in Exposure and Reference Stations (Results of studies conducted under Part 1, Section 7)
- Table 5 – QAQC of Effluent and Water Quality Data

Additional Appendices

- Appendix A – Information specified by Section 8.1 of Reference Method EPS 1/Rm/13: 96 hr acute rainbow trout test
- Appendix B – Information specified by Section 8.1 of Reference Method EPS 1/Rm/14: 72 hr acute *Daphnia magna* test
- Appendix C – 7-d Topsmelt Growth and Survival Sublethal Toxicity Test
- Appendix D – 92-h Echinoderm Fertilization Sublethal Toxicity Test
- Appendix E – 7-d Sublethal Champia (Algae) Sublethal Toxicity Test
- Appendix F – Results of Effluent Characterization, as per Paragraph 15(1)(a)
- Appendix G – Acute Toxicity Testing Reports
- Appendix H – Sublethal Toxicity Testing Reports
- Appendix I – Polaris 2005 Sampling Event Chronology
- Appendix J – Letter from ALS explaining missed holding times of alkalinity and nitrate for July 6,2005 sample

The MMER and EEM data required to be reported in electronic format were submitted electronically through the RISS online system on November 10 2005. In addition to this hardcopy report, an electronic pdf version of this report is being emailed to you (e-mailed November 10, 2005).

If you have any questions regarding the annual report or aspects of the application of the MMER to the Polaris Mine, please feel free to contact me.

Yours truly,

Original signed by B. Donald
Bruce Donald

Attachments: 2005 3rd Quarter Regulatory Data Tables
cc: Randy Baker (Azimuth Consulting Group)
Ken Russell (Environment Canada)
Jenny Ferone (Environment Canada)

Polaris Mine 2005 3rd Quarter MMER Report

Prepared for

Environment Canada, Prairie & Northern Region
Room 200, 4999 98th Ave.
Edmonton, AB, T6B 2X3

November 10, 2005

Teck Cominco
Bag 2000
Kimberley, BC, Canada
V1A 3E1

2005 3rd QUARTER MMER REPORT

LOCATION - FINAL DISCHARGE POINT FROM GARROW LAKE (GARROW LAKE DAM SIPHONS)

Table 1a. CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4 SAMPLED WEEKLY

Sample Taken During The Week of	Date Sample Taken	DELETERIOUS SUBSTANCE (mg/L)[1] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	pH[1]	Collection Method
3-Jul-05	6-Jul-05	*0.00020*	0.00024	*0.0050*	0.00017	0.00060	0.0127	4	0.0050	7.49	Grab
10-Jul-05	13-Jul-05	*0.00020*	0.00061	*0.0050*	0.00230	0.00088	0.0205	*3.0*	*0.0050*	7.48	Grab
10-Jul-05	16-Jul-05	*0.00020*	0.00042	0.0444	0.00042	0.00081	0.0179	*3.0*	0.0090	7.59	Grab
17-Jul-05	23-Jul-05	*0.00020*	0.00047	*0.0050*	0.00024	0.00105	0.0325	*3.0*	*0.0050*	7.56	Grab
24-Jul-05	30-Jul-05	0.00021	0.00050	*0.0050*	0.00020	0.00141	0.0405	*3.0*	*0.0050*	7.70	Grab
31-Jul-05	6-Aug-05	*0.00020*	0.00052	*0.0050*	0.00047	0.00166	0.0356	*3.0*	*0.0050*	7.65	Grab
7-Aug-05	13-Aug-05	*0.00020*	0.00052	*0.0050*	0.00111	0.00149	0.0310	*3.0*	0.0080	7.79	Grab
14-Aug-05	24-Aug-05[3]	*0.00020*	0.00101	*0.0050*	0.00093	0.00474	0.0905	4.8	0.0090	8.13	Grab
21-Aug-05	27-Aug-05	*0.00020*	0.00079	*0.0050*	0.00076	0.00356	0.0680	3.7	0.0100	7.92	Grab
28-Aug-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
4-Sep-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
11-Sep-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
18-Sep-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]
25-Sep-05	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L and pH which is in pH units

Note [2] - "nd" refers to no effluent discharge to sample

Note [3] - due to weather conditions samples could not be collected the week of August 14th, two sets were collected the following week.

Concentrations in italicized font are less than the detection limit shown.

Table 1b. MONTHLY MEAN CONCENTRATIONS OF EFFLUENT FOR MMER SCHEDULE 4

MONTH OF	MONTHLY MEAN CONCENTRATION[1] OF DELETERIOUS SUBSTANCE[3] Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226
July/04	0.0002	0.00045	0.0129	0.00066	0.00095	0.0248	3	0.0058
August/04	0.0002	0.00071	0.00500	0.00082	0.00286	0.0563	3.6	0.0080
September/04	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]	nd[2]

Note[1] - All concentrations are in mg/L except Radium 226 which is Bq/L

Note [2] - "nd" refers to no effluent discharge to sample

Note[3] - Monthly Mean Concentrations - the MEAN value of the concentrations measured in all water samples collected during each month when a deleterious substance is deposited.

Table 1c. MASS LOADING OF DELETERIOUS SUBSTANCE FOR EACH DAY SAMPLED

Sample Taken During The Week of	Date Sample Taken	DAILY MASS LOADING OF DELETERIOUS SUBSTANCE (kg/day)[1]								Average Daily Flow Rate (m^3/day)[4]
		Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[1]	
3-Jul-05	6-Jul-05	0.002	0.002	0.042	0.001	0.005	0.108	34	42,353	8,471
10-Jul-05	13-Jul-05	0.001	0.002	0.018	0.008	0.003	0.075	11	18,178	3,636
10-Jul-05	16-Jul-05	0.001	0.001	0.148	0.001	0.003	0.060	10	30,086	3,343
17-Jul-05	23-Jul-05	0.001	0.003	0.027	0.001	0.006	0.177	16	27,214	5,443
24-Jul-05	30-Jul-05	0.000	0.001	0.011	0.000	0.003	0.092	7	11,299	2,260
31-Jul-05	6-Aug-05	0.001	0.003	0.034	0.003	0.011	0.240	20	33,734	6,747
7-Aug-05	13-Aug-05	0.002	0.006	0.056	0.012	0.017	0.348	34	89,872	11,234
14-Aug-05	24-Aug-05[3]	0.004	0.018	0.089	0.017	0.084	1.604	85	159,501	17,722
21-Aug-05	27-Aug-05	0.003	0.010	0.063	0.010	0.045	0.856	47	125,830	12,583
28-Aug-05	nd[2]	0	0	0	0	0	0	0	0	0
4-Sep-05	nd[2]	0	0	0	0	0	0	0	0	0
11-Sep-05	nd[2]	0	0	0	0	0	0	0	0	0
18-Sep-05	nd[2]	0	0	0	0	0	0	0	0	0
25-Sep-05	nd[2]	0	0	0	0	0	0	0	0	0

Note[1] - Mass Loading is in kilograms per day of the deleterious substance deposited except Radium 226 which is in Bq per day

Note [2] - "nd" refers to no effluent discharge to sample

Note [3] - August 24 data are presented in the week of the August 14th

Note [4] - Discharge for August 6 is an estimate pending verification by Teck Cominco.

Table 1d. MASS LOADING PER CALENDAR MONTH FOR EACH DELETERIOUS SUBSTANCE

CALENDAR MONTH OF	MASS LOADING[1] FOR DELETERIOUS SUBSTANCE (kg/month)[2]								Average Weekly Flow Rate[3] (m^3/week)	Total Monthly Volume[4] (m^3/month)
	Arsenic	Copper	Cyanide	Lead	Nickel	Zinc	TSS	Radium 226[2]		
July/04	0.03	0.06	1.53	0.08	0.12	3.16	483.14	800,602	32,412	143,540
August/04	0.07	0.29	1.87	0.32	1.21	23.62	1,438.14	3,169,267	84,501	374,218
September/04	0	0	0	0	0	0	0	0	0	0

Note[1] - Total Mass Loading for Calendar month calculated by multiplying the Average Daily Mass Loading for the Month x # days in the month

Note[2] - Mass loading units are in kg per month except Radium 226, which is in Bq permonth

Note[3] - Average Weekly Flow Rate calculated by multiplying Average Daily Flow Rate x 7 days per week

Note[4] - Total Monthly Volume calculated by multiplying Average Daily Flow Rate for the month x days in month

Table 2

RESULTS OF ACUTE LETHALITY TESTS AND
DAPHNIA MAGNA MONITORING TESTS

Date Sample Collected	Effluent Acutely Lethal to Rainbow Trout (yes or no)	Effluent Acutely Lethal to *Daphnia magna* (yes or no)
16-Jul-05	No	No
6-Aug-05	No	No

Non-compliance Information

If effluent was non-compliant with the aurthorized limits set out in Schedule4, indicate the cause(s) of non-compliance and remedial measures planned or implemented. Also indicate remedial meaures planned or implemented in response to the failure of acute lethality tests.

There were no non-compliant concentrations, and no failed acute lethality toxicity tests during 2005 3rd Quarter for Polaris Mine.

Table 3. 2005 3rd Quarter Polaris Mine Effluent Characterization Results (Part 1, Section 4)

Effluent Characterization from Final Discharge Point - Garrow Lake Former Dam / Syphons
Northing: 75°22'32"
Easting: 96°48'37"

Facility Name:		Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)				
FDP Name:		Garrow Lake Syphons				
Sample ID:		G Creek	G-Creek	G-Creek		
Sampling Date:		6-Jul-05	16-Jul-05	6-Aug-05		
Sample Method:		Grab	Grab	Grab		
Parameter	**Units**				***Detection Limit***	**Methods[1]**
Hardness	mg/L	149	184	375	*0.54 - 5.4*	Calculation - EPA Method 3005A, ICPOES (EPA Method 6010B)[4]
Alkalinity, Total	mg/L	28.1	29.2	52.5	*2.0*	Colourimetry - APHA Method 2320 (potentiometric titration)
Aluminum, Total	mg/L	<0.20	0.0085	<0.20	*0.001 - 0.2*	ICPMS[3]
Cadmium, Total	mg/L	0.000034	0.000044	0.000097	*0.000020*	SPR-IDA[2], ICPMS[3]
Iron, Total	mg/L	0.012	0.043	0.014	*0.010*	SPR-IDA[2], ICPMS[3]
Mercury, Total	mg/L	<0.000010	<0.000010	<0.000010	*0.000010*	Cold Vapour Atomic Florescence Spectrophotometry
Molybdenum, Total	mg/L	<0.0050	<0.0050	<0.0050	*0.0050*	ICPMS[3]
Ammonia Nitrogen	mg/L	0.036	0.037	<0.020	*0.020*	APHA Method 4500-NH3 (selective ion electrode)
Nitrate Nitrogen	mg/L	0.032	<0.050	0.072	*0.025 - 0.050*	APHA Method 4110 (determination of inorganic ions by ion chromatography)
Arsenic, Total	mg/L	<0.00020	<0.00020	<0.00020	*0.00020*	Hydride-Vapour Atomic Absorption Spectrophotometry
Copper, Total	mg/L	0.000240	0.000424	0.000516	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Cyanide, Total	mg/L	<0.0050	0.0444	<0.0050	*0.0050*	Colourimetry - APHA Method 4500-CN (cynate hydrolosis using an ammonia selective electrode
Lead, Total	mg/L	0.000166	0.000415	0.000467	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Nickel, Total	mg/L	0.000601	0.000807	0.00166	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Zinc, Total	mg/L	0.0127	0.0179	0.0356	*0.00050*	Chelation SPR-IDA[2], ICPMS[3]
Total Suspended Solids	mg/L	4.0	<3.0	<3.0	*3.0*	Gravimetry - APHA Method 2540 (filtration through glass fibre filter)
Radium-226 (a)	Bq/L	0.0050	0.009	<0.0050	*0.0050*	Radio Chemistry[5]
pH	pH units	7.49	7.59	7.65	*0.010*	APHA Method 4500-H (pH electrode meter)

Notes:

< = Less than the detection limit indicated.

(a) Results are expressed as Becquerels per litre (Bq/L). This analysis is subcontracted to SRC, Saskatoon.

[1]Original data reports are available upon request

[2]SPR-IDA = Suspended Particulate Resin consisting of immobilized iminodiacetate on a divinyl benzene polymer is used to chelate and preconcentrate metals in seawater (preparation technique).

[3]Instrumental analysis is by ICPMS = Inductively Coupled Mass Spectrometry.

[4]This analysis is carried out using procedures adapted from "StandardMethods for the Examination of Water and Wastewater" 20th Edition 1998, published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the USEPA. The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emissionspectrophotometry ICPOES (EPA Method 6010B).

[5]All radium isotopes in the sample solution are separated by coprecipitation with lead sulfate. The precipitate is redissolved and the radium isotopes are separated by coprecipitation with barium sulfate. The precipitate is filtered and mounted on a stainless steel disk. It is then counted on an alpha spectrometer. The radium 226 alpha energy is distinct and the peak can be clearly identified.

Table 4. 2005 3rd Quarter Polaris Mine Water Quality Monitoring Results (Part 1, Section 7)

Station:		Exposure Area		Reference Area			
Description:		Garrow Bay at Mouth of Garrow Creek Confluence		Garrow Bay ~1km NE of exposure station (confluence with Garrow Creek).			
Northing:		75°22'15"		75°22'40"			
Easting:		96°48'30"		96°47'12"			
Facility Name:		Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)		Teck Cominco Metals Limited - Polaris Mine (Little Cornwallis Island)			
FDP Name:		Garrow Lake Syphons		Garrow Lake Syphons			
Area Name:		Garrow Bay Exposure		Garrow Bay Reference			
Sample ID:		G-BAY	G-Bay (b)	T-BAY REF	Ref		
Sampling Date:		16-Jul-05	6-Aug-05	16-Jul-05	6-Aug-05		
Sample Method:		Grab	Grab	Grab	Grab		
Parameters	**Units**					***Detection Limit***	**Methods[1]**
Hardness	mg/L	215	385	271	840	*0.54-5.4*	Calculation - EPA Method 3005A, ICPOES (EPA Method 6010B)[4]
Alkalinity, Total	mg/L	44.2	63.2	23.0	53.5	*2.0*	Colourimetry - APHA Method 2320 (potentiometric titration)
Aluminum, Total	mg/L	0.0519	<0.10	0.0619	<0.10	*0.001-0.2*	ICPMS[3]
Cadmium, Total	mg/L	0.000051	0.000081	<0.000020	<0.000020	*0.000020*	SPR-IDA[2], ICPMS[3]
Iron, Total	mg/L	0.207	0.015	0.217	0.011	*0.010*	SPR-IDA[2], ICPMS[3]
Mercury, Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	*0.000010*	Cold Vapour Atomic Florescence Spectrophotometry
Molybdenum, Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	*0.0050*	ICPMS[3]
Ammonia Nitrogen	mg/L	0.048	<0.020	<0.020	<0.020	*0.020*	APHA Method 4500-NH3 (selective ion electrode)
Nitrate Nitrogen	mg/L	<0.050	0.092	<0.050	0.0261	*0.025*	APHA Method 4110 (determination of inorganic ions by ion chromatography)
Arsenic, Total	mg/L	<0.00020	<0.00020	0.00050	0.00024	*0.00020*	Hydride-Vapour Atomic Absorption Spectrophotometry
Copper, Total	mg/L	0.000748	0.000608	0.000563	0.000305	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Cyanide, Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	*0.0050*	Colourimetry - APHA Method 4500-CN (cynate hydrolosis using an ammonia selective electrode
Lead, Total	mg/L	0.00147	0.000517	0.000690	0.000078	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Nickel, Total	mg/L	0.00126	0.00188	0.000554	0.000412	*0.000050*	Chelation SPR-IDA[2], ICPMS[3]
Zinc, Total	mg/L	0.0154	0.0224	0.00323	0.00122	*0.00050*	Chelation SPR-IDA[2], ICPMS[3]
Total Suspended Solids	mg/L	16.7	<3.0	<3.0	<3.0	*3.0*	Gravimetry - APHA Method 2540 (filtration through glass fibre filter)
Radium-226 (a,b)	Bq/L	0.010	n/a	<0.0050	<0.0050	*0.0050*	Radio Chemistry[5]
pH	pH units	7.64	7.96	7.40	7.89	*0.010*	APHA Method 4500-H (pH electrode meter)
Water Temperature[6]	°C	0.2	0.6	-0.1	0.2	*n/a*	Field - Campbell Scientific Hydrolab Model H20, or YSI Meter Model 85
Dissolved Oxygen[6]	mg/L	13.2	11.6	15.2	13.9	*n/a*	Field - Campbell Scientific Hydrolab Model H20, or YSI Meter Model 85

Notes

The Garrow Bay exposure area (mouth of the creek), and Garrow Bay reference area were frozen during the July 6, 2005 sampling event.

< = Less than the detection limit indicated.

(a) Results are expressed as Becquerels per litre (Bq/L). This analysis is subcontracted to SRC, Saskatoon.

(b) n/a for August 6, 2005 sample = not available, the sample was lost during analysis by SRC with no additional sample remaining to repeat the analysis.

[1]Original data reports are available upon request

[2]SPR-IDA = Suspended Particulate Resin consisting of immobilized iminodiacetate on a divinyl benzene polymer is used to chelate and preconcentrate metals in seawater (preparation technique).

[3]Instrumental analysis is by ICPMS = Inductively Coupled Mass Spectrometry.

[4]This analysis is carried out using procedures adapted from "StandardMethods for the Examination of Water and Wastewater" 20th Edition 1998, published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the USEPA. The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emissionspectrophotometry ICPOES (EPA Method 6010B).

[5]All radium isotopes in the sample solution are separated by coprecipitation with lead sulfate. The precipitate is redissolved and the radium isotopes are separated by coprecipitation with barium sulfate. The precipitate is filtered and mounted on a stainless steel disk. It is then counted on an alpha spectrometer. The radium 226 alpha energy is distinct and the peak can be clearly identified.

[6]Temperature and dissolved oxygen data are estimated pending verification by Teck Cominco.

Table 5. 2005 3rd Quarter Polaris Mine QAQC Sample Results[1] Including Field Duplicates, Field Blanks, and Transport Blanks.

Sample Type:		Field Duplicate	Original Sample		Field Duplicate	Original Sample		Field Duplicate	Original Sample	
Sample ID:		Dup	G Creek		DUP	G-Creek		Dup	Ref	
Location:		Garrow Lake Syphons			Garrow Lake Syphons			Garrow Bay Reference		
Description:		Final Discharge Point		RPD[2]	Final Discharge Point		RPD[2]	~1km NE of confluence with Garrow Creek		RPD[2]
Sampling Date:		6-Jul-05		(%)	16-Jul-05		(%)	6-Aug-05		(%)
Parameters	**Parameter Units**									
Hardness	mg/L	140	149	6.0	187	184	1.6	852	840	1.4
Alkalinity, Total	mg/L	28.0	28.1	0.4	29.0	29.2	0.7	53.8	53.5	0.6
Aluminum, Total	mg/L	<0.10	<0.20	n/a	0.0087	0.0085	2.4	<0.10	<0.10	n/a
Cadmium, Total	mg/L	0.000040	0.000034	17.6	0.000049	0.000044	11.4	<0.000020	<0.000020	n/a
Iron, Total	mg/L	0.013	0.012	8.3	0.043	0.043	0.0	0.011	0.011	0.0
Mercury, Total	mg/L	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a
Molybdenum, Total	mg/L	<0.0050	<0.0050	n/a	<0.0050	<0.0050	n/a	<0.0050	<0.0050	n/a
Ammonia Nitrogen	mg/L	0.032	0.036	11.1	0.044	0.037	18.9	<0.020	<0.020	n/a
Nitrate Nitrogen	mg/L	0.028	0.032	12.5	<0.050	<0.050	n/a	0.0348	0.0261	33.3
Arsenic, Total	mg/L	0.00021	<0.00020	n/a	<0.00020	<0.00020	n/a	<0.00020	0.00024	n/a
Copper, Total	mg/L	0.000295	0.000240	22.9	0.000376	0.000424	11.3	0.000321	0.000305	5.2
Cyanide, Total	mg/L	<0.0050	<0.0050	n/a	0.0058	0.0444	86.9	<0.0050	<0.0050	n/a
Lead, Total	mg/L	0.000241	0.000166	45.2	0.000409	0.000415	1.4	0.000062	0.000078	20.5
Nickel, Total	mg/L	0.000673	0.000601	12.0	0.000819	0.000807	1.5	0.000460	0.000412	11.7
Zinc, Total	mg/L	0.0136	0.0127	7.1	0.0185	0.0179	3.4	0.00165	0.00122	35.2
Total Suspended Solids	mg/L	<3.0	4.0	n/a	<3.0	<3.0	n/a	<3.0	<3.0	n/a
Radium-226 (a,b)	Bq/L	<0.0050	0.0050	n/a	<0.0050	0.009	n/a	0.0060	<0.0050	n/a
pH	pH units	7.62	7.49	1.7	7.58	7.59	0.1	7.80	7.89	1.1
Salinity	o/oo	<1.0	<1.0	n/a	<1.0	<1.0	n/a	4.6	4.6	0.0
Calcium, Total	mg/L	16.5	19.1	13.6	21.4	21.1	1.4	58.1	57.6	0.9
Magnesium, Total	mg/L	24.0	24.6	2.4	32.3	31.9	1.3	172	169	1.8

Notes

[1]QAQC samples were collected during each EEM monitoring event. At least one field duplicate and/or one blank sample was collected during each event.

[2]RPD = Relative Percent Difference = [Absolute value (DUP-ORIG)/ORIG]*100%

Cells in grey shading have RPD values >50% for co-located field duplicates

[3]Distilled water from onsite distiller, stored for 1 year in jerry cans onsite.

[4]Commercial distilled water transported to mine site.

QAQC Results

A total of 3 duplicate samples and 5 blank samples were collected during the 2005 EEM program at Polaris mine. All RPD values were less than 50%, with the exception of one measurement of cyanide on July 16, 2005. Cyanide is not used in the process and is typically measured at less than the detection limit. With the exception of the aforementioned cyanide measurement, which is questionable, the data generally indicate good reproducibility between co-located field duplicates (i.e., low measurement and analytical variability).

Blank samples from the on-site distilled water that had been stored indicated relatively high levels of zinc, copper, and lead. This contamination was considered to be a result of the storage procedure and metal leaching from the metal jerry cans that the water was stored in for the year. The transport blanks using commmercial distilled water indicated low concentrations of all paramters (i.e., typically less than, or slightly higher than detection limits), which reveals no background contamination issues with the analysis.

Table 5. 2005 3rd Quarter Polaris Mine QAQC Sample Results[1] Including Field Duplicates, Field Blanks, and Transport Blanks.

Sample Type:		Field Blank	Field Blank	Field Blank	ALS Travel Blank	ALS Travel Blank
Sample ID:						
Location:		n/a	n/a	n/a	n/a	n/a
Description:		Distilled Water[3]	Distilled Water[3]	Distilled Water[3]	Distilled Water[4]	Distilled Water[5]
Sampling Date:		6-Jul-05	16-Jul-05	6-Aug-05	24-Aug-05	24-Aug-05
Parameters	**Parameter Units**					
Hardness	mg/L	3.07	<0.54	0.85	<0.50	<0.50
Alkalinity, Total	mg/L	3.2	<2.0	<2.0	<2.0	<2.0
Aluminum, Total	mg/L	<0.0010	<0.0050	<0.10	<0.0010	<0.0010
Cadmium, Total	mg/L	<0.000050	<0.000020	<0.000050	<0.000020	<0.000050
Iron, Total	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Mercury, Total	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum, Total	mg/L	<0.000050	<0.0050	<0.0050	<0.000050	<0.000050
Ammonia Nitrogen	mg/L	<0.020	<0.020	<0.020	-	-
Nitrate Nitrogen	mg/L	<0.0050	<0.0050	<0.0050	-	-
Arsenic, Total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Copper, Total	mg/L	0.00484	0.00167	0.0244	<0.000050	<0.00010
Cyanide, Total	mg/L	<0.0050	<0.0050	<0.0050	-	-
Lead, Total	mg/L	0.00212	0.00607	0.0445	<0.000050	<0.000050
Nickel, Total	mg/L	<0.00010	<0.000050	<0.00050	<0.000050	<0.00010
Zinc, Total	mg/L	0.0080	0.00440	0.0040	<0.00050	<0.0010
Total Suspended Solids	mg/L	<3.0	<3.0	<3.0	<3.0	<3.0
Radium-226 (a,b)	Bq/L	<0.0050	<0.0050	<0.0050	-	-
pH	pH units	6.27	5.59	6.17	5.51	5.53
Salinity	o/oo	<1.0	<1.0	<1.0	<1.0	<1.0
Calcium, Total	mg/L	1.23	0.084	0.341	<0.050	<0.050
Magnesium, Total	mg/L	<0.10	<0.10	<0.10	<0.050	<0.050

POLARIS MINE – 2005 3rd QUARTER MMER REPORT

APPENDIX A

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/13: 96 hr acute rainbow trout test

APPENDIX B

i. Information specified by Section 8.1 of Reference Method EPS 1/Rm/14: 72 hr acute *Daphnia magna* test

APPENDIX C

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPAW 95-EPA West Coast: 7-day Topsmelt Survival and Growth Tests.

APPENDIX D

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPS 1/Rm/27-EC: 92 hr Echinoderm (sand dollar) Fertilization Test

APPENDIX E

i. Information specified in Schedule 5 of the MMER (June 2002) for Reference Method EPA/600/4-91-003, Method 1009.0: Algae (*Champia parvula*) 7-day Sublethal Growth Tests

APPENDIX F

i. Results of Effluent Characterization, as per Paragraph 15(1)(a)

APPENDIX G

ii. Acute toxicity testing laboratory reports

APPENDIX H

i. Sublethal toxicity testing laboratory reports

APPENDIX I

i. Polaris 2005 Sampling Event Chronology

APPENDIX J

i. Letter from ALS explaining missed holding times for July 6, 2005 sample

APPENDIX A

96-h Acute Rainbow Trout Toxicity Test

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Saturday July 16, 2005 – 0900h
   - Test 2: Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method

- Water was collected from at least 15cm below the surface using a water pump with silicon tubing
- Water was collected from the upstream direction
- The pump was flushed with site water for at least one minute prior to sample collection
- 2 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Test 1
   - Brenda Bolton (Gartner Lee) Test 2

vii. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek_Acute_071605
   - Test 2 – Garrow Creek

viii. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1045h
     Test 2 – Tuesday August 9, 2005 – 1015h

ix. Temperature upon sample receipt at laboratory
   - Test 1 – 12.7 °C
   - Test 2 – 19.0 °C

Section 8.1.2 Test Facilities and Conditions

i. Test type & method
   - 96-hour Rainbow Trout LC_{50}

ii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements

iii. Name and city of testing laboratory

- EVS Environment Consultants, North Vancouver, BC

iv. Source of test species
   - Sun Valley

v. Percent mortality of fish in stock tank(s)
   - Test 1: 0.1%
   - Test 2: 0.1%

vi. Species of test organism
   - Rainbow Trout (*Oncorhynchus mykiss*)

vii. Date and time for start of definitive test
   - Test 1: July 21, 2005 – 1035h
   - Test 2: August 11, 2005 – 1500h

viii. Person(s) performing the test and verifying the results

- Test 1: Marriah Grey, Robert Harrison, Julianna Kalocai
- Test 2: Anja Fouche, Robert Harrison, Julianna Kalocai

ix. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
- Test 1: pH - 7.3, T - 15.0 °C, DO - 10.4 mg/L, C – 1445 µmhos/cm
- Test 2: pH - 7.4, T - 15.0 °C, DO - 10.1 mg/L, C – 2510 µmhos/cm

x. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment

xi. Indication of aeration of test solutions before introduction of fish
- Test 1: 6.5 ± 1 mL/min/L for 30mins
- Test 2: 6.5 ± 1 mL/min/L for 30mins

xii. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- Control (0%) - 10 L (test 1&2)
- 6.25% - 10 L (test 1&2)
- 12.5% - 10 L (test 1&2)
- 25% - 10 L (test 1&2)
- 50% - 10 L (test 1&2)
- 100% - 10 L (test 1&2)

xiii. Measurements of dissolved oxygen, pH and temperature

Sample Collection Date	Test Concentration (% v/v)	Temperature (0hr) (°C)	Temperture (48 hr) (°C)	Dissolved Oxygen (0hr) (mg/L)	Dissolved Oxygen (48hr) (mg/L)	pH (0hr) pH units	pH (48hr) pH units	Conductivity (0hr) umhos/cm
Test 1	0 (Control)	15	15	10.1	9.7	7	6.7	37
16-Jul-05	6.25	15	15	10.1	9.5	7.1	6.8	194
	12.5	15	15	10.1	9.8	7.1	6.8	301
	25	15	15	10.1	9.8	7.1	6.8	418
	50	15	15	10.1	9.8	7.2	6.9	775
	100	15	15	10.2	9.8	7.3	7	1445
Test 2	0 (Control)	15	15	10.1	9.3	7	7	40
19-Aug-05	6.25	15	15	10.1	9.4	7	7	323
	12.5	15	15	10.1	9.4	7	7.1	535
	25	15	15	10.1	9.6	7	7.1	827
	50	15	15	10.1	9.6	7.2	7.2	1373
	100	15	15	10.1	9.7	7.4	7.3	2510

xiv. Number of fish added to each test vessel
- 10 fish/ 10 L vessel (Test 1 & 2)

xv. Mean and range of fork length of control fish at end of test
- Test 1: 30 mm (25 – 33)
- Test 2: 31 mm (27 – 35)

xvi. Mean wet weight of individual control fish at end of the test
- Test 1: 0.29 g (0.20 – 0.37)
- Test 2: 0.33 g (0.22 – 0.46)

xvii. Estimated loading density of fish in test solutions
- Test 1: 0.29 g/L
- Test 2: 0.33 g/L

Section 8.1.3 Results

i. Number of mortalities of fish in each test solution
   - Results were the same for Test 1, and Test 2, except where noted
   - Control (0%) - 0
   - 6.25% - 0
   - 12.5% - 0
   - 25% - 0
   - 50% - 0
   - 100% - 0

ii. Number of control fish showing atypical/stressed behaviour
   - None in Test 1 or Test 2

iii. Mean mortality rate in solutions of effluent and control water
   - Results were the same for Test 1 and Test 2
   - Control (0%) - 0%
   - 6.25% - 0%
   - 12.5% - 0%
   - 25% - 0%
   - 50% - 0%
   - 100% - 0%

iv. Estimate of 96-h LC50 in multi-concentration tests
   - Results were the same for Test 1 and Test 2
   - 96hr LC_{50} concentration > 100% effluent

v. Most recent 96-h LC50 for reference toxicity test(s)
   - Reference toxicity tests for Toxicant: SDS
   - Test 1 & 2: (Jul-12-03) 96-h LC_{50} = 24mg/L SDS, 95% CL = 18-32mg/L

vi. Reference toxicant warning limits (mean +/- 2SD)
   - Reference toxicity tests for Toxicant: SDS
   - Test 1 & 2: 96-h LC_{50} = 29 +/- 12 mg/L SDS

APPENDIX B

72-h Acute *Daphnia magna* Toxicity Test

Section 8.1.1 Effluent

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for monthly acute toxicity testing were collected
   - Test 1: Saturday July 16, 2005 – 0900h
   - Test 2: Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 2 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Test 1
   - Brenda Bolton (Gartner Lee) Test 2

vii. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek_Acute_071605
   - Test 2 – Garrow Creek

viii. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1045h
     Test 2 – Tuesday August 9, 2005 – 1015h

ix. Temperature upon sample receipt at laboratory
   - Test 1 – 12.7 °C
   - Test 2 – 19.0 °C

Section 8.1.2 Test Facilities and Conditions

ii. Test type & method
   - 48-hour *Daphnia magna* LC_{50}

iii. Indications of deviations from requirements in Sections 2 to 7 of Method EPS 1/RM/13
   - No deviations from requirements

iv. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

v. Species of test organism
   - *Daphnia magna*

vi. Date and time for start of definitive test
   - Test 1: July 19, 2005 – 1600h
   - Test 2: August 11, 2005 – 1030h

vii. Person(s) performing the test and verifying the results
   - Test 1: Shiva Behnia, Julianna Kalocai
   - Test 2: Shiva Behnia, Julianna Kalocai

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
   - Test 1: pH - 7.3, T – 21.0 °C, DO - 10.8 mg/L, C – 1566 µmhos/cm
   - Test 2: pH - 7.5, T - 21.0 °C, DO - 10.8 mg/L, C – 2850 µmhos/cm

ix. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment

x. Indication of any adjustment of hardness of effluent sample
- Test 1: No hardness adjustment (initial hardness = 160 mg/L)
- Test 2: No hardness adjustment (initial hardness = 300 mg/L)

xi. Indication of any aeration of sample
- Test 1: 25-50 mL/min/L for 12mins
- Test 2: 25-50 mL/min/L for 15mins

xii. Concentrations and volumes tested
- Concentrations (% effluent volume / total volume) tested and total volumes used for both Test 1 and Test 2 were:
- Control (0%) - 200 mL
- 6.25% - 200 mL
- 12.5% - 200 mL
- 25% - 200 mL
- 50% - 200 mL
- 100% - 200 mL

xiii. Measurements of dissolved oxygen, pH and temperature

Sample Collection Date	Test Concentration (% v/v)	Temperature (0hr) (°C)	Temperture (48 hr) (°C)	Dissolved Oxygen (0hr) (mg/L)	Dissolved Oxygen (48hr) (mg/L)	pH (0hr) pH units	pH (48hr) pH units	Conductivity (0hr) umhos/cm	Hardness (0hr) (mg/L)
Test 1	0 (Control)	20	21	9.1	8.7	7.6	7.6	344	94
16-Jul-05	6.25	20	21	9.1	8.7	7.6	7.6	426	
	12.5	20	21.5	9	8.7	7.6	7.7	505	
	25	20.5	21.5	9	8.7	7.6	7.7	648	
	50	20.5	21	9	8.7	7.4	7.7	954	
	100	21	21.5	8.9	8.7	7.4	7.5	1566	160
Test 2	0 (Control)	20	21	9.1	8.6	7.4	7.6	354	94
19-Aug-05	6.25	20	21	9	8.5	7.4	7.7	505	
	12.5	20.5	21	9	8.5	7.5	7.7	654	
	25	20.5	21	8.9	8.5	7.5	7.7	990	
	50	21	21	8.9	8.5	7.5	7.6	1582	
	100	21	21	8.9	8.5	7.6	7.6	2850	300

xiv. Estimates of time to first brood, average number of neonates per brood, and percent mortality during the seven-day period prior to the test
- Test 1: 8 days to brood, >34 neonates/brood, 0% mortality in 7d prior to test
- Test 2: 7 days to brood, >29 neonates/brood, 0% mortality in 7d prior to test

xv. Number of neonates per test vessel and milliliters of solution per daphnid
- Methods for all tests and dilution series were the same:
- 10 neonates per vessel
- 200 mL of solution per vessel
- 20 mL of solution per daphnid

Section 8.1.3 Results

i. Number of dead and/or immobile daphnids in each test solution including controls
   - Results were the same for Test 1 and Test 2
   - Control (0%) - 0 dead / immobile
   - 6.25% - 0 dead / immobile
   - 12.5% - 0 dead / immobile
   - 25% - 0 dead / immobile
   - 50% - 0 dead / immobile
   - 100% - 0 dead / immobile

ii. For single-concentration test the number of daphnids dead in each of three replicate effluent solutions and in each of three replicate control solutions at end of test. Also report the mean value.
   - Single concentration test was not conducted, dilution series tests were conducted

iii. Estimate of 48-h LC50 and 95% confidence limits in multi-concentration tests, 48-h EC50 for immobilization and 95% confidence limits, indication of statistical method on which results are based.
   - Test 1: 48-h LC_{50} = > 100% effluent
   - Test 2: 48-h LC_{50} = > 100% effluent

iv. Most recent 48-h LC50 for reference toxicant test(s), reference chemical(s), date test initiated, historic geometric mean LC50 and warning limits.
   - Reference toxicity tests for Toxicant: Zinc
   - Test 1: (Jul-19-05) 96-h LC_{50} = 426µg/L Zinc, 95% CL = 362 – 504 µg/L
   - Test 2: (Aug-15-05) 96-h LC_{50} = 481µg/L Zinc, 95% CL = 388 – 597 µg/L

v. Reference toxicant warning limits (mean +/- 2 SD)
   - Reference toxicity tests for Toxicant: Zinc
   - Test 1: 96-h LC_{50} = 445 (+/- 280) µg/L Zinc
   - Test 2: 96-h LC_{50} = 445 (+/- 280) µg/L Zinc

APPENDIX C

7-d Topsmelt Growth and Survival Toxicity Test

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for sublethal toxicity testing were collected:
     Test 1 – Saturday July 16, 2005 – 0900h
     Test 2 – Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water from final discharge point

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 3 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Tests 1
   - Brenda Bolton (Gartner Lee) Test 2

vii. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek_Sublethal_071605
   - Test 2 – Garrow Creek

viii. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1045h
     Test 2 – Tuesday August 9, 2005 – 1015h

ix. Temperature upon sample receipt at laboratory
   - Test 1 – 12.7 °C
   - Test 2 – 19.0 °C

Test Organisms Imported from External Supplier

i. Species of test organism
   - Topsmelt (*Atherinops affinis*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - Aquatic Bio Systems (ABS), Fort Collins, Colorado

iv. Date test species acquired on
   - Test 1 – July 19, 2005
   - Test 2 – August 9, 2005

v. Indications of deviations from EC guidance on the importation of test organisms
   - No deviations from EC requirements

vi. Percent mortality of fish in 24-hour period preceding the test
   - Test 1 - <10% mortality in approximately 450 fish upon receipt
   - Test 2 - <10% mortality in approximately 450 fish upon receipt

vii. Age at start of test
   - Test 1 – 10 days post-hatch
   - Test 2 – 10 days post-hatch

viii. Unusual appearance, behaviour, or treatment of larvae before their use in the test
- Nothing unusual noted for any test

ix. Confirmation that larvae are actively feeding and swimbladders are not inflated
- All tests - Larvae actively feeding and swimbladders not inflated

x. Confirmation that temperature change was <3°C and dissolved oxygen was maintained at >6mg/L during transport
- Temperature change was <2°C and dissolved oxygen supersaturated mg/L during transport

xi. Test organism acclimation rate at the testing laboratory
- For both tests: Organisms were received on the day of set-up
- Organisms were received in holding water conditions of DO=supersaturated, pH = 7.3, T = 21°C, salinity = 33ppt
- Organisms were acclimated to EVS water holding conditions of DO = 7.5 mg/L, pH = 7.8, T=20°C salinity = 28-29ppt,
- Acclimation was conducted in the lab on the day of the test by adding lab seawater at approximately 30 min. intervals. The differences between the water quality upon receipt and EVS holding conditions were minor.

Test Facilities and Conditions

i. Test type & method
- 7-day Topsmelt (*Atherinops affinis*) Survival and Growth Toxicity Test
- Static renewal
- Sample water was renewed daily
- Reference Method - EPA/600/R-95/136 (EPAW 95-EPA West Coast)

ii. Dates or test days during test when subsamples or multiple samples were renewed
- Samples were renewed daily for all tests (Test Day 1,2,3,4,5,6)
- Three subsamples were used on days i) 0-1; ii) 2-3; and iii) 4-5-6-7

iii. Indications of deviations from requirements in Sections 11 of Method EPA/600/R-95/136 (EPAW 95-EPA West Coast)
- No deviations from requirements
- Salinity controls were run
- Sample water salinity for
    - Test 1 was 6 ppt
    - Test 2 was 1.0 ppt

iv. Date and time for start of definitive test
- Test 1 Tuesday July 19, 2005 – 1430h
- Test 2 Tuesday August 9, 2005 – 1500h

v. Date for test completion
- Test 1 July 26, 2005
- Test 2 August 16, 2005

vi. Test vessel description
- For all tests was a 600mL beaker

vii. Person(s) performing the test and verifying the results
- Test 1: Testing and overall setup conducted by: Jenny Shao and QA/QC by: Julianna Kalokai
- Test 2: Testing and overall setup conducted by: Jenny Shao and QA/QC by: Julianna Kalokai

viii. pH, temperature, dissolved oxygen, and conductivity of unadjusted, undiluted effluent
- Test 1: pH 7.7, T 20.0 °C, DO 11.1 mg/L, C 1520 µmhos/cm
- Test 2: pH 7.7, T 20.0 °C, DO 9.8 mg/L, C 2700 µmhos/cm

ix. Confirmation that no adjustment of sample or solution pH occurred
- For both tests, no pH adjustment

x. Indication of aeration of test solutions before introduction of fish
- For both tests, no pre-aeration was conducted, none was required

xi. Indication that EC guidance document for salinity adjustment was followed
- The following was done for all 3 tests:
    - No deviations from EC guidance document on preparation of hypersaline brine (HSB)
    - HSB prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
    - No deviations from EC guidance document for salinity adjustment of sample
    - HSB was added to samples to salinity adjust them to ~30ppt
    - For a 200mL volume the concentrations were prepared by adding:
        - Test 1: 143mL of effluent + 57mL of HSB for the highest concentration. This solution was then diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions).
        - Test 2: 135mL of effluent + 65mL of HSB for the highest concentration. This solution was then diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions).

xii. Type and source of control/dilution water
- For all 3 tests, control/dilution water was UV-sterilized, 0.45μm-filtered natural seawater from the Vancouver Aquarium

xiii. Concentrations and volumes tested:
- Concentrations (% effluent volume / total volume) tested and total volumes used were:
- For Test 1:
    - Control (0%) - 200 mL
    - Salinity Control (0%) - 200 mL
    - 4.5% - 200mL
    - 8.9% - 200mL
    - 17.9% - 200mL
    - 35.7% - 200mL
    - 71.4% - 200mL
- For Test 2:
    - Control (0%) - 200 mL
    - Salinity Control (0%) - 200 mL
    - 4.2% - 200mL
    - 8.4% - 200mL
    - 16.9% - 200mL
    - 33.7% - 200mL
    - 67.4% - 200mL

xiv. Number of replicated per concentration
- For both tests: 5 replicates per concentration

xv. Number of organisms added to each test vessel
- For both tests: 5 fish per vessel

xvi. Manner and rate of exchange of test solutions
- For both tests: Daily renewal

xvii. Measurements of dissolved oxygen, pH and temperature, and salinity for each 24 hr period

- Test 1: See attached photocopied pages 1 and 2 of original laboratory report
- Test 2: See attached photocopied pages 3 and 4 of original laboratory report

Results

i. Number and % of mortalities of fish in each test solution. Note that this data is presented in units of number of SURVIVORS and % MORTLITY. (Data is entered from original handwritten tables in lab reports)

- Test 1: Totals from all 5 replicates are presented:

Concentration		Number of Survivors - Day of Test							% Mortality on the Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Brine	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Control	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
4.5%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
8.9%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20
17.9%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
35.7%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
71.4%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0

- Test 2: Totals from all 5 replicates are presented:

Concentration		Number of Survivors - Day of Test							% Mortality - Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Control	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0

Concentration		Number of Survivors - Day of Test							% Mortality - Day of Test						
(% effluent v/v)	Replicate	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	B	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20
Brine	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
Control	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	E	5	5	4	4	4	4	3	0	0	20	0	0	0	20
4.2%	A	5	5	4	4	4	4	4	0	0	20	0	0	0	20
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	4	4	4	4	4	4	0	20	0	0	0	0	0
	E	5	4	4	4	4	4	4	0	20	0	0	0	0	0
8.4%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	D	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
16.9%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	4	4	4	4	4	0	0	20	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	4	4	4	4	3	0	0	20	0	0	0	20
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20
33.7%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	C	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	D	5	5	4	4	4	4	4	0	0	20	0	0	0	0
	E	5	5	5	5	5	5	5	0	0	0	0	0	0	0
67.4%	A	5	5	5	5	5	5	5	0	0	0	0	0	0	0
	B	5	4	4	4	4	4	4	0	20	0	0	0	0	0
	C	5	5	5	5	5	5	3	0	0	0	0	0	0	40
	D	5	5	5	5	5	5	4	0	0	0	0	0	0	20
	E	5	5	5	5	5	5	4	0	0	0	0	0	0	20

ii. Average dry weight (mg) per original fish in test vessel. No preservation of fish was used. Fish were dried and then weighed.

- Test 1: Mean dry weight (mg) of each replicate and overall means are presented:

Concentration	Replicate					Overall Mean	Standard Deviation
(% effluent v/v)	1	2	3	4	5		
D-Control	0.9600	1.0480	0.7560	1.0100	0.8060	0.9160	0.1284
B-Control	1.0780	1.1300	1.0720	0.9420	0.6900	0.9824	0.1775
4.5	0.7320	0.6840	0.9000	0.5200	1.0080	0.7688	0.1903
8.9	1.0120	1.1320	0.9960	0.5400	0.3960	0.8152	0.3253
17.9	0.9600	1.0280	0.9220	1.2440	0.9020	1.0112	0.1387
35.7	0.8420	1.2900	1.2400	0.9640	0.9900	1.0652	0.1916
71.4	1.2300	0.6620	0.9660	1.1000	0.5680	0.9052	0.2828

- Test 2: Mean dry weight (mg) of each replicate are presented:

Concentration	Replicate						
(% effluent v/v)	1	2	3	4	5	Overall Mean	Standard Deviation
D-Control	0.8000	0.6080	1.0980	0.7760	0.5640	0.7692	0.2105
B-Control	0.8380	1.0760	0.9920	0.8020	0.8620	0.9140	0.1155
4.2	0.8120	0.9280	0.9700	1.0420	0.5720	0.8648	0.1837
8.4	0.8980	0.8560	0.7120	1.0200	1.0200	0.9012	0.1285
16.9	0.9820	0.8880	0.6860	0.5780	0.6420	0.7552	0.1718
33.7	0.7260	0.9700	0.7060	0.6300	0.7240	0.7512	0.1284
67.4	1.0340	0.8380	0.6120	0.8640	0.7040	0.8104	0.1615

iii. Estimate of 7-d LC_{50} (95% CL)

- Test 1: 7-d LC_{50} concentration > 71.4% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 2: 7-d LC_{50} concentration > 67.4% effluent (highest concentration tested due to dilution for salinity adjustment)
- Quantal statistic methods not applicable

iv. Estimate of 7-d IC_{25} (95% CL) for growth

- Test 1: 7-d IC_{25} concentration > 71.4% effluent (highest concentration tested due to dilution for salinity adjustment)
- Test 2: 7-d IC_{25} concentration > 67.4% effluent (highest concentration tested due to dilution for salinity adjustment)

v. Current reference toxicity tests (95% CL) for 7-d LC_{50} for survival and 7-d IC_{50} for growth

- Test 1 :Reference toxicity tests for Toxicant: Copper
    - Test conducted on July 19, 2005, same day as effluent test
    - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
    - 7-d LC_{50} survival = 117 mg/L Cu, 95% CL = 100-136 mg/L
    - 7-d IC_{50} growth = 116 mg/L Cu, 95% CL = 81-156 mg/L
- Test 2 :Reference toxicity tests for Toxicant: Copper
    - Test conducted on August 9, 2005, same day as effluent test
    - Reference toxicant test was conducted on the same batch of externally supplied topsmelt used in the effluent test and under the same experimental conditions as the effluent test
    - 7-d LC_{50} survival = 103 mg/L Cu, 95% CL = 91-118 mg/L
    - 7-d IC_{50} growth = 95 mg/L Cu, 95% CL = 75-127 mg/L

vi. Reference toxicity warning limits (+/- SD) for 7-d LC_{50} for survival and 7-d IC_{50} for growth

- Test 1: Reference toxicity tests for Toxicant: Copper
    - 7-d LC_{50} survival = 133 ± 39mg/L Cu
    - 7-d IC_{50} growth = 132 ± 46mg/L Cu
- Test 2: Reference toxicity tests for Toxicant: Copper
    - 7-d LC_{50} survival = 132 ± 40mg/L Cu,
    - 7-d IC_{50} growth = 133 ± 40mg/L Cu

APPENDIX D

92-h Echinoderm Fertilization Test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75^{o} 22' 32" N, 97^{o} 48' 37" W.

ii. Date & time of sampling
   - Samples for sublethal toxicity testing were collected:
     Test 1 – Saturday July 16, 2005 – 0900h
     Test 2 – Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 4 x 20L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Tests 1
   - Brenda Bolton (Gartner Lee) Test 2

x. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek_Sublethal_071605
   - Test 2 – Garrow Creek

xi. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1045h
     Test 2 – Tuesday August 9, 2005 – 1015h

xii. Temperature upon sample receipt at laboratory
   - Test 1 – 12.7 °C
   - Test 2 – 19.0 °C

Test Organisms

i. Species of test organism
   - Sandollar Echinoid (*Dendraster excentricus*)

ii. Name and city of testing laboratory
   - EVS Environment Consultants, North Vancouver, BC

iii. Source of test species
   - Westwind Sealab, Victoria BC
   - All adults providing gametes are from the same population and source
   - Gametes are spawned in-house at EVS

iv. Date test species acquired on
   - Test 1: July 19, 2005
   - Test 2: August 9, 2005

v. Holding time and conditions for adults
   - Test 1: Adults received at the testing laboratory the day of the test.
   - Test 2: Adults received at the testing laboratory the day of the test.

vi. Indications of deviations from EC guidance on the importation of test organisms
   - Test 1: No deviations from EC requirements
   - Test 2: No deviations from EC requirements

vii. Weekly percent mortality of adults being held over 7d preceding test

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- Test 1: <2% per day over the 7 days preceding the test
- Test 2: <2% per day over the 7 days preceding the test

viii. Age of test organisms
- Test 1: < 4 hours after spawning
- Test 3: < 4 hours after spawning

ix. Unusual appearance, behaviour, or treatment of adults or gametes before test start, or anything unusual about the test
- Test 1: Organisms appear healthy, in good condition, nothing unusual about test organisms or test
- Test 2: Organisms appear healthy, in good condition, nothing unusual about test organisms or test

Test Facilities and Conditions

i. Test type & method
- Echinoderm (*Dendraster excentricus*) Fertilization Toxicity Test
- Static
- Reference Method – EPS/1/RM/27 with 1997 amendments

ii. Test duration
- Test 1: 10:10 min (10min sperm + 10min sperm & egg)
- Test 2: 10:10 min (10min sperm + 10min sperm & egg)

iii. Date and time for start of definitive test
- Test 1: Tuesday July 19, 2005 – 1514h
- Test 2: Tuesday August 9, 2005 – 1723h

iv. Test vessel description
- Test 1: 16 x 125mm test tubes
- Test 2: 16 x 125mm test tubes

v. Person(s) performing the test and verifying the results
- Test 1: Testing by Shawn Seguin; QA/QC reviewed by Julianna Kalokai.
- Test 2: Testing by Shawn Seguin; QA/QC reviewed by Julianna Kalokai.

vi. Indication of rate and duration of pre-aeration of test solutions before initiation of test
- Test 1: No pre-aeration
- Test 2: No pre-aeration

vii. Confirmation that no adjustment of sample or solution pH occurred
- Test 1: No pH adjustment
- Test 2: No pH adjustment

viii. Procedure for sample filtration
- Test 1: No sample filtration
- Test 2: No sample filtration

ix. Procedure for preparation of hypersaline brine (HSB) as per EC guidance document on salinity adjustment – July 1997

- Test 1: Hypersaline brine (HSB) was prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine). HSB was added to samples to salinity adjust them to 30ppt. For a 10mL volume the concentrations were prepared by adding 7.28mL of effluent + 2.72mL of HSB for the highest concentration. This solution was diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions). No deviations from EC guidance document (July 1997) for salinity adjustment of sample.
- Test 2: Hypersaline brine (HSB) was prepared from natural seawater concentrated to 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine). HSB was added to samples to salinity adjust them to 30ppt. For a 10mL volume the concentrations were prepared by adding 7.13mL of effluent + 2.87mL of HSB for

the highest concentration. This solution was diluted using natural seawater for the lower test concentrations (i.e., 50% of the highest concentration + 50% of the dilution water, repeated for subsequent dilutions). No deviations from EC guidance document (July 1997) for salinity adjustment of sample.

x. Procedure for salinity adjustment as per EC guidance document on salinity adjustment – July 1997
- No deviations from EC guidance for salinity adjustment
- Test 1: salinity adjusted from 3.0 to 28 ppt
- Test 2: salinity adjusted from 1.0 to 29 ppt

xi. Type and source of control/dilution water
- Test 1: UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium
- Test 2: UV-sterilized, 0.45µm-filtered natural seawater from the Vancouver Aquarium

xii. Concentrations and volumes tested
- Test 1: Concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 10mL
    - Salinity Control (0%) - 10mL
    - 4.6% - 10mL
    - 9.1% - 10mL
    - 18.2% - 10mL
    - 36.4% - 10mL
    - 72.8% - 10mL
- Test 2: Concentrations (% effluent volume / total volume) tested and total volumes used were:
    - Control (0%) - 10mL
    - Salinity Control (0%) - 10mL
    - 4.5% - 10mL
    - 8.9% - 10mL
    - 17.8% - 10mL
    - 35.6% - 10mL
    - 71.3% - 10mL

xiii. Number of replicated per concentration
- Test 1: 4 replicates per treatment concentration
- Test 2: 4 replicates per treatment concentration

xiv. Number of organisms per container
- Test 1: 2000 eggs per vessel (100 counted)
- Test 2: 2000 eggs per vessel (100 counted)

xv. Measurements of pH and dissolved oxygen in sample water before use
- Test 1: pH 8.2, DO 8.5
- Test 3: pH 8.3, DO 8.5

xvi. Measurements of pH, temperature, dissolved oxygen, and salinity during test
- Test 1: pH – 7.9 – 8.3, T - 15.0°C, DO - 8.5mg/L, salinity - 28ppt
- Test 2: pH – 7.5 – 8.4, T - 15.0°C, DO – 7.8 – 8.5mg/L, salinity - 29ppt

Results

i. Number and % of fertilized eggs in each test concentration
- Test 1: (Number is equal to percent since totals were 100)
    - Control (0%): # Fert = 64, 60, 66, 69
    - 4.6%: # Fert = 56, 51, 52, 53
    - 9.1%: # Fert = 39, 37, 37, 36
    - 18.2%: # Fert = 33, 28, 29, 30
    - 36.4%: # Fert = 39, 39, 37, 36

Reporting Requirements for Reference Method EPS1/RM/27-EC 92 (Sperm Cell)

- 72.8%: # Fert = 20, 16, 21, 21

- Test 2: (Number is equal to percent since totals were 100)
  - Control (0%): # Fert = 88, 81, 85, 86
  - Salinity Control: # Fert = 91, 86, 85, 87
  - 4.5%: # Fert = 82, 80, 79,78
  - 8.9%: # Fert = 76, 77, 77, 76
  - 17.8%: # Fert = 64, 59, 63, 61
  - 35.6%: # Fert = 50, 54, 54, 53
  - 71.3%: # Fert = 37, 40, 37,35

ii. Estimate of IC_{25} (95% CL) for fertilization success

- Test 1: IC_{25} concentration = 5.2 (4.4 – 6.0)% v/v effluent
- Test 2: IC_{25} concentration = 15.6 (13.6 – 18.3)% v/v effluent
- Quantitative statistic used to generate IC_{25} values was log-linear interpolation (200 resamples) calculated in ToxCalc v5.0.23 (for both Test 1 and Test 2)

iii. Current reference toxicity tests (95% CL) for IC_{50} for fertilization

- Test 1: Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test conducted on July 19, 2005, same day as effluent test
  - Reference test conducted under same conditions
  - IC_{50} for fertilization = 5.8 mg/L SDS, 95% CL = (5.2 – 6.5)mg/L
- Test 2: Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test conducted on August 9, 2005, same day as effluent test
  - Reference test conducted under same conditions
  - IC_{50} for fertilization = 3.9 mg/L SDS, 95% CL = (3.6 – 4.1) mg/L

iv. Reference toxicant warning limits (+/- 2SD) for IC_{50} for fertilization

- Test 1: 3.6 +/- 4.4 mg/L SDS
- Test 2: 3.9 +/- 4.3 mg/L SDS

APPENDIX E

7-d Sublethal *Champia* (Algae) Toxicity Test

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

Effluent Sample

i. Name & location of operation generating the effluent
   - Polaris Mine, Little Cornwallis Island, Nunavut
   - Final Discharge Point for Garrow Lake is geo referenced as 75° 22' 32" N, 97° 48' 37" W.

ii. Date & time of sampling
   - Samples for yearly sublethal toxicity testing were collected:
     Test 1 – Saturday July 16, 2005 – 0900h
     Test 2 – Saturday August 6, 2005 – 1000h

iii. Type of sample
   - Final effluent water

iv. Brief description of sampling point
   - 20m downstream of the siphon discharge point at Garrow Lake dam

v. Sampling method
   - Water was collected from at least 15cm below the surface using a water pump with silicon tubing
   - Water was collected from the upstream direction
   - The pump was flushed with site water for at least one minute prior to sample collection
   - 1 x 4L sample bottles were filled

vi. Name of person submitting samples
   - Blake Hamer (Gartner Lee) Tests 1
   - Brenda Bolton (Gartner Lee) Test 2

vii. Temperature of water upon receipt at lab
   - Test 1: 18°C
   - Test 2: 22°C

xiii. Labeling/coding of sample (Sample IDs)
   - Test 1 – G-Creek Sublethal 071605
   - Test 2 – Garrow Creek

xiv. Date & time of sample receipt
   - Samples for sublethal toxicity testing were received:
     Test 1 – Tuesday July 19, 2005 – 1300h
     Test 2 – Tuesday August 9, 2005 – 0900h

Test Organisms

i. Species of test organism
   - Algae (*Champia parvula*)

ii. Name and city of testing laboratory
   - Test 1: Stantec Consulting Ltd, Guelph Ontario
   - Saskatchewan Research Council [SRC], Saskatoon, SK

iii. Source of test species and health of organisms
   - Test 1
     - Source was Stantec in-house culture
     - Batch number CH05-07
     - Sexually mature male and female branches
     - Females have trichogynes, males have sori with spermatia
     - No organisms exhibiting unusual appearance, behaviour or undergoing unusual treatment were used in the test
   - Test 2
     - Sexually mature male and female branches
     - Obtained from USEPA, Hatfield Marine Science Center, Newport Oregon, 1995
     - Appear in excellent health, nothing unusual

- Females have trichogynes, males have sori with spermatia

iv. Any unusual appearance, behaviour, or treatment of test organisms, before their use in test
- Test 1 and Test 2
  - Nothing unusual about the appearance, behaviour, or treatment of test organisms, before their use in test; everything is normal
  - Nothing unusual about the tests

Test Facilities and Conditions

i. Test type & method
- Test 1:
- Test of Sexual Reproduction using the Red Macroalga *Champia parvula*, EPA-821-R-02-014, October 2002 Method 1009.0, with Canadian adaptations (Environment Canada 1998, 1999)
- Static, non-renewal
- 48-hour exposure, followed by 7 day recovery period for cystocarp development
- Test 2:
- Test of Sexual Reproduction using the Red Macroalga *Champia parvula*, Reference Method - EPA/600/4-91/003, Method 1009.0
- Static, non-renewal
- 2 day exposure, followed by 5-7 day recovery period for cystocarp development

ii. Date and time for start of definitive test
- Test 1: Tuesday July 19, 2005 17:45h
- Test 3: Tuesday August 9, 2005 – time not noted but lab notes state tests started within 72 hrs of collection

xviii. Date for test completion
- Test 1 – July 28, 2005
- Test 2 – August 16, 2005

iii. Test vessel description
- Test 1: 270mL transparent polystyrene cups with polystyrene lids
- Test 2: 270mL transparent polystyrene cups with polystyrene lids

iv. Person(s) performing the test and verifying the results
- Test 1: E. Jonczyk/ K. Johnson
- Tests 2: Mary Moody

v. Indication of pre-aeration of test solutions
- Test 1: No pre-aeration
- Test 2: No pre-aeration

vi. Confirmation that no pH adjustment of sample or solution occurred
- Test 1: No pH adjustment
- Test 2: - No pH adjustment

vii. Indication that EC guidance document for salinity adjustment was followed
- Test 1:
  - No deviations from EC guidance document on preparation of hypersaline brine (Environment Canada Salinity Adjustment Guidance Document, revised Dec. 2001)
  - HSB prepared from natural seawater at 90ppt (by filtering to at least 10 μm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
  - No deviations from EC guidance document for salinity adjustment of sample
  - Salinity adjustment (for a 1000mL volume): 660mL effluent + 330mL HSB + 10mL test nutrient solution

- Salinity of samples adjusted from 0ppt to 32ppt

- Test 2:
  - No deviations from EC guidance document on preparation of hypersaline brine (May 2001)
  - HSB prepared from natural seawater at 90ppt (by filtering to at least 10 µm before placing it into the freezer and then freezing/refreezing to remove frozen layer and concentrate salts in the hypersaline brine)
  - No deviations from EC guidance document for salinity adjustment of sample
  - Salinity adjustment: 600mL effluent + 260mL HSB + 8.6 ml test nutrient solution

Salinity of samples adjusted from 2ppt to 30ppt

viii. Type and source of control/dilution water

- Test 1:
  - Natural seawater collected from Pointe-du-Chene in Shediac Bay, New Brunswick.
  - No chemicals added.
  - Filtered to 0.45µm prior to use
- Test 2
  - Natural seawater collected at the Pacific Environmental Center, Environment Canada, North Vancouver, BC
  - Filtered to 0.2µm and autoclaved prior to use
  - Salinity adjusted as per EC guidance document to 30ppt with HSB from the same source

ix. Type and quantity of any chemicals added to the control dilution water

- Test 1: No chemicals added to dilution water. 10 mL of test nutrients.
- Test 3: No chemicals added. Test nutrients as described in Test Method USEPA/600/4-91/003, Method 1009.0 were added at concentration of 10mL/L, analytical grade, 8.6 mL added

x. Concentrations and volumes of test solutions

- Concentrations (% effluent volume / total volume) tested and total volumes used were:

- Tests 1:
  - Control (Natural Seawater) (0%) - 100mL
  - Salinity Control Brine (0%) - 100mL
  - 2.1% - 100mL
  - 4.4% - 100mL
  - 8.3% - 100mL
  - 16.5% - 100mL
  - 33% - 100mL
  - 66% - 100mL
- Tests 2:
  - Control (Natural Seawater) (0%) - 100mL, 4.5cm depth
  - Salinity Control Brine (0%) - 100mL, 4.5cm depth
  - 4.38% - 100mL, 4.5cm depth
  - 8.75% - 100mL, 4.5cm depth
  - 17.5% - 100mL, 4.5cm depth
  - 35% - 100mL, 4.5cm depth
  - 70% - 100mL, 4.5cm depth

xi. Number of replicates per concentration

- Tests 1& 2: 3 replicates per concentration

xii. Number of organisms per test chamber

- Tests 1 & 2: 5 female branches + 2 male branches per chamber

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

xiii. Measurements of pH, temperature, dissolved oxygen, and salinity of sample before use
- Test 1 (unadjusted effluent): pH – 8.0, T – 22.0 °C, DO – 10.2mg/L, salinity - 0ppt
- Test 1 (before use): pH – 8.0, T – 22.5 °C, DO – 7.0mg/L, salinity - 32ppt
- Test 2 (unadjusted sample): pH - 7.75, T – 23.0 °C, DO – 8.6mg/L, salinity - 2ppt
- Test 2 (before use): pH – 8.35, T – 23.0 °C, DO – 7.6mg/L, salinity - 30ppt

xiv. Measurements of pH, temperature, dissolved oxygen, and salinity of test solution and controls at 0hr, 48hr, and the beginning and end of recovery period
- Test 1: See attached photocopied page 5 of original laboratory report
- Test 2: See attached photocopied pages 6 of original laboratory report

Results

i. Number and % mortality of female plants after recovery in each test solution
- Totals from all 3 replicates are presented:
- Test 1:
  - Control (0%): 0 (0%) mortality
  - Salinity Control (0%): 0 (0%) mortality
  - 2.1%: 0 (0%) mortality
  - 4.4%: 0 (0%) mortality
  - 8.3%: 0 (0%) mortality
  - 16.5%: 0 (0%) mortality
  - 33%: 0 (0%) mortality
  - 66%: 0 (0%) mortality
- Test 2:
  - Control (0%): 0 (0%) mortality
  - Salinity Control (0%): 0 (0%) mortality
  - 4.38%: 0 (0%) mortality
  - 8.75%: 0 (0%) mortality
  - 17.5%: 0 (0%) mortality
  - 35%: 0 (0%) mortality
  - 70%: 0 (0%) mortality

ii. Mean number of cystocarps per plant in each replicate of each test concentration
- Test 1: (Replicates are A, B, and C)
  - Control (0%): A) 26.8, B) 27.2, C) 26.4
  - Salinity Control (0%): A) 27.6, B) 27.4, C) 28.4
  - 2.1%: A) 29.4, B) 29.0, C) 30.0
  - 4.4%: A) 26.2, B) 26.8, C) 27.4
  - 8.3%: A) 27.6, B) 27.2, C) 28.0
  - 16.5%: A) 25.4, B) 26.4, C) 26.6
  - 33%: A) 18.4, B) 15.0, C) 18.4
  - 66%: A) 0.4, B) 0.2, C) 0.2
- Test 2: (Replicates are A, B, and C)
  - Control (0%): A) 104.0, B) 74.2, C) 79.6
  - Salinity Control (0%): A) 103.8, B) 84.6, C) 99.0
  - 4.38%: A) 89.8, B) 70.0, C) 82.6
  - 8.75%: A) 86.6, B) 98.4, C) 93.6
  - 17.5%: A) 95.6, B) 94.0, C) 88.4
  - 35%: A) 91.8, B) 88.8, C) 67.2
  - 70%: A) 35.0, B) 36.6, C) 28.4

Reporting Requirements for Reference Method EPA/600/4-91-003, Method 1009.0 (*Champia*)

iii. Estimate of IC_{25} (95% CL) for cystocarp development

- Test 1: IC_{25} concentration = 24.6 (22.2 – 27.2)% effluent v/v
- Quantal statistic method was linear interpolation determined using ToxStat 3.5
- Test 2: IC_{25} concentration = 45.3 (27.5 – 52.4)% effluent v/v
- Quantal statistic method was linear interpolation (200 resamples) determined using ToxCalc v5.0.23

iv. Current reference toxicity tests (95% CL) for IC_{50} for cystocarp development

- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
  - Test 1: Test conducted on July 19, 2005, same day as effluent test
    - Reference toxicant test was conducted under the same experimental conditions as the effluent test
    - IC_{50} cystocarp development = 0.134 mg/L SDS, 95% CL = (0.123 – 0.143) mg/L
  - Test 2: Test conducted on August 17, 2005, within 30 days of effluent test
    - Reference toxicant test was conducted under the same experimental conditions as the effluent test
    - IC_{50} cystocarp development = 1.31mg/L SDS, 95% CL = (1.20 - 1.41) mg/L

v. Reference toxicant warning limits (+/- 2SD) for IC_{50} for cystocarp development

- Reference toxicity tests for Toxicant: Sodium Dodecyl Sulfate
- Test 1: 0.155 (0.112 – 0.216) mg/L SDS
- Test 2: 1.41 (1.15 – 1.74) mg/L SDS

Pages 1 to 6 inclusive are included in the hardcopy sent in the mail. This data can also be found in the original lab reports in Appendix H.

APPENDIX F

Results of Effluent Characterization as per Paragraph 15(1)(a)

RESULTS OF EFFLUENT CHARACTERIZATION

AS PER PARAGRAPH 15(1)(a)

Nine MMER effluent samples were collected during the 3nd Quarter of 2005 between July 6, 2005 and August 27, 2005. "Quarterly" EEM samples were collected from the effluent, exposure, and reference stations on July 16, 2005 and August 6, 2005 and analyzed for a wider suite of elements, as per the guidance document. Monthly loadings of metals to Garrow Bay were calculated based on average weekly discharge volumes from Garrow Lake to Garrow Bay via the creek outflow. The August 6, 2005 effluent volume discharge is estimated and will be finalized by Teck Cominco.

Holding times for nitrate and alkalinity were missed during the July 6, 2005 event due to an oversight by the laboratory. The oversight is explained in Appendix I and is not likely to influence results. A quarterly event with toxicity testing was planned for this event; however, due to a delay in shipment because of weather conditions at the mine site, toxicity samples missed holding times and were discarded at the labs. The parameters that missed holding times were "quarterly" parameters, and additional measurements were taken on July 16, 2005, corresponding to acute and sublethal toxicity testing.

Due to the high Arctic, remote location of the mine, travel into or out of the mine site can be hazardous due to weather conditions such as fog and snow. As the mine has ceased operations and little infrastructure exists onsite, sampling this season was conducted by small field crews stationed onsite, or by flying technicians in on a weekly basis to collect the MMER samples. In August and September, several planned MMER sampling attempts did not proceed due to hazardous weather conditions that prevented flights from getting into the mine site or from departing Resolute Bay. MMER samples were collected at the next possible time, and Ken Russell and Jenny Ferone were kept informed of this situation. The 2005 sampling chronology is presented in Appendix I. The last sample was collected on August 27, 2005. After this event, the mine was inaccessible due to weather until September 13, 2005, when Garrow Creek (final discharge point) was frozen with no discharge.

There were no exceedances of any Schedule 4 discharge limits during the quarter.

Water samples for acute and sublethal toxicity testing were collected using a pump system from about 20 m downstream of the historic dam location on Garrow Lake, within the main flow of the creek. Acute Lethality Testing was conducted on samples collected July 16, 2005 and August 6, 2005. There were no adverse effects observed for either the 96-hr Rainbow Trout toxicity test, or the 48-hr *Daphnia magna* toxicity test. LC_{50} values were >100% effluent for both species in all testing events.

Sublethal Toxicity Testing was conducted on samples collected July 16, 2005 and August 6, 2005. As this is considered a marine discharge, marine species were used for sublethal testing following brine adjustment of the brackish effluent (as per EC test protocols). Testing for fish (7-d Topsmelt growth and survival) and invertebrates (Sand dollar) was conducted at EVS Environment Consultants, Vancouver, BC, while algae (48-h *Champia*) testing was undertaken at Stantec Guelph, ON, for the July test, and at the Saskatchewan Research Council, Saskatoon SK, for the August test.

There were no effects observed in the Topsmelt Survival and Growth Test at the highest concentrations tested (>71.4%, and >67.4% effluent v/v).

Sublethal effects were observed for the echinoid and algal species in both tests. In the echinoid *(Dendraster excentricus)* fertilization test,

- the IC_{25}'s were 5.2, and 15.6% v/v, and
- the IC_{50}'s were 13.2, and 55% v/v

In the *Champia parvula* sexual reproduction test

- the IC_{25}'s were 24.6, and 45.3% v/v,
- the IC_{50} was 61.4% v/v in the second test (not reported in the first test).

Zinc is the primary contaminant of potential concern (COPC) identified in mine effluent. Concentrations of zinc during 2005 averaged 39 µg/L and ranged between 13 and 91 µg/L, which are well below the MMER effluent limit of 500µg/L. These concentrations are also lower than those measured in 2003, 128µg/L (range 48 – 186µg/L), and in 2004, 72 µg/L (range 35 – 198 µg/L), and show a decreasing pattern over the last three years. Note the CCME guideline for zinc is 30 µg/L and the BC AWQG guidelines are 7.5 and 33 µg/L, for the chronic and acute guidelines, respectively. Concentrations of zinc in Polaris mine effluent were not substantially higher than these guidelines in 2005.

On July 16, 2004 and August 6, 2005, the concentrations of zinc in the effluent were 17.9 and 35.6 µg/L, respectively. The echinoid test endpoints converted into concentrations of zinc results in values of 0.93 and 5.5 µg Zn/L for the IC_{25}'s, and 2.4 and 19.6 µg Zn/L for the IC_{50}. Reference toxicity tests of zinc on *Dendraster* fertilization give mean EC_{50} concentrations of 8.5 – 60 µg Zn/L (Dinnel et al. 1983). The reported range of *Dendratster* EC_{50}'s correspond to the August 6, 2005 IC_{50} of 19.6 µg Zn/L. The IC_{50} zinc concentration in the July 16, 2005 sample is lower than the literature EC_{50}'s and may indicate that other substances in the effluent were contributing to the sublethal effects in this sample. The echinoid test is quite sensitive to zinc, with IC25 (converted) zinc concentrations being less than the BC AWQG chronic guideline of 7.5 µg/L.

Endpoints for the *Champia* test in terms of zinc concentrations were 4.4 and 16.1 µg Zn/L (IC_{25}'s), and 21.9 µg Zn/L (IC_{50} in the August 6, 2005 sample). The reference IC_{25} endpoint for zinc in the *Champia* test performed in-house at SRC, reported in 2003, was 27 µg Zn/L (95% confidence limits 16-42µg/L). This reference concentration is similar to the zinc concentrations corresponding to the IC25 an IC50 in the August 6, 2005 sample. Like the echinoid results, the IC25 converted zinc concentration in the July 16, 2005 sample was lower than reference endpoints and may indicate that other substances in this sample were contributing to toxicity. *Champia* also appears to be sensitive to zinc concentrations between the BC AWQG chronic guideline of 7.5 µg/L and maximum guideline of 33 µg/L.

Given the similarity between zinc concentrations in the effluent samples and the effects concentrations of zinc in reference tests, it is likely that zinc is responsible for the sublethal effects observed in both the *Dendraster* and *Champia* tests.

Reference: Dinnel, P.A., Q.J. Stober, J.M. Link, M.W. Letourneau, W.E. Roberts, S.P. Felton, and R.E. Nakatan. 1983. Methodology and Validation of a Sperm Cell Toxicity Test for Testing Toxic Substances in Marine Waters. Final Report, FRI-UW-8306, Fisheries Research Inst., School of Fisheries, University of Washington, Seattle, WA :208. Source: EPA EcoTox database.

APPENDIX G

Acute Toxicity Testing Laboratory Reports

EVS environment consultants
A member of the Golder group of companies

Golder Associates

Golder Associates Ltd.

195 Pemberton Avenue
North Vancouver, British Columbia, Canada V7P 2R4
Telephone 604-986-4331
Fax 604-662-8548

E/05/0336
04-1424-044

August 17, 2005

Azimuth Consulting Group
218 – 2902 West Broadway
Vancouver, BC V6K 2G8

Attention: Ms. Cheryl Mackintosh

RE: WORK ORDERS: 0500296, 297
TOXICITY TEST RESULTS ON THE SAMPLES COLLECTED JULY 16, 2005

Dear Ms. Mackintosh

We are pleased to provide you with the results of the toxicity tests performed on the effluent sample identified as G-Creek-acute-071605 collected July 16, 2005. The sample was tested with the 48-h *Daphnia magna* and the 96-h rainbow trout LC50 toxicity tests. The tests were performed according to the Environment Canada protocol for conducting acute toxicity tests using *D. magna* (EPS 1/RM/14, Second Edition, 2000) and rainbow trout (EPS 1/RM/13, Second Edition, 2000). An independent EVS/Golder QA/QC review confirmed that all acceptability criteria specified by the protocol were met. The results of these tests are summarized from the appended data and are presented in Table 1.

Should you have any questions or comments regarding this report, please do not hesitate to contact the undersigned at 604-986-4331.

Yours very truly,
EVS ENVIRONMENT CONSULTANTS
A Member of the Golder Group of Companies

for Jennifer Young, B.Sc.
Bioassay Team Leader – Cladoceran Team

Verified By:

QA/QC Committee:
Cathy McPherson, B.Sc.
Julianna Kalocai, M.Sc.

Attachment: Table 1
RH/clz
O:\Data\Final\2004\1424\04-1424-044\LET 0817 2005 Tox Test WO 0500296 297 1.doc

Table 1
Toxicity Test Results

SAMPLE ID	SAMPLE DATE	48h *Daphnia magna* LC50 (95% CL) % (v/v)	96-h Rainbow Trout - LC50 (95% CL) % (v/v)
G-Creek-Acute-071605	July 16, 2005	>100	>100

CL – confidence limits.

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* TOXICITY TEST DATA SUMMARY

Client: Azimuth
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500297
EVS Analysts: SXB
Test Type: 48h LC50
Test Initiation Date: 19 July 05

SAMPLE INFORMATION

Identification: G-Creek-Acute-071605
Amount Received: 1x2L Subsampled from 1x20L RBT
Date Collected: 16 July 05
Date Received: July 19, 2005
Temperature (°C): 21.0
pH: 7.3 ① 7.4
Dissolved Oxygen (mg/L): 10.8 ① 8.9
Conductivity (µmhos/cm): 1566
Hardness (mg/L as $CaCO_3$): 160
Alkalinity (mg/L as $CaCO_3$): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —

pH adjustment details: —
① Pre-aeration rate and duration: 12 min @ 25-50 mL/min/L

DILUTION/CONTROL WATER (initial water quality)

Water Type: moderately Hard water (July13B)
Temperature (°C): 20.0
pH: 7.6
Dissolved Oxygen (mg/L): 9.1
Conductivity (µS/cm): 344
Hardness (mg/L as $CaCO_3$): 94
Alkalinity (mg/L as $CaCO_3$): 64
Other: —

TEST SPECIES INFORMATION

Broodstock Culture ID (in-house culture): 05 July A/B
Age (on Day 0): < 24hr
Days to First Brood: 8
Avg. Young/Brood (after 1st brood): 34
% Mortality in 7 d Before Test: 0
Reference Toxicant: Zinc
Current Reference Toxicant Result
Reference Toxicant Test Date: July 19, 2005
48-h LC50 and 95% CL: 426 (362-504) mg/L Zn
Reference Toxicant Warning Limits (mean ± 2SD) and CV
445 ± 280 mg/L Zn ; CV = 31

TEST CONDITIONS

Temperature Range (°C): 20.0 - 21.0
pH Range: 7.4 - 7.7
Dissolved Oxygen Range (mg/L): ~~5~~ 8.7 - 9.1
Conductivity Range (µS/cm): 344 - 1566
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/200ml
Other: —

TEST RESULTS: The 48hr LC50 of G-Creek-Acute-071605 is >100% (V/V).

Data Verified By: [signature]
Date Verified: Aug. 16/05

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* ACUTE TOXICITY TEST DATA

Client: Azimuth
Sample ID: G-Greek-Acute-071605
EVS Project No.: 04-1424-044
Date Collected: 16 July 05
EVS Work Order No.: 0500297
Test Initiation Date/Time: 19 July 05 @ 16:00
Daphnid Broodstock Batch: 05 July A/B
No. Organisms/Volume: 10/200 ml

Concentration % (v/v)	Number of Survivors (1 to 48 h)					Dissolved Oxygen (mg/L)			Temperature (°C)			pH			Conductivity (µmhos/cm)	
	1	2	4	24	48	0	24	48	0	24	48	0	24	48	0	48
Control				10	10	9.1	8.7	8.7	20.0	21.0	21.0	7.6	7.5	7.6	344	344
6.25				10	10	9.1	8.8	8.7	20.0	21.0	21.0	7.6	7.5	7.6	426	425
12.5				10	10	9.0	8.8	8.7	20.0	21.0	21.5	7.6	7.5	7.7	505	506
25				10	10	9.0	8.7	8.7	20.5	21.0	21.5	7.6	7.5	7.7 SDZ	948	647
50				10	10	~~8.8~~ 9.0	8.7	8.7	20.5	21.0	21.0	7.4	7.5	7.7	958	944
100				10	10	8.9	8.7	8.7	21.0	21.0	21.5	7.4	7.4	7.5	1566	1532
Technician Initials					TL	SXB	SXB	TL	SXB	SXB	TL	SXB	SXB	TL	SXB	TL

Sample Description: clear - colourless
WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-020501 DO II-A-011201 Cond. IIA-990901
Comments:

Test Set Up By: SXB Data Verified By: [signature] Date Verified: Aug. 16/05

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA SUMMARY

Client: Azimuth
EVS Project No.: 04-1424-044 (Golder ~~EVS~~ REA)
EVS Work Order No.: OS00296
EVS Analysts: MJG, REA
Test Type: 96-h LC50
Test Initiation Date: July 21/05 @ 1035

SAMPLE
Identification: G-Creek 071605 Acute
Amount Received: 2 x 20L
Date Collected: July 16/05
Date Received: July 19/05
Other:

DILUTION/CONTROL WATER (initial water quality)
Fresh Water (dechlorinated): ✓
Temperature (°C): 15
pH: 7.0
Dissolved Oxygen (mg/L): 10.1
Conductivity (µS/cm): 37
Hardness (mg/L as $CaCO_3$): 14
Alkalinity (mg/L as $CaCO_3$): 8
Other:

TEST SPECIES INFORMATION
Source: Sun Valley
Collection Date/Batch: 062205
Control Fish Size (mean, SD and range measured at end of test)
Date Measured: July 25/05
Fork Length (mm): 30 ± 3 (25-33)
Wet Weight (g): 0.29 ± 0.07 (0.20-0.37)
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: July 12/05
Duration of Acclimation (days): 20
96-h LC50 (and 95% CL): 24 (18 and 32)
Reference Toxicant Warning Limits (mean ± 2SD) and CV
29 ± 12 mg/L SDS CV: 21%

TEST CONDITIONS
Dissolved Oxygen Range (mg/L): 9.5-10.2
Temperature Range (°C): 15
pH Range: 6.7-7.3
Conductivity Range (µS/cm): 37-1463
Aeration Provided? (give rate): 6.5 ± 1 mL/min/L
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/10L
Loading Density (g/L): 0.29
Acclimation Before Testing (days): 29
Mortality In Previous Week of Acclimation (%): 0.1
Other: ✓

TEST RESULTS The 96-h LC50 is estimated to be > 100% (v/v)

Data Verified By: Ralph K
Date Verified: Aug. 4/05

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA

WHOLE SAMPLE WATER QUALITY

	Initial	pH Adjustment[1]	After 30-min Pre-aeration
Temp. (°C)	15		15
pH	7.3		7.3
DO (mg/L)	10.4		10.2
Cond. (µS/cm)	1445		1445

1. Document pH adjustment procedure (if used) under "Comments".

Client: Azimuth
Golder ~~EVS~~ Project No.: 04-1424-044
EVS Work Order No.: 05002296
Trout Batch No. and 7-d Acclimation Mortality: 062205/0.5%
No. Fish/Volume: 10/10L
Sample ID: G-Creek 071605 Acute
Date/Time Collected: July 16/05 @ 0900
Test Initiation Date/Time: July 21/05 @ 1035

Total Pre-Aeration Time: 30 min

Concentration % (v/v)	Number of Survivors (1 to 96 hours)							Dissolved Oxygen (mg/L)					Temperature (°C)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
control				10	10	10	10	10.5	9.8	9.6	9.5	9.7	15	15	15	15	15	7.0	6.8	6.9	7.0	6.7	37	41
6.25				10	10	10	10	10.1	10.0	9.8	9.6	9.5	15	15	15	15	15	7.1	6.9	6.9	6.9	6.8	194	197
12.5				10	10	10	10	10.1	9.9	9.8	9.6	9.8	15	15	15	15	15	7.1	6.9	6.9	6.9	6.8	301	305
25				10	10	10	10	10.1	9.9	9.9	9.6	9.8	15	15	15	15	15	7.1	7.0	7.1	7.0	6.8	418	423
50				10	10	10	10	10.1	9.9	9.8	9.6	9.8	15	15	15	15	15	7.2	7.0	7.1	7.0	6.9	775	784
100				10	10	10	10	10.2	10.0	9.6	9.8	9.8	15	15	15	15	15	7.3	7.1	7.2	7.2	7.0	1445	1463
Technician Initials				RDH	MC	MC	RDH	RDH	RDH	MC	MC	RDH	RDH	RDH	MC	MC	RDH	RDH	RDH	MC	MC	RDH	RDH	RDH

WQ Instruments Used: Temperature calibrated Hg thermometer pH II-A-030302 DO II-A-3 Conductivity II-A-030363
Sample Description: clear
Comments:

Test Set Up By: RDH Data Verified By: [signature] Date Verified: Aug. 4/05

CHAIN-OF-CUSTODY/TEST REQUEST FORM

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

Client Name: Teck Cominco
Client Contact Name: Bruce Donald
Ship to: BILL TO AZIMUTH CONSULTING GROUP.
Address: Bag 2000
Kimberley, BC
V1A 3E1
Phone: (250)427-8405
Fax: (250)427-5451
Sampled By: Blake Hamer
Attn: Edmond Canuia
Shipping Date: July 16/05

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	1 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	2 Sample Container Type by Code	Test(s) Requested: 96-hr LC50 Rainbow Trout	48-hr LC50 Daphnia Magna	7-Day Toxicity Test	20 min. Echinoderm Fertilization			3 Notes? (e.g. preserved, saltwater, freshwater, may contain sewage)	Receipt Sample Temp. (°C)	4 Condition/Integrity
For composite sample record date & time starting and ending																
16/07/05	0900	G-Creek_Acute_071605	E		G	2×20	P	X	X					Effluent Water		
16/07/05	0900	G-Creek_Sublethal_071605	E		G	3×20	P			X	X			Effluent Water		

EVS Receipt Check List - SAP
EVS Project #: 04-1424-DQ049
EVS Workorder #: 0500296/7/8/9
Sample Storage Location: 4°C [X] Chemical [ ] Other
Supporting documentation/other information attached if applicable:

1.	Signatures & dates correct?	Y N
2.	Chain-of-custody fully completed?	Y N
3.	Containers arrived in good condition (unbroken)?	Y N
4.	Container labels completed (i.e., dates, ID's)?	Y N
5.	Container labels agreed with custody papers?	Y N
6.	Sample receipt temperature within acceptable range?	Y N
7a.	Sediment testing going to be initiated within 14 days?	Y N
7b.	If no, are samples under Nitrogen? If not, why?	Y N
8.	Chain-of-custody generated upon receipt.	[ ]
9.	Sample containers originate from EVS.	[ ]

PO/Reference No.:
Project Title: Polaris MMER -
Results Needed By: Routine Turn Around.

Comments/Instructions: Bill to: Azimuth Consulting Group. Temp: 12.7°C
Electronic Results, to: Cheryl Mackintosh, Azimuth, cmackintosh@azimuthgroup.ca
Bruce Donald, Teck Cominco, ~~bdonald~~ bruce.donald@teckcominco.com.

A) Released By: Blake Hamer Date: July 16, 2005
Company: GLL Time: 1030
Courier name:
Shipping containers secured by: ~~Tape~~ Straps Lock Other (circle one)
Custody seals used? Yes No

B) Received by: SAP Date: 19 July 05
Company: Golder Time: 10:45
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

C) Released By: Date:
Company: Time:
Courier name:
Shipping containers secured by: Tape Straps Lock Other (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify)
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

Revision Date: Sept. 25, 2000

Distribution of copies:
White, yellow, pink - accompany the shipment
Orange - retained by consignor (e.g., shipper)
Yellow - retained by consignee (e.g., receiver)
Pink - for use as needed
White - returned to consignor by consignee

EVS environment consultants
A member of the Golder group of companies

Golder Associates

Golder Associates Ltd.

195 Pemberton Avenue
North Vancouver, British Columbia, Canada V7P 2R4
Telephone 604-986-4331
Fax 604-662-8548

E/05/0341
04-1424-044

August 31, 2005

Azimuth Consulting Group
218 – 2902 West Broadway
Vancouver, BC V6K 2G8

Attention: Ms. Cheryl Mackintosh

RE: WORK ORDERS: 0500334, 335
TOXICITY TEST RESULTS ON THE SAMPLES COLLECTED AUGUST 6, 2005

Dear Ms. Mackintosh

We are pleased to provide you with the results of the toxicity tests performed on the effluent sample identified as Garrow Creek collected August 6, 2005. The sample was tested with the 48-h *Daphnia magna* and the 96-h rainbow trout LC50 toxicity tests. The tests were performed according to the Environment Canada protocol for conducting acute toxicity tests using *D. magna* (EPS 1/RM/14, Second Edition, 2000) and rainbow trout (EPS 1/RM/13, Second Edition, 2000). An independent EVS/Golder QA/QC review confirmed that all acceptability criteria specified by the protocol were met. The results of these tests are summarized from the appended data and are presented in Table 1.

Should you have any questions or comments regarding this report, please do not hesitate to contact the undersigned at 604-986-4331.

Yours very truly,
EVS ENVIRONMENT CONSULTANTS
A Member of the Golder Group of Companies

Jennifer Young, B.Sc.
Bioassay Team Leader – Cladoceran Team

Verified By:

QA/QC Committee:
Cathy McPherson, B.Sc.
Julianna Kalocai, M.Sc.

Attachment: Table 1
RH/clz
O:\Data\Final\2004\1424\04-1424-044\LET 0831 2005 Tox Test 0500334 335 .doc

Table 1
Toxicity Test Results

SAMPLE ID	SAMPLE DATE	48h *Daphnia magna* LC50 (95% CL) % (v/v)	96-h Rainbow Trout - LC50 (95% CL) % (v/v)
Garrow Creek	August 6, 2005	>100	>100

CL – confidence limits.

Toxicity testing was carried out in accordance with applicable test methodologies and/or standards of practice. Our liability is limited solely to the cost of re-testing in the event of non-compliance with such test specifications or standards of practice. Golder/EVS accepts no responsibility or liability for the interpretation or use of these testing results by others, nor for any delay, loss, damage or interruptions of testing, collection, preparation, and delivery of samples or test results resulting from events or circumstances beyond our control.

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting Group
EVS Analysts: SXB
EVS Project No.: 04-1424-044
Test Type: 48h LC50
EVS Work Order No.: 0500335
Test Initiation Date: 11 Aug 05

SAMPLE INFORMATION

Identification: Garrow Creek
Amount Received: 5x20L
Date Collected: 06 Aug 05
Date Received: 09 Aug 05
Temperature (°C): 21.0 → 21.0
pH: 7.5 → 7.6
Dissolved Oxygen (mg/L): 10.8 → 8.9
Conductivity (µmhos/cm): 2850
Hardness (mg/L as $CaCO_3$): ~~300~~
Alkalinity (mg/L as $CaCO_3$): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —

pH adjustment details: none
Pre-aeration rate and duration: 15 Min @ 25 to 50 ml/L/min

DILUTION/CONTROL WATER (initial water quality)

Water Type: Moderately Hard water (July 30 C)
Temperature (°C): 20.0
pH: 7.4
Dissolved Oxygen (mg/L): 9.1
Conductivity (µS/cm): 354
Hardness (mg/L as $CaCO_3$): ~~300~~ 94
Alkalinity (mg/L as $CaCO_3$): ~~of~~ 70
Other: —

TEST SPECIES INFORMATION

Broodstock Culture ID (in-house culture): 18 July A/B/C
Age (on Day 0): <24hr
Days to First Brood: 7.0
Avg. Young/Brood (after 1st brood): ~~7~~ 29
% Mortality in 7 d Before Test: 0
Reference Toxicant: ZinC
Current Reference Toxicant Result
Reference Toxicant Test Date: Aug 15, 2005
48-h LC50 and 95% CL: 481 (388-597) mg/L Zn
Reference Toxicant Warning Limits (mean ± 2SD) and CV
445 ± 280 mg/L Zn ; CV = 31

TEST CONDITIONS

Temperature Range (°C): 20.0-21.0
pH Range: 7.4-7.7
Dissolved Oxygen Range (mg/L): 8.5-9.1
Conductivity Range (µS/cm): 350-2850
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10/200ml
Other: —

TEST RESULTS The 48hr LC50 of Garrow Creek is >100% (v)

Data Verified By: Ralph
Date Verified: Aug. 31/05

EVS ENVIRONMENT CONSULTANTS
48-h *Daphnia magna* ACUTE TOXICITY TEST DATA

Client: Azimuth Consulting Group
Sample ID: ~~6 Creek~~ Garrow Creek
EVS Project No.: 04-1424-044
Date Collected: 06 Aug 05
EVS Work Order No.: 0500335
Test Initiation Date/Time: 11 Aug 05 @ 10:30
Daphnid Broodstock Batch: 18 July A/B/C
No. Organisms/Volume: 10/200 ml

Concentration % (v/v)	Number of Survivors (1 to 48 h)					Dissolved Oxygen (mg/L)			Temperature (°C)			pH			Conductivity (µmhos/cm)	
	1	2	4	24	48	0	24	48	0	24	48	0	24	48	0	48
Control				10	10	9.1	8.9	8.6	20.0	21.0	21.0	7.4	7.7	7.6	354	350
6.25				10	10	9.0	8.8	8.5	20.0	21.0	21.0	7.4	7.7	7.7	505	508
12.5				10	10	9.0	8.8	8.5	20.5	21.0	21.0	7.5	7.7	7.7	654	667
25				10	10	8.9	8.8	8.5	20.5	21.0	21.0	7.5	7.7	7.7	990	992
50				10	10	8.9	8.7	8.5	20.5	21.0	21.0	7.5	7.7	7.6	1458	1593
100				10	10	8.9	8.7	8.5	21.0	21.0	21.0	7.6	7.7	7.6	2850	2766
Technician Initials				SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB	SXB

Sample Description: clear - colourless
WQ Instruments Used: Temp: Calibrated Hg thermometer pH II-A-020501 DO II-A-011201 Cond. IIA-990901
Comments:

Test Set Up By: SXB Data Verified By: [signature] Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA SUMMARY

Client: Azimuth
EVS Project No.: 04-1424-044 (Golder Ref)
EVS Work Order No.: 0500334

EVS Analysts: AXF, RCH
Test Type: 96-h LC50
Test Initiation Date: Aug 11/05 @ 1500

SAMPLE
Identification: Garrow Creek
Amount Received: 5 + 20L
Date Collected: Aug 6/05
Date Received: Aug 9/05
Other: —

DILUTION/CONTROL WATER (initial water quality)
Fresh Water (dechlorinated): ✓
Temperature (°C): 15
pH: 7.0
Dissolved Oxygen (mg/L): 10.1
Conductivity (µS/cm): 40
Hardness (mg/L as $CaCO_3$): 14
Alkalinity (mg/L as $CaCO_3$): 8
Other: —

TEST SPECIES INFORMATION
Source: Sun Valley
Collection Date/Batch: 062205
Control Fish Size (mean, SD and range measured at end of test)
Date Measured: Aug 15/05
Fork Length (mm): 31 ± 3 (27 and 35)
Wet Weight (g): 0.33 ± 0.08 (0.22 and 0.46)
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: July 12/05
Duration of Acclimation (days): 20
96-h LC50 (and 95% CL): 24 (18 and 32)
Reference Toxicant Warning Limits (mean ± 2SD) and CV
29 ± 12 mg/L SDS CV: 21%

TEST CONDITIONS
Dissolved Oxygen Range (mg/L): 9.0 – 10.1
Temperature Range (°C): 15
pH Range: 6.8 – 7.4
Conductivity Range (µS/cm): 40 – 2850
Aeration Provided? (give rate): 6.5 ± 1 mL/min/L
Photoperiod (L:D h): 16:8
No. Organisms/Volume: 10 / 10L
Loading Density (g/L): 0.33
Acclimation Before Testing (days): 50
Mortality In Previous Week of Acclimation (%): 0.1
Other: —

TEST RESULTS: The 96-h LC50 is estimated to be > 100% (v/v)

Data Verified By: [signature] Date Verified: Aug. 30/05

EVS ENVIRONMENT CONSULTANTS
RAINBOW TROUT ACUTE TOXICITY TEST DATA

WHOLE SAMPLE WATER QUALITY

	Initial	pH Adjustment[1]	After 30-min Pre-aeration
Temp. (°C)	15	/	15
pH	7.4	/	7.4
DO (mg/L)	10.1	/	10.1
Cond. (µS/cm)	2510	/	2510

1. Document pH adjustment procedure (if used) under "Comments".

Total Pre-Aeration Time 30 min

Client ~~EVS~~ Golder Azimuth
Project No. 04-1424-044
EVS Work Order No. 0500334
Trout Batch No. and 7-d Acclimation Mortality 062205/0.1%
No. Fish/Volume 10 / 10L
Sample ID Garron Creek
Date/Time Collected Aug 6/05 @ 1100
Test Initiation Date/Time Aug 11/05 @ 1500

Concentration % (v/v)	Survivors 1	Survivors 2	Survivors 4	Survivors 24	Survivors 48	Survivors 72	Survivors 96	DO 0	DO 24	DO 48	DO 72	DO 96	Temp 0	Temp 24	Temp 48	Temp 72	Temp 96	pH 0	pH 24	pH 48	pH 72	pH 96	Cond 0	Cond 96
control				10	10	10	10	10.1	9.2	9.4 (8)	~~10.4~~ 10.0 AXF	9.3	15	15	15	15	15	7.0	7.1	6.8	6.9	7.0	40	51
6.25				10	10	10	10	10.1	9.0	10.0	~~10.2~~ 10.0	9.4	15	15	15	15	15	7.0	7.1	6.9	7.0	7.0	323	349
12.5				10	10	10	10	10.1	9.2	10.0	~~10.2~~ 10.0	9.4	15	15	15	15	15	7.0	7.1	6.9	7.1	7.1	535	571
25				10	10	10	10	10.1	9.4	10.0	~~10.2~~ 10.0	9.6	15	15	15	15	15	7.0	7.1	6.9	7.1	7.1	827	864
50				10	10	10	10	10.1	9.4	~~10.4~~ 10.1 AXF	~~10.3~~ 10.1 AXF	9.6	15	15	15	15	15	7.2	7.2	7.0	7.1	7.2	1373	1431
100				10	10	10	10	10.1	9.8	~~10.8~~ 10.1 AXF	~~10.5~~ 10.1 AXF	9.7	15	15	15	15	15	7.4	7.3	7.0	7.1	7.3	2510	2850
Technician Initials				[illegible]	AXF	AXF	[illegible]	[illegible]	[illegible]	AXF (1)	AXF (1)	[illegible]	[illegible]	[illegible]	AXF	AXF	[illegible]	[illegible]	[illegible]	AXF	AXF	[illegible]	[illegible]	[illegible]

WQ Instruments Used: Temperature calibrated Hg thermometre pH II-A-030302 DO II-A-3 Conductivity II-A-030304

Sample Description clear

Comments (1) Re-calibrated D.O. meter

Test Set Up By [signature] Data Verified By [signature] Date Verified Aug. 30/05

Forms\Lab\Datasheets\Trout\ACUTE.DOC August 26, 2002

CHAIN-OF-CUSTODY / TEST REQUEST FORM

0743

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

Client Name Teck Cominco
Address Box 2000
Kimberly BC
V1A 3G1

Client Contact Bruce Donald
Phone 250-427-8405
Fax 250-427-8451
Sampled by B.Bolton

Ship to
Attn. Edmund Canaria

Shipping Date Aug 6/05

Collection Date (DD/MMM/YYYY) [1]	Time (24-h clock) [1]	Sample Identification	Type of Each Sample [2]	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	Sample Container Type by Code [3]	Test(s) Requested: Sublethal toxicity					Sample Notes (preserved, saltwater, freshwater, may contain sewage...) [4]
06/Aug/05	10:00 am	Gorrow Creek	E		G	1x20L		X					Client is actually Azimuth Consulting

PO/Reference No.
Project Title
Results Needed By

Comments/Instructions

1) Released by: B Bolton Date: Aug 6/05
Company: Gartner Lee Ltd. Time: 14:00 hrs
Courier Name:

1) Received by: (SRS) Date: 9 Aug 05
Company: Golder Time: 10:15

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: Date:
Company: Time:

Shaded area to be completed by Golder Laboratory upon sample receipt.
Golder Project No. 0500327/328/334/33
Golder Work Order No. 04-1424-044
Condition Upon Receipt Good
Receipt Sample Temp. (°C) 19.0

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies: White, Yellow — accompany the shipment
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Please see instructions for completion on back of form

APPENDIX H

Sublethal Toxicity Testing Laboratory Reports

Stantec Consulting Ltd.
11B Nicholas Beaver Road RR3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

stantec.com

Stantec

Work Order : 207782
Sample Number : 13103

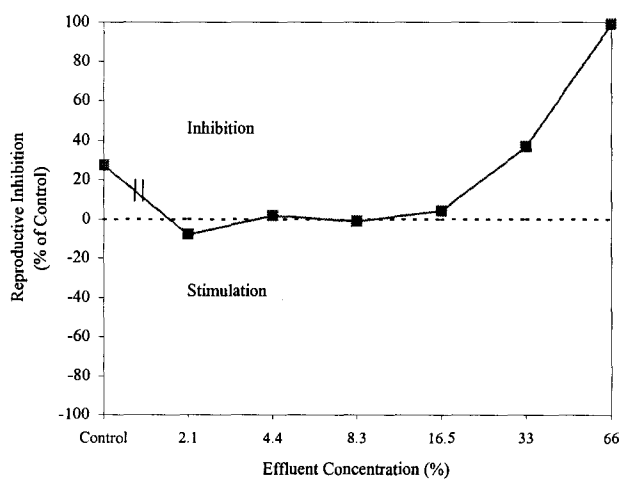
Sample Identification

Company :	Azimuth Consulting Group Inc.		
Location :	Vancouver, BC	Date Collected :	2005-07-16
Substance :	G-Creek Sublethal 071605	Time Collected :	09:00
Sampling Method :	Grab	Date Received :	2005-07-19
Sampled By :	B. Hamer	Time Received :	13:00
Shipped By:	Fed Ex/Rd	Date Tested :	2005-07-19
Temp. on arrival :	18.0°C	Lab Storage:	4±2 °C
Sample Description:	Clear, colourless, odourless.		

Test Results

Effect	Value	95% Confidence Limits	Statistical Method
IC25 (Reproduction)	24.6%	22.2-27.2	Linear Interpolation (Toxstat 3.5) b

Champia parvula Reproductive Inhibition



Note: Statistical analyses were performed using pooled control and salt control data.

Work Order Number: 207782
Sample Number: 13103

Test Conditions

Test Organism [a]	*Champia parvula*	Test Vessel	240 mL polystyrene cup
Organism Batch Number	CH05-07	Number of Replicates	3
Source	Stantec in-house culture	Number of Organisms per Replicate	5 females / 2 males
Life Stage [c]	Sexually mature	Test Volume (per replicate)	100 mL
Mean Organism Mortality	0% (7 days prior to testing)	Test Solution Depth	5 cm
Salinity Adjustment [d]	Yes	Recovery Volume (per replicate)	200 mL
pH Adjustment	None	Recovery Solution Depth	7 cm
Sample Filtration	None	Recovery Water Filtered (prior to dilution)	Yes (60µm)
Test Aeration (during exposure)	None	Date of Test Initiation	2005-07-19
Test Aeration (during recovery)	Yes (continuous, gentle aeration)	Time of Test Initiation	17:45
Photoperiod (h)	16 light / 8 dark	Date of Recovery Initiation	2005-07-21
Light Intensity	1000 - 1600 lux	Date of Test Completion	2005-07-28
Test Temperature (°C)	23.0 – 26.0	Test Duration	48 hours
Control/Dilution Water [e]	Natural seawater	Recovery Duration	7 days
Test Type	Static non-renewal	Analyst(s)	EJ/KJ

[a] Test Organism : No organisms exhibiting unusual appearance, behaviour, or undergoing unusual treatment were used in the test. All test organisms were from the same culture.

[c] Life Stage : Test organisms were sexually mature males having sori with spermatia and sexually mature females having trichogynes.

[d] Salinity Adjustment : Salinity adjustment was performed following the procedure for Hypersaline Brine Addition (Environment Canada Salinity Adjustment Guidance Document, revised December 2001).

[e] Control/Dilution Water : Filtered (0.45 µm) natural seawater from Pointe-du-Chene in Shediac Bay, New Brunswick. No chemicals added.

Test Method : Test of Sexual Reproduction using the Red Macroalga *Champia parvula.* EPA-821-R-02-014, October 2002, Method 1009.0, with Canadian adaptations (Environment Canada 1998, 1999).

Comments

Nutrient addition of 10 mls to the 100% salinity adjusted sample, prior to test initiation, reduced the maximum concentration tested from 66.7% to 66%.

Noted Deviation(s): The maximum test temperature of 24.0 °C, as specified by the test method, was exceeded on Day 4 of the recovery period. There were no other unusual conditions or deviations from the test protocol. The results reported relate only to the sample tested.

Reference Toxicant Data

Substance :	Sodium Dodecyl Sulphate (SDS)	Historical Mean IC50 :	0.155 mg/L
Test Date :	2005-07-19	Warning Limits (± 2 SD) :	0.112-0.216
Test Duration :	48 hrs exposure, 7 days recovery	Statistical Method :	Linear Interpolation (Toxstat 3.5)[b]
IC50 Reproduction	0.134 mg/L	Test Conducted By :	E. Jonczyk/K. Johnson
95% Confidence Limits:	0.123-0.143	Organism Batch :	CH05-07

The reference toxicant test was conducted under conditions identical to the test.

References

[b] West, Inc. and D. Gulley. 1996. Toxstat Release 3.5. Western Ecosystems Technology. Cheyenne, WY, U.S.A.

Date: 2005-08-25

Approved By: Project Manager

Work Order : 207782
Sample Number : 13103

Cystocarp Counts

Concentration (%)	Replicate	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Replicate Mean	Treatment Mean	Standard Deviation
Control	A	19	27	34	30	24	26.8	26.8	6.98
	B	32	21	36	25	22	27.2		
	C	23	42	29	21	17	26.4		
Salt Control	A	31	26	24	18	39	27.6	27.8	7.94
	B	24	29	32	37	15	27.4		
	C	17	22	28	35	40	28.4		
2.1	A	27	24	37	25	34	29.4	29.5	7.50
	B	33	19	39	28	26	29.0		
	C	24	31	42	16	37	30.0		
4.4	A	11	29	34	22	35	26.2	26.8	8.13
	B	27	24	38	15	30	26.8		
	C	28	31	22	38	18	27.4		
8.3	A	34	30	21	25	28	27.6	27.6	7.14
	B	16	24	32	29	35	27.2		
	C	39	34	25	13	29	28.0		
16.5	A	22	26	23	13	43	25.4	26.1	8.41
	B	29	19	31	29	24	26.4		
	C	15	24	32	41	21	26.6		
33	A	13	17	12	23	27	18.4	17.3	5.55
	B	16	20	15	13	11	15.0		
	C	10	18	26	24	14	18.4		
66	A	0	1	0	1	0	0.4	0.3	0.46
	B	0	0	1	0	0	0.2		
	C	1	0	0	0	0	0.2		

Plant Mortality Data

Exposure Period

	♂ 0 Hours		♀ 0 Hours		♂ 48 Hours		♀ 48 Hours		♀ Test Completion	
Concentration (%)	Number Dead	Mortality (%)	Number Dead	Mortality (%)	Number Dead	Mortality (%)	Number Dead	Mortality (%)	Number Dead	Mortality (%)
Control	0	0	0	0	0	0	0	0	0	0
Salt Control	0	0	0	0	0	0	0	0	0	0
2.1	0	0	0	0	0	0	0	0	0	0
4.4	0	0	0	0	0	0	0	0	0	0
8.3	0	0	0	0	0	0	0	0	0	0
16.5	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0

Test Data Reviewed By: [signature]
Date: 2005-08-11

Work Order : 207782
Sample : 13103

Water Chemistry Data

Initial Water Chemistry (100% Effluent)

	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	O2 Saturation (%)*	Salinity (‰)
Initial Parameters:	22.0	8.0	10.2	122	0
Parameters after Salinity Adjustment [1]:	22.5	8.0	7.0	98	32
Chemistry after Pre-Aeration [1,2]:	-	-	-	-	-

Exposure Period Water Chemistry

0 hours

Date & Time : 2005-07-19 17:45
Analyst(s) : EJ/KJ

Test Conc. (%)	pH	Dissolved Oxygen (mg/L)	O_2 Sat. (%)*	Salinity (‰)	Temperature (°C)
66	7.8	7.8	106	32	22.5
33	7.7	7.3	102	32	22.5
16.5	7.7	7.2	100	32	22.5
8.3	7.7	7.1	100	32	22.5
4.4	7.7	7.3	103	32	22.5
2.1	7.7	7.0	99	32	23.0
Salt Control	7.7	5.9	83	30	24.0
Control	7.7	6.4	91	30	22.0

48 hours

Date & Time : 2005-07-21 16:00
Analyst(s) : KJ

Test Conc. (%)	pH	Dissolved Oxygen (mg/L)	O_2 Sat. (%)*	Salinity (‰)	Temperature (°C)
66	8.8	7.7	99	31	23.0
33	8.9	7.0	98	31	23.0
16.5	8.7	6.9	98	31	23.0
8.3	9.1	6.9	97	31	22.0
4.4	8.7	6.8	96	30	22.5
2.1	8.9	6.6	94	30	22.0
Salt Control	9.0	6.2	91	30	22.0
Control	9.1	6.7	95	30	22.0

Initial Water Chemistry (Recovery Water)

	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	O2 Saturation (%)*	Salinity (‰)
Initial Parameters:	22.0	7.5	6.6	93	30

Recovery Period Water Chemistry

0 hours

Date & Time : 2005-07-21 16:00
Analyst(s) : KJ

Test Conc. (%)	pH	Dissolved Oxygen (mg/L)	O_2 Sat. (%)*	Salinity (‰)	Temperature (°C)
66	7.5	6.6	93	30	22.0
33	7.5	6.6	93	30	22.0
16.5	7.5	6.6	93	30	22.0
8.3	7.5	6.6	93	30	22.0
4.4	7.5	6.6	93	30	22.0
2.1	7.5	6.6	93	30	22.0
Salt Control	7.5	6.6	93	30	22.0
Control	7.5	6.6	93	30	22.0

Test Completion

Date & Time : 2005-07-28 16:00
Analyst(s) : EJ

Test Conc. (%)	pH	Dissolved Oxygen (mg/L)	O_2 Sat. (%)*	Salinity (‰)	Temperature (°C)
66	8.0	7.4	92	30	22.0
33	8.0	7.5	93	30	22.0
16.5	8.0	7.3	91	30	22.0
8.3	8.1	7.4	92	30	22.0
4.4	8.0	7.5	93	30	22.0
2.1	8.0	7.5	93	30	22.0
Salt Control	8.1	7.5	93	30	22.0
Control	7.8	7.6	95	30	22.0

Daily Temperature Monitoring

Date:	2005-07-19	2005-07-20	2005-07-21	2005-07-22	2005-07-23	2005-07-24	2005-07-25	2005-07-26	2005-07-27	2005-07-28
Temp. (°C):	23.0	24.0	24.0	24.0	23.0	24.0	26.0	24.0	23.0	23.0

[1] if applicable
[2] @ <100 bubbles/min
* adjusted for barometric pressure

August 2005

LABORATORY REPORT

Azimuth Consulting Group

POLARIS MINE

ENVIRONMENTAL EFFECTS MONITORING PROGRAM

July 16, 2005 Sample

PREPARED FOR:

Azimuth Consulting Group
Vancouver, BC

PREPARED BY:

EVS environment consultants
A Member of the Golder Group of Companies
North Vancouver, BC

AZIMUTH CONSULTING GROUP

POLARIS MINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM

JULY 16, 2005 SAMPLE

LABORATORY REPORT

Prepared for

Azimuth Consulting Group
218-2902 W. Broadway
Vancouver, BC
V6K 2G8

Prepared by

EVS Environment Consultants (A Member of the Golder Group of Companies)
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

EVS Project No.

04-1424-044

August 2005

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1. INTRODUCTION

EVS Environment Consultants (a member of the Golder Group of Companies) conducted sublethal Metal Mining Effluent Regulations (MMER) toxicity testing for Azimuth Consulting Group as part of the Environmental Effects Monitoring (EEM) program for Polaris Mine.

A sample, identified as G Creek-071605, was collected from the Polaris Mine Site on July 16, 2005 in 20-L collapsible polyethylene containers. It was received at the EVS laboratory on July 19, 2005 and was stored in the dark at 4°C prior to test initiation. The sample was evaluated for toxicity using the 7-d topsmelt (*Atherinops affinis*) survival and growth toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. Toxicity testing was initiated on the day of initial sample receipt.

This report describes the methods and results of the 7-d topsmelt (*Atherinops affinis*) toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. The raw data and statistical analyses are provided in Appendices I and II respectively, and the chain-of-custody form is provided in Appendix III.

2. METHODS

2.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

A static-renewal 7-d survival and growth toxicity and reference toxicant tests using topsmelt (*A. affinis*) was conducted in accordance with U.S. Environmental Protection Agency (USEPA, 1995). Test conditions and methods are summarized in Table 1.

This 7-day test exposes topsmelt larvae to different concentrations of a given sample. Fish are fed on a daily basis and both survival and growth endpoints are measured at test termination. These observations are assessed in comparison to the pooled negative and brine controls.

2.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The echinoderm (*Dendraster excentricus*) fertilization toxicity test was conducted in accordance with Environment Canada (1992 with 1997 amendments). Test conditions and methods are summarized in Table 2.

This fertilization test involves exposing echinoderm sperm to a series of test concentrations for ten minutes, echinoderm eggs are then added allowing fertilization to occur for ten minutes. Following the ten minutes exposure time, the eggs are preserved and the number of fertilized and unfertilized eggs in each replicate are counted. These observations are assessed in comparison to the pooled negative and brine controls.

2.3 STATISTICAL ANALYSIS

Statistical analyses for all tests were conducted using the computer software program TOXCALC (version 5.0.23; Tidepool Scientific Software, 1994).

2.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This study followed a comprehensive QA/QC Program to ensure full documentation and minimize possible errors in computation and reporting of results. The following general QA/QC guidelines were applied in this test: use of negative controls, use of positive controls, use of brine controls, replication, instrument calibration, water quality maintenance and

record-keeping, and use of standard operating procedures (SOPs). To ensure data and reporting meet quality standards, all data and statistical analyses were reviewed by a member of our QA/QC Committee prior to reporting the results.

Toxicity testing was carried out in accordance with applicable test methodologies and/or standards of practice. Our liability is limited solely to the cost of re-testing in the event of non-compliance with such test specifications or standards of practice. Golder/EVS accepts no responsibility or liability for the interpretation or use of these testing results by others, or for any delay, loss, damage or interruptions of testing, collection, preparation, and delivery of samples or test results resulting from events or circumstances beyond our control.

Table 1. 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static-renewal
Test duration	7 d
Test chamber	600-mL beaker
Test solution volume	200 mL
Number of replicate chambers per treatment	5
Number of organisms per test chamber	5
Age of test organisms at test initiation	10 d
Food	Newly hatched *Artemia* nauplii (<24 hours old)
Feeding Regime	Fed 0.5 mL/ beaker twice daily of concentrated nauplii suspension (prepared to provide 200 nauplii in 0.5 mL); no feeding at test termination
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5μm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.5, 8.9, 17.9, 35.7, 71.4% (v/v)
Renewal of dilutions	Daily
Aeration	None
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity daily
Temperature	20 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Overhead full-spectrum fluorescent lights; 538 – 1076 lux; 16:8 light:dark photoperiod
Reference toxicant	Initiated concurrently with sample using copper to generate LC50 and IC50 values; results compared to lab mean ± 2 SD
Endpoints	Survival and growth (dry weight)
Test validity	≥ 80% mean control survival; ≥ 0.85 mg/fish mean dry weight for surviving control fish
Reference protocol	US EPA (1995), EPA/600/R-95/136

Table 2. Echinoderm (*Dendraster excentricus*) fertilization toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static
Test duration	10:10 min
Test chamber	16 X 125 mm test tubes
Test solution volume	10 mL
Number of replicate chambers per treatment	4
Number of eggs per test chamber	2000
Age of test organisms	< 4 hours after spawning
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5μm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.6, 9.1, 18.3, 36.6, 72.8% (v/v)
Renewal of dilutions	None
Aeration	None during testing
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity
Temperature	15 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Ambient laboratory illumination (moderate intensity)
Reference toxicant	Initiated concurrently with test; same test methods as above using SDS to generate an EC50 value; results compared to lab mean ± 2 SD
Endpoint	Fertilization of eggs
Test validity	≥ 50% and ≤ 100% mean control fertilization
Reference protocols	Environment Canada (1992), (EPS/1/RM/27 with 1997 amendments)

3. RESULTS

3.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

The test results are summarized in Table 1 and the raw statistical analyses are provided in Appendix I.

The highest concentration tested was approximately 71.4% due to salinity adjustment. The mean survival in both the negative and brine controls was 100%. Mean dry weight in the pooled controls was 0.95mg. The negative and brine controls were not significantly different for both the growth and survival endpoints ($p = 0.52$ and $p = 1.00$, respectively).

The *A. affinis* survival and growth toxicity test showed no adverse effects on survival or growth in all tested concentrations relative to the pooled controls ($p \leq 0.05$). For the survival and growth endpoints the NOEC was 71.4, and the LOEC was >71.4% (v/v). The LC50 for survival was >71.4% (v/v). The IC50 and IC25 for growth were both >71.4% (v/v).

3.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The test results are summarized in Table 2 and the raw statistical analyses are provided in Appendix II.

The highest concentration tested was 72.8% due to salinity adjustment. Mean fertilization in the pooled controls was 66.9%. The negative and brine controls were not significantly different ($p = 0.09$).

The *D. excentricus* fertilization toxicity test exhibited adverse effects on egg fertilization in all test concentrations relative to the pooled controls ($p \leq 0.05$). The NOEC was <4.6 and LOEC was 4.6 % (v/v). The IC50 and IC25 (95% confidence limits) values were 13.2 (10.6 – 17.1) and 5.2 (4.4 – 6.0) % (v/v), respectively.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The tests met all passing criteria for test validity as outlined in the respective protocols. Water quality parameters during the test were all within the acceptable range of values. Point estimates for the reference toxicant tests were all within the laboratory mean ± 2 standard deviations, indicating that the tests were within acceptable limits of variability.

Table 3. Summary of results for the 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test

TEST CONCENTRATION (% V/V)	SURVIVAL (%)(MEAN ± SD)	GROWTH (DRY WEIGHT MG) (MEAN ± SD)
D-Control	100.0 ± 0.0	0.92 ± 0.13
Brine Control	100.0 ± 0.0	0.98 ± 0.18
Pooled Controls	100.0 ± 0.0	0.95 ± 0.15
4.5	96.0 ± 8.9	0.77 ± 0.19
8.9	96.0 ± 8.9	0.82 ± 0.33
17.9	100.0 ± 0.0	1.01 ± 0.14
35.9	100.0 ± 0.0	1.07 ± 0.19
71.4	96.0 ± 8.9	0.91 ± 0.28
TEST ENDPOINT	**SURVIVAL (% V/V)**	**GROWTH (% V/V)**
NOEC	71.4	71.4
LOEC	>71.4	>71.4
LC50	>71.4	na
IC50	na	>71.4
IC25	na	>71.4

SD – Standard Deviation; na – not applicable.

Table 4. Summary of results for the Echinoderm (*Dendraster excentricus*) fertilization toxicity test

TEST CONCENTRATION (% v/v)	PROPORTION FERTILIZED (%) (MEAN ± SD)
Negative Control	64.8 ± 3.8
Brine Control	69.0 ± 1.8
Pooled Control	66.9 ± 3.6
4.6	53.0 ± 2.2*
9.1	37.2 ± 1.3*
18.2	30.0 ± 2.2*
36.5	23.5 ± 2.9*
72.8	19.5 ± 2.4*
TEST ENDPOINT	**PROPORTION FERTILIZED %(v/v)**
NOEC	<4.6
LOEC	4.6
IC50 (95% CL)	13.2 (10.6 – 17.1)
IC25 (95% CL)	5.2 (4.4 – 6.0)

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; CL – Confidence Limits.

4. REFERENCES

Environment Canada. 1992. Biological test method: fertilization of echinoids (sea urchins and sand dollars). Environmental Protection Series, Report EPS 1/RM/27, December 1992. Environment Canada, Conservation and Protection, Ottawa, ON. 68 pp + appendices. Amended November 1997.

EVS (EVS Environment Consultants). 2004. Topsmelt (*Atherinops affinis*) 7-d larval survival and growth test. EVS SOP 1100-5. In: EVS Consultants Laboratory Standard Operating Procedures (SOP) Manual. Volume II: Water Toxicity Tests. EVS Environment Consultants, North Vancouver, BC.

US EPA (U.S. Environmental Protection Agency). 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. 3rd edition. US Environmental Protection Agency, Office of Water (4303T). US Environmental Protection Agency, Washington, DC. EPA/821/R-02/014. 464 pp.

US EPA. 1995. Short term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. 2nd edition. US Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Office of Research and Development, Washington, DC. EPA/600/R-95/136. 563 pp.

Tidepool Scientific Software. 1994. TOXCALC: Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.23. Tidepool Scientific Software, McKinleyville, CA. 80 pp.

APPENDIX I

Raw Data and Statistical Analyses:

Atherinops affinis

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client: Polaris
EVS Project No.: 04-1424-064
EVS Work Order No.: 05~~00758~~ 298
EVS Analysts: JXS, SXB, MJG, AXF
Test Initiation Date: 19-July-05

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	G Creek ~~N~~ sublethal 071605	G Creek	G Creek
Amount Received	1 ~~8~~ x 20L	1x20L	1x20L
Date Collected	16Jul05	16Jul05	16Jul05
Date Received	19Jul05	19Jul05	19Jul05
Temperature (°C)	20.0	20.0	20.0
pH	7.7 ①→ 8.2	7.8 ①→ 8.2	7.7 ①→ 8.3
DO (mg/L)	11.1 ①→ 7.6	11.0 ①→ 7.6	10.8 ①→ 7.6
Conductivity (μmhos/cm)	1520	1520	1520
Salinity (ppt)	6 ①→ 29	6 ①→ 29	6 ①→ 29
Ammonia (mg/L N)	-	-	-
Chlorine (mg/L Cl)	-	-	-
Other	① After Salinity Adjustment		

DILUTION/CONTROL WATER (initial water quality)
Water Type: Filtered. UV sterilized seawater
Temperature (°C): 20.0
pH: 7.8
Dissolved Oxygen (mg/L): 7.5
Salinity: 28

TEST SPECIES INFORMATION
Source: ABS
Date Received: 19-July-05
Age (on Day 0): 10-d
Reference Toxicant: Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date: 19Jul05
7-d survival LC50: ~~122 (106-140)~~ 117 (100-136) μg/L Cu
7-d growth IC50: ~~112 (80-149)~~ 116 (81-156) μg/L Cu
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50: 133 ± 39 μg/L Cu CV=15%
7-d growth IC50: 132 ± 46 μg/L Cu CV=17%

TEST CONDITIONS
Temperature Range (°C): 20.0 - 21.0
pH Range: 7.7 - 8.3
Dissolved Oxygen Range (mg/L): 6.2 - 7.7
Salinity (ppt): 28 - ~~29~~ 30
Photoperiod (L:D h): 16:8
Aeration Provided?: No
Other: -

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	%(v/v)	71.4	>71.4	>71.4		
Growth	%(v/v)	71.4	>71.4		>71.4	>71.4

Other:

Data Verified By: [signature]
Date Verified: Aug. 22/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client: Polaris
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500298

Sample ID: G-Creek Sublethal 071605
Test Initiation Date/Time: 19-July-05/1430
Source/Date Received: ABS/19-July-05

% (v/v) Concentration	Temperature (°C)														
	0	1		2		3		4		5		6		7
D-control	20.0	20.5	20.0	20.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
B-control	20.5	20.5	20.5	20.5	20.5	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
4.5	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
8.9	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
~~35.7~~ 17.9	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
~~71.4~~ 35.7	20.0	20.5	20.0	20.3	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
71.4	20.0	20.5	20.0	20.3	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
Tech. Initials	TJ	SXB	SXB	SXB	SXB	SXB	SXB	MV	MV	MV	MV	MV	MV	TJ

% (v/v) Concentration	pH													
	0	1 old	1 new	2		3		4		5		6		7
D-control	7.8	7.7	7.7	7.7	7.8	7.8	~~7.8~~ 7.9	7.8	7.8	7.8	7.8	7.8	~~7.8~~ 7.9	8.0
B-control	7.9	7.7	8.0	7.7	7.9	7.8	7.9	7.8	7.8	7.8	7.8	7.8	7.9	8.0
4.5	7.9	7.7	8.0	7.7	7.9	7.8	7.9	7.9	7.9	7.8	7.9	7.9	7.9	7.7
8.9	7.9	7.8	8.0	7.7	7.9	7.8	8.0	7.9	7.9	7.8	8.0	7.9	8.0	7.7
17.9	8.0	7.8	8.1	7.7	8.0	7.9	8.0	8.0	8.0	7.9	8.1	8.0	8.1	7.7
35.7	8.1	7.9	8.1	7.8	8.1	7.9	8.1	8.0	8.2	7.9	8.2	8.0	8.2	7.8
71.4	8.2	7.9	~~7.8~~ 8.2	7.8	8.2	7.9	8.3	8.0	8.3	8.0	8.2	8.0	8.3	7.8
Tech. Initials	TJ	SXB	SXB	SXB	SXB	SXB	SXB	MV	MV	MV	MV	MV	MV	TJ

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-030301
Comments: D used II-A-51

Test Set Up By: TJ, SXB Data Verified By: [signature] Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client Polaris
Sample ID G-Creek Sublethal C7160S
EVS Project No. 04-1424-044
Test Initiation Date/Time 19-July-05 1430
EVS Work Order No. 0500~~28~~298
Source/Date Received ABS 19-July-05

% (v/v) Concentration	Salinity (ppt)													
	0	1		2		3		4		5		6		7
D-control	28	28	28	28	28	28	28	28	28	28	28	28	28	28
B-control	30	30	30	30	30	30	30	30	30	30	30	30	30	30
4.5	28	28	28	28	28	28	28	28	28	28	28	28	28	28
8.9	28	28	28	28	28	28	28	28	28	28	28	28	28	28
17.9	28	28	28	28	28	28	28	28	28	28	28	28	28	28
35.7	28	28	28	28	28	28	28	28	28	28	28	28	28	28
71.4	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Tech. Initials	TM	SXB	SXB	SXB	SXB	SXB	SXB	SXB	ML	SXB	ML	SXB	ML	TM

% (v/v) Concentration	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6		7
D-control	7.5	6.6	7.5	6.7	7.5	6.5	7.5	6.5	7.7	6.6	7.7	6.6	7.7	6.4
B-control	7.5	6.6	7.5	6.7	7.5	6.5	7.5	6.5	7.7	6.7	7.7	6.6	7.6	6.2
4.5	7.5	6.5	7.5	6.7	7.5	6.5	7.5	6.5	7.7	6.6	7.7	6.5	7.7	6.6
8.9	7.5	6.5	7.5	6.8	7.6	6.6	7.5	6.4	7.6	6.6	7.7	6.6	7.7	6.7
17.9	7.6	6.5	7.5	6.7	7.6	6.7	7.5	6.4	7.6	6.5	7.7	6.6	7.7	6.6
35.7	7.6	6.6	7.5	6.8	7.6	6.6	7.6	6.5	7.6	6.5	7.6	6.6	7.6	6.2
71.4	7.6	6.5	7.5	6.7	7.6	6.6	7.6	6.5	7.6	6.6	7.6	6.6	7.6	6.4
Tech. Initials	TM	SXB	SXB	SXB	SXB	SXB	SXB	ML	ML	ML	ML	ML	ML	TM

WQ Instruments Used: Salinity II-A-030303 DO II-A-14
Comments

Test Set Up By TM. SXB Data Verified By [signature] Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client Polaris
EVS Project No. 04-1424-044
EVS Work Order No. 0500 ~~358~~ 398

Sample ID G-Creek Sublethal 071605
Test Species/Batch A affinis / 19-July-05
Test Initiation Date/Time 19-July-05 / 1430h
No. of Organisms/Volume 5 / 200 ml

Concentration % v/v	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
D-control	A	T1	5	5	5	5	5	5	5	
	B	T2	5	5	5	5	5	5	5	
	C	T3	5	5	5	5	5	5	5	
	D	T4	5	5	5	5	5	5	5	
	E	T5	5	5	5	5	5	5	5	
B-control	A	T6	5	5	5	5	5	5	5	
	B	T7	5	5	5	5	5	5	5	
	C	T8	5	5	5	5	5	5	5	
	D	T9	5	5	5	5	5	5	5	
	E	T10	5	5	5	5	5	5	5	
4.5	A	T11	5	5	5	5	5	5	5	
	B	T12	5	5	5	5	5	5	5	
	C	T13	5	5	5	5	5	5	5	
	D	T14	5	5	5	5	5	5	4	
	E	T15	5	5	5	5	5	5	5	
8.9	A	T16	5	5	5	5	5	5	5	
	B	T17	5	5	5	5	5	5	5	
	C	T18	5	5	5	5	5	5	5	
	D	T19	5	5	5	5	5	5	5	
	E	T20	5	5	5	5	5	5	4	
Technician Initials		TM	SKB	SKL	SKB	MML	MML	MM	TM	

Sample Description colorless, clear.
Data Verified By [signature] Date Verified Aug 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client Polaris
EVS Project No. 04-1424-044
EVS Work Order No. 0500~~0858~~398

Sample ID G-Creek 071605 Sublethal
Test Species/Batch A. affinis / 19-July-05
Test Initiation Date/Time 19-July-05 / 1430h
No. of Organisms/Volume 5/200ml

% (v/v) Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
17.9	A	T21	5	5	5	5	5	5	5	
	B	T22	5	5	5	5	5	5	5	
	C	T23	5	5	5	5	5	5	5	
	D	T24	5	5	5	5	5	5	5	
	E	T25	5	5	5	5	5	5	5	
~~35.9~~ RSD 35.7	A	T26	5	5	5	5	5	5	5	
	B	T27	5	5	5	5	5	5	5	
	C	T28	5	5	5	5	5	5	5	
	D	T29	5	5	5	5	5	5	5	
	E	T30	5	5	5	5	5	5	5	
71.4	A	T31	5	5	5	5	5	5	5	
	B	T32	5	5	5	5	5	5	4	
	C	T33	5	5	5	5	5	5	5	
	D	T34	5	5	5	5	5	5	5	
	E	T35	5	5	5	5	5	5	5	
	A									
	B									
	C									
	D									
	E									
Technician Initials		TM	SNB	SNB	SNB	MM	MM	MM	MM	

Sample Description colorless clear.
Data Verified By Gail Fink Date Verified Aug. 18/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Polaris

EVS Project No.: 04-1424-044

EVS Work Order No.: 05002[illegible]

Start Date (Day 0): 19-July-05 071605 sublethal

Sample ID: G-Creek

Balance Type/Serial Number: Sartorius / BP-211D

Sample ID (Y/N)	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
D-CTL	A	T1	1237.86	1242.66	5	5		AXF/[illegible]
	B	T2	1223.60	1228.84	5	5		
	C	T3	1234.30	1238.08	5	5		
	D	T4	122157	1226.62	5	5	confirmed 1226.58 mg ✓	
	E	T5	1215.08	1219.11	5	5		
B-CTL	A	T6	1236.55	1241.94	5	5		
	B	T7	1230.84	1236.489	5	5		
	C	T8	1223.70	1229.06	5	5		
	D	T9	1242.73	1247.44	5	5		
	E	T10	1228.47	1231.92	5	5		
4.5	A	T11	1221.11	1224.77	5	5	confirmed 1224.75 mg ✓	
	B	T12	1237.55	1240.97	5	5		
	C	T13	1221.54	1226.04	5	5		
	D	T14	1229.99	1232.59	4	4		
	E	T15	1220.96	1226.00	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph K

Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Polaris

EVS Project No.: 04-1424-044

EVS Work Order No.: 0500788

Start Date (Day 0): 19-July-05

Sample ID: G-Creek ~~07605~~ 07605 Sublethal 07/605

Balance Type/Serial Number: Sartorius / BP-211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
8-9	A	T16	1221.54	1226.60	5	5		AXF 7/20
	B	T17	1235.48	1241.14	5	5		
	C	T18	1237.41	1242.39	5	5		
	D	T19	1236.28	1238.98	5	5	Confirmed 1238.99 mg ✓	
	E	T20	1219.90	1221.88	4	4		
17.9	A	T21	1227.04	1231.84	5	5		
	B	T22	1246.60	1251.74	5	5		
	C	T23	1239.07	1243.68	5	5		
	D	T24	1231.19	1237.41	5	5		
	E	T25	AXF 1229.72	1234.23	5	5		
~~35.9~~ 35.7	A	T26	1230.92	1235.13	5	5	Confirmed 1235.14 mg ✓	
	B	T27	1228.42	1234.87	5	5		
	C	T28	1231.53	1237.73	5	5		
	D	T29	1235.66	1240.48	5	5		
	E	T30	1228.20	1233.15	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph K

Date Verified: Aug. 18/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client Polaris

EVS Project No. 04-1424-044

EVS Work Order No. 05002838

Start Date (Day 0) 19-July-05

Sample ID G-Creek ~~07/605~~ Sublethal 07/605

Balance Type/Serial Number Sartorius / BP-211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
71.4	A	T31	1227.99	1234.14	5	5		AXF 7.7
	B	T32	1230.90	1234.21	4	4		
	C	T33	1234.94	1239.77	5	5		
	D	T34	1230.30	1235.80	5	5		
	E	T35	1232.19	1234.5~~4~~.03	5	5		
	A							
	B							
	C							
	D							
	E							
	A							
	B							
	C							
	D							
	E							

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By Qacji 4

Date Verified Aug. 17/05

Test: LF-Larval Fish Growth and Survival Test | Test ID: 0500298
Species: AA-Atherinops affinis | Protocol: EPAW 95-EPA West Coast
Sample ID: G_CREEK_Sublethal_071605 | Sample Type: EFF2-Industrial
Start Date: 7/19/2005 End Date: 7/26/2005 | Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1237.86	1242.66
	2	2	D-Control	5							5	5	1223.6	1228.84
	3	3	D-Control	5							5	5	1234.3	1238.08
	4	4	D-Control	5							5	5	1221.57	1226.62
	5	5	D-Control	5							5	5	1215.08	1219.11
	6	1	B-Control	5							5	5	1236.55	1241.94
	7	2	B-Control	5							5	5	1230.84	1236.49
	8	3	B-Control	5							5	5	1223.7	1229.06
	9	4	B-Control	5							5	5	1242.73	1247.44
	10	5	B-Control	5							5	5	1228.47	1231.92
	11	1	4.5	5							5	5	1221.11	1224.77
	12	2	4.5	5							5	5	1237.55	1240.97
	13	3	4.5	5							5	5	1221.54	1226.04
	14	4	4.5	5							4	4	1229.99	1232.59
	15	5	4.5	5							5	5	1220.96	1226
	16	1	8.9	5							5	5	1221.54	1226.6
	17	2	8.9	5							5	5	1235.48	1241.14
	18	3	8.9	5							5	5	1237.41	1242.39
	19	4	8.9	5							5	5	1236.28	1238.98
	20	5	8.9	5							4	4	1219.9	1221.88
	21	1	17.9	5							5	5	1227.04	1231.84
	22	2	17.9	5							5	5	1246.6	1251.74
	23	3	17.9	5							5	5	1239.07	1243.68
	24	4	17.9	5							5	5	1231.19	1237.41
	25	5	17.9	5							5	5	1229.72	1234.23
	26	1	35.7	5							5	5	1230.92	1235.13
	27	2	35.7	5							5	5	1228.42	1234.87
	28	3	35.7	5							5	5	1231.53	1237.73
	29	4	35.7	5							5	5	1235.66	1240.48
	30	5	35.7	5							5	5	1228.2	1233.15
	31	1	71.4	5							5	5	1227.99	1234.14
	32	2	71.4	5							4	4	1230.9	1234.21
	33	3	71.4	5							5	5	1234.94	1239.77
	34	4	71.4	5							5	5	1230.3	1235.8
	35	5	71.4	5							5	5	1232.19	1235.03

Comments: Azimuth(Polaris) 04-1424-044

Reviewed by Aug. 18/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	7/19/2005	Test ID:	500298	Sample ID:	G_CREEK_Sublethal_071605
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris) 04-1424-044				

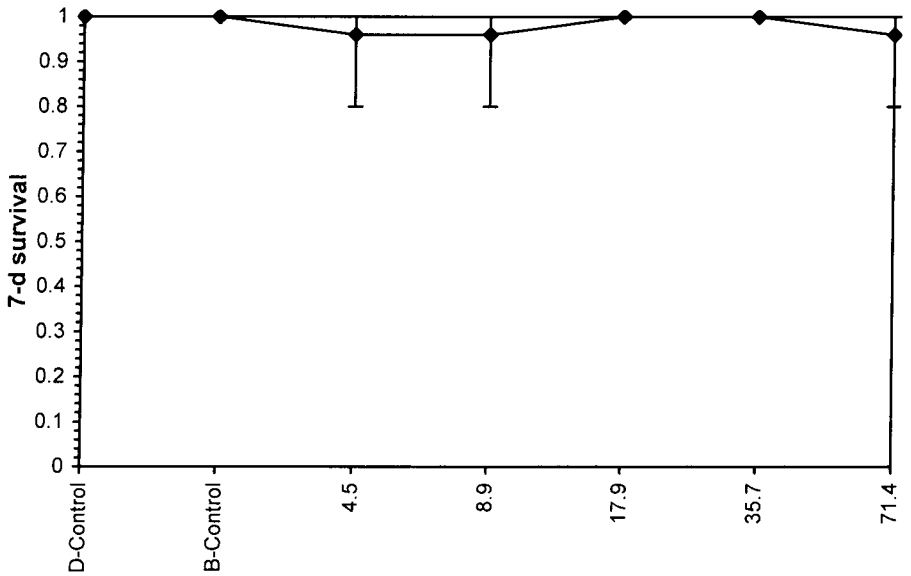
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
B-Control	1.0000	1.0000	1.0000	1.0000	1.0000
4.5	1.0000	1.0000	1.0000	0.8000	1.0000
8.9	1.0000	1.0000	1.0000	1.0000	0.8000
17.9	1.0000	1.0000	1.0000	1.0000	1.0000
35.7	1.0000	1.0000	1.0000	1.0000	1.0000
71.4	1.0000	0.8000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5		
B-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5		
4.5	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
8.9	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
17.9	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
35.7	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
71.4	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.59678	0.9	-2.2346	4.3922
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	71.4	>71.4		1.40056

Dose-Response Plot



Statistical comparisons were against the negative control.

Larval Fish Growth and Survival Test-7-d survival

Start Date:	7/19/2005	Test ID:	500298	Sample ID:	G_CREEK_Sublethal_071605
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris) 04-1424-044				

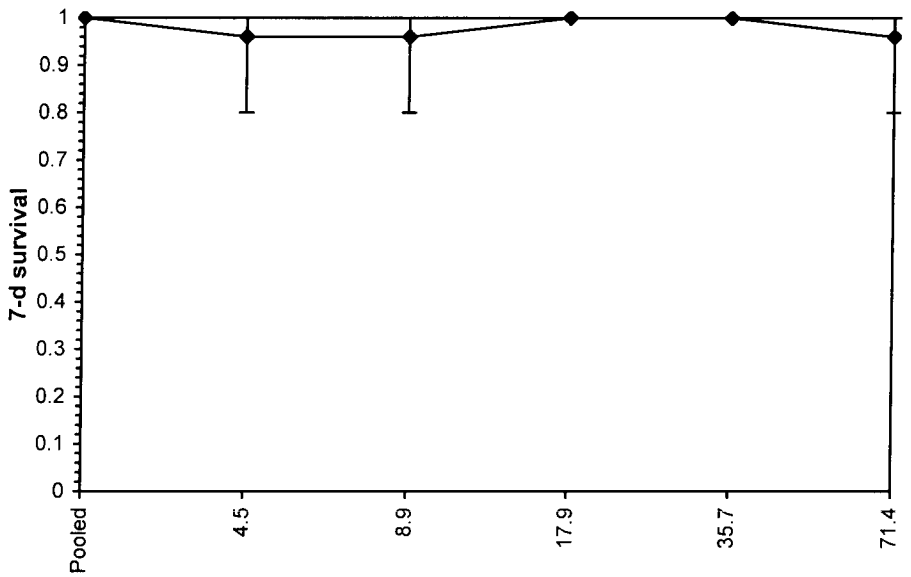
Conc-%	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
B-Control	1.0000	1.0000	1.0000	1.0000	1.0000
4.5	1.0000	1.0000	1.0000	0.8000	1.0000
8.9	1.0000	1.0000	1.0000	1.0000	0.8000
17.9	1.0000	1.0000	1.0000	1.0000	1.0000
35.7	1.0000	1.0000	1.0000	1.0000	1.0000
71.4	1.0000	0.8000	1.0000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical
Pooled	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	10		
4.5	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00
8.9	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00
17.9	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
35.7	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	40.00	21.00
71.4	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	35.00	21.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.58129	0.91	-2.3952	5.50568
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	71.4	>71.4		1.40056

Dose-Response Plot



Statistical comparisons were agianst the pooled controls.

Reviewed by: Aug. 18/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/19/2005	Test ID:	500298	Sample ID:	G_CREEK_Sublethal_071605
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris) 04-1424-044				

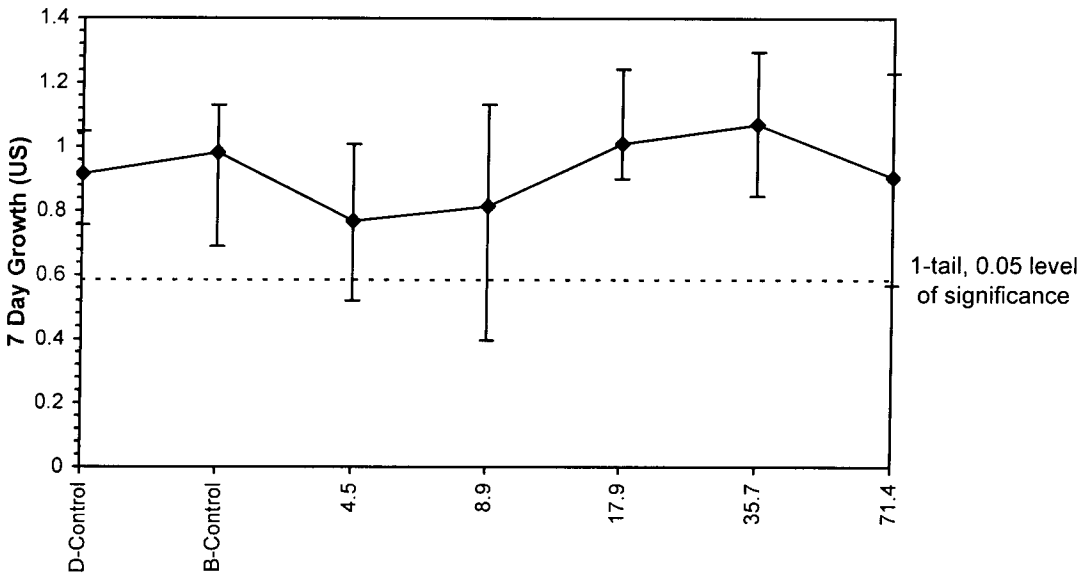
Conc-%	1	2	3	4	5
D-Control	0.9600	1.0480	0.7560	1.0100	0.8060
B-Control	1.0780	1.1300	1.0720	0.9420	0.6900
4.5	0.7320	0.6840	0.9000	0.5200	1.0080
8.9	1.0120	1.1320	0.9960	0.5400	0.3960
17.9	0.9600	1.0280	0.9220	1.2440	0.9020
35.7	0.8420	1.2900	1.2400	0.9640	0.9900
71.4	1.2300	0.6620	0.9660	1.1000	0.5680

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9160	0.1284	0.9160	0.7560	1.0480	14.012	5			
B-Control	0.9824	0.1775	0.9824	0.6900	1.1300	18.072	5			
4.5	0.7688	0.1903	0.7688	0.5200	1.0080	24.755	5	1.051	2.360	0.3307
8.9	0.8152	0.3253	0.8152	0.3960	1.1320	39.903	5	0.719	2.360	0.3307
17.9	1.0112	0.1387	1.0112	0.9020	1.2440	13.719	5	-0.679	2.360	0.3307
35.7	1.0652	0.1916	1.0652	0.8420	1.2900	17.985	5	-1.065	2.360	0.3307
71.4	0.9052	0.2828	0.9052	0.5680	1.2300	31.246	5	0.077	2.360	0.3307

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96171	0.9	-0.2156	-0.8642
Bartlett's Test indicates equal variances (p = 0.42)	4.97608	15.0863		
The control means are not significantly different (p = 0.52)	0.67773	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	71.4	>71.4		1.40056	0.33065	0.36097	0.06323	0.04907	0.30153	5, 24

Dose-Response Plot



Statistical comparisons were against the negative control.

Reviewed by: Aug. 18/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/19/2005	Test ID:	500298	Sample ID:	G_CREEK_Sublethal_071605
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth(Polaris) 04-1424-044				

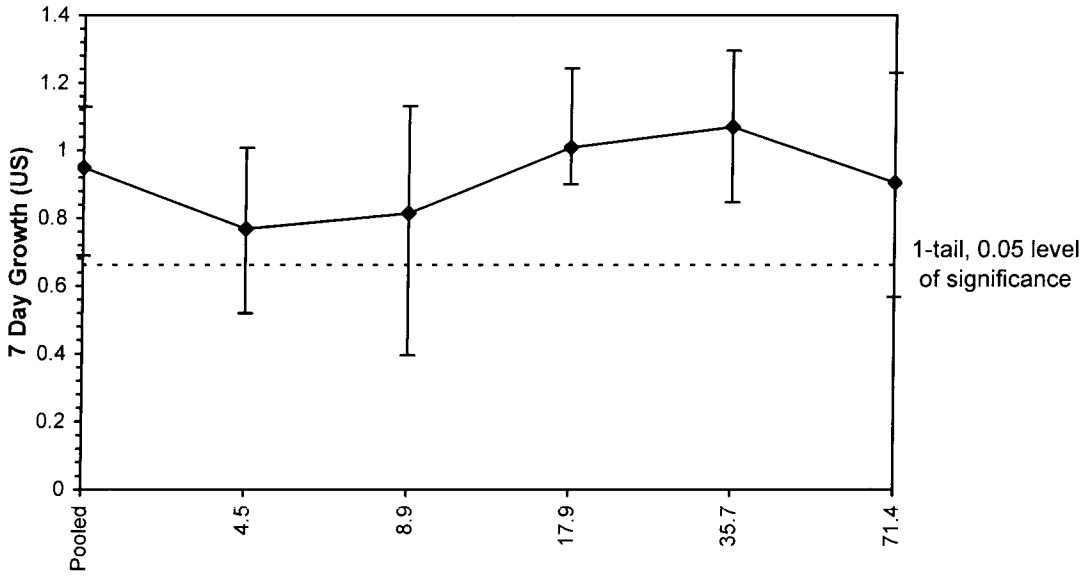
Conc-%	1	2	3	4	5
D-Control	0.9600	1.0480	0.7560	1.0100	0.8060
B-Control	1.0780	1.1300	1.0720	0.9420	0.6900
4.5	0.7320	0.6840	0.9000	0.5200	1.0080
8.9	1.0120	1.1320	0.9960	0.5400	0.3960
17.9	0.9600	1.0280	0.9220	1.2440	0.9020
35.7	0.8420	1.2900	1.2400	0.9640	0.9900
71.4	1.2300	0.6620	0.9660	1.1000	0.5680

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Pooled	0.9492	0.1502	0.9492	0.6900	1.1300	15.822	10			
4.5	0.7688	0.1903	0.7688	0.5200	1.0080	24.755	5	1.547	2.462	0.2871
8.9	0.8152	0.3253	0.8152	0.3960	1.1320	39.903	5	1.149	2.462	0.2871
17.9	1.0112	0.1387	1.0112	0.9020	1.2440	13.719	5	-0.532	2.462	0.2871
35.7	1.0652	0.1916	1.0652	0.8420	1.2900	17.985	5	-0.995	2.462	0.2871
71.4	0.9052	0.2828	0.9052	0.5680	1.2300	31.246	5	0.377	2.462	0.2871

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9613	0.91	-0.2544	-0.8676
Bartlett's Test indicates equal variances (p = 0.38)	5.3243	15.0863		
The control means are not significantly different (p = 0.52)	0.67773	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	71.4	>71.4		1.40056	0.28714	0.30251	0.06509	0.04534	0.24132	5, 29

Dose-Response Plot



Statistical comparisons were against the ~~negative control~~ Pooled controls

Reviewed by Aug-18/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client (Polaris) Azimuth

EVS Project No. 04-1424-044

EVS Work Order No. 0500~~25~~298 RSO

EVS Analysts JXS, SXB, MJG, AXF

Test Initiation Date 19-July-05

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	100 mg/L Cu Stock (05-Cu-001)		
Amount ~~Received~~ Prepared	1x1L		
Date ~~Collected~~ Prepared	7 Mar 05		
Date Received	na		
Temperature (°C)	↓		
pH	↓		
DO (mg/L)	↓		
Conductivity (μmhos/cm)	↓		
Salinity (ppt)	↓		
Ammonia (mg/L N)	↓		
Chlorine (mg/L Cl)	↓		
Other	↓		

RSO

DILUTION/CONTROL WATER (initial water quality)

Water Type Filtered, UV sterilized seawater

Temperature (°C) 20.0

pH 7.8

Dissolved Oxygen (mg/L) 7.5

Salinity 28

TEST CONDITIONS

Temperature Range (°C) 20.0 - 21.0

pH Range 7.7 - 8.0

Dissolved Oxygen Range (mg/L) ~~6.3~~ 6.2 - 7.7

Salinity (ppt) 28

Photoperiod (L:D h) 16:8

Aeration Provided? No

Other -

TEST SPECIES INFORMATION

Source ABS

Date Received 19-July-05

Age (on Day 0) 10-d

Reference Toxicant Cu

Current Reference Toxicant Result (incl. 95% CL)

Reference Toxicant Test Date 19 Jul 05

7-d survival LC50 ~~122 (106-140)~~ 117(100-136) µg/L Cu

7-d growth IC50 ~~112 (80-144)~~ 116(81-156) µg/L Cu

Reference Toxicant Warning Limits (mean ± 2SD) and CV

7-d survival LC50 133 ± 39 µg/L Cu CV=15%

7-d growth IC50 132 ± 46 µg/L Cu CV=17%

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	µg/L Cu	100	180	117 (100-136) ~~122 (106-140)~~		
Growth	µg/L Cu	56	100		116 (81-156) ~~112 (80-144)~~	83 (68-114) ~~80 (65-114)~~

Other

Data Verified By [signature]

Date Verified Aug 22/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client (Polaris) Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500~~258~~ 298 RSD

Sample ID Cu Reference Toxicant
Test Initiation Date/Time 19-July-05/1440h
Source/Date Received ABS/19-July-05

Cu (µg/L) Concentration	Temperature (°C)													
	0	old	1 new	2		3		4		5		6		7
0-control	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
32	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
56	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
100	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
180	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0	20.0	21.0	20.0	21.0	20.0	20.5
320	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0 ~~21.0~~	—	—	—	—	—	—
								MG						
Tech. Initials	TH	SxB	SxB	SxB	SxB	SxB	SxB	MG	MG	MG	MG	MG	MG	TH

Cu (µg/L) Concentration	pH													
	0	old	1 new	2		3		4		5		6		7
0-control	7.8	7.7	7.7	7.7	7.8	7.7	7.9	7.8	7.9	7.8	7.8	7.9	7.9	7.9
32	7.8	7.7	7.7	7.7	7.8	7.7	7.9	7.8	7.9	7.8	7.8	7.9	7.9	7.9
56	7.8	7.7	7.8	7.7	7.8	7.7	7.9	7.8	7.9	7.8	7.8	7.9	7.9	7.9
100	7.8	7.7	7.7	7.7	7.8	7.8	7.9	7.8	7.9	7.8	7.8	8.0	7.9	7.9
180	7.8	7.7	7.8	7.7	7.8	7.8	7.9	7.8	7.9	7.8	7.8	8.0	7.9	7.9
320	7.8	7.7	7.8	7.7	7.8	7.8	7.9	7.8	7.9	7.8	7.8	8.0	7.9	7.9
Tech. Initials	TH	SxB	SxB	SxB	SxB	SxB	SxB	MG	MG	MG	MG	MG	MG	TH

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-030301
Comments

Test Set Up By JMS. SxB Data Verified By Qalfish Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client (Polaris) Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 05072158 2918 RSP

Sample ID Cu Reference Toxicant
Test Initiation Date/Time 19-July-05/1440h
Source/Date Received ABS/19-July-05

Cu (mg/L) Concentration	Salinity (ppt)													
	0	1		2		3		4		5		6		7
0-control	28	28	28	28	28	28	28	28	28	28	28	28	28	28
32	28	28	28	28	28	28	28	28	28	28	28	28	28	28
56	28	28	28	28	28	28	28	28	28	28	28	28	28	28
100	28	28	28	28	28	28	28	28	28	28	28	28	28	28
180	28	28	28	28	28	28	28	28	28	28	28	28	28	28
320	28	28	28	28	28	28	28	28	—	—	—		—	—
Tech. Initials	TJ	SXB	SXB	SXB	SXB	SXB	SXB	SXB	MC	SXB	MC	SXB	MC	SXB

Cu (mg/L) Concentration	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6 MC 7.7		7
0-control	7.5	6.8	7.5	6.7	7.5	6.6	7.5	6.6	7.7	6.5	7.7	6.6	~~7.9~~	6.2
32	7.5	6.5	7.5	6.7	7.5	6.5	7.5	6.6	7.7	6.5	7.7	6.6	7.7	6.3
56	7.5	6.6	7.5	6.8	7.5	6.6	7.5	6.5	7.7	6.5	7.7	6.7	7.7	6.6
100	7.5	6.6	7.5	6.7	7.5	6.6	7.5	6.6	7.7	6.4	7.7	6.7	7.7	6.4
180	7.5	6.6	7.5	6.7	7.5	6.6	7.5	6.6	7.7	6.5	7.7	6.6	7.7 MC	6.6
320	7.5	6.6	7.5	6.7	7.5	6.7	7.5	6.5	~~7.7~~ MC	—	—	—	—	
Tech. Initials	TJ	SXB	SXB	SXB	SXB	SXB	SXB	MC	MC	MC	MC	MC	MC	TJ

WQ Instruments Used: Salinity I-A-050505 DO I-A-0814
Comments

Test Set Up By TJ SXB Data Verified By [signature] Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client (Polaris) Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0589 ~~458~~ 298
RSO

Sample ID Cu Reference Toxicant
Test Species/Batch A. affinis/19-July-05
Test Initiation Date/Time 19-July-05/1440h
No. of Organisms/Volume 5/200mL

Cu (mg/L) Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
D-control	A	A80	5	5	5	5	5	5	5	
	B	A81	5	5	5	5	5	5	5	
	C	A82	5	5	5	5	5	5	5	
	D	A83	5	5	5	5	5	5	dead 4	
	E	A84	5	5	5	5	5	5	5	
32	A	A85	5	5	5	5	5	5	5	
	B	A86	5	5	5	5	5	5	5	
	C	A87	5	5	5	5	5	5	5	
	D	A88	5	5	5	5	5	5	5	
	E	A89	5	5	5	5	5	5	4	
56	A	A91	5	5	4	4	4	4	4	
	B	A92	5	5	5	5	5	5	5	
	C	A93	5	5	5	5	5	5	5	
	D	A94	5	5	5	5	5	5	5	
	E	A95	5	5	5	5	5	5	5	
100	A	A66	5	3	2	2	2	2	2	
	B	A67	4	1	1	1	1	1	1	
	C	A68	5	4	4	4	4	4	4	
	D	A69	5	4	4	4	4	5	4	
	E	A70	5	5	5	5	5	5	5	
Technician Initials		TM	SXB	SXB	SXB	TM	TM	TM	TM	

Sample Description clear, colorless.
Data Verified By Qalfish Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client (Polaris) Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500~~158~~ 292
150

Sample ID Cu Reference Toxicant
Test Species/Batch A. affinis/19-July-05
Test Initiation Date/Time 19-July-05/1440h
No. of Organisms/Volume 5/200 ml

Cu (mg/L) Concentration	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
180	A		4	3	0	0	0	0 MK	—	
	B	471	5	5	4	4	4	~~3~~ 4	3	
	C		5	3	2	1	0	0	—	
	D		4	2	2	1	0	0	—	
	E	472	5	3	2	2	1	1	1	
320	A		3	2	1	0	0	0	-	
	B		2	2	0	0	0	0	—	
	C		2	2	1	0	0	0	—	
	D		2	2	0	0	0	0	—	
	E		3	2	0	0	0	0	—	
	A									
	B									
	C									
	D									
	E									
	A									
	B									
	C									
	D									
	E									
Technician Initials		TM	SxB	SxB	SxB	MK	MK	MK	TM	

Sample Description clear, colorless
Data Verified By Malfik Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500298

Start Date (Day 0): 19-July-05
Sample ID: Cu Reference Toxicant
Balance Type/Serial Number: Sartorius / BP-211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
D-CTL	A	A80	1225.71	1231.08	5	5		JxT/TT
	B	A81	1228.66	1232.69	5	5		
	C	A82	1235.20	1239.66	5	5	Confirmed 1239.84 mg ✓	
	D	A83	1233.97	1239.36	~~5~~ 4	~~5~~ 4	1 fish lost when transferring	
	E	A84	1228.91	1234.00	5	5		

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: [signature]
Date Verified: Aug. 18/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500298

Start Date (Day 0): 19-Jul-05
Sample ID: Cu Reference Toxicant
Balance Type/Serial Number: Sartorius/BP-211D

Sample ID	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
32	A	A85	1229.51	1236.23	5	5		AXF/mm
	B	A86	1233.16	1239.24	5	5		
	C	A87	1234.56	1238.84	5	5		
	D	A88	1225.13	1231.48	5	5		
	E	A89	1236.28	1241.25	4	4		
56	A	A91	1245.68	1249.99	4	4		
	B	A92	1222.48	1227.32	5	5		
	C	A93	1240.76	1246.95	5	5		
	D	A94	1233.51	1239.05	5	5		
	E	A95	1239.61	1245.85	5	5		
	A							
	B							
	C							
	D							
	E							

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph

Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TOXICITY TEST – DRY WEIGHT DATA

Client: Azimuth (Polaris)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500248

Start Date (Day 0): 19-Jul-05
Sample ID: Cu Reference Toxicant
Balance Type/Serial Number: Sartorius/BP-211D

Sample ID mg/L	Rep.	Pan No.	Pan Weight (mg) [1]	Final Weight (mg) (pan + biomass) [1]	Number of Survivors	Number Weighed	Comments (e.g., confirmation weights, organisms lost in transfer)	Tech. Init.
100	A	A66	1227.36	1229.94	2	2		AXF
	B	A67	1237.38	1238.70	1	1		
	C	A68	1224.68	1228.~~49~~ 24	4	4	Confirmed 1228.25 mg ✓	
	D	A69	1232.31	1236.61	4	4		
	E	A70	1244.03	1247.98	5	5		
180	~~A~~ B	A71	1239.12	1241.93	3	3	Confirmed 1241.90 mg ✓	
	~~B~~ E	A72	1214.89	1215.67	1	1		
	~~C~~	~~A73~~	~~1221.50~~					
	~~D~~	~~A74~~	~~1238.30~~					
	~~E~~							
	A							
	B							
	C							
	D							
	E							

1. Re-confirm weights for 10% of final weights and record under "Comments"; relative percent difference (RPD) between pairs of weights should be ≤10% of organism weight.

Data Verified By: Ralph

Date Verified: Aug. 17/05

Test: LF-Larval Fish Growth and Survival Test
Test ID: RTAACu45
Species: AA-Atherinops affinis
Protocol: EPAW 95-EPA West Coast
Sample ID: REF-Ref Toxicant
Sample Type: CU-Copper
Start Date: 7/19/2005 End Date: 7/26/2005
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1225.71	1231.08
	2	2	D-Control	5							5	5	1228.66	1232.69
	3	3	D-Control	5							5	5	1235.2	1239.86
	4	4	D-Control	5							5	5	1233.97	1239.36
	5	5	D-Control	5							5	5	1228.91	1234
	6	1	32.0	5							5	5	1229.51	1236.23
	7	2	32.0	5							5	5	1233.16	1239.24
	8	3	32.0	5							5	5	1234.56	1238.84
	9	4	32.0	5							5	5	1225.13	1231.48
	10	5	32.0	5							4	4	1236.28	1241.25
	11	1	56.0	5							4	4	1245.68	1249.99
	12	2	56.0	5							5	5	1222.48	1227.32
	13	3	56.0	5							5	5	1240.76	1246.95
	14	4	56.0	5							5	5	1233.51	1239.05
	15	5	56.0	5							5	5	1239.61	1245.85
	16	1	100.0	5							2	2	1227.36	1229.94
	17	2	100.0	5							1	1	1237.38	1238.7
	18	3	100.0	5							4	4	1224.68	1228.24
	19	4	100.0	5							4	4	1232.31	1236.61
	20	5	100.0	5							5	5	1244.03	1247.98
	21	1	180.0	5							0	0	0	0
	22	2	180.0	5							3	3	1239.12	1241.93
	23	3	180.0	5							0	0	0	0
	24	4	180.0	5							0	0	0	0
	25	5	180.0	5							1	1	1214.89	1215.67
	26	1	320.0	5							0	0	0	0
	27	2	320.0	5							0	0	0	0
	28	3	320.0	5							0	0	0	0
	29	4	320.0	5							0	0	0	0
	30	5	320.0	5							0	0	0	0

Comments: Azimuth Polaris 04-1424-044 (0500298)

Reviewed by: Aug. 22/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	7/19/2005	Test ID:	RTAACu45	Sample ID:	REF-Ref Toxicant
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth Polaris 04-1424-044 (0500298)				

Conc-ug/L	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000
32	1.0000	1.0000	1.0000	1.0000	0.8000
56	0.8000	1.0000	1.0000	1.0000	1.0000
100	0.4000	0.2000	0.8000	0.8000	1.0000
180	0.0000	0.6000	0.0000	0.0000	0.2000
320	0.0000	0.0000	0.0000	0.0000	0.0000

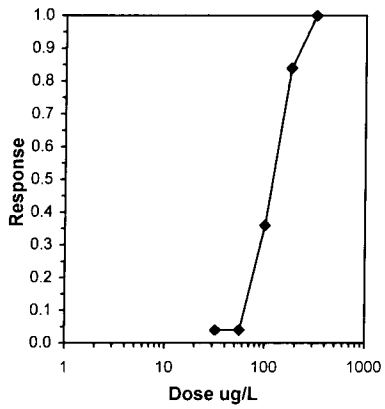
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5			0	25
32	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	17.00	1	25
56	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	25.00	17.00	1	25
100	0.6400	0.3286	0.9416	0.4636	1.3453	38.004	5	17.50	17.00	9	25
*180	0.1600	0.2608	0.4053	0.2255	0.8861	71.039	5	15.00	17.00	21	25
320	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	5			25	25

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.90309	0.888	0.17519	1.66432
Equality of variance cannot be confirmed				

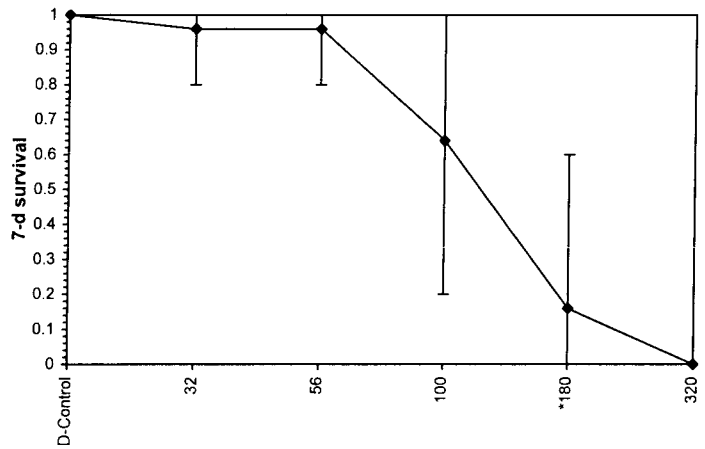
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	180	134.164	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL		
0.0%				
5.0%	116.88	100.05	136.55	
10.0%	116.41	98.86	137.08	
20.0%	117.22	94.25	145.79	
Auto-4.0%	117.04	100.39	136.44	ug/L Cu



Dose-Response Plot



Reviewed by Aug. 22/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	7/19/2005	Test ID:	RTAACu45	Sample ID:	REF-Ref Toxicant
End Date:	7/26/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth Polaris 04-1424-044 (0500298)				

Conc-ug/L	1	2	3	4	5
D-Control	1.0740	0.8060	0.9320	1.0780	1.0180
32	1.3440	1.2160	0.8560	1.2700	0.9940 ✓
56	0.8620	0.9680	1.2380	1.1080	1.2480
100	0.5160	0.2640 ✓	0.7120	0.8600	0.7900
180	0.0000	0.5620	0.0000	0.0000	0.1560 ✓
320	0.0000	0.0000	0.0000	0.0000	0.0000

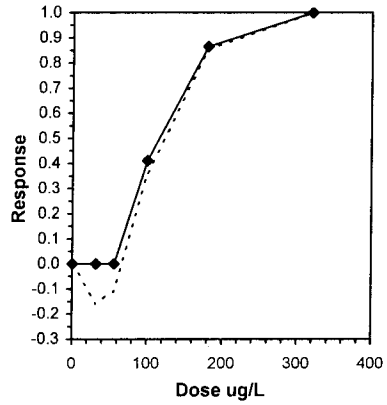
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9816	0.1145	0.9816	0.8060	1.0780	11.666	5				1.0675	1.0000
32	1.1360	0.2038	1.1360	0.8560	1.3440	17.943	5	-1.219	2.300	0.2913	1.0675	1.0000
56	1.0848	0.1688	1.0848	0.8620	1.2480	15.557	5	-0.815	2.300	0.2913	1.0675	1.0000
*100	0.6284	0.2409	0.6284	0.2640	0.8600	38.338	5	2.789	2.300	0.2913	0.6284	0.5887
*180	0.1436	0.2435	0.1436	0.0000	0.5620	169.535	5	6.618	2.300	0.2913	0.1436	0.1345
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5				0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9755	0.888	0.077	-0.1953
Bartlett's Test indicates equal variances (p = 0.66)	2.41004	13.2767		

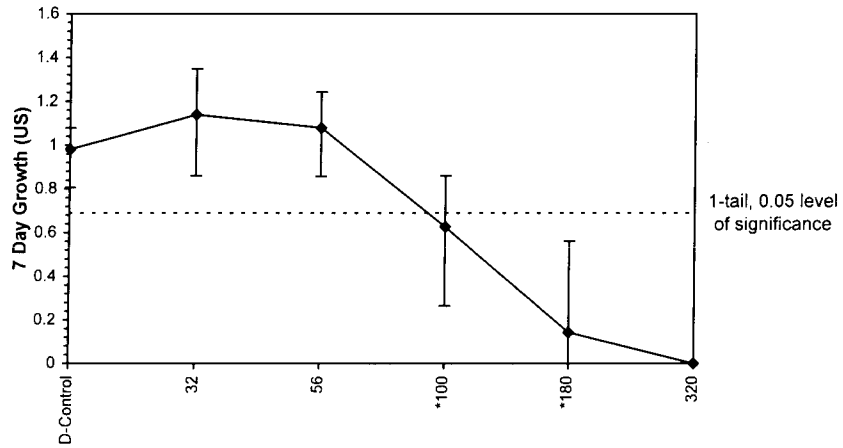
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	56	100	74.8331		0.29126	0.29672	0.85895	0.04009	5.4E-07	4, 20

Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew	
IC05	61.35	6.16	30.65	67.13	-1.9529	
IC10	66.70	4.93	43.95	78.27	-0.6852	
IC15	72.05	5.63	55.64	91.09	0.5478	
IC20	77.39	6.77	62.96	102.78	1.0777	
IC25	82.74	7.81	67.65	114.17	0.9592	
IC40	98.79	11.11	78.22	135.91	0.5373	
IC50	115.62	14.64	80.73	156.41	0.6255	ug/L Cu



Dose-Response Plot



Reviewed by Aug 22/05

APPENDIX II

Raw Data and Statistical Analyses:

Dendraster excentricus

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client Azimuth Consulting (Polaris Mine)
EVS Project No. 04-1424-044
EVS Work Order No. 0500299

EVS Analysts SRS
Test Initiation Date 19 July 05

SAMPLE

Identification G-creek sublethal 071605
Amount Received 3x20L
Date Collected 16-Jul-05
Date Received 19-Jul-05
Temperature (°C) 14.0 ① → 15.0
pH 7.5 ① → 8.2
Dissolved Oxygen (mg/L) 11.1 ① → 8.5
Conductivity (µmhos/cm) 1520
Salinity (ppt) 3.0 ① → 28
Ammonia (mg/L N) —
Chlorine (mg/L Cl) —
Other —

① Brine Adjustment

TEST SPECIES

Organism Dendraster excentricus
Source Westcoast Sea Lab
Date Received ~~SDS~~ SRS 19 Jul 05
Reference Toxicant SDS
Current Reference Toxicant Result
Reference Toxicant Test Date 19 Jul 05
IC50 (and 95% CL) 5.8 (5.2 - 6.5) mg/L
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.6 ± 4.4 mg/L SDS; CV = 60%

DILUTION/CONTROL WATER (initial water quality)

Water Type UV sterilized; 0.45µm filtered SW
Temperature (°C) 15
pH 7.9
Dissolved Oxygen (mg/L) 8.5
Salinity (ppt) 28
Other —

TEST CONDITIONS

Temperature Range (°C) 15.0
pH Range 7.9 - 8.3
Dissolved Oxygen Range (mg/L) ~~7.9~~ SRS 7.9 - 8.5
Salinity Range (ppt) 28
Sperm:Egg Ratio 2000:1
Test Duration 10:10
Other —

TEST RESULTS

Statistical comparisons were against pooled controls
IC_{50}: 13.2 (10.8 - 16.9) % v/v
IC_{25}: 5.2 (4.4 - 6.1) % v/v
NOEC: < 4.6 % v/v
LOEC: 4.6 % v/v

Data Verified By [signature]
Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client: Azimuth (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500299
Logbook: Edmonds #13 Pages: 68-71

Test Initiation Date/Time: 19 July 05 / 1514
Test Species: Dendraster excentricus
Source/Date Received: Westmar Seatab / 19 July 05
Test Duration: 10:10

Sample ID G-Creek sublethal 071605	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
Control	15	7.9	28	8.5	
Brine Control	15	8.3	28	8.5	
4.6 %v/v	15	8.0	28	8.5	
9.1% v/v	15	8.1	28	8.5	
18.2 ~~SRS~~ ±8.3 %v/v	15	8.1	28	8.5	
36.4 ~~SRS~~ ±6.6 %v/v	15	8.1	28	8.5	
Max (72.8%v)	15	8.2	28	8.5	
Technician Initials	SRS	SRS	SRS	SRS	

WQ Instruments Used: Temp. Calibrated Hg Thermometer pH II-A-030301 Salinity II-A-030304 DO II-A-20

Sample Description: Sample is clear with no odour.

Data Verified By: Qaljf Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: Azimuth (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500299
Logbook: Echinoid #13 Pages: 68-71

Test Initiation Date/Time: 19 July 05 / 1514
Test Species: Dendraster excentricus
Source/Date Received: 19 July 05 / Westwind Seaclub
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Sample ID (%(V/V))	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
Control	A	64	36		SRS
	B	60	40		
	C	66	34		
	D	69	31		
G-Creek Subsurface 071605 4.6	A	56	44		SRS
	B	51	49		
	C	52	48		
	D	53	47		
G-Creek Subsurface 071605 9.1	A	39	61		SRS
	B	37	63		
	C	37	63		
	D	36	64		
G-Creek Subsurface 071605 18.2 SRS	A	33	67		SRS
	B	~~38~~ 28	72		
	C	29	71		
	D	30	70		
G-Creek Subsurface 071605 36.4 SRS	A	20	80		SRS
	B	27	73		
	C	23	77		
	D	24	76		
G-Creek Subsurface 071605 Max (72.8)	A	20	80		SRS
	B	16	84		
	C	21	79		
	D	21	79		

Data Verified By: [signature]
Date Verified: Aug. 17/05

Test: SC-Sperm Cell Fertilization test					Test ID: 0500299		
Species: DE-Dendraster excentricus					Protocol: EPS1/RM/27-EC 92 (Sperm Cell)		
Sample ID: g_creek sublethal 071605					Sample Type: GW-groundwater		
Start Date: 7/19/2004 10:10			End Date: 7/19/2004		Lab ID: BCEVS-EVS Environment Consultants		
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	64	36	
	2	2	D-Control	100	60	40	
	3	3	D-Control	100	66	34	
	4	4	D-Control	100	69	31	
	5	1	B-Control	100	70	30	
	6	2	B-Control	100	68	32	
	7	3	B-Control	100	71	29	
	8	4	B-Control	100	67	33	
	9	1	4.600	100	56	44	
	10	2	4.600	100	51	49	
	11	3	4.600	100	52	48	
	12	4	4.600	100	53	47	
	13	1	9.100	100	39	61	
	14	2	9.100	100	37	63	
	15	3	9.100	100	37	63	
	16	4	9.100	100	36	64	
	17	1	18.200	100	33	67	
	18	2	18.200	100	28	72	
	19	3	18.200	100	29	71	
	20	4	18.200	100	30	70	
	21	1	36.400	100	20	80	
	22	2	36.400	100	27	73	
	23	3	36.400	100	23	77	
	24	4	36.400	100	24	76	
	25	1	72.800	100	20	80	
	26	2	72.800	100	16	84	
	27	3	72.800	100	21	79	
	28	4	72.800	100	21	79	

Comments: Azimuth Consulting Group (Polaris) 04-1424-044 (0500299)

Reviewed by: Aug 19/04

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/19/2004 10:10	Test ID:	500299	Sample ID:	g_creek sublethal 071605
End Date:	7/19/2004	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	GW-groundwater
Sample Date:	7/16/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm (	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris) 04-1424-044 (0500299)				

Conc-%	1	2	3	4
D-Control	0.6400	0.6000	0.6600	0.6900
B-Control	0.7000	0.6800	0.7100	0.6700
4.6	0.5600	0.5100	0.5200	0.5300
9.1	0.3900	0.3700	0.3700	0.3600
18.2	0.3300	0.2800	0.2900	0.3000
36.4	0.2000	0.2700	0.2300	0.2400
72.8	0.2000	0.1600	0.2100	0.2100

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	0.6688	0.0356	0.6688	0.6000	0.7100	5.328	8				0.6688	1.0000
*4.6	0.5300	0.0216	0.5300	0.5100	0.5600	4.076	4	8.308	2.508	0.0419	0.5300	0.7925
*9.1	0.3725	0.0126	0.3725	0.3600	0.3900	3.378	4	17.739	2.508	0.0419	0.3725	0.5570
*18.2	0.3000	0.0216	0.3000	0.2800	0.3300	7.201	4	22.080	2.508	0.0419	0.3000	0.4486
*36.4	0.2350	0.0289	0.2350	0.2000	0.2700	12.284	4	25.972	2.508	0.0419	0.2350	0.3514
*72.8	0.1950	0.0238	0.1950	0.1600	0.2100	12.208	4	28.367	2.508	0.0419	0.1950	0.2916

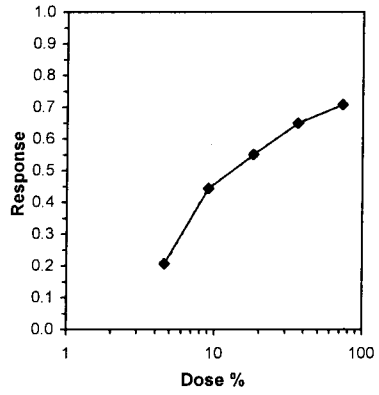
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96577	0.896	-0.6264	0.89125
Bartlett's Test indicates equal variances (p = 0.59)	3.72999	15.0863		
The control means are not significantly different (p = 0.09)	2.02707	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	<4.6	4.6			0.04189	0.06264	0.18978	0.00074	1.0E-18	5, 22

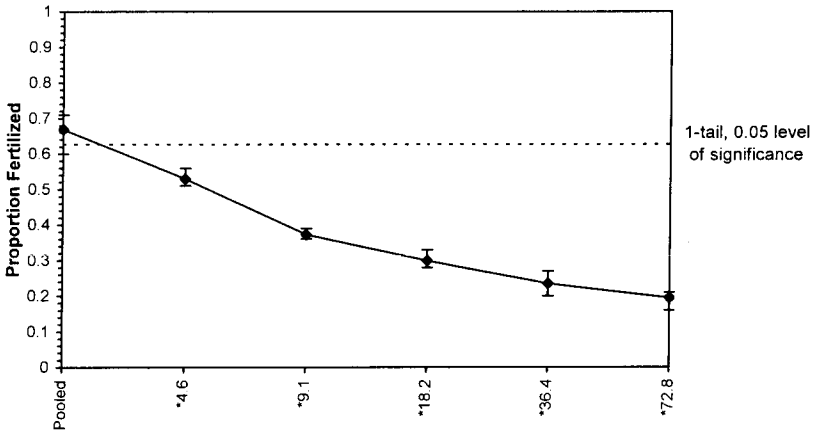
Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05*	0.515	0.065	0.376	0.746	1.1707	
IC10*	1.294	0.204	0.886	2.030	1.4723	
IC15*	2.475	0.454	1.574	4.227	1.0928	
IC20*	4.263	0.546	2.495	5.437	-0.5325	
IC25	5.229	0.268	4.417	6.073	-0.2992	
IC40	8.069	0.268	7.197	8.864	-0.1114	
IC50	13.159	1.074	10.756	16.853	0.9349	%v/v

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Note: Statistical comparisons were against pooled controls

Reviewed by:

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/19/2004 10:10	Test ID:	500299	Sample ID:	g_creek sublethal 071605
End Date:	7/19/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	GW-groundwater
Sample Date:	7/16/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris) 04-1424-044 (0500299)				

Conc-%	1	2	3	4
D-Control	0.6400	0.6000	0.6600	0.6900
B-Control	0.7000	0.6800	0.7100	0.6700
4.6	0.5600	0.5100	0.5200	0.5300
9.1	0.3900	0.3700	0.3700	0.3600
18.2	0.3300	0.2800	0.2900	0.3000
36.4	0.2000	0.2700	0.2300	0.2400
72.8	0.2000	0.1600	0.2100	0.2100

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6475	0.0377	0.6475	0.6000	0.6900	5.830	4				0.6475	1.0000
B-Control	0.6900	0.0183	0.6900	0.6700	0.7100	2.646	4					
*4.6	0.5300	0.0216	0.5300	0.5100	0.5600	4.076	4	6.504	2.410	0.0435	0.5300	0.8185
*9.1	0.3725	0.0126	0.3725	0.3600	0.3900	3.378	4	15.222	2.410	0.0435	0.3725	0.5753
*18.2	0.3000	0.0216	0.3000	0.2800	0.3300	7.201	4	19.235	2.410	0.0435	0.3000	0.4633
*36.4	0.2350	0.0289	0.2350	0.2000	0.2700	12.284	4	22.833	2.410	0.0435	0.2350	0.3629
*72.8	0.1950	0.0238	0.1950	0.1600	0.2100	12.208	4	25.047	2.410	0.0435	0.1950	0.3012

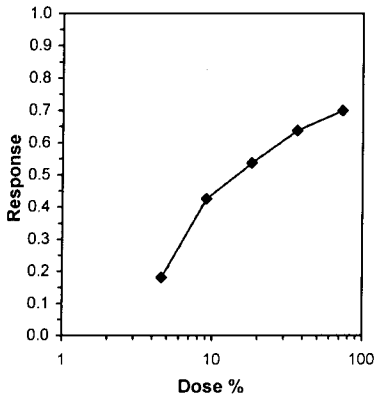
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98059	0.884	-0.1047	-0.1759
Bartlett's Test indicates equal variances (p = 0.67)	3.19845	15.0863		
The control means are not significantly different (p = 0.09)	2.02707	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<4.6	4.6			0.04354	0.06724	0.12461	0.00065	6.1E-15	5, 18

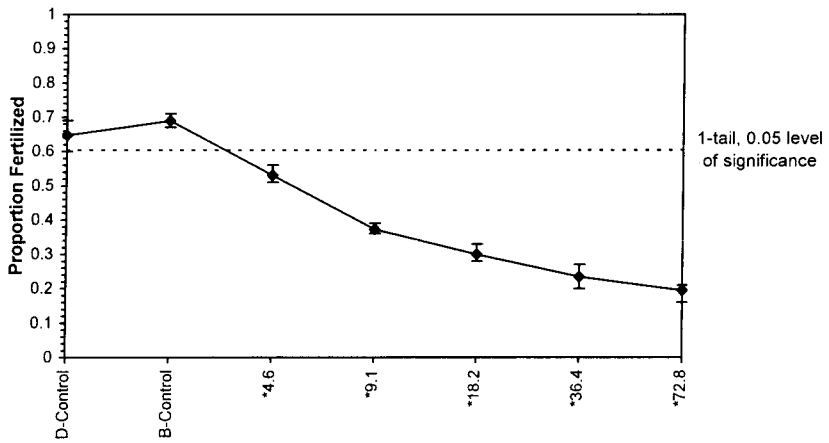
Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05*	0.607	0.161	0.394	1.360	2.3644	
IC10*	1.584	0.557	0.927	4.356	2.4779	
IC15*	3.154	0.865	1.634	6.106	0.5417	
IC20	4.857	0.524	3.042	6.173	-0.5720	
IC25	5.612	0.375	4.664	6.952	0.2814	
IC40	8.513	0.444	7.515	10.306	1.0512	
IC50	14.556	1.689	10.887	21.343	0.9377	%v/v

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Note: Statistical comparisons were against the dilution control

Reviewed by

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500299

EVS Analysts: SRS
Test Initiation Date: 19 July 05

SAMPLE

Identification: SDS Reftox Stock Soln #05-3-004
Amount ~~Received~~ Prep'd: 1 x 1L
Date ~~Collected~~ Prep'd: 7-Jun-05
Date Received: N/A
Temperature (°C):
pH:
Dissolved Oxygen (mg/L):
Conductivity (µmhos/cm):
Salinity (ppt):
Ammonia (mg/L N):
Chlorine (mg/L Cl):
Other:

TEST SPECIES

Organism: Dendraster excentricus
Source: Westwind Sealab
Date Received: 19 July 05
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 19 July 05
IC50 (and 95% CL): 5.8 (5.2 - 6.5) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.6 ± 4.4 mg/L SDS, CV% = 60

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV sterilized; 0.45 µm filtered SW
Temperature (°C): 15
pH: 7.9
Dissolved Oxygen (mg/L): 8.5
Salinity (ppt): 28
Other: —

TEST CONDITIONS

Temperature Range (°C): 15
pH Range: 7.8 - 7.9
Dissolved Oxygen Range (mg/L): 8.5
Salinity Range (ppt): 28
Sperm:Egg Ratio: 2000:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC50: 5.8 (5.2 - 6.5) mg/L SDS
IC25: 3.0 (2.6 - 3.5) mg/L SDS
NOEC: 1.0 mg/L SDS
LOEC: 1.8 mg/L SDS

Data Verified By: [signature]
Date Verified: Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client Azimuth (Polaris Mine)
EVS Project No. 04-1424-044
EVS Work Order No. 0500299
Logbook #13 Pages 68-71'

Test Initiation Date/Time 19 July 05 / 1514
Test Species Dendraster excentricus
Source/Date Received Weston Seatab / 19 July 05
Test Duration 10:10

Reftox

Sample ID SDS (mg/L)	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
Control	15	7.9	29	8.5	
1.0	15	7.8	28	8.5	
1.8	15	7.8	28	8.5	
3.2	15	7.8	28	8.5	
5.6	15	7.8	28	8.4 8.5	
10.0	15	7.8	28	8.4 8.5	
Technician Initials	SRS	SRS	SRS	SRS	

WQ Instruments Used: Temp. Calibrated Hg Thermometer pH ID-A-030301 Salinity ID-A-080304 DO ID-A-20

Sample Description

Data Verified By [signature] Date Verified Aug. 17/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNTS (CONTROLS)

Client: Azimuth (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0508299
Logbook: #13 Pages: 68-71

Test Initiation Date/Time: 19 Aug 05 / 1514
Test Species: Dendraster excentricus
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Concentration SDS (mg/L)	Replicate	No. Fertilized Eggs	No. Unfertilized Eggs	Comments	Tech. Initials
Reference Toxicant					
1.0	A	71	29		SRS
	B	69	31		
	C	71	29		
	D	70	30		
1.8	A	56	44		
	B	60	40		
	C	62	38		
	D	60	40		
3.2	A	~~51~~ 51	~~49~~ 49		
	B	47	53		
	C	51	49		
	D	50	50		
5.6	A	34	66		
	B	37	63		
	C	32	68		
	D	36	64		
10	A	20	80		
	B	21	79		
	C	18	82		
	D	19	81		
Control Seawater					
Brine Control	A	70	30		SRS
	B	68	32		
	C	71	29		
	D	67	33		

Data Verified By: [signature] Date Verified: Aug 17/05

Test: SC-Sperm Cell Fertilization test						Test ID: rtdesds051	
Species: DE-Dendraster excentricus						Protocol: EPS1/RM/27-EC 92 (Sperm Cell)	
Sample ID: REF-Ref Toxicant						Sample Type: SDS-Sodium dodecyl sulfate	
Start Date: 7/19/2005 10:10			End Date: 7/19/2005			Lab ID: BCEVS-EVS Environment Consultants	
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	64	36	
	2	2	D-Control	100	60	40	
	3	3	D-Control	100	66	34	
	4	4	D-Control	100	69	31	
	5	1	1.000	100	71	29	
	6	2	1.000	100	69	31	
	7	3	1.000	100	71	29	
	8	4	1.000	100	70	30	
	9	1	1.800	100	56	44	
	10	2	1.800	100	60	40	
	11	3	1.800	100	62	38	
	12	4	1.800	100	60	40	
	13	1	3.200	100	51	49	
	14	2	3.200	100	47	53	
	15	3	3.200	100	51	49	
	16	4	3.200	100	50	50	
	17	1	5.600	100	34	66	
	18	2	5.600	100	37	63	
	19	3	5.600	100	32	68	
	20	4	5.600	100	36	64	
	21	1	10.000	100	20	80	
	22	2	10.000	100	21	79	
	23	3	10.000	100	18	82	
	24	4	10.000	100	19	81	

Comments: Azimuth Consulting Group 04-1424-044 (0500299)

Reviewed by Aug. 17/05

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	7/19/2005 10:10	Test ID:	rtdesds051	Sample ID:	REF-Ref Toxicant
End Date:	7/19/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	SDS-Sodium dodecyl sulfate
Sample Date:		Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group 04-1424-044 (0500299)				

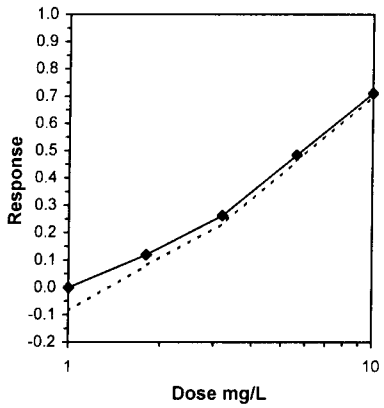
Conc-mg/L	1	2	3	4
D-Control	0.6400	0.6000	0.6600	0.6900
1	0.7100	0.6900	0.7100	0.7000
1.8	0.5600	0.6000	0.6200	0.6000
3.2	0.5100	0.4700	0.5100	0.5000
5.6	0.3400	0.3700	0.3200	0.3600
10	0.2000	0.2100	0.1800	0.1900

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6475	0.0377	0.6475	0.6000	0.6900	5.830	4				0.6750	1.0000
1	0.7025	0.0096	0.7025	0.6900	0.7100	1.363	4	-3.386	2.410	0.0391	0.6750	1.0000
*1.8	0.5950	0.0252	0.5950	0.5600	0.6200	4.230	4	3.232	2.410	0.0391	0.5950	0.8815
*3.2	0.4975	0.0189	0.4975	0.4700	0.5100	3.805	4	9.234	2.410	0.0391	0.4975	0.7370
*5.6	0.3475	0.0222	0.3475	0.3200	0.3700	6.381	4	18.468	2.410	0.0391	0.3475	0.5148
*10	0.1950	0.0129	0.1950	0.1800	0.2100	6.620	4	27.855	2.410	0.0391	0.1950	0.2889

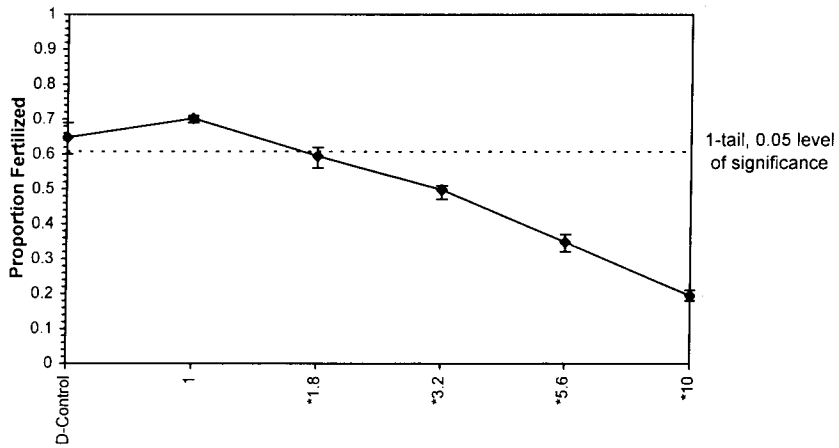
Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96443		0.884		-0.4619	0.4979
Bartlett's Test indicates equal variances (p = 0.33)					5.80467		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	1	1.8	1.34164		0.03915	0.06046	0.15043	0.00053	1.8E-16	5, 18

Log-Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew	
IC05	1.3050	0.0620	1.1588	1.5675	0.7327	
IC10	1.6566	0.1267	1.3262	2.1192	0.1987	
IC15	2.0587	0.1538	1.5036	2.4959	-0.3268	
IC20	2.5196	0.1504	2.0886	3.0277	-0.0752	
IC25	3.0499	0.1581	2.5656	3.5441	-0.1894	
IC40	4.5501	0.1485	4.0503	5.0634	-0.0472	
IC50	5.8248	0.2258	5.1944	6.4999	-0.1156	mg/L SDS



Dose-Response Plot



Reviewed by: Aug. 17/05

APPENDIX III

Chain-of-Custody Form

CHAIN-OF-CUSTODY/TEST REQUEST FORM

Please see instructions for completion on back. Shaded areas to be completed by EVS Laboratory upon sample receipt.

EVS environment consultants
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.evsenvironment.com

Client Name: Teck Cominco
Client Contact Name: Bruce Donald
Ship to: BILL TO AZIMUTH CONSULTING GROUP.
Address: Bay 2000 Kimberley BC V1A 3E1
Phone: (250)427-8405
Fax: (250)427-8451
Sampled By: Blake Hamer
Attn: Edmond Canuria
Shipping Date: July 16/05

Collection Date (dd/mmm/yy)	Time (24-h clock)	Sample Identification	1 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G = grab; C = composite	Number of Sample Containers x Volume of Sample Container (i.e., 1 x 20 L)	2 Sample Container Type by Code	Test(s) Requested: 96-hr LC50 Rainbow Trout	48-hr LC50 Daphnia Magna	7-Day Toxicity Test	20 min Echinoderm Fertilization			3 Notes? (e.g. preserved, saltwater, freshwater, may contain sewage)	Receipt Sample Temp. (°C)	4 Condition/Integrity
For composite sample record date & time starting and ending																
16/07/05	0900	C-Creek_Acute_071605	E		G	2x20	P	X	X					Effluent Water		
16/07/05	0900	C-Creek_Sublethal_071605	E		G	3x20	P			X	X			Effluent Water		

EVS Receipt Check List SAP

EVS Project #: 04-1424-0044
EVS Workorder #: 0500296/7/8/9
Sample Storage Location: 4°C (X), Chemical ( ), Other _____
Supporting documentation/other information attached if applicable.

1.	Signatures & dates correct?	Y N
2.	Chain-of-custody fully completed?	Y N
3.	Containers arrived in good condition (unbroken)?	Y N
4.	Container labels completed (i.e., dates, ID's)?	Y N
5.	Container labels agreed with custody papers?	Y N
6.	Sample receipt temperature within acceptable range?	Y N
7a.	Sediment testing going to be initiated within 14 days?	Y N
7b.	If no, are samples under Nitrogen? If not, why?	Y N
8.	Chain-of-custody generated upon receipt.	☐
9.	Sample containers originate from EVS.	☐

PO/Reference No.:
Project Title: Polaris MMER.
Results Needed By: Routine Turn Around.

Comments/Instructions: Bill to: Azimuth Consulting Group.
Electronic Results to: Cheryl Mackintosh, Azimuth, cmackintosh@azimuthgroup.ca
Bruce Donald, Teck Cominco, bruce.donald@teckcominco.com.
Temp: 12.7°C

A) Released By: Blake Hamer Date: July 16, 2005
Company: GLL Time: 1030
Courier name: _____
Shipping containers secured by: ~~Tape~~ Straps Lock Other _____ (circle one)
Custody seals used? Yes No

B) Received by: SAP Date: 19 July 05
Company: Golder Time: 10:45
Shipping containers received secure? (Yes) No
Custody seals intact? (Yes) No N/A

C) Released By: Date:
Company: Time:
Courier name: _____
Shipping containers secured by: Tape Straps Lock Other _____ (circle one)
Custody seals used? Yes No

D) Received by: Date:
Company: Time:
Shipping containers received secure? Yes No
Custody seals intact? Yes No N/A

1 Receiving Water (RW); Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
2 Collapsible Carboy (CC); Glass Jar (GJ); Jerry Can (JC); Plastic HDPE (P); Plastic Bucket (PB); Other (Please Specify)
3 Please note any conditions the lab should be aware of for safety and storage concerns
4 Acceptable (A); Unacceptable (U). Please note specifics (e.g., broken, leaking, lid not on) under Comments/Instructions

Revision Date: Sept. 25, 2000

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smart science solutions

Champia parvula Sexual Reproduction Test Results

for Sample E452

for

Azimuth Consulting Group

by

Mary Moody
Environment and Minerals Division
Saskatchewan Research Council

SRC Publication No. 11020-7C05

August 2005

Saskatchewan Research Council
15 Innovation Boulevard, Saskatoon, SK S7N 2X8
Phone: 306-933-5469

Champia parvula Sexual Reproduction Test Quality Assurance Summary

Client	Azimuth Consulting Group	SRC Sample #	E452
File #	MM478	Test Initiation Date	Aug 9/05
Analyst	M. Moody	Test Completion Date	Aug 16/05
Sample Identity/Name	Garrow Creek		

This report is based on the Report Assessment Checklist for EEM Cycle Two: Test of Sexual Reproduction using the Red Macroalga *Champia parvula.* (May 1999)

Test Organisms, Method and Conditions - Species: *Champia parvula,* sexually mature male and female branches, in good health, males having sori with spermatia, females having trichogynes. Method: EPA/600/4-91/003, Method 1009.0, static, non-renewal; 2-day effluent exposure followed by 5 to 7 day recovery period in control medium for cystocarp development. Exposure/Dilution Medium: natural seawater collected at Pacific Environmental Science Centre, Environment Canada, North Vancouver, B.C., filtered to 0.2µm and autoclaved before use, adjusted as necessary to salinity 30 ppt. with hypersaline brine made from the same source water. Test medium is natural seawater enriched with 10 ml/L Test Nutrient Solution. Recovery Medium is natural seawater as above, enriched with 10 ml/L Culture Nutrient Solution (method section 16.10.1.3).

Reference Toxicant Test - Method: EPA/600/4-91/003, Method 1009.0, static, non-renewal; 2-day toxicant exposure followed by 5 to 7 day recovery period in control medium for cystocarp development. Test conditions: performed under same experimental conditions as effluent sample. Compound: sodium dodecyl sulphate mg/L

Date of test: Aug 17/05	Historic value, warning limits ±2SD
IC_{50} (95 % CL) mg/L 1.31 (1.20 - 1.41)	1.41 (1.15 - 1.74)

Quality Control Data - There was no unusual appearance or treatment of test organisms before their use in the test. There was nothing unusual about the test, no deviation from the test method or problems encountered. No control mortality was observed in any control solution during observation periods. Sample was tested within 72 hours of collection. The mean number of cystocarps per plant counted in this test must be >10 to be acceptable. Data for this test is as follows.

natural seawater controls	85.9
brine controls	95.8
pooled control cystocarp count*	90.9

* this number used in calculation of IC values as required in EC guidance document on salinity adjustment, July 1997

Toxicity Test Results

IC_{25} (95 % CL) %v/v	45.3 (27.5 - 52.4)
Signature	M. Moody
Date	Aug 24/05

Saskatchewan Research Council
15 Innovation Boulevard, Saskatoon, SK S7N 2X8
Phone: 306-933-5469

Test Data Summary

SAMPLE

				SRC#	E452
Identification/Name	Garrow Creek			Analyst	Mary Moody
Date/Time Received	Aug 9/05@ 0900	Date Collected	Aug 6/05	Temperature Upon Receipt (°C)	22 with ice packs
Test Initiation Date	Aug 9/05	Test Completion Date	Aug 16/05		

ORGANISM INFORMATION

Species	*Champia parvula*	Appearance/Health of *Champia*	excellent
Source	sexually mature male and female branches, obtained from USEPA, Hatfield Marine Science Center, Newport, Oregon, 1995		
Females, Presence of Trichogynes	yes	Males, Presence of Sori with Spermatia	yes

TEST CONDITIONS

Test Method	USEPA/600/4-91/003, Method 1009.0	Dilution water	Natural seawater from Pacific Environmental Science Centre, North Vancouver B.C.
Test Type	static, non-renewal; 2 day effluent exposure followed by 5-7 day recovery period in control medium for cystocarp development		
Test Vessels (Exposure & Recovery)	270 ml transparent polystyrene cups, transparent polystyrene lids		
Exposure Volume / Depth	100 ml / 4.5 cm	Recovery Volume / Depth	200 ml / 7.3 cm
Replicates/Conc.	3	No. of organisms (female/male)	5/2
Number and Concentrations of Test Solutions (%v/v)	Controls: (two) natural sea water, brine Tests: 70, 35, 17.5, 8.75, 4.38		
Chemicals added to control/dilution water	Test Nutrients as described in method cited at 10 ml/L, analytical grade		

Sample Treatment

D.O. on unadjusted sample salinity adjustment (mg/L)	8.6	D.O. after salinity adjustment (mg/L)	7.7		
Aeration (duration/rate)	none	Filtration	none	pH Adjustment	none
Salinity Adjustment*	600 mL effluent + 260 mL hypersaline brine + 8.6 mL test nutrient solution				
Hypersaline Brine for Salinity Adjustment*	Prepared from natural seawater, at 90 ppt salinity				

* *as per EC guidance document on salinity adjustment, May 2001*

Exposure Period (48 h) and Recovery Period (5-7 days)

Temperature, pH, D.O. and Salinity of test solutions and controls on following page

Photoperiod (L:D h)	16:8	Agitation of tests and controls during exposure	gentle rotary shaking

Recovery Medium: natural sea water containing 10 ml/L Culture Nutrients (section 16.10.1.3 of cited method)

Aeration during recovery: gentle aeration supplied

TOXICITY TEST RESULTS

IC_{25} (%v/v) (95% CL)	45.3 (27.5 - 52.4)	IC_{50} (%v/v), (95% CL)	61.4 (50.4 - 66.6)
Mean control cystocarps/female (pooled natural sea water and brine controls)			90.9

Submitted By: Mary Moody **Date:** Aug 24/05

Saskatchewan Research Council
15 Innovation Boulevard, Saskatoon, SK S7N 2X8
Phone: 306-933-5469

Water Quality Data

Sample Identification/Name Garrow Creek SRC# E452

INITIAL WATER QUALITY	UNADJUSTED SAMPLE at test start, without salinity adjustment	TEST MEDIUM	RECOVERY MEDIUM
Temperature (°C)	23	23	23
Dissolved Oxygen (mg/L)	8.6	7.6	7.8
pH	7.75	8.35	8.10
Salinity (ppt):	2	30	30

Sample Description clear colourless liquid Length of Recovery Period (days) 5

Water Quality Data during Exposure Period (0, 48 hr) and Recovery Period (0 and end)

Concentration % (v/v)	Temperature (°C)				Dissolved Oxygen (mg/L)				pH				Salinity (ppt)			
	exposure		recovery		exposure		recovery		exposure		recovery		exposure		recovery	
	0	48	0	end	0	48	0	end	0	48	0	end	0	48	0	end
Control-NSW*	23	23	23	23	7.6	7.8	7.8	7.9	8.34	8.37	8.10	7.98	30	30	30	30
Control-brine	23	23	23	23	7.8	7.8	7.8	7.8	8.11	8.59	8.10	8.01	30	30	30	30
A 70	23	23	23	23	7.7	7.8	7.8	7.9	8.05	8.54	8.10	8.03	30	30	30	30
C 17.5	23	23	23	23	7.8	7.8	7.8	7.9	8.29	8.64	8.10	8.67	30	30	30	30
E 4.38	23	23	23	23	7.6	7.8	7.8	7.9	8.34	8.47	8.10	8.05	30	30	30	30

RECOVERY PERIOD - TEMPERATURE MONITORING (initial daily entries)

Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
23	23	23	23	23	23		

Comments

pH before salt addition: 7.75, after salt addition 8.12

*NSW natural sea water

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Saskatchewan Research Council
15 Innovation Boulevard, Saskatoon, SK S7N 2X8
Phone: 306-933-5469

Test Data

Sample Identification Garrow Creek E452

Concentration % (v/v) #		Rep	Mortality #	Mortality %	Individual Plant Cystocarp Counts 1	2	3	4	5	mean	SD*	Comments
Control, Natural Sea Water		A	0	0	130	80	119	96	95	104.0	20.1	Mean and SD 85.9, 23.8 Healthy red colour, normal growth
		B	0	0	63	86	60	60	102	74.2	19.0	
		C	0	0	95	106	54	54	89	79.6	24.2	
Control, brine		A	0	0	96	98	129	106	90	103.8	15.2	Mean and SD 95.8, 15.3 Healthy red colour, normal growth
		B	0	0	75	74	103	91	80	84.6	12.3	
		C	0	0	97	96	104	118	80	99.0	13.8	
E	4.38	A	0	0	105	60	81	103	100	89.8	19.2	Mean and SD 80.8, 17.4 Healthy red colour, normal growth
		B	0	0	88	53	65	84	60	70.0	15.3	
		C	0	0	103	75	85	64	86	82.6	14.5	
D	8.75	A	0	0	110	88	75	72	88	86.6	15.0	Mean and SD 92.9, 22.9 Healthy red colour, normal growth
		B	0	0	109	127	75	71	110	98.4	24.3	
		C	0	0	82	50	124	121	91	93.6	30.5	
C	17.5	A	0	0	100	138	92	71	77	95.6	24.6	Mean and SD 92.7, 19.1 Healthy red colour, normal growth
		B	0	0	107	107	65	100	91	94.0	17.5	
		C	0	0	99	101	63	94	85	88.4	15.5	
B	35	A	0	0	82	67	118	115	77	91.8	23.2	Mean and SD 82.6, 24.2 Healthy red colour, normal growth
		B	0	0	67	88	76	138	75	88.8	28.5	
		C	0	0	55	75	58	57	91	67.2	15.5	
A	70	A	0	0	35	27	40	37	36	35.0	4.8	Mean and SD 33.3, 8.3 Healthy red colour, normal growth
		B	0	0	44	41	18	40	40	36.6	10.5	
		C	0	0	22	41	23	25	31	28.4	7.9	

* Standard Deviation

Submitted by: C. McNeely Date: Aug 24/05

Algal Reproduction Test-Reproduction

Start Date:	8/9/2005	Test ID:	CP478IM	Sample ID:	E452
End Date:	8/16/2005	Lab ID:	SRC-Saskatchewan Researc	Sample Type:	effluent
Sample Date:	8/6/2005	Protocol:	EPA MARINE	Test Species:	CP-Champia parvula
Comments:	Azimuth, Garrow Creek				

Conc-%	1	2	3
control NSW	104.0	74.2	79.6
control salt	103.8	84.6	99.0
4.38	89.8	70.0	82.6
8.75	86.6	98.4	93.6
17.5	95.6	94.0	88.4
35	91.8	88.8	67.2
70	35.0	36.6	28.4

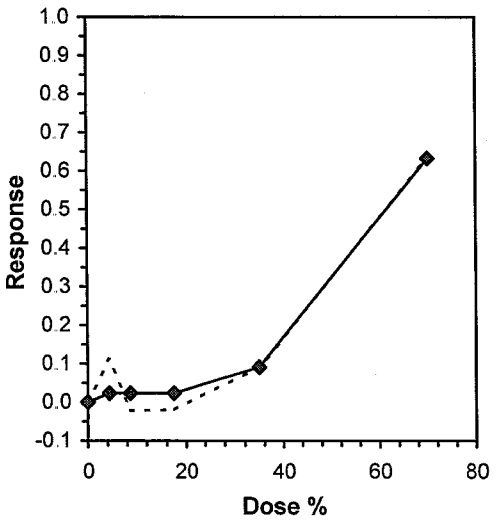
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	90.867	1.0000	90.867	74.200	104.000	14.348	6				90.867	1.0000
4.38	80.800	0.8892	80.800	70.000	89.800	12.403	3	1.401	2.602	18.693	88.778	0.9770
8.75	92.867	1.0220	92.867	86.600	98.400	6.390	3	-0.278	2.602	18.693	88.778	0.9770
17.5	92.667	1.0198	92.667	88.400	95.600	4.080	3	-0.251	2.602	18.693	88.778	0.9770
35	82.600	0.9090	82.600	67.200	91.800	16.248	3	1.151	2.602	18.693	82.600	0.9090
*70	33.333	0.3668	33.333	28.400	36.600	13.040	3	8.010	2.602	18.693	33.333	0.3668

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95534	0.873	-0.382	-0.7392
Bartlett's Test indicates equal variances (p = 0.41)	5.05585	15.0863		
The control means are not significantly different (p = 0.41)	0.91096	2.77645		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test Treatments vs Pooled Controls	35	70	49.4975	2.85714	18.6933	0.20572	1647.03	103.188	1.5E-05	5, 15

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	24.453	14.175	0.000	46.034	-0.2407
IC10	35.583	10.745	0.000	44.063	-1.3971
IC15	38.810	6.323	10.646	46.832	-1.1329
IC20	42.038	5.167	19.403	49.607	-1.0896
IC25	45.266	4.472	27.509	52.378	-1.0088
IC40	54.949	3.252	41.542	60.787	-1.0203
IC50	61.404	2.558	50.439	66.550	-0.9526



SRC

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

№ 0744

CHAIN-OF-CUSTODY / TEST REQUEST FORM

Client Name: Bruce Donald
Address: Box 2000, Kimberly BC, V1A 3E1

Client Contact: Bruce Donald
Phone: 250-427-8405
Fax: 250-427-8451
Sampled by: E Bolton

Ship to: SRC, 15 Innovation Boulevard, Saskatoon SK S7N 2X8
Attn.: Mary Moody

Shipping Date: Aug 6/05

Collection Date (DD/MMM/YYYY) [1]	Time (24-h clock) [1]	Sample Identification	Type of Each Sample [2]	Material Safety Data Sheet Attached? (✔)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	Sample Container Type by Code [3]	Test(s) Requested: [illegible]	Test(s) Requested	Test(s) Requested	Test(s) Requested	Test(s) Requested	Sample Notes (preserved, saltwater, freshwater, may contain sewage...) [4]
06/08/05	10:00	Borrow Creek	E		G	2x2L							
		received Aug 9/05 2x2L at 22°C with ice packs											

PO/Reference No.
Project Title
Results Needed By

Comments/Instructions

1) Released by: E Bolton — Date: Aug 6/05 — Company: Gartner Lee — Time: 14:00 hrs — Courier Name: [illegible]

2) Released by: — Date: — Company: — Time: — Courier Name:

1) Received by: M Moody — Date: Aug 9/05 — Company: SRC — Time: 0900

Received by: — Date: — Company: — Time:

Shaded area to be completed by Golder Laboratory upon sample receipt.
Golder Project No.
Golder Work Order No.
Condition Upon Receipt
Receipt Sample Temp. (C)

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

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6/6 MM

Please see instructions for completion on back of form

Revision Date: November 22, 2004

September 2005

LABORATORY REPORT

Azimuth Consulting Group

POLARIS MINE

ENVIRONMENTAL EFFECTS MONITORING PROGRAM

August 6, 2005 Sample

PREPARED FOR:

Azimuth Consulting Group
Vancouver, BC

PREPARED BY:

EVS environment consultants
A Member of the Golder Group of Companies
North Vancouver, BC

AZIMUTH CONSULTING GROUP

POLARIS MINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM

AUGUST 6, 2005 SAMPLE

LABORATORY REPORT

Prepared for

Azimuth Consulting Group
218-2902 W. Broadway
Vancouver, BC
V6K 2G8

Prepared by

EVS Environment Consultants (A Member of the Golder Group of Companies)
195 Pemberton Avenue
North Vancouver, BC
Canada V7P 2R4

EVS Project No.

04-1424-044

September 2005

TABLE OF CONTENTS

LIST OF TABLES

GLOSSARY

Control	A treatment in an investigation or study that duplicates all the conditions and factors that might affect the results of the investigation, except the specific condition that is being studied. In an aquatic toxicity test, the control must duplicate all the conditions of the exposure treatment(s), but must contain no test substance. The control is used to determine the absence of measurable toxicity due to basic test conditions (e.g., quality of the dilution water, health of test organisms, or effects due to handling of test organisms). (Environment Canada, 1998)
Dilution water	Water used to dilute the test material in an aquatic toxicity test in order to prepare either different concentrations of a test chemical or different percentages of an effluent for the various test treatments. The water (negative) control in a test is prepared with dilution water only. (Rand, 1995)
Effluent	Any liquid waste (e.g., industrial, municipal) discharged to the aquatic environment. (Environment Canada, 1998)
Endpoint	The reaction of the organisms to show the effect which is intended to mark completion of the test, and also the measurement(s) or value(s) derived, that characterize the results of the test (e.g., IC*p*). (Environment Canada, 1998)
IC*p*	The inhibiting concentration for a (specified) percent effect. It represents a point estimate of the concentration of test substance that is estimated to cause a designated percent impairment in a quantitative biological function such as the size attained by fish during a growth period. This term should be used for any toxicological test which measures a quantitative effect or change in rate, such as growth, reproduction, or respiration. (Environment Canada, 1998)
LC50	The median lethal concentration, i.e., the concentration of substance in water estimated to be lethal to 50% of the test organisms. The LC50 and its 95% confidence limits are usually derived by statistical analysis of mortalities in several test concentrations, after a fixed period of exposure. The duration of exposure must be specified (e.g., 96-h LC50). (Environment Canada, 1998)

LOEC	The lowest-observed-effect-concentration. This is the lowest concentration of a test substance to which organisms are exposed, that causes adverse effects on the organism which are detected by the observer and are statistically significant. For example, the LOEC might be the lowest test concentration at which growth of fish was decreased significantly from that of the control groups. LOEC is generally reserved for adverse sublethal effects but can also be used for mortality, which might sometimes be the most sensitive effect observed. (Environment Canada, 1998)
NOEC	The no-observed-effect-concentration. This is the highest concentration of a test substance or material to which organisms are exposed, that does not cause any observed and statistically significant adverse effects on the organism. For example, the NOEC might be the highest test concentration at which growth was not decreased significantly from that of the control groups. NOEC customarily refers to adverse sublethal effects, and to the most sensitive effect unless otherwise specified. (Environment Canada, 1998)
Percentage (%)	A concentration expressed in parts per hundred parts. One percentage represents one unit or part of substance (e.g., effluent, elutriate, leachate or receiving water) diluted with water or medium to a total of 100 parts. Depending on the test substance, concentrations can be prepared on a weight-per-weight, weight-per-volume, or volume-per-volume basis, and are expressed as the percentage of test substance in the final sediment mixture or solution. (Environment Canada, 1999b)
Quality assurance (QA)	A program organized and designed to provide accurate and precise results. Included are selection of proper technical methods; tests, or laboratory procedures; sample collection and preservation; selection of limits; evaluation of data; quality control; and qualifications and training of personnel. (Rand, 1995)
Quality control (QC)	Specific actions required to provide information for the quality assurance program. Included are standardization, calibration, replicates, and control and check samples suitable for statistical estimates of confidence of the data. (Rand, 1995)

Reference toxicant	A standard chemical used to measure the sensitivity of the test organisms to establish confidence in the toxicity data obtained for a test substance. In most instances, a toxicity test with a reference toxicant is performed to assess the sensitivity of the organisms at the time the test substance is evaluated, and to determine the precision of results obtained by the laboratory for that chemical. (Environment Canada, 1999b)
Significant difference	A quantitative determination of the probability that two measurements of the same parameter are different, given the variability of the measurements.

1. INTRODUCTION

EVS Environment Consultants (a member of the Golder Group of Companies) conducted sublethal Metal Mining Effluent Regulations (MMER) toxicity testing for Azimuth Consulting Group as part of the Environmental Effects Monitoring (EEM) program for Polaris Mine.

A sample, identified as Garrow Creek, was collected from the Polaris Mine Site on August 6, 2005 in 20-L collapsible polyethylene containers. It was received at the EVS laboratory on August 9, 2005 and was stored in the dark at 4°C prior to test initiation. The sample was evaluated for toxicity using the 7-d topsmelt (*Atherinops affinis*) survival and growth toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. Toxicity testing was initiated on the day of initial sample receipt.

This report describes the methods and results of the 7-d topsmelt (*Atherinops affinis*) toxicity test and the echinoderm (*Dendraster excentricus*) fertilization toxicity test. The raw data and statistical analyses are provided in Appendices I and II respectively, and the chain-of-custody form is provided in Appendix III.

2. METHODS

2.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

A static-renewal 7-d survival and growth toxicity and reference toxicant tests using topsmelt (*A. affinis*) was conducted in accordance with U.S. Environmental Protection Agency (USEPA, 1995). Test conditions and methods are summarized in Table 1.

This 7-day test exposes topsmelt larvae to different concentrations of a given sample. Fish are fed on a daily basis and both survival and growth endpoints are measured at test termination. These observations are assessed in comparison to the pooled negative and brine controls.

2.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The echinoderm (*Dendraster excentricus*) fertilization toxicity test was conducted in accordance with Environment Canada (1992 with 1997 amendments). Test conditions and methods are summarized in Table 2.

This fertilization test involves exposing echinoderm sperm to a series of test concentrations for ten minutes, echinoderm eggs are then added allowing fertilization to occur for ten minutes. Following the ten minutes exposure time, the eggs are preserved and the number of fertilized and unfertilized eggs in each replicate are counted. These observations are assessed in comparison to the pooled negative and brine controls.

2.3 STATISTICAL ANALYSIS

Statistical analyses for all tests were conducted using the computer software program TOXCALC (version 5.0.23; Tidepool Scientific Software, 1994).

2.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This study followed a comprehensive QA/QC Program to ensure full documentation and minimize possible errors in computation and reporting of results. The following general QA/QC guidelines were applied in this test: use of negative controls, use of positive controls, use of brine controls, replication, instrument calibration, water quality maintenance and

record-keeping, and use of standard operating procedures (SOPs). To ensure data and reporting meet quality standards, all data and statistical analyses were reviewed by a member of our QA/QC Committee prior to reporting the results.

Toxicity testing was carried out in accordance with applicable test methodologies and/or standards of practice. Our liability is limited solely to the cost of re-testing in the event of non-compliance with such test specifications or standards of practice. Golder/EVS accepts no responsibility or liability for the interpretation or use of these testing results by others, or for any delay, loss, damage or interruptions of testing, collection, preparation, and delivery of samples or test results resulting from events or circumstances beyond our control.

Table 1. 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static-renewal
Test duration	7 d
Test chamber	600-mL beaker
Test solution volume	200 mL
Number of replicate chambers per treatment	5
Number of organisms per test chamber	5
Age of test organisms at test initiation	10 d
Food	Newly hatched *Artemia* nauplii (<24 hours old)
Feeding Regime	Fed 0.5 mL/ beaker twice daily of concentrated nauplii suspension (prepared to provide 200 nauplii in 0.5 mL); no feeding at test termination
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5μm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.2, 8.4, 16.9, 33.7, 67.4% (v/v)
Renewal of dilutions	Daily
Aeration	None
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity daily
Temperature	20 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Overhead full-spectrum fluorescent lights; 538 – 1076 lux; 16:8 light:dark photoperiod
Reference toxicant	Initiated concurrently with sample using copper to generate LC50 and IC50 values; results compared to lab mean ± 2 SD
Endpoints	Survival and growth (dry weight)
Test validity	≥ 80% mean control survival; ≥ 0.85 mg/fish mean dry weight for surviving control fish
Reference protocol	US EPA (1995), EPA/600/R-95/136

Table 2. Echinoderm (*Dendraster excentricus*) fertilization toxicity test methods

TEST PARAMETER	TEST CONDITION
Test type	Static
Test duration	10:10 min
Test chamber	16 X 125 mm test tubes
Test solution volume	10 mL
Number of replicate chambers per treatment	4
Number of eggs per test chamber	2000
Age of test organisms	< 4 hours after spawning
Sample manipulations (e.g. pre-aeration, pH adjustment, filtration)	Salinity-adjusted
Control/dilution water	UV-sterilized and 0.5μm-filtered natural sea water from Vancouver Aquarium, BC
Dilutions	4.5, 8.9, 17.8, 35.6, 71.3% (v/v)
Renewal of dilutions	None
Aeration	None during testing
Water quality parameters and frequency	Temperature, pH, dissolved oxygen, and salinity
Temperature	15 ± 1°C
Salinity	30 ± 2 (sample adjusted with hypersaline brine [HSB]. Preparation of HSB and salinity adjustment as per EC guidance document on salinity adjustment –July 1997)
Lighting	Ambient laboratory illumination (moderate intensity)
Reference toxicant	Initiated concurrently with test; same test methods as above using SDS to generate an EC50 value; results compared to lab mean ± 2 SD
Endpoint	Fertilization of eggs
Test validity	≥ 50% and ≤ 100% mean control fertilization
Reference protocols	Environment Canada (1992), (EPS/1/RM/27 with 1997 amendments)

3. RESULTS

3.1 7-D TOPSMELT (*ATHERINOPS AFFINIS*) SURVIVAL AND GROWTH TOXICITY TEST

The test results are summarized in Table 3 and the raw statistical analyses are provided in Appendix I.

The highest concentration tested was approximately 67.4% due to salinity adjustment. The mean survival for the negative and brine controls was 92 and 88%, respectively. Mean dry weight in the pooled controls was 0.86mg. The negative and brine controls were not significantly different for both the growth and survival endpoints (p = 0.40 and p = 0.70, respectively).

The *A. affinis* survival and growth toxicity test showed no adverse effects on survival or growth in all tested concentrations relative to the pooled controls ($p \leq 0.05$). For the survival and growth endpoints, the NOEC was 67.4, and the LOEC was >67.4% (v/v). The LC50 for survival was >67.4% (v/v). The IC50 and IC25 for growth were both >67.4% (v/v).

3.2 ECHINODERM (*DENDRASTER EXCENTRICUS*) FERTILIZATION TOXICITY TEST

The test results are summarized in Table 4 and the raw statistical analyses are provided in Appendix II.

The highest concentration tested was 71.3% due to salinity adjustment. Mean fertilization in the pooled controls was 86%. The negative and brine controls were not significantly different (p =0.30).

The *D. excentricus* fertilization toxicity test exhibited adverse effects on egg fertilization in all test concentrations relative to the pooled controls ($p \leq 0.05$). The NOEC was <4.5 and LOEC was 4.5% (v/v). The IC50 and IC25 (95% confidence limits) values were 55.0 (49.2 – 61.1) and 15.6 (13.6 – 18.3) % (v/v), respectively.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The tests met all passing criteria for test validity as outlined in the respective protocols. Water quality parameters during the test were all within the acceptable range of values. Point estimates for the reference toxicant tests were all within the laboratory mean ± 2 standard deviations, indicating that the tests were within acceptable limits of variability.

Table 3. Summary of results for the 7-d Topsmelt (*Atherinops affinis)* survival and growth toxicity test

TEST CONCENTRATION (% v/v)	SURVIVAL (%)(MEAN ± SD)	GROWTH (DRY WEIGHT MG) (MEAN ± SD)
Negative Control	92.0 ± 11.0	0.81 ± 0.24
Brine Control	88.0 ± 17.9	0.91 ± 0.12
Pooled Controls	90.0 ± 11.0	0.86 ± 0.18
4.2	88.0 ± 11.0	0.86 ± 0.18
8.4	96.0 ± 8.9	0.90 ± 0.13
16.9	80.0 ± 14.1	0.76 ± 0.17
33.7	92.0 ± 11.0	0.75 ± 0.13
67.4	80.0 ± 14.1	0.81 ± 0.16
TEST ENDPOINT	**SURVIVAL (% v/v)**	**GROWTH (% v/v)**
NOEC	67.4	67.4
LOEC	>67.4	>67.4
LC50	>67.4	na
IC50	na	>67.4
IC25	na	>67.4

SD – Standard Deviation; na – not applicable.

Table 4. Summary of results for the Echinoderm (*Dendraster excentricus)* fertilization toxicity test

TEST CONCENTRATION (% v/v)	PROPORTION FERTILIZED (%) (MEAN ± SD)
Negative Control	85.0 ± 2.9
Brine Control	87.2 ± 2.6
Pooled Controls	86.1 ± 2.8
4.5	79.8 ± 1.7*
8.9	76.5 ± 0.6*
17.8	61.8 ± 2.2*
35.6	52.8 ± 1.9*
71.3	37.2 ± 2.1*
TEST ENDPOINT	**PROPORTION FERTILIZED %(v/v)**
NOEC	<4.5
LOEC	4.5
IC50 (95% CL)	55.0 (49.2 – 61.1)
IC25 (95% CL)	15.6 (13.6– 18.3)

*Indicates significant difference ($p \leq 0.05$) relative to the pooled controls.
SD – Standard Deviation; CL – Confidence Limits.

4. REFERENCES

Environment Canada. 1992. Biological test method: fertilization of echinoids (sea urchins and sand dollars). Environmental Protection Series, Report EPS 1/RM/27, December 1992. Environment Canada, Conservation and Protection, Ottawa, ON. 68 pp + appendices. Amended November 1997.

US EPA. 1995. Short term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. 2nd edition. US Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Office of Research and Development, Washington, DC. EPA/600/R-95/136. 563 pp.

Tidepool Scientific Software. 1994. TOXCALC: Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.23. Tidepool Scientific Software, McKinleyville, CA. 80 pp.

APPENDIX I

Raw Data and Statistical Analyses:

Atherinops affinis

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

EVS Analysts MJG SxB JxS RSO
Test Initiation Date 9 Aug 05

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	Garrow Creek	Garrow Creek	Garrow Creek
Amount Received	5 x 20L	5 x 20L	5 x 20L
Date Collected	6-Aug-05	6 Aug 05	6 Aug 05
Date Received	9-Aug-05	9 Aug 05	9 Aug 05
Temperature (°C)	20.0	20.0	20.0
pH	7.7 ① → 8.3	7.8 ① → 8.4	7.9 ① → 8.4
DO (mg/L)	9.8 ① → 7.6	10.0 ① → 7.6	10.5 ① → 7.6
Conductivity (µmhos/cm)	-	-	-
Salinity (ppt)	1.0 ① → 30.0	1.0 ① → 30.0	1.0 ① → 30.0
Ammonia (mg/L N)	-	-	
Chlorine (mg/L Cl)	-	-	
Other	① After salinity adjustment	① After salinity adjustment	① After salinity adjustment

DILUTION/CONTROL WATER (initial water quality)
Water Type unsterilized filtered SW
Temperature (°C) 20.0
pH 7.9
Dissolved Oxygen (mg/L) 7.7
Salinity 29

TEST SPECIES INFORMATION
Source ABS Inc.
Date Received 9-Aug-05
Age (on Day 0) 10 days
Reference Toxicant Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date 9 Aug 05
7-d survival LC50 103 (91-118) ~~103 (88-124)~~ mg/L Cu
7-d growth IC50 95 ~~(75-125)~~ (76-127) mg/L Cu
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50 132 ± 40 mg/L Cu CV=15%
7-d growth IC50 133 ± 40 mg/L Cu CV=15%

TEST CONDITIONS
Temperature Range (°C) 20.0 - 21.0
pH Range 7.7 ~~7.9~~ - 8.4
Dissolved Oxygen Range (mg/L) 6.4-7.7
Salinity (ppt) 28-31
Photoperiod (L:D h) 16:8
Aeration Provided? None
Other -

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	% (v/v)	67.4	>67.4	>67.4		
Growth		67.4	~~>67.4~~ >67.4		>67.4	>67.4

Other

Data Verified By Qualfish
Date Verified Sept 1/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

Sample ID G. Creek (Garrow Creek)
Test Initiation Date/Time 9 Aug 05 / 1500h
Source/Date Received ABS Inc / 9 Aug 05

Concentration % (v/v)	Temperature (°C)													
	0	1		2		3		4		5		6		7
D-Control	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0
B-Control	20.0	20.5	20.0	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5	20.0	20.5
4.2	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0
8.4	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	20.5	20.0	21.0
16.9	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0
33.7	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0
67.4	20.0	20.5	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5	20.0	21.0	20.0	21.0
Tech. Initials	SxB	SxB	SxB	VL	VL	SxB	SRJ	SxB	SxB	SxB	SxB	TM	TM	TM

Concentration % (v/v)	pH													
	0	old / New		2		3		4		5		6		7
D-Control	7.9	7.9	8.0	7.9	7.9	7.7	7.9	7.7	8.0 SxB 8.0	7.8	7.9	8.0	7.9	8.0
B-Control	8.0	7.9	8.1	8.0	8.0	7.7	7.9	7.7	7.9 SxB	7.8	7.9	8.0	7.9	7.9
4.2	8.0	7.9	8.2	7.9	8.1	7.7	8.0	7.7	8.1	7.8	8.0	8.0	7.9	7.9
8.4	8.0	8.0	8.2	7.9	8.1	7.8	8.0	7.8	8.1	7.8	8.0	8.0	8.0	8.0
16.9	8.1	8.0	8.3	8.0	8.2	7.9	8.1	7.8	8.2	7.9	8.1	8.1	8.0	8.0
33.7	8.1	8.0	8.3	8.1	8.3	8.1	8.1	7.9	8.3	7.9	8.2	8.2	8.1	8.1
67.4	8.3	8.1	8.4	8.1	8.4	8.1	8.2	8.0	8.4	8.0	8.3	8.4	8.1	8.1
Tech. Initials	SxB	SxB	SxB	VL	VL	SxB	SRJ	SxB	SxB	SxB	SxB	TM	TM	TM

WQ Instruments Used: Temp. Calibrated Hg Thermometer pH 030302

Comments

Test Set Up By SxB Data Verified By [signature] Date Verified Aug. 31/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA

Client Azimuth

EVS Project No. C4-1424-044

EVS Work Order No. 0500327

Sample ID C. Creek Control Creek

Test Initiation Date/Time 9 Aug 05 / 1500

Source/Date Received ABS Inc. / 9 Aug 05

Concentration % (v/v)	Salinity (ppt)													
	0	1		2		3		4		5		6 D		7
D-Control	29	29	29	29	29	30	30	30	30	31	30	28	28	29
B-Control	30	30	30	30	30	30	30	31	30	30	30	30	30	30
4.2	30	31	30	30	30	30	30	30	30	30	30	30	28	29
8.4	30	30	30	30	30	30	30	30	30	30	30	30	28	29
16.9	30	30	30	30	30	30	30	30	30	30	30	30	28	29
33.7	30	31	30	30	30	31	30	30	30	30	30	30	28	29
67.4	30	30	30	30	30	31	30	31	30	31	30	30	29	30
Tech. Initials	SxB	SxB	SxB	MJG	MJG	SxB	SxB	SxB	SxB	SxB	SxB	TT	TT	TT

Concentration % (v/v)	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6		7
D-Control	7.7	6.7	7.7	6.6	7.6	6.6	7.6	6.6	7.6	6.7	7.6	6.4	7.5	6.4
B-Control	7.6	6.6	7.6	6.4	7.6	6.6	7.6	6.6	7.6	6.7	7.6	6.6	7.5	6.6
4.2	7.6	6.7	7.6	6.4	7.6	6.4	7.6	6.5	7.6	6.5	7.6	6.6	7.5	6.6
8.4	7.6	6.7	7.6	6.5	7.6	6.7	7.6	6.6	7.6	6.6	7.6	6.4	7.5	6.4
16.9	7.7	6.6	7.6	6.4	7.6	6.5	7.6	6.5	7.6	6.6	7.6	6.5	7.5	6.6
33.7	7.6	6.6	7.6	6.8	7.6	6.8	7.6	6.6	7.6	6.5	7.6	6.5	7.5	6.6
67.4	7.6	6.7	7.6	6.6	7.6	6.6	7.6	6.7	7.6	6.7	7.6	6.4	7.6	6.4
Tech. Initials	SxB	SxB	SxB	MJG	MJG	SxB	SxB	SxB	SxB	SxB	SxB	TT	TT	TT

WQ Instruments Used: Salinity ~~II~~ III (Acc) II C3 DO II-A-20

Comments (1) meet II-14-030306

Test Set Up By SxB Data Verified By Qa/QC Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

Sample ID G-Creek (Perran Creek)
Test Species/Batch Atherinops affinis, Petaluma
Test Initiation Date/Time 9 Aug 05 1500
No. of Organisms/Volume 5 / 200 mL

Concentration % (v/v)	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
D.CTL	A	1T	5	5	5	5	5	5	5	
	B	2T	5	5	5	5	5	5	4	
	C	3T	5	5	5	5	5	5	5	
	D	4T	5	5	5	5	5	5	5	
	E	5T	5	5	5	5	5	5	4	
B-CTL	A	6T	5	5	5	5	5	5	5	
	B	7T	5	5	5	5	5	5	5	
	C	8T	5	5	5	5	5	5	5	
	D	9T	5	5	5	5	5	5	4	
	E	10T	5	5	4 ①	4	4	4	3	
4.2	A	11T	5	4	SXB 4	4	4	4	4	
	B	12T	5	5	5	5	5	5	5	
	C	13T	5	5	5	5	5	5	5	
	D	14T	5	4	SXB 4	4	4	4	4	
	E	15T	5	4 ①	4 SXB	4	4	4	4	① No Body
8.4	A	16T	5	5	5	5	5	5	5	
	B	17T	5	5	5	5	5	5	5	
	C	18T	5	5	5	5	5	5	4	
	D	19T	5	5	5	5	5	5	5	
	E	20T	5	5	5	5	5	5	5	
Technician Initials		SXB	SXB	ML	SXB	SXB	SXB	JH	SXB	

Sample Description light brown, no smell
Data Verified By [signature] Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500327

Sample ID: Garrow Creek
Test Species/Batch: Atherinops affinis
Test Initiation Date/Time: 9 Aug 05 1500
No. of Organisms/Volume: 5/200mL

Concentration % (v/v)	Rep.	Pan No.	Number of Survivors – Day of Test 1	2	3	4	5	6	7	Comments
16.9	A	21 T	5	5	5	5	5	5	5	① No dead body - ~~Technician~~ EVS
	B	22	5	5	4	4	4	4	4	
	C	23	5	5	5	5	5	5	4	
	D	24	5	5	①4	4	4	4	3	
	E	25	5	5	5	5	5	5	4	
33.7	A	26	5	5	5	5	5	5	5	
	B	27	5	5	~~5~~5	4	4	4	4	
	C	28	5	5	5	5	5	5	5	
	D	~~29~~	5	5	4	4	4	*	4	
	E	30	5	5	5	5	5	5	5	
67.4	A	31	5	5	5	5	5	5	5	
	B	32	5	4	4	4	4	4	4	
	C	33	5	5	5	5	5	5	~~4~~3	
	D	34	5	5	5	5	5	5	4	
	E	35	~~5~~4	5	5	5	5	5	4	
	A									
	B									
	C									
	D									
	E									
Technician Initials		~~SXB~~	SXB	ML	SXB	SXB	SXB	MS	SXB	

Sample Description: clear - colourless
Data Verified By: Qualified
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS

Larval Fish Toxicity Tests - Dry Weight Data

CLIENT:	Azimuth	TEST TYPE:	7-d Survival and Growth
PROJECT #	04-1424-044	TEST SPECIES:	*Atherinops affinis*
WORK ORDER #:	0500327	TEST INITIATION DATE:	9-Aug-05
BALANCE TYPE:	Sartorius BP211D		

Pan No.	Rep	Sample ID: Garrow Creek % (v/v)	Survival At Start	Number of Survivors	Number Weighed	Pan weight (mg)	Final Weight (mg) Pan + Biomass	Tech'n Initials	Comments
T-1	A	Control	5	5	4	1218.92	1222.92	RSD	Fish lost in transfer.
T-2	B		5	4	4	1231.52	1234.56	RSD	
T-3	C		5	5	5	1229.15	1234.64	RSD	
T-4	D		5	5	5	1235.47	1239.35	RSD	
T-5	E		5	4	4	1241.65	1244.47	RSD	
T-6	A	Brine Control	5	5	5	1217.25	1221.44	RSD	
T-7	B		5	5	5	1229.47	1234.85	RSD	
T-8	C		5	5	5	1233	1237.96	RSD	
T-9	D		5	4	4	1236.48	1240.49	RSD	
T-10	E		5	3	3	1237.67	1241.98	RSD	
T-11	A	4.2	5	4	4	1236.79	1240.85	RSD	
T-12	B		5	5	5	1221.62	1226.26	RSD	
T-13	C		5	5	5	1236.85	1241.7	RSD	
T-14	D		5	4	4	1231.67	1236.88	RSD	
T-15	E		5	4	4	1227.6	1230.46	RSD	
T-16	A	8.4	5	5	5	1232.12	1236.61	RSD	
T-17	B		5	5	5	1221.55	1225.83	RSD	
T-18	C		5	4	4	1226.4	1229.96	RSD	
T-19	D		5	5	5	1224.88	1229.98	RSD	
T-20	E		5	5	5	1228.72	1233.82	RSD	
T-21	A	16.9	5	5	5	1226.33	1231.24	RSD	
T-22	B		5	4	4	1227.45	1231.89	RSD	
T-23	C		5	4	4	1223.67	1227.1	RSD	
T-24	D		5	3	3	1228.16	1231.05	RSD	
T-25	E		5	4	4	1218.71	1221.92	RSD	
T-26	A	33.7	5	5	5	1229.33	1232.96	RSD	
T-27	B		5	4	4	1223.13	1227.98	RSD	
T-28	C		5	5	5	1222.55	1226.08	RSD	
T-29	D		5	4	4	1231.12	1234.27	RSD	
T-30	E		5	5	5	1230.86	1234.48	RSD	
T-31	A	67.4	5	5	5	1234.04	1239.21	RSD	
T-32	B		5	4	4	1236.02	1240.21	RSD	
T-33	C		5	3	3	1229.02	1232.08	RSD	
T-34	D		5	4	4	1231.66	1235.98	RSD	
T-35	E		5	4	4	1231.22	1234.74	RSD	
T-16	(d)						1236.52 ✓	RSD	
T-21	(d)						1231.16 ✓	RSD	
T-35	(d)						1234.81 ✓	RSD	

(d) - duplicate; pan reweighed after being placed in the oven and desiccated a second time.

Aug. 31/05

Test: LF-Larval Fish Growth and Survival Test
Species: AA-Atherinops affinis
Sample ID: Garrow_Creek
Start Date: 8/9/2005 End Date: 8/16/2005

Test ID: 0500327
Protocol: EPAW 95-EPA West Coast
Sample Type: EFF2-Industrial
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	4	1218.92	1222.92
	2	2	D-Control	5							4	4	1231.52	1234.56
	3	3	D-Control	5							5	5	1229.15	1234.64
	4	4	D-Control	5							5	5	1235.47	1239.35
	5	5	D-Control	5							4	4	1241.65	1244.47
	6	1	B-Control	5							5	5	1217.25	1221.44
	7	2	B-Control	5							5	5	1229.47	1234.85
	8	3	B-Control	5							5	5	1233	1237.96
	9	4	B-Control	5							4	4	1236.48	1240.49
	10	5	B-Control	5							3	3	1237.67	1241.98
	11	1	4.2	5							4	4	1236.79	1240.85
	12	2	4.2	5							5	5	1221.62	1226.26
	13	3	4.2	5							5	5	1236.85	1241.7
	14	4	4.2	5							4	4	1231.67	1236.88
	15	5	4.2	5							4	4	1227.6	1230.46
	16	1	8.4	5							5	5	1232.12	1236.61
	17	2	8.4	5							5	5	1221.55	1225.83
	18	3	8.4	5							4	4	1226.4	1229.96
	19	4	8.4	5							5	5	1224.88	1229.98
	20	5	8.4	5							5	5	1228.72	1233.82
	21	1	16.9	5							5	5	1226.33	1231.24
	22	2	16.9	5							4	4	1227.45	1231.89
	23	3	16.9	5							4	4	1223.67	1227.1
	24	4	16.9	5							3	3	1228.16	1231.05
	25	5	16.9	5							4	4	1218.71	1221.92
	26	1	33.7	5							5	5	1229.33	1232.96
	27	2	33.7	5							4	4	1223.13	1227.98
	28	3	33.7	5							5	5	1222.55	1226.08
	29	4	33.7	5							4	4	1231.12	1234.27
	30	5	33.7	5							5	5	1230.86	1234.48
	31	1	67.4	5							5	5	1234.04	1239.21
	32	2	67.4	5							4	4	1236.02	1240.21
	33	3	67.4	5							3	3	1229.02	1232.08
	34	4	67.4	5							4	4	1231.66	1235.98
	35	5	67.4	5							4	4	1231.22	1234.74

Comments: Azimuth - Polaris 04-1424-044

Reviewed by: Aug 31/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	8/9/2005	Test ID:	500327	Sample ID:	Garrow_Creek
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

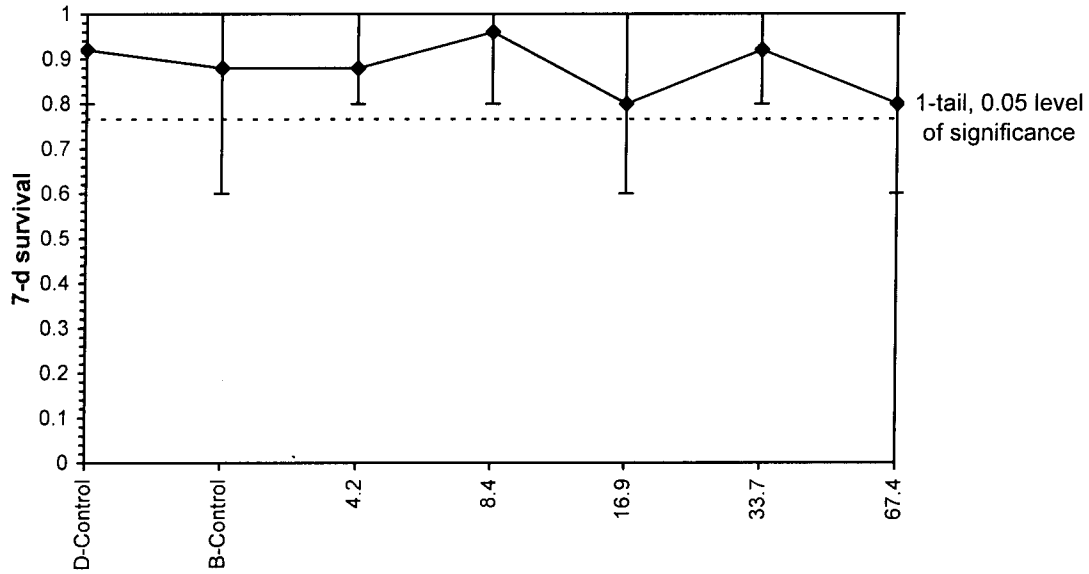
Conc-%	1	2	3	4	5
D-Control	1.0000	0.8000	1.0000	1.0000	0.8000
B-Control	1.0000	1.0000	1.0000	0.8000	0.6000
4.2	0.8000	1.0000	1.0000	0.8000	0.8000
8.4	1.0000	1.0000	0.8000	1.0000	1.0000
16.9	1.0000	0.8000	0.8000	0.6000	0.8000
33.7	1.0000	0.8000	1.0000	0.8000	1.0000
67.4	1.0000	0.8000	0.6000	0.8000	0.8000

			Transform: Arcsin Square Root					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9200	0.1095	1.2500	1.1071	1.3453	10.434	5			
B-Control	0.8800	0.1789	1.2058	0.8861	1.3453	17.113	5			
4.2	0.8800	0.1095	1.2024	1.1071	1.3453	10.848	5	0.544	2.360	0.2068
8.4	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	-0.544	2.360	0.2068
16.9	0.8000	0.1414	1.1106	0.8861	1.3453	14.625	5	1.592	2.360	0.2068
33.7	0.9200	0.1095	1.2500	1.1071	1.3453	10.434	5	0.000	2.360	0.2068
67.4	0.8000	0.1414	1.1106	0.8861	1.3453	14.625	5	1.592	2.360	0.2068

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94769	0.9	-0.1197	-0.6919
Bartlett's Test indicates equal variances (p = 0.97)	0.91421	15.0863		
The control means are not significantly different (p = 0.70)	0.405	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	67.4	>67.4		1.48368	0.154	0.171	0.03047	0.01919	0.20149	5, 24

Dose-Response Plot



Statistical analysis performed with the negative control.

Reviewed by: Aug 31/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	8/9/2005	Test ID:	500327	Sample ID:	Garrow_Creek
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

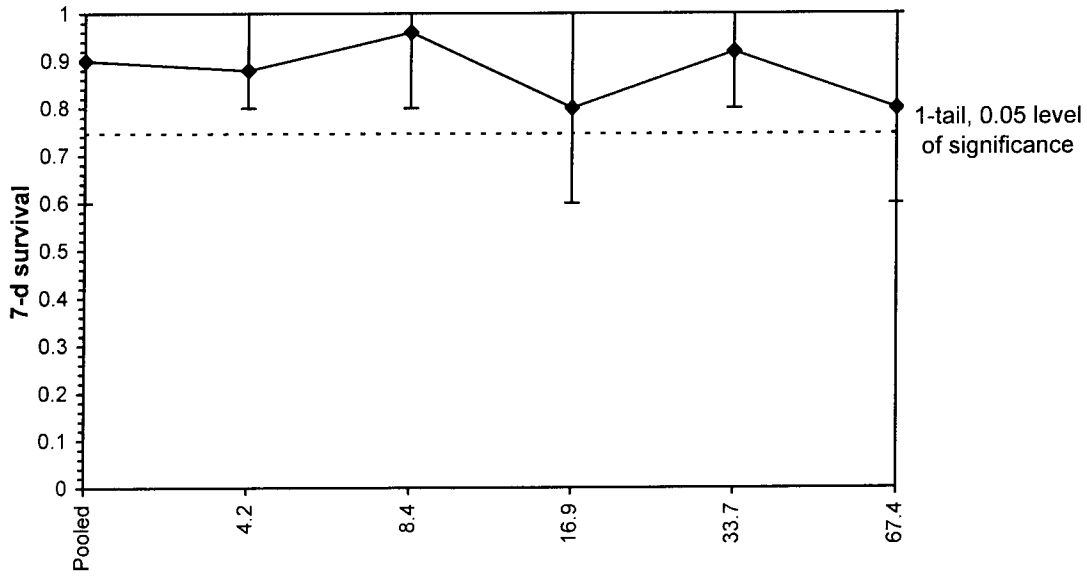
Conc-%	1	2	3	4	5
D-Control	1.0000	0.8000	1.0000	1.0000	0.8000
B-Control	1.0000	1.0000	1.0000	0.8000	0.6000
4.2	0.8000	1.0000	1.0000	0.8000	0.8000
8.4	1.0000	1.0000	0.8000	1.0000	1.0000
16.9	1.0000	0.8000	0.8000	0.6000	0.8000
33.7	1.0000	0.8000	1.0000	0.8000	1.0000
67.4	1.0000	0.8000	0.6000	0.8000	0.8000

			Transform: Arcsin Square Root					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Pooled	0.9000	0.1414	1.2279	0.8861	1.3453	13.389	10			
4.2	0.8800	0.1095	1.2024	1.1071	1.3453	10.848	5	0.315	2.462	0.1997
8.4	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5	-0.860	2.462	0.1997
16.9	0.8000	0.1414	1.1106	0.8861	1.3453	14.625	5	1.447	2.462	0.1997
33.7	0.9200	0.1095	1.2500	1.1071	1.3453	10.434	5	-0.273	2.462	0.1997
67.4	0.8000	0.1414	1.1106	0.8861	1.3453	14.625	5	1.447	2.462	0.1997

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95136	0.91	-0.4731	-0.265
Bartlett's Test indicates equal variances (p = 0.95)	1.19442	15.0863		
The control means are not significantly different (p = 0.70)	0.405	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	67.4	>67.4		1.48368	0.15355	0.17312	0.0295	0.02192	0.27347	5, 29

Dose-Response Plot



Statistical analysis performed with pooled controls.

Reviewed by: Aug 31/05

Larval Fish Growth and Survival Test-7 Day Growth (CND)

Start Date:	8/9/2005	Test ID:	500327	Sample ID:	GARROW_CREEK
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

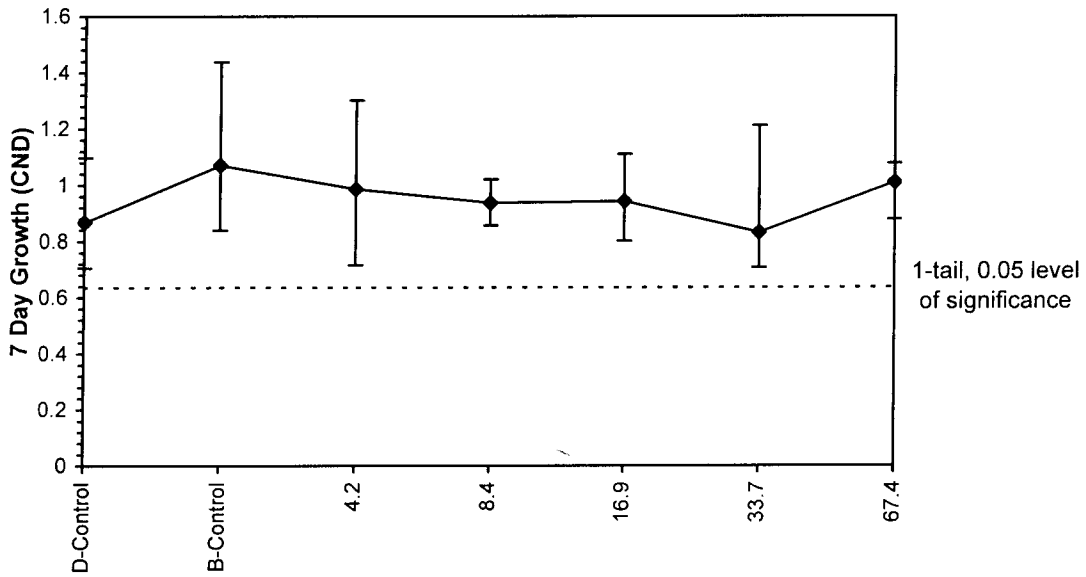
Conc-%	1	2	3	4	5
D-Control	1.0000	0.7600	1.0980	0.7760	0.7050
B-Control	0.8380	1.0760	0.9920	1.0025	1.4367
4.2	1.0150	0.9280	0.9700	1.3025	0.7150
8.4	0.8980	0.8560	0.8900	1.0200	1.0200
16.9	0.9820	1.1100	0.8575	0.9633	0.8025
33.7	0.7260	1.2125	0.7060	0.7875	0.7240
67.4	1.0340	1.0475	1.0200	1.0800	0.8800

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.8678	0.1710	0.8678	0.7050	1.0980	19.710	5			
B-Control	1.0690	0.2230	1.0690	0.8380	1.4367	20.861	5			
4.2	0.9861	0.2110	0.9861	0.7150	1.3025	21.397	5	-1.198	2.360	0.2331
8.4	0.9368	0.0776	0.9368	0.8560	1.0200	8.280	5	-0.699	2.360	0.2331
16.9	0.9431	0.1192	0.9431	0.8025	1.1100	12.644	5	-0.762	2.360	0.2331
33.7	0.8312	0.2154	0.8312	0.7060	1.2125	25.910	5	0.371	2.360	0.2331
67.4	1.0123	0.0772	1.0123	0.8800	1.0800	7.629	5	-1.463	2.360	0.2331

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94085	0.9	0.90895	1.11753
Bartlett's Test indicates equal variances (p = 0.22)	7.00651	15.0863		
The control means are not significantly different (p = 0.15)	1.60103	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	67.4	>67.4		1.48368	0.23312	0.26863	0.02377	0.02439	0.45333	5, 24

Dose-Response Plot



Statistical analysis performed on negative control using Canadian method to assess test validity criteria.

Reviewed by: Aug-31/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	8/9/2005	Test ID:	500327	Sample ID:	GARROW_CRE
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

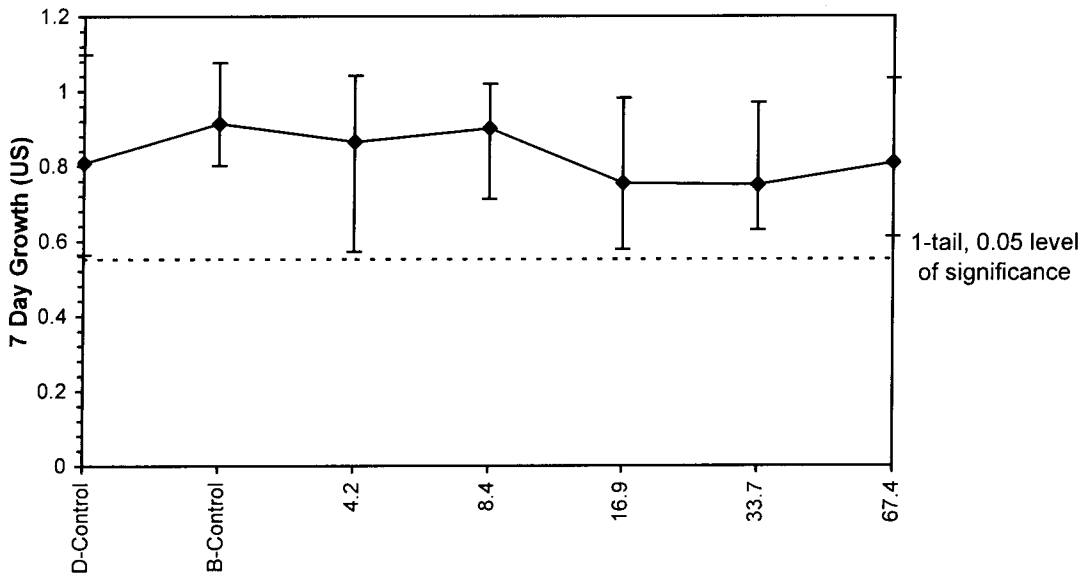
Conc-%	1	2	3	4	5
D-Control	1.0000	0.6080	1.0980	0.7760	0.5640
B-Control	0.8380	1.0760	0.9920	0.8020	0.8620
4.2	0.8120	0.9280	0.9700	1.0420	0.5720
8.4	0.8980	0.8560	0.7120	1.0200	1.0200
16.9	0.9820	0.8880	0.6860	0.5780	0.6420
33.7	0.7260	0.9700	0.7060	0.6300	0.7240
67.4	1.0340	0.8380	0.6120	0.8640	0.7040

			Transform: Untransformed					1-Tailed		
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.8092	0.2353	0.8092	0.5640	1.0980	29.082	5			
B-Control	0.9140	0.1155	0.9140	0.8020	1.0760	12.636	5			
4.2	0.8648	0.1837	0.8648	0.5720	1.0420	21.242	5	-0.511	2.360	0.2569
8.4	0.9012	0.1285	0.9012	0.7120	1.0200	14.262	5	-0.845	2.360	0.2569
16.9	0.7552	0.1718	0.7552	0.5780	0.9820	22.750	5	0.496	2.360	0.2569
33.7	0.7512	0.1284	0.7512	0.6300	0.9700	17.097	5	0.533	2.360	0.2569
67.4	0.8104	0.1615	0.8104	0.6120	1.0340	19.927	5	-0.011	2.360	0.2569

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96877	0.9	0.03752	-0.9001
Bartlett's Test indicates equal variances (p = 0.85)	1.98489	15.0863		
The control means are not significantly different (p = 0.40)	0.89395	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	67.4	>67.4		1.48368	0.25689	0.31747	0.01761	0.02962	0.70433	5, 24

Dose-Response Plot



Statistical analysis performed with D-control

Reviewed by: Sept 1/05

Larval Fish Growth and Survival Test-7 Day Growth (US)					
Start Date:	8/9/2005	Test ID:	500327	Sample ID:	GARROW_CRE
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment Cc	Sample Type:	EFF2-Industrial
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

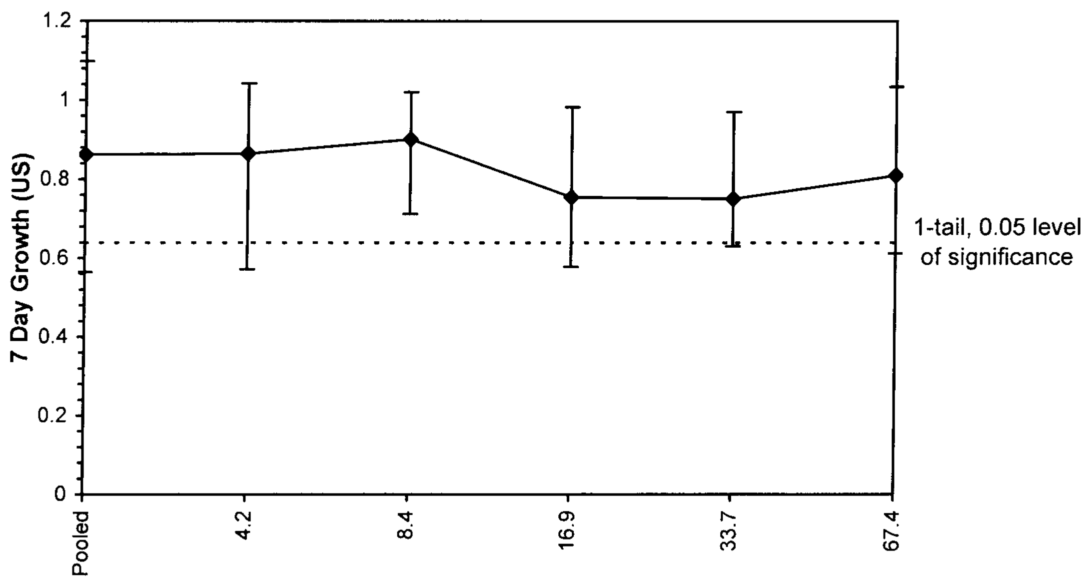
Conc-%	1	2	3	4	5
D-Control	1.0000	0.6080	1.0980	0.7760	0.5640
B-Control	0.8380	1.0760	0.9920	0.8020	0.8620
4.2	0.8120	0.9280	0.9700	1.0420	0.5720
8.4	0.8980	0.8560	0.7120	1.0200	1.0200
16.9	0.9820	0.8880	0.6860	0.5780	0.6420
33.7	0.7260	0.9700	0.7060	0.6300	0.7240
67.4	1.0340	0.8380	0.6120	0.8640	0.7040

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Pooled	0.8616	0.1833	0.8616	0.5640	1.0980	21.272	10			
4.2	0.8648	0.1837	0.8648	0.5720	1.0420	21.242	5	-0.035	2.462	0.2228
8.4	0.9012	0.1285	0.9012	0.7120	1.0200	14.262	5	-0.438	2.462	0.2228
16.9	0.7552	0.1718	0.7552	0.5780	0.9820	22.750	5	1.176	2.462	0.2228
33.7	0.7512	0.1284	0.7512	0.6300	0.9700	17.097	5	1.220	2.462	0.2228
67.4	0.8104	0.1615	0.8104	0.6120	1.0340	19.927	5	0.566	2.462	0.2228

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95378	0.91	-0.1738	-0.7645
Bartlett's Test indicates equal variances (p = 0.96)	1.08676	15.0863		
The control means are not significantly different (p = 0.40)	0.89395	2.306		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	67.4	>67.4		1.48368	0.22282	0.25861	0.02046	0.0273	0.59313	5, 29

Dose-Response Plot



Statistical analysis performed with pooled controls.

ToxCalc v5.0.23

Reviewed by: Ogalj4 Sept 1/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST DATA SUMMARY

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

EVS Analysts SxB MJG JxS RS
Test Initiation Date 9 Aug 05

Sample	Initial Sample	Refresh Samples	
	Day 0	Day 2	Day 4
Identification	100mg/L Cu Stock (05Cu001)		
Amount ~~Received~~ Prepared	1X1L		
Date ~~Collected~~ Prepared	1-Mar-05		
Date Received	na		
Temperature (°C)			
pH			
DO (mg/L)			
Conductivity (µmhos/cm)			
Salinity (ppt)			
Ammonia (mg/L N)			
Chlorine (mg/L Cl)			
Other			

DILUTION/CONTROL WATER (initial water quality)
Water Type UV sterilized filtered SW
Temperature (°C) 20.0
pH 7.9
Dissolved Oxygen (mg/L) 7.7
Salinity 29

TEST CONDITIONS
Temperature Range (°C) 20.0 - 20.5
pH Range 7.8 - 8.0
Dissolved Oxygen Range (mg/L) 6.4 - 7.7
Salinity (ppt) 28 - 31
Photoperiod (L:D h) 16:8
Aeration Provided? None
Other -

TEST SPECIES INFORMATION
Source ABS Inc
Date Received 9 Aug 05
Age (on Day 0) 10 days
Reference Toxicant Cu
Current Reference Toxicant Result (incl. 95% CL)
Reference Toxicant Test Date 9 Aug 05
7-d survival LC50 ~~107 (88-129)~~ 103 (91-118) mg/L Cu
7-d growth IC50 ~~95 (75-125)~~ 76-127 mg/L Cu
Reference Toxicant Warning Limits (mean ± 2SD) and CV
7-d survival LC50 132 ± 40 mg/L Cu CV=15%
7-d growth IC50 133 ± 40 mg/L Cu CV=15%

TEST RESULTS

Endpoint	Conc. Units	NOEC	LOEC	LC50 (95% CL)	IC50 (95% CL)	IC25 (95% CL)
Survival	mg/L Cu	56	100	~~107 (88-129)~~ 103 (91-118)		
Growth		~~32~~ 56	~~32~~ 100		~~95 (75-125)~~ 76-127	~~64 (7-91)~~ 71 (11-91)

Other

Data Verified By [signature] Date Verified Sept. 1/05

EVS ENVIRONMENT CONSULTANTS

7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client Azimuth

EVS Project No. 04-1424-044

EVS Work Order No. C500327

Sample ID Cu Reftox

Test Initiation Date/Time 9 Aug 05 1500

Source/Date Received ABS Inc. / 9 Aug 05

Concentration mg/L Cu	Temperature (°C)													
	0	1 old	1 new	2		3		4		5		6		7
CTL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5
32	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5
56	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.5	20.0	20.5
100	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.5
180	20.0	20.0	20.0	20.0	20.0	20.0	20.0	~~20.0~~	~~20.0~~	20.0	20.0			
320	20.0	20.0	20.0	20.0	20.0									
Tech. Initials	SxB	SxB	SxB	MTL	MTL	SRS	SRS	SxB	SxB	SxB	SxB	TM	TM	TM

Concentration mg/L Cu	pH													
	0	1		2		3		4		5		6		7
CTL	7.9	7.9	8.0	7.9	7.9	7.8	7.9	7.8	8.0	7.9	7.9	7.9	8.0	7.9
32	7.9	8.0	8.0	7.9	7.9	7.8	7.9	~~7.8~~ 7.9	7.9	7.9	7.9	7.9	8.0	8.0
56	7.9	7.9	8.0	8.0	7.9	7.8	7.9	~~7.8~~ 7.9	8.0	7.9	7.9	8.0	8.0	8.0
100	7.9	7.9	8.0	8.0	7.9	7.8	7.9	7.8	8.0	7.9	7.9	8.0	8.0	8.0
180	7.9	7.8	8.0	~~7.9~~ 7.9	7.9	7.8	7.9	~~7.8~~	~~8.0~~	~~7.9~~	~~7.9~~			
320	7.9	7.9	8.0	~~7.9~~	7.9									
				MTL										
Tech. Initials	SxB	SxB	SxB	MTL	MTL	SRS	SRS	SxB	SxB	SxB	SxB	TM	TM	TM

WQ Instruments Used: Temp. Calibrated Ag Thermometer pH 030302

Comments

Test Set Up By SxB Data Verified By [signature] Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* SURVIVAL AND GROWTH TEST – WATER QUALITY DATA (EEM)

Client Azimuth
EVS Project No. 04-1424-044
EVS Work Order No. 0500327

Sample ID Cu Reftox
Test Initiation Date/Time 9 Aug -05 / 1500
Source/Date Received ABS In 9 Aug 05

Concentration mg/L Cu	Salinity (ppt)													
	0	1		2		3		4		5		6 D		7
CTL	29	29	29	29	29	30	30	31	30	30	30	30	28	29
32	29	29	29	29	29	30	30	30	30	30	30	29	28	29
56	29	29	29	29	29	30	30	30	30	30	30	29	28	29
100	29	29	29	29	29	30	30	30	30	30	30	29	28	29
180	29	29	29	29	29	~~30~~	30	~~30~~	~~30~~	~~30~~	~~30~~			
320	29	29	29	29	29									
Tech. Initials	SXB	SXB	SXB	MC	MC	SRS	SRS	SXB	SXB	SXB	SXB	TH	TH	TH

Concentration mg/L Cu	Dissolved Oxygen (mg/L)													
	0	1		2		3		4		5		6		7
CTL	7.7	6.8	7.7	6.6	7.6	6.8	7.6	6.6	7.6	6.7	7.6	6.6	~~7.6~~ 7.5	6.6
32	7.7	6.9	7.7	6.5	7.6	6.9	7.6	6.7	7.6	6.9	7.6	6.4	7.5	6.6
56	7.7	6.8	7.7	6.7	7.6	7.0	7.6	6.8	7.6	6.9	7.6	6.6	7.5	6.4
100	7.7	6.8	7.7	6.6	7.6	7.0	7.6	6.9	7.6	7.0	7.6	6.6	7.5	6.4
180	7.7	6.9	7.7	6.5	7.6	7.1	7.6	~~6.9~~	~~7.6~~	~~7.0~~				
320	7.7	6.8	7.7	6.5	7.6	X								
Tech. Initials	SXB	SXB	SXB	MC	MC	SRS	SRS	SXB	SXB	SXB	SXB	TH	TH	TH

WQ Instruments Used: Salinity II-C-3 DO II-A-20
Comments Dosed II-A-050506

Test Set Up By SXB Data Verified By Qualified Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500327

Sample ID: cu_Lefton
Test Species/Batch: Atherinops affinis
Test Initiation Date/Time: 9 Aug 05 1500
No. of Organisms/Volume: 5/200mL

Concentration mg/L Cu	Rep.	Pan No.	Number of Survivors – Day of Test							Comments
			1	2	3	4	5	6	7	
CTL	A	36 T	5	5	5	5	5	5	5	
	B	37	5	5	5	5	5	5	5	
	C	38	5	5	5	5	5	5	5	
	D	39	5	5	4	4	4	4	4	
	E	40	5	5	5	5	5	5	5	
32	A	41	5	5	5	5	5	5	5	
	B	42	5	5	5	5	5	5	4	① one fish stuck on wall while feeding – technician error.
	C	43	5	5	4	4	4	4	4	
	D	44	5	5	①4	4	4	4	4	
	E	45	5	5	4	4	4	3①	3	
56	A	46	5	5	5	5	5	5	5	
	B	47	5	5	5	5	5	5	5	
	C	48	5	5	5	5	5	5	5	
	D	49	5	5	5	5	5	5	5	
	E	50	5	5	5	5	5	5	5	
100	A	51	5	3	3	3	3	3	3	
	B	52	5	~~3~~ 2	2	2	2	2	2	
	C	53	5	4	3	3	3	3	3	
	D	54	5	4	4	4	3	3	3	
	E	55	5	3	2	2	2	2	2	
Technician Initials		SXB	SXB	MH	SXB	SXB	SXB	TM	SXB	

Sample Description: clear colourless
Data Verified By: [signature]
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
7-d *Atherinops affinis* TOXICITY TEST – DAILY SURVIVAL DATA

Client: Azimuth
EVS Project No.: 041424049
EVS Work Order No.: 0500327

Sample ID: Cu Reftox
Test Species/Batch: Atherinops affinis
Test Initiation Date/Time: 9 Aug 05 / 1500
No. of Organisms/Volume: 5 / 200mL

Concentration mg/L Cu	Rep.	Pan No.	Number of Survivors – Day of Test 1	2	3	4	5	6	7	Comments
18	A	56	3	2	2	2	2	2	1	
	B		4	0	0	-	-	-	-	
	C		5	0	0	-	-	-	-	
	D		4	1	0	-	-	-	-	
	E		2	0	0	-	-	-	-	
32	A		SXB 0	0	0	-	-	-	-	
	B		2	0	0	-	-	-	-	
	C		SXB 0	0	0	-	-	-	-	
	D		SXB 0	0	0	-	-	-	-	
	E		1	0	0	-	-	-	-	
	A									
	B									
	C									
	D									
	E									
	A									
	B									
	C									
	D									
	E									
Technician Initials		SXB	SXB	MV	SXB	SXB	SXB	TM	SXB	

Sample Description: clear - colourless
Data Verified By: Qacfq
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS

Larval Fish Toxicity Tests - Dry Weight Data

CLIENT: Azimuth
PROJECT #: 04-1424-044
WORK ORDER #: 0500327
BALANCE TYPE: Sartorius BP211D

TEST TYPE: 7-d Survival and Growth
TEST SPECIES: *Atherinops affinis*
TEST INITIATION DATE: 9-Aug-05

Pan No.	Rep	Sample ID: Cu ug/L	Survival At Start	Number of Survivors	Number Weighed	Pan weight (mg)	Final Weight (mg) Pan + Biomass	Tech'n Initials	Comments
T-36	A	Control	5	5	5	1227.73	1231.65	RSD	
T-37	B		5	5	5	1237.69	1243.76	RSD	
T-38	C		5	5	5	1233.73	1238.72	RSD	
T-39	D		5	4	4	1228.92	1231.78	RSD	
T-40	E		5	5	5	1227.75	1233.44	RSD	
T-41	A	32	5	5	5	1231.67	1236.17	RSD	
T-42	B		5	4	4	1224.44	1228.26	RSD	
T-43	C		5	4	4	1238.77	1241.92	RSD	
T-44	D		4	4	4	1227	1230.34	RSD	Tech error --fish killed during testing.
T-45	E		4	3	3	1236.71	1239.86	RSD	Tech error - fish killed during testing.
T-46	A	56	5	5	5	1230.75	1234.97	RSD	
T-47	B		5	5	5	1220.44	1224.77	RSD	
T-48	C		5	5	5	1226.91	1231.88	RSD	
T-49	D		5	5	5	1227.66	1232.44	RSD	
T-50	E		5	5	5	1233.65	1238.33	RSD	
T-51	A	100	5	3	3	1063.07	1065.92	RSD	
T-52	B		5	2	2	1070.3	1071.8	RSD	
T-53	C		5	3	3	1061.53	1063.78	RSD	
T-54	D		5	3	3	1059.1	1061.99	RSD	
T-55	E		5	2	2	1037.82	1038.91	RSD	
T-56	A	180	5	1	1	1044.2	1044.67	RSD	
T-57	B		5	0	0	1036.78	0	RSD	
T-58	C		5	0	0	1044.68	0	RSD	
T-59	D		5	0	0	1044.41	0	RSD	
T-60	E		5	0	0	1045.27	0	RSD	
T-61	A	320	5	0	0	0	0	RSD	
T-62	B		5	0	0	0	0	RSD	
T-63	C		5	0	0	0	0	RSD	
T-64	D		5	0	0	0	0	RSD	
T-65	E		5	0	0	0	0	RSD	
T-36	(d)						1231.53 ✓	RSD	
T-50	(d)						1238.37 ✓	RSD	
T-51	(d)						1065.88 ✓	RSD	

(d) - duplicate; pan reweighed after being placed in the oven and desiccated a second time.

QA/QC review: Ralph 4
Sept. 1/05

Test: LF-Larval Fish Growth and Survival Test												Test ID: rtaacu46		
Species: AA-Atherinops affinis												Protocol: EPAW 95-EPA West Coast		
Sample ID: REF-Ref Toxicant												Sample Type: CU-Copper		
Start Date: 8/9/2005			End Date: 8/16/2005									Lab ID: BCEVS-EVS Environment Consultants		
Pos	ID	Rep	Group	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	No. Fish Weighed	Total Wgt(mg)	Tare Wgt(mg)
	1	1	D-Control	5							5	5	1227.73	1231.65
	2	2	D-Control	5							5	5	1237.69	1243.76
	3	3	D-Control	5							5	5	1233.73	1238.72
	4	4	D-Control	5							4	4	1228.92	1231.78
	5	5	D-Control	5							5	5	1227.75	1233.44
	6	1	32.0	5							5	5	1231.67	1236.17
	7	2	32.0	5							4	4	1224.44	1228.26
	8	3	32.0	5							4	4	1238.77	1241.92
	9	4	32.0	4							4	4	1227	1230.34
	10	5	32.0	4							3	3	1236.71	1239.86
	11	1	56.0	5							5	5	1230.75	1234.97
	12	2	56.0	5							5	5	1220.44	1224.77
	13	3	56.0	5							5	5	1226.91	1231.88
	14	4	56.0	5							5	5	1227.66	1232.44
	15	5	56.0	5							5	5	1233.65	1238.33
	16	1	100.0	5							3	3	1063.07	1065.92
	17	2	100.0	5							2	2	1070.3	1071.8
	18	3	100.0	5							3	3	1061.53	1063.78
	19	4	100.0	5							3	3	1059.1	1061.99
	20	5	100.0	5							2	2	1037.82	1038.91
	21	1	180.0	5							1	1	1044.2	1044.67
	22	2	180.0	5							0	0	1036.78	0
	23	3	180.0	5							0	0	1044.68	0
	24	4	180.0	5							0	0	1044.41	0
	25	5	180.0	5							0	0	1045.27	0
	26	1	320.0	5							0	0	0	0
	27	2	320.0	5							0	0	0	0
	28	3	320.0	5							0	0	0	0
	29	4	320.0	5							0	0	0	0
	30	5	320.0	5							0	0	0	0

Comments: Azimuth - Polaris 04-1424-044

Reviewed by Aug 31/05

Larval Fish Growth and Survival Test-7-d survival

Start Date:	8/9/2005	Test ID:	rtaacu46	Sample ID:	REF-Ref Toxicant
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

Conc-ug/L	1	2	3	4	5
D-Control	1.0000	1.0000	1.0000	0.8000	1.0000
32	1.0000	0.8000	0.8000	1.0000	0.7500
56	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.6000	0.4000	0.6000	0.6000	0.4000
180	0.2000	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000

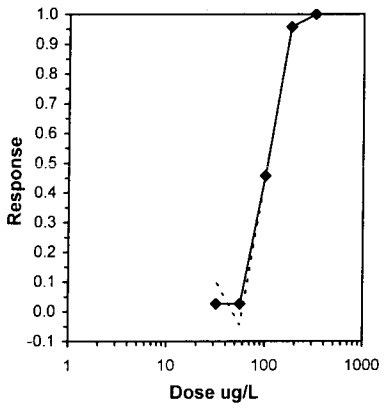
			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9600	0.0894	1.2977	1.1071	1.3453	8.207	5			1	25
32	0.8700	0.1204	1.1850	1.0472	1.3453	11.519	5	20.00	17.00	3	23
56	1.0000	0.0000	1.3453	1.3453	1.3453	0.000	5	30.00	17.00	0	25
*100	0.5200	0.1095	0.8055	0.6847	0.8861	13.691	5	15.00	17.00	12	25
*180	0.0400	0.0894	0.2731	0.2255	0.4636	38.990	5	15.00	17.00	24	25
320	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	5			25	25

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98032	0.888	0.05175	-0.2912
Equality of variance cannot be confirmed				

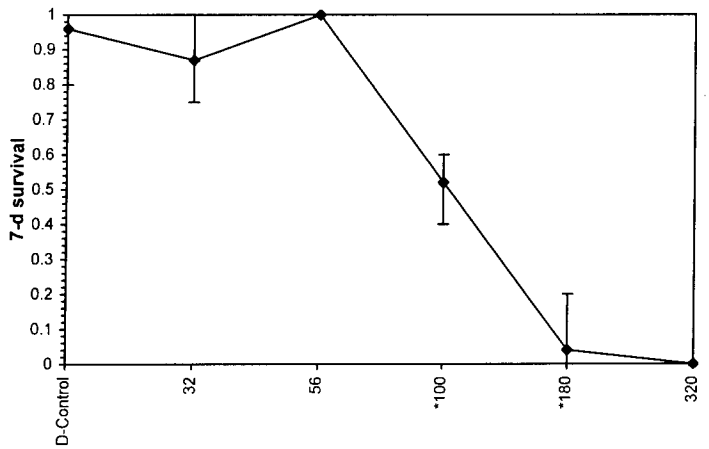
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	56	100	74.8331	

Trimmed Spearman-Karber

Trim Level	EC50	95% CL		
0.0%				
5.0%	103.41	90.52	118.14	
10.0%	103.63	89.27	120.30	
20.0%	104.05	85.12	127.20	
Auto-2.6%	103.48	90.82	117.90	ug/L Cu



Dose-Response Plot



Reviewed by [signature] Aug-31/05

Larval Fish Growth and Survival Test-7 Day Growth (US)

Start Date:	8/9/2005	Test ID:	rtaacu46	Sample ID:	REF-Ref Toxicant
End Date:	8/16/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	CU-Copper
Sample Date:		Protocol:	EPAW 95-EPA West Coast	Test Species:	AA-Atherinops affinis
Comments:	Azimuth - Polaris 04-1424-044				

Conc-ug/L	1	2	3	4	5
D-Control	0.7840	1.2140	0.9980	0.5720	1.1380
32	0.9000	0.7640	0.6300	0.8350	0.7875
56	0.8440	0.8660	0.9940	0.9560	0.9360
100	0.5700	0.3000	0.4500	0.5780	0.2180
180	0.0940	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000

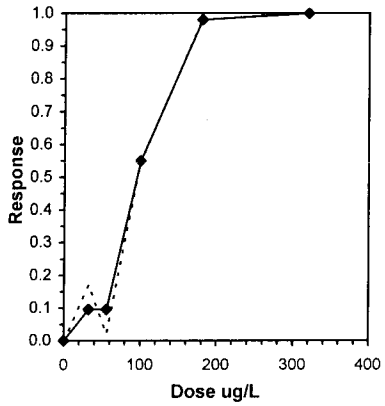
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-ug/L	Mean	SD	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	0.9412	0.2633	0.9412	0.5720	1.2140	27.979	5			0.9412	1.0000
32	0.7833	0.1002	0.7833	0.6300	0.9000	12.796	5	23.00	17.00	0.8512	0.9044
56	0.9192	0.0627	0.9192	0.8440	0.9940	6.819	5	25.00	17.00	0.8512	0.9044
*100	0.4232	0.1609	0.4232	0.2180	0.5780	38.013	5	16.00	17.00	0.4232	0.4496
*180	0.0188	0.0420	0.0188	0.0000	0.0940	223.607	5	15.00	17.00	0.0188	0.0200
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5			0.0000	0.0000

Auxiliary Tests				Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)				0.96904	0.888	-0.5637	1.29994
Bartlett's Test indicates unequal variances (p = 8.40E-03)				13.6784	13.2767		
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**			
Steel's Many-One Rank Test	56	100	74.8331				

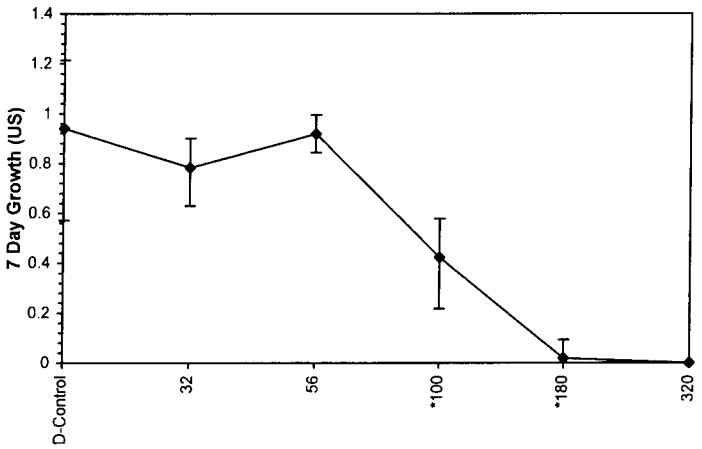
Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew	
IC05*	16.742	22.428	0.966	84.151	0.6591	
IC10	56.429	21.864	0.000	72.829	0.0540	
IC15	61.266	19.804	0.000	78.932	-0.6284	
IC20	66.103	16.425	4.297	85.035	-1.1939	
IC25	70.941	10.605	11.216	91.139	-1.6164	
IC40	85.453	7.896	65.694	112.047	0.4556	
IC50	95.128	8.949	75.508	127.164	0.6374	ug/L Cu

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Reviewed by Aug. 31/05

APPENDIX II

Raw Data and Statistical Analyses:

Dendraster excentricus

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting (Pebble Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500328

EVS Analysts: SRS, JAP
Test Initiation Date: 09 Aug 05

SAMPLE

Identification: Garrow Creek
Amount Received: 5x20L
Date Collected: 06 Aug 05
Date Received: 09 Aug 05
Temperature (°C): 16 @ → 15
pH: 7.3 @ → 8.3
Dissolved Oxygen (mg/L): 10.0 @ → 8.5
Conductivity (µmhos/cm): 2700
Salinity (ppt): 1.0 @ → 29.0
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —
Other: —

@ Brine Adjustment

TEST SPECIES

Organism: Dendraster excentricus
Source: Westwind Sealab
Date Received: 09 Aug 05
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 09 Aug 05
IC50 (and 95% CL): 3.9 (3.6-4.1) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.9 ± 4.3 mg/L SDS, CV = 55%

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV sterilized, 0.5µm filtered SW
Temperature (°C): 15
pH: 8.0
Dissolved Oxygen (mg/L): 8.5
Salinity (ppt): 29
Other: —

TEST CONDITIONS

Temperature Range (°C): 15
pH Range: 7.8 → ~~8.04~~ 8.2 ~~8.3~~ 8.4
Dissolved Oxygen Range (mg/L): ~~7.81~~ 7.8 → 8.5
Salinity Range (ppt): 29
Sperm:Egg Ratio: 2000:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC 50: 55.0 (49.2 - 61.1) % v/v
IC 25: 15.6 (13.6 - 18.3) % v/v
NOEC: < 4.5 % v/v
LOEC: 4.5 % v/v
Statistical comparisons were against pooled controls

Data Verified By: [signature]
Date Verified: Aug. 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client Azimuth Consulting (Polaris Mine)
EVS Project No. 04-1424-04
EVS Work Order No. 0500328
Logbook Echinoid #13 Pages 71-74

Test Initiation Date/Time 9Aug05 / 1723
Test Species Dendraster excentricus
Source/Date Received Westwind Seafds / 9 Aug 05
Test Duration 10:10

Sample ID %(v/v)	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
Garrow Creek - Max	15	8.3	29	8.5	
Garrow Creek - 36	15	8.1	29	8.4	
Garrow Creek - 18	15	7.9	29	8.4	
Garrow Creek - 9	15	7.9	29	8.4	
Garrow Creek - 4.5	15	7.8	29	8.4	
Cntl	15	8.0	29	8.5	
Brine Cntl	15	8.4	29	7.8	
Technician Initials	SRS/JAP	SRS/JAP	SRS/JAP	SRS/JAP	

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-51 Salinity II-A-030303 DO II-A-20

Sample Description Clear with no odour

Data Verified By [signature] Date Verified Aug-31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: Azimuth Consulting (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500328
Logbook: Echinoid Pages: 71-74

Test Initiation Date/Time: 09 Aug 05 / 1723
Test Species: Dendraster excentricus
Source/Date Received: Westward Sealab / 09 Aug 05
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Sample ID	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
Control	A	88	12		SRS
	B	81	19		
	C	85	15		
	D	86	14		
Brine Control	A	91	9		
	B	86	14		
	C	85	15		
	D	87	13		
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				
	A				
	B				
	C				
	D				

Data Verified By: Ralph
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNT (SAMPLES)

Client: Azimuth Consulting (Polaris Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500328
Logbook: Echinoid Pages: 71-74

Test Initiation Date/Time: 09 Aug 05 / 1723
Test Species: Dendraster excentricus
Source/Date Received: Westwind Sealab / 09 Aug 05
Test Duration: 10:10
Sperm:Egg Ratio: 2000:1

Sample ID % (v/v) Saxon Creek	Replicate	Number of Fertilized Eggs	Number of Unfertilized Eggs	Comments	Tech. Initials
Max 71.3%	A	37	63		SRS
	B	40	60		↓
	C	37	63		
	D	35	65		
35.6 ~~36%~~	A	50	50		
	B	54	46		
	C	54	46		
	D	53	47		
17.8 ~~18%~~	A	64	36		
	B	59	41		
	C	63	37		
	D	61	39		
8.9%	A	76	24		
	B	77	23		
	C	77	23		
	D	76	24		
4.5%	A	82	18		
	B	80	20		
	C	79	21		
	D	78	22		↓
	A				
	B				
	C				
	D				

Data Verified By: [signature] Date Verified: Aug 31/05

Test: SC-Sperm Cell Fertilization test
Species: DE-Dendraster excentricus
Sample ID: Garrow Creek
Start Date: 8/9/2004 10:10 End Date: 8/9/2004

Test ID: 0500328
Protocol: EPS1/RM/27-EC 92 (Sperm Cell)
Sample Type: ~~GW-groundwater~~ Effluent
Lab ID: BCEVS-EVS Environment Consultants

Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	88	12	
	2	2	D-Control	100	81	19	
	3	3	D-Control	100	85	15	
	4	4	D-Control	100	86	14	
	5	1	B-Control	100	91	9	
	6	2	B-Control	100	86	14	
	7	3	B-Control	100	85	15	
	8	4	B-Control	100	87	13	
	9	1	4.500	100	78	22	
	10	2	4.500	100	79	21	
	11	3	4.500	100	80	20	
	12	4	4.500	100	82	18	
	13	1	8.900	100	76	24	
	14	2	8.900	100	77	23	
	15	3	8.900	100	77	23	
	16	4	8.900	100	76	24	
	17	1	17.800	100	61	39	
	18	2	17.800	100	63	37	
	19	3	17.800	100	59	41	
	20	4	17.800	100	64	36	
	21	1	35.600	100	53	47	
	22	2	35.600	100	54	46	
	23	3	35.600	100	54	46	
	24	4	35.600	100	50	50	
	25	1	71.300	100	35	65	
	26	2	71.300	100	37	63	
	27	3	71.300	100	40	60	
	28	4	71.300	100	37	63	

Comments: Azimuth Consulting Group (Polaris Mine) 04-1424-044 (0500328)

Reviewed by: Aug-31/05

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/9/2004 10:10	Test ID:	500328	Sample ID:	Garrow Creek
End Date:	8/9/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	~~GW-groundwater~~ Effluent
Sample Date:	8/6/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris Mine) 04-1424-044 (0500328)				

Conc-%	1	2	3	4
D-Control	0.8800	0.8100	0.8500	0.8600
B-Control	0.9100	0.8600	0.8500	0.8700
4.5	0.7800	0.7900	0.8000	0.8200
8.9	0.7600	0.7700	0.7700	0.7600
17.8	0.6100	0.6300	0.5900	0.6400
35.6	0.5300	0.5400	0.5400	0.5000
71.3	0.3500	0.3700	0.4000	0.3700

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8500	0.0294	0.8500	0.8100	0.8800	3.463	4				0.8500	1.0000
B-Control	0.8725	0.0263	0.8725	0.8500	0.9100	3.014	4					
*4.5	0.7975	0.0171	0.7975	0.7800	0.8200	2.141	4	3.662	2.410	0.0346	0.7975	0.9382
*8.9	0.7650	0.0058	0.7650	0.7600	0.7700	0.755	4	5.929	2.410	0.0346	0.7650	0.9000
*17.8	0.6175	0.0222	0.6175	0.5900	0.6400	3.591	4	16.217	2.410	0.0346	0.6175	0.7265
*35.6	0.5275	0.0189	0.5275	0.5000	0.5400	3.589	4	22.494	2.410	0.0346	0.5275	0.6206
*71.3	0.3725	0.0206	0.3725	0.3500	0.4000	5.534	4	33.305	2.410	0.0346	0.3725	0.4382

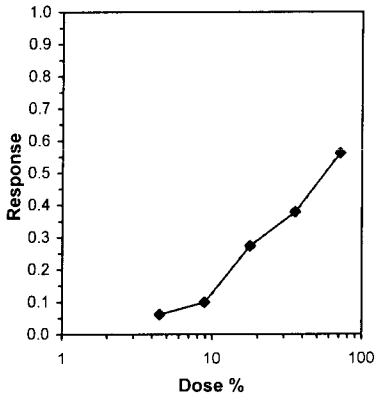
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96944	0.884	-0.376	-0.1401
Bartlett's Test indicates equal variances (p = 0.37)	5.40444	15.0863		
The control means are not significantly different (p = 0.30)	1.13994	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<4.5	4.5			0.03455	0.04065	0.13432	0.00041	5.3E-17	5, 18

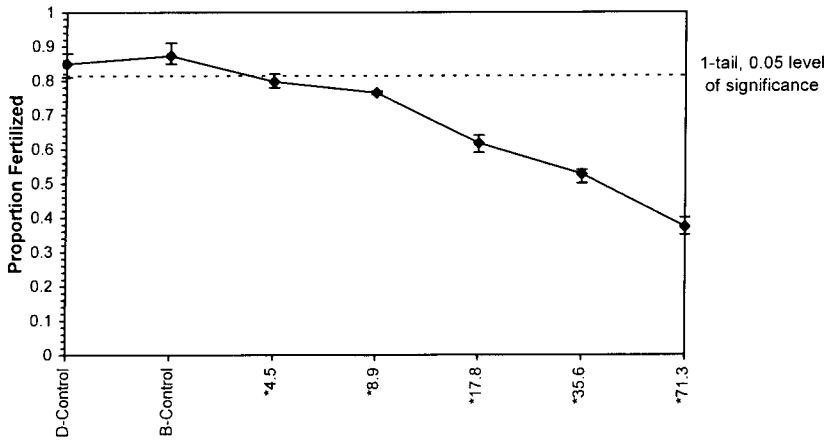
Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	2.975	1.400	0.565	7.600	0.6911
IC10	8.900	1.288	3.027	10.418	-0.8297
IC15	10.909	0.614	9.311	12.929	0.4646
IC20	13.326	0.777	11.427	15.949	0.5340
IC25	16.234	1.070	13.604	20.191	0.7205
IC40	38.524	1.817	32.550	43.489	-0.4616
IC50	56.411	2.378	49.614	64.710	0.5505

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Note: statistical comparisons are against dilution control

Reviewed by: Aug 31/05

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/9/2004 10:10	Test ID:	500328	Sample ID:	Garrow Creek
End Date:	8/9/2004	Lab ID:	BCEVS-EVS Environment C	Sample Type:	~~GW-groundwater~~ Effluent
Sample Date:	8/6/2004	Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group (Polaris Mine) 04-1424-044 (0500328)				

Conc-%	1	2	3	4
D-Control	0.8800	0.8100	0.8500	0.8600
B-Control	0.9100	0.8600	0.8500	0.8700
4.5	0.7800	0.7900	0.8000	0.8200
8.9	0.7600	0.7700	0.7700	0.7600
17.8	0.6100	0.6300	0.5900	0.6400
35.6	0.5300	0.5400	0.5400	0.5000
71.3	0.3500	0.3700	0.4000	0.3700

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Pooled	0.8613	0.0285	0.8613	0.8100	0.9100	3.310	8				0.8613	1.0000
*4.5	0.7975	0.0171	0.7975	0.7800	0.8200	2.141	4	4.768	2.508	0.0335	0.7975	0.9260
*8.9	0.7650	0.0058	0.7650	0.7600	0.7700	0.755	4	7.199	2.508	0.0335	0.7650	0.8882
*17.8	0.6175	0.0222	0.6175	0.5900	0.6400	3.591	4	18.231	2.508	0.0335	0.6175	0.7170
*35.6	0.5275	0.0189	0.5275	0.5000	0.5400	3.589	4	24.962	2.508	0.0335	0.5275	0.6125
*71.3	0.3725	0.0206	0.3725	0.3500	0.4000	5.534	4	36.555	2.508	0.0335	0.3725	0.4325

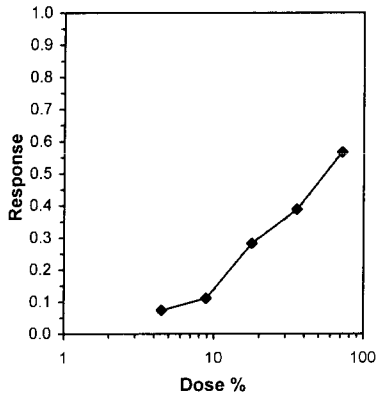
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97972	0.896	-0.1255	1.3485
Bartlett's Test indicates equal variances (p = 0.30)	6.1116	15.0863		
The control means are not significantly different (p = 0.30)	1.13994	2.44691		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	<4.5	4.5			0.03354	0.03894	0.16656	0.00048	3.5E-20	5, 22

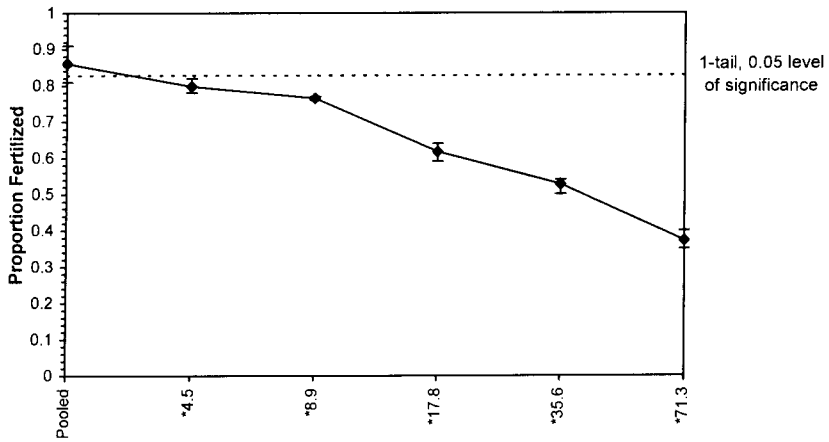
Log-Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew	
IC05*	2.163	0.950	0.835	6.375	1.2352	
IC10	7.243	1.368	2.765	10.506	-0.2796	
IC15	10.424	0.446	9.200	11.908	0.1462	
IC20	12.777	0.574	11.163	14.753	0.1484	
IC25	15.613	0.797	13.605	18.305	0.1477	
IC40	37.370	1.848	30.582	42.085	-0.6715	
IC50	55.010	2.043	49.176	61.090	0.1372	%v/v

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Note: statistical comparisons are against pooled controls

Reviewed by: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST DATA SUMMARY

Client: Azimuth Consulting (Pebble Mine)
EVS Project No.: 04-1424-044
EVS Work Order No.: 0500328

EVS Analysts: SRS, JAP
Test Initiation Date: 09 Aug 05

SAMPLE

Identification: SDS Reftox Soln #05-5-009
Amount ~~Received~~ Prep'd: 1L
Date ~~Collected~~ Prep'd: 05 Aug 05
Date Received: —
Temperature (°C): —
pH: —
Dissolved Oxygen (mg/L): —
Conductivity (µmhos/cm): —
Salinity (ppt): —
Ammonia (mg/L N): —
Chlorine (mg/L Cl): —
Other: —

TEST SPECIES

Organism: Dendraster excentricus
Source: Westwind Sealab
Date Received: 09 Aug 05
Reference Toxicant: SDS
Current Reference Toxicant Result
Reference Toxicant Test Date: 09 Aug 05
IC50 (and 95% CL): 3.9 (3.6 - 4.1) mg/L SDS
Reference Toxicant Warning Limits (mean ± 2SD) and CV
3.9 ± 4.3 mg/L SDS; CV = 55%

DILUTION/CONTROL WATER (initial water quality)

Water Type: UV sterilized, 0.5µm filtered SW
Temperature (°C): 15
pH: 8.0
Dissolved Oxygen (mg/L): 8.5
Salinity (ppt): 29
Other: —

TEST CONDITIONS

Temperature Range (°C): 15
pH Range: 7.8 - 8.0
Dissolved Oxygen Range (mg/L): 8.4 - 8.5
Salinity Range (ppt): 29
Sperm:Egg Ratio: 2000:1
Test Duration: 10:10
Other: —

TEST RESULTS

IC 50: 3.9 (3.6-4.1) mg/L SDS
IC 25: 2.3 (2.2-2.4) mg/L SDS
NOEC: 1.0 mg/L SDS
LOEC: 1.8 mg/L SDS

Data Verified By: [signature]
Date Verified: Aug 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST INITIAL WATER QUALITY

Client Azimuth Consulting (Polaris Mine)
EVS Project No. 04-1424-8044
EVS Work Order No. 0500328
Logbook Echinoid #13 Pages 71-74

Test Initiation Date/Time 9 Aug 05 / 1723
Test Species Dendraster excentricus
Source/Date Received Westwind Seclab / 9 Aug 05
Test Duration 10:16

Reftox

Sample ID SDS (mg/L)	Temperature (°C)	pH	Salinity (ppt)	Dissolved Oxygen (mg/L)	Comments
Cnt1	15	8.0	29	8.5	
1.0	15	7.8	29	8.4	
1.8	15	7.8	29	8.4	
3.2	15	7.8	29	8.4	
5.6	15	7.9	29	8.4	
10.0	15	7.9	29	8.4	
Technician Initials	SRS/JAP	SRS/JAP	SRS/JAP	SRS/JAP	

WQ Instruments Used: Temp. Calibrated Hg thermometer pH II-A-57 Salinity II-A-030303 DO II-A-20

Sample Description

Data Verified By Ralph K Date Verified Aug 31/05

EVS ENVIRONMENT CONSULTANTS
ECHINOID FERTILIZATION TOXICITY TEST – EGG COUNTS (CONTROLS)

Client: Azimuth Consulting (Polaris Mine) Test Initiation Date/Time: 09/Aug/05 / 1723
EVS Project No.: 04-1424-044 Test Species: Dendraster excentricus
EVS Work Order No.: 0500328 Test Duration: 10:10
Logbook: Echinoid Pages: 71-74 Sperm:Egg Ratio: 2000:1
Reftox

Concentration 5 DS (mg/L)	Replicate	No. Fertilized Eggs	No. Unfertilized Eggs	Comments	Tech. Initials
Reference Toxicant					
1.0	A	88	12		SRS
	B	84	16		
	C	89	11		
	D	87	13		
1.8	A	75	25		
	B	~~74~~ SRS 73	27		
	C	~~72~~ SRS 74	26		
	D	73	27		
3.2	A	49	51		
	B	52	48		
	C	53	47		
	D	49	51		
5.6	A	26	74		
	B	28	72		
	C	26	74		
	D	27	73		
10.0	A	16	84		
	B	11	89		
	C	14	86		
	D	15	85		
Control Seawater					
Cntl	A	88	12		SRS
	B	81	19		
	C	85	15		
	D	86	14		

Data Verified By: Ralph Ky Date Verified: Aug 31/05

Test: SC-Sperm Cell Fertilization test						Test ID: rtdesds052	
Species: DE-Dendraster excentricus						Protocol: EPS1/RM/27-EC 92 (Sperm Cell)	
Sample ID: REF-Ref Toxicant						Sample Type: SDS-Sodium dodecyl sulfate	
Start Date: 8/9/2005 10:10			End Date: 8/9/2005			Lab ID: BCEVS-EVS Environment Consultants	
Pos	ID	Rep	Group	Total Counted	Number Fertilized	Number Unfertilized	Notes
	1	1	D-Control	100	88	12	
	2	2	D-Control	100	81	19	
	3	3	D-Control	100	85	15	
	4	4	D-Control	100	86	14	
	5	1	1.000	100	88	12	
	6	2	1.000	100	84	16	
	7	3	1.000	100	89	11	
	8	4	1.000	100	87	13	
	9	1	1.800	100	75	25	
	10	2	1.800	100	73	27	
	11	3	1.800	100	74	26	
	12	4	1.800	100	73	27	
	13	1	3.200	100	49	51	
	14	2	3.200	100	52	48	
	15	3	3.200	100	53	47	
	16	4	3.200	100	49	51	
	17	1	5.600	100	26	74	
	18	2	5.600	100	28	72	
	19	3	5.600	100	26	74	
	20	4	5.600	100	27	73	
	21	1	10.000	100	16	84	
	22	2	10.000	100	11	89	
	23	3	10.000	100	14	86	
	24	4	10.000	100	15	85	

Comments: Azimuth Consulting Group 04-1424-044 (0500328)

Reviewed by: Aug 31/05

Sperm Cell Fertilization test-Proportion Fertilized

Start Date:	8/9/2005 10:10	Test ID:	rtdesds052	Sample ID:	REF-Ref Toxicant
End Date:	8/9/2005	Lab ID:	BCEVS-EVS Environment C	Sample Type:	SDS-Sodium dodecyl sulfate
Sample Date:		Protocol:	EPS1/RM/27-EC 92 (Sperm	Test Species:	DE-Dendraster excentricus
Comments:	Azimuth Consulting Group 04-1424-044 (0500328)				

Conc-mg/L	1	2	3	4
D-Control	0.8800	0.8100	0.8500	0.8600
1	0.8800	0.8400	0.8900	0.8700
1.8	0.7500	0.7300	0.7400	0.7300
3.2	0.4900	0.5200	0.5300	0.4900
5.6	0.2600	0.2800	0.2600	0.2700
10	0.1600	0.1100	0.1400	0.1500

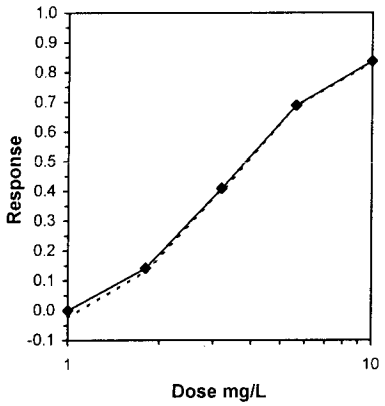
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	SD	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8500	0.0294	0.8500	0.8100	0.8800	3.463	4				0.8600	1.0000
1	0.8700	0.0216	0.8700	0.8400	0.8900	2.483	4	-1.412	2.410	0.0341	0.8600	1.0000
*1.8	0.7375	0.0096	0.7375	0.7300	0.7500	1.298	4	7.941	2.410	0.0341	0.7375	0.8576
*3.2	0.5075	0.0206	0.5075	0.4900	0.5300	4.062	4	24.176	2.410	0.0341	0.5075	0.5901
*5.6	0.2675	0.0096	0.2675	0.2600	0.2800	3.579	4	41.118	2.410	0.0341	0.2675	0.3110
*10	0.1400	0.0216	0.1400	0.1100	0.1600	15.430	4	50.118	2.410	0.0341	0.1400	0.1628

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.95791		0.884		-0.5718	-0.0762
Bartlett's Test indicates equal variances (p = 0.43)					4.8475		15.0863			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	1	1.8	1.34164		0.03414	0.04017	0.38111	0.0004	3.8E-21	5, 18

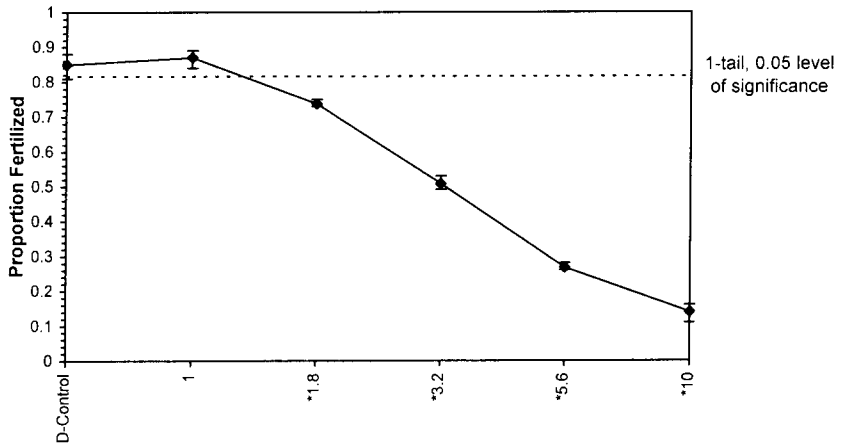
Log-Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05	1.2507	0.0219	1.1728	1.3194	0.2839
IC10	1.5329	0.0430	1.4377	1.6889	1.2146
IC15	1.8323	0.0408	1.7124	1.9570	0.2306
IC20	2.0553	0.0391	1.9513	2.1828	0.4191
IC25	2.2959	0.0426	2.1872	2.4359	0.3093
IC40	3.1375	0.0735	2.9274	3.3760	0.1213
IC50	3.8600	0.0706	3.6272	4.0719	-0.0638

mg/L SDS



Dose-Response Plot



Reviewed by: Aug 31 05

APPENDIX III

Chain-of-Custody Form

CHAIN-OF-CUSTODY / TEST REQUEST FORM

0743

Client Name: Teck Cominco
Address: Box 2000, Kimberley BC, V1A 3E1
Client Contact: Bruce Donald
Phone: 250-427-5405
Fax: 250-427-8451
Sampled by: B Bolton
Ship to:
Attn.: Edmund Canonia
Shipping Date: Aug 6/05

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	3 Sample Container Type by Code	Test(s) Requested: Sublethal toxicity					4 Sample Notes (preserved, saltwater, freshwater, may contain sewage...)
06/Aug/05	10:00 am	Garrow Creek	E		G	1 x 20L		X					Client is actually Azimuth Consulting

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by: B Bolton Date: Aug 6/05
Company: Gartner Lee Ltd. Time: 14:00 hrs
Courier Name:

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: (SRS) Date: 9 Aug 05
Company: Golder Time: 10:15

1) Received by: Date:
Company: Time:

Shaded area to be completed by Golder Laboratory upon sample receipt.

Golder Project No.: 0500327 / 328 / 334 / 335
Golder Work Order No.: 04-1424-044
Condition Upon Receipt: Good
Receipt Sample Temp. (°C): 19.0

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies: White, Yellow — accompany the shipment
Pink — kept by consignor (e.g. shipper)
Yellow — kept by consignee (e.g. receiver)
White — returned to consignor by consignee

Please see instructions for completion on back of form

Revision Date: November 22, 2004

CHAIN-OF-CUSTODY / TEST REQUEST FORM

No. 0742

Client Name: Teck Cominco
Client Contact: Bruce Donald
Ship to:
Address: Box 2000
Kimberly, BC
V1A 3E1
Phone: 250-427-8405
Fax: 250-427-8451
Sampled by: B Bolton
Attn: Edmund Camacia

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

Shipping Date: Aug 6/05

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	3 Sample Container Type by Code	Test(s) Requested: Sub-lethal toxicity	Test(s) Requested	Test(s) Requested	Test(s) Requested	Test(s) Requested	4 Sample Notes (preserved, saltwater, freshwater, may contain sewage...)
06/Aug/05	10:00 am	Garrow Creek	E		G	2x20L	P	X					Client is actually Azimuth consulting

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by: B Bolton Date: Aug 6/05
Company: Gartner Lee Ltd Time: 14 hrs
Courier Name:

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: (SRS) Date: 9 Aug 05
Company: Golder Time: 10:15

1) Received by: Date:
Company: Time:

Shaded area to be completed by Golder Laboratory upon sample receipt

Golder Project No.: 0500327 /328/334/335
Golder Work Order No.: 04-1924-044
Condition Upon Receipt: Good
Receipt Sample Temp. (°C): 19.0

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies: White, Yellow – accompany the shipment
Pink – kept by consignor (e.g. shipper)
Yellow – kept by consignee (e.g. receiver)
White – returned to consignor by consignee

Please see instructions for completion on back of form

Revision Date: November 22, 2004

CHAIN-OF-CUSTODY / TEST REQUEST FORM

10 0741

Golder Associates
195 Pemberton Avenue
North Vancouver, B.C.
Canada V7P 2R4
Tel: 604-986-4331
Fax: 604-662-8548
www.golder.com

Client Name: Teck Cominco
Address: Box 2000, Kimberly, BC V1A 3E1
Client Contact: Bruce Donald
Phone: 250-427-8405
Fax: 250-427-8451
Sampled by: B Bolton
Ship to:
Attn.: Edmund Camaria
Shipping Date: Aug 6/05

1 Collection Date (DD/MMM/YYYY)	1 Time (24-h clock)	Sample Identification	2 Type of Each Sample	Material Safety Data Sheet Attached? (✓)	Sample Collection Method G=grab C=composite	Number of Sample Containers x Volume of Sample Containers (1 x 20L)	3 Sample Container Type by Code	Test(s) Requested: Acute toxicity					4 Sample Notes (preserved, saltwater, freshwater, may contain sewage...)
06/Aug/05	10:00	Garrow Creek	20L		G	2x20L	P	X					Client is actually Azimuth consulting

PO/Reference No.:
Project Title:
Results Needed By:

Comments/Instructions:

1) Released by: Brenda Bolton Date: Aug 6/05
Company: Gartner Lee Time: 14:00 hrs
Courier Name:

2) Released by: Date:
Company: Time:
Courier Name:

1) Received by: (SRS) Date: 9 Aug 05
Company: Golder Time: 10:15

1) Received by: Date:
Company: Time:

Shaded area to be completed by Golder laboratory upon sample receipt.

Golder Project No.: 0500327 / 328/334/335
Golder Work Order No.: 04-1429-044
Condition Upon Receipt: Good
Receipt Sample Temp. (°C): 19.0

1 For composite effluent or water samples, the sample collection date/time is the **end** of the compositing period.
2 Receiving Water (RW): Effluent (E); Elutriate (ELU); Sediment (SED); Chemical (CHEM); Stormwater (SW); Other (Please Specify)
3 Collapsible Carboy (CC); glass jar (GJ); Jerry Can (JC); Plastic HDPE (P); Other (Please Specify)
4 Please note any conditions the lab should be aware of for safety and storage concerns

Distribution of copies:
White, Yellow – accompany the shipment
Pink – kept by consignor (e.g. shipper)
Yellow – kept by consignee (e.g. receiver)
White – returned to consignor by consignee

Please see instructions for completion on back of form

Revision Date: November 22, 2004

APPENDIX I

Polaris 2005 Sampling Event Chronology

Appendix I - Polaris 2005 Sampling and Event Chronology

Becasue mine activities at the Polaris Mine Site ceased during the 2005 season, collection of the MMER and EEM data was conducted by small field crews stationed on-site for limited time periods (early season) and then by flying technicians into the site on a weekly basis in the latter part of the season. Because of the remote location of the high Arctic mine site and the unpredictable weather conditions, sample shipping and transport issues typically arise throughout the season. This season there were several flight attempts into the mine site during the latter part of the season that were unsuccessful due to hazardous weather conditions. The following is a chronology of the 2005 MMER/EEM sampling program, including sample attempts that were prevented due to weather conditions and/or shipping difficulties.

Date	Event Type	Observation/ Comments
Sat. Jun-25-05	-	Flow initiated in Garrow Creek
Wed. Jun-29-05	Monthly/Quarterly	FDP accessible; exposure (Garrow Bay) and reference (Garrow Bay) stations were ice covered precluding sample collection; no exceedances of MMER Schedule 4 limits; T-Hg, alkalinity and nitrate were analyzed after holding times due to an oversight by the ALS lab; a letter explaining this oversight was included in the 2nd quarter report. The EVS and Stantech labs were not able to accommodate a toxicity testing program for this event, as samples would have arrived during a statutory holiday (i.e., Friday July 1, 2005)
Wed. Jul-06-05	Monthly/Quarterly Failed attempt for collecting toxicity samples	FDP accessible; exposure (Garrow Bay) and reference (Garrow Bay) stations were ice covered precluding sample collection; no exceedances of MMER Schedule 4 limits; alkalinity and nitrate were analyzed after holding time due to an oversight by the ALS lab; a letter explaining this oversight is included in the 3nd quarter report Samples for toxicity testing were collected. However, due to fog conditions at the mine site, the flight into and out of the mine site was delayed and missed the connecting flight out of Resolute Bay. Toxicity samples missed holding times and were discarded by the labs, or stopped en-route.
Wed. Jul-13-05	Weekly	A weekly sample was collected as the program schedule was adjusted to Saturday collections to enable sample delivery to the labs earlier in the week (i.e., Tuesday). Although this shipping schedule adds an extra day in transit, if there are no weather delays, then samples should arrive at the labs within the holding time for all toxicity tests.
Sat. Jul-16-05	Monthly/Quarterly Acute Toxicity Sublethal Toxicity	All effluent and water quality monitoring stations were accessible for sample collection. Samples arrived at the labs on Tuesday July 19, 2005 within holding times for all tests. No exceedances of Schedule 4 limits. No acute toxicity.
Sat. Jul-23-05	Weekly	No exceedances of Schedule 4 limits.
Sat. Jul-23-05	Weekly	No exceedances of Schedule 4 limits.
Sat. Jul-23-05	Weekly	No exceedances of Schedule 4 limits.
Sat. Aug-06-05	Monthly/Quarterly Acute Toxicity Sublethal Toxicity	All effluent and water quality monitoring stations were accessible for sample collection. Samples arrived at the labs on Tuesday August 9, 2005 within holding times for all tests. No exceedances of Schedule 4 limits. No acute toxicity.
Sat. Aug-13-05	Weekly	No exceedances of Schedule 4 limits.
Sat. Aug-20-05	Failed attempt for Weekly sample	Flight to Polaris Mine site from Resolute was attempted but did not land due to thick fog and therefore unsafe landing conditions. Jenny Ferone and Ken Russell were notified of this and the following failed attempts on August 29, 2005.
Sun. Aug-21-05	Failed attempt for Weekly sample	Flight to Polaris Mine site from Resolute was attempted but did not land due to thick fog and therefore unsafe landing conditions. Jenny Ferone and Ken Russell were notified of this and the following failed attempts on August 29, 2005.
Mon. Aug-22-05	Failed attempt for Weekly sample	Fog conditions from satellite photos indicated weather was the same or worse than the previous 2 days. No flight attempted over to site due to unsafe landing conditions. Jenny Ferone and Ken Russell were notified of this and the following failed attempts on August 29, 2005.
Tue. Aug-23-05	Failed attempt for Weekly sample	Fog conditions from satellite photos indicated weather was the same or worse than the previous 3 days. No flight attempted over to site due to unsafe landing conditions. Jenny Ferone and Ken Russell were notified of this and the following failed attempts on August 29, 2005.
Wed. Aug-24-05	Weekly	The sample attempt made on Wed August 24, 2005, was successful, following the failed attempts since the previous Saturday. No exceedances of Schedule 4 limits.
Sat. Aug-27-05	Weekly	No exceedances of Schedule 4 limits.

Date	Event Type	Observation/ Comments
Wed. Aug-31-05	Failed attempt for Weekly sample	An attempt to fly into Polaris was made. However, due to fog conditions at the mine site, and the plane was unable to land. Ken Russell and Jenny Ferone were notified of this failed attempt on September 1, 2005.
Sat. Sep-03-05	Failed attempt for Weekly sample	Thick fog and poor visibility prevented the plane from leaving Resolute. Ken Russell and Jenny Ferone were notified of this failed attempt on September 6, 2005.
Wed. Sep-07-05	Failed attempt for Weekly sample	The planned flight into Polaris was cancelled by the pilot due to snow conditions (5-10cm) in Resolute and potentially unsafe conditions for landing at the mine site. Ken Russell and Jenny Ferone were notified of this failed attempt on September 7, 2005.
Sat. Sep-10-05	Failed attempt for Weekly sample	A monthly chemistry plus acute toxicity testing event was planned. However, due to blowing snow conditions, it was deemed by the pilot too hazardous to land an aircraft at the mine site. Ken Russell (Environment Canada) was informed on September 13, 2005.
Tue. Sep-13-05	-	A monthly chemistry plus acute toxicity testing event was planned. However, upon arrival at the mine site, the creek was found to be frozen. Ken Russell was informed on September 13, 2005

APPENDIX J

Letter from ALS explaining missed holding times for July 6, 2005 sample

ALS Environmental

August 5, 2005

Mr. Bruce Donald
Teck Cominco
Bag 2000
Kimberley, BC V1A 3E1

Dear Mr. Donald,

RE: Concerns Regarding Analytical Service

This is in response to email correspondence dated July 29, 2005 through August 3, 2005 expressing concerns over the services provided by ALS Environmental on some Teck Cominco / Azimuth Consulting Group submissions from late June and early July. The examples noted in the emails and the overall concerns over the service provided are taken very seriously by ALS Environmental, and this response letter will hopefully help to address the concerns that were expressed.

In order to provide some clarity and to help resolve the various items of concerns, the following are some of the details that relate to the individual concerns expressed in the emails.

1) missed analyses for samples submitted,
2) missed holding times for Nitrate, Mercury, Alkalinity.

Details of Expressed Concerns

Missed Analysis / Missed Holding Times for Samples Submitted for 2 Submissions:

Polaris MMER (ALS W1416) analysed for pH, Salinity, Total Cyanide, Ammonia, Total Suspended Solids, Radium 226 and total metals
Date / Time Received: Monday, July 11, 2005 @ 10:10 am.
Date / Time Reported: Monday, July 25, 2005 @ 2:23 pm for all but the Radium 226 via email
Wednesday, July 27, 2005 @ 2:42 pm for all analysis via email

Polaris MMER (ALS W1458) analysed for pH, Salinity, Total Cyanide, Ammonia, Total Suspended Solids, Radium 226 and total metals including Mercury
Date / Time Received: Tuesday, July 12, 2005 @ 9:30 am.
Date / Reported: Monday, July 25, 2005 @ 2:23 pm for all but the Radium 226 via email
Wednesday, July 27, 2005 @ 2:42 pm for all analysis via email.

On July 28, 2005, Cheryl Mackintosh of Azimuth Consulting Group called Leanne Harris and expressed concern over the fact that the Mercury analysis for W1416 was missing. Upon investigation, it was

discovered that the Mercury was missed at the time of receipt; although it was indicated on the chain of custody. The Mercury analysis for this sample was completed at Ms. Mackintosh's request, but it should be noted that it was one day past the recommended holding time of 28 days for Mercury analysis in water.

On July 29, 2005, Ms. Mackintosh emailed Ms. Harris to inquire about the missing analysis of Nitrate and Alkalinity on the two above referenced submissions. The 48 hour recommended holding time for Nitrate had been exceeded prior to receipt of the samples, but the analysis was carried out as per request. The 14 day holding time for Alkalinity had been exceeded by the time the analysis was completed.

Ms. Mackintosh indicated in subsequent email correspondence that these samples had been identified in an email as MMER monthly samples; which meant that they should have been analysed for a fuller suite of analyses. ALS missed the analysis requests and in future will work toward improved communication internally to prevent a similar situation from occurring again.

The results for the Mercury and Alkalinity analysis with holding time exceedences were compared to other routine monitoring results. Historically, the samples compare well with previous submissions analysed within the holding times. Future submissions will be analysed within the appropriate holding times for Mercury and Alkalinity as long as the samples are received with sufficient time to do the analysis. For the Nitrate analysis, with the very short holding time of 48 hours, these samples will not be able to reach a lab within the holding time due to the remote nature of the site. The recommended holding time for these analyses is usually based on studies done with chemically active samples (such as waste waters or discharge samples), which chemically change over short periods of time. While there is no way to tell exactly how these samples are changing over time (without doing a detailed study that incorporates time studies), in general clean water samples from groundwater or surface water sources usually don't have a large amount of chemical activity.

Hopefully, this letter has summarized and addressed the concerns that have been raised. Most of the issue relates to communication. Increased effort in ensuring that there is excellent communication between our staff and the client, as well as thorough communication internally, helps to yield a successful project.

Thank you for bringing this matter to our attention as it helps us to assess our operation and continuously adjust and improve. Please feel free to contact either of the undersigned if you would like to discuss the matter further.

Sincerely,

Joyce Chow, B. Sc.
Branch Manager

Heather Ross-Easton, B.Sc.
Client Services Representative

cc: Cheryl Mackintosh, Azimuth Consulting Group Inc.
Patrick Allard, Azimuth Consulting Group Inc.
Randy Baker, Azimuth Consulting Group Inc.