City of Morro Bay and
Cayucos Sanitary District

OFFSHORE MONITORING AND REPORTING PROGRAM

SEMIANNUAL EFFLUENT SAMPLING

CHEMICAL AND BIOASSAY ANALYSIS RESULTS

JANUARY 2010

Marine Research Specialists

3140 Telegraph Rd., Suite A
Ventura, California 93003

Report to

City of Morro Bay and
Cayucos Sanitary District

955 Shasta Avenue
Morro Bay, California 93442
(805) 772-6272

MONITORING AND REPORTING PROGRAM

SEMIANNUAL EFFLUENT REPORT

CHEMICAL AND BIOASSAY ANALYSIS RESULTS

JANUARY 2010

Prepared by

Bonnie Luke
Douglas A. Coats

Marine Research Specialists

3140 Telegraph Rd., Suite A
Ventura, California 93003

Telephone: (805) 644-1180
Telefax: (805) 289-3935
E-mail: Marine@Rain.org

January 2010

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____

Mr. Bruce Ambo
City of Morro Bay

Date _____

marine research specialists
3140 Telegraph Road, Suite A • Ventura, CA 93003 • (805) 644-1180

Bruce Keogh
Wastewater Division Manager
City of Morro Bay
955 Shasta Avenue
Morro Bay, CA 93442

29 January 2010

Reference: Semiannual Effluent Self-Monitoring Report for January through June 2010

Dear Mr. Keogh:

This self-monitoring report documents the chemical and bioassay analysis results for effluent samples collected in January 2010 as required by NPDES discharge permit CA0047881.[1] Analyses of effluent samples collected on 13 January 2010 were conducted in accordance with the monitoring requirements specified in the permit, including:

- Chronic bioassays and chemical analyses conducted on a composite sample; and
- Nutrient compounds measured in a grab sample.

The three attachments to this report demonstrate that all chemical concentrations and toxicological endpoints were well within the limitations specified in the discharge permit. Attachment A compares the results of the analyses with the limitations established for each of the effluent parameters specified in the permit. The comparisons are based on the minimum-level (ML) reporting requirements of the permit, and all units have been converted to those used in the discharge monitoring forms that were submitted under separate cover to the California Division of Water Quality (Attachment B). Attachment C collates the original laboratory reports, including raw data and results, pertinent QA/QC analyses, and chains of custody.

The comprehensive chemical and bioassay analyses of effluent samples collected in January 2010 augment data collected over the past two decades. Together, the measurements demonstrate the consistently benign character of the discharge from the MBSCD[2] treatment plant. The general lack of toxicity and chemical contaminants within the effluent samples reflects the absence of heavy industry within the collection area and the high performance of the treatment process. The concentrations of the few chemical compounds detected in the January 2010 samples were typical of wastewater derived from domestic sources, and all concentrations were considerably below the limits specified in the NPDES discharge permit.

Eight chemical compounds were detected in the January 2010 effluent. Of those, only three had concentrations high enough to be reliably quantified above their respective MLs. Two of the quantifiable concentrations were associated with commonly occurring metals: copper and zinc. These metals enter the wastewater collection system through erosion of natural mineral deposits along the central California coast, and through corrosion within household plumbing systems. The concentrations of both metals were an order of magnitude below levels deemed deleterious to marine organisms.

Cyanide was the only additional compound detected at quantifiable levels within the January-2010 effluent sample. Although cyanide occurs naturally, it can also form in the treatment process as a byproduct of the disinfection process. It has been detected at quantifiable levels within approximately 20% of the effluent samples collected over the past decade and a half. However, as with copper and zinc, cyanide's measured concentration was low compared to its permit limitation and therefore, not of ecological concern.

---

[1] Regional Water Quality Control Board (RWQCB) - Central Coast Region and the Environmental Protection Agency (EPA) – Region IX. 2009. Waste Discharge Requirements (Order No. R3-2008-0065) and National Pollutant Discharge Elimination System (Permit No. CA0047881) for the Morro Bay and Cayucos Wastewater Treatment Plant Discharges to the Pacific Ocean, Morro Bay, San Luis Obispo County. Effective 1 March 2009.

[2] City of Morro Bay and the Cayucos Sanitary District, joint owners of the wastewater treatment and disposal facility

Chronic bioassays affirm the effluent's overall low toxicity. As with past bioassays, chronic toxicity tests on the January 2010 effluent samples measured germination and growth response in giant kelp spores (*Macrocystis pyrifera*) after exposure to a range of effluent dilutions. Toxicity screening studies conducted in 1993[3] established giant kelp as substantially more sensitive to MBCSD effluent than other standard test species, such as the larvae of the inland silverside (*Menidia beryllina*) and bay mussel (*Mytilus edulis*). As part of an additional screening study conducted on the January 2010 samples, the effluent's effect on the development of larval red abalone (*Haliotis rufescens*) was also tested. Adverse effects on kelp and abalone were not observed in effluent that was more than 13 times more concentrated than that allowed by the discharge permit.

Please contact the undersigned if you have questions regarding these results.

Sincerely,

Bonnie Luke
Program Manager

Enclosure (Four Report Copies)

[3] Table 2-4, Page 2-7 of the MBCSD 1993 Annual Monitoring. Report to the City of Morro Bay and Cayucos Sanitary District. Prepared by Marine Research Specialists, February 1994.

ATTACHMENT A

MINIMUM LEVEL REPORTING

ATTACHMENT A
Analytical Results for Effluent Samples Collected during January 2010

Chemical Compound or Parameter	Units	Method	Detection Limit[a]	Practical[b] Quantification Limit	Minimum Level[c]	Permit[d] Limit	Reported Value
Nutrients							
Nitrate (as N)	mg/L	300.0	0.002	0.1	0.1	—[e]	ND
Urea (as N)	mg/L	Mulvenna & Savid	0.0007	0.01	10.	—	0.098 as measured
Ortho-Phosphate (as P)	mg/L	300.0	0.003	0.1	0.1	—	3.6 as measured
Dissolved Silica (Si02)	mg/L	4500-SI-E	0.04	0.05	0.05	—	12.1 as measured
Objectives for the Protection of Marine Aquatic Life							
Arsenic	mg/L	200.8	0.0011	0.002	0.002	0.67	DNQ 0.0013 Est. Conc.
Cadmium	mg/L	200.7	0.00057	0.01	0.01	0.13	DNQ 0.00064 Est. Conc.
Chromium VI[f]	mg/L	200.7	0.0008	0.01	0.01	0.27	ND
Copper	mg/L	200.7	0.0015	0.01	0.01	0.14	0.022 as measured
Lead	mg/L	200.8	0.00019	0.001	0.0005	0.27	DNQ 0.00099 Est. Conc.
Mercury	µg/L	245.1	0.016	0.2	0.2	5.29	ND
Nickel	mg/L	200.7	0.0015	0.01	0.02	0.67	DNQ 0.0037 Est. Conc.
Selenium	mg/L	200.8	0.00054	0.002	0.002	2.01	DNQ 0.001 Est. Conc.
Silver	mg/L	200.7	0.0019	0.01	0.01	0.07	ND
Zinc	mg/L	200.7	0.0021	0.05	0.02	1.62	0.059 as measured
Cyanide	mg/L	335.4	0.0028	0.005	0.005	0.13	0.0057 as measured

[a] The Method Detection Limit (MDL) is the analysis- and instrument-specific minimum concentration at which the presence of a substance can be reported with 99% confidence. It is determined from an analysis of a sample in a matrix containing the analyte.

[b] The Practical Quantification Limit (PQL) is the analysis- and instrument-specific minimum concentration of a substance that can be routinely determined with a high degree of certainty (>99.9% confidence).

[c] The Minimum Level (ML) is the method-specific minimum concentration of a substance that can be quantitatively measured in a sample given the current analytical performance used by most certified laboratories within California, as specified in the 2005 Ocean Plan.

[d] The Permit Limit is the lowest, most-stringent threshold that is associated with the longest-duration averaging period. For limits established to protect marine aquatic life, the six-month median is the most stringent threshold. For other constituents, limits are imposed only on monthly averages.

[e] No permit limits have been established for nutrients.

[f] Total chromium concentration was reported rather than the concentration of the hexavalent oxidation state alone.

Analytical Results for Effluent Samples Collected during January 2010

Chemical Compound or Parameter	Units	Method	Detection Limit[a]	Practical[b] Quantification Limit	Minimum Level[c]	Permit[d] Limit	Reported Value
Chronic Toxicity *M. pyrifera* Germination Growth	TUc	600/R-95/136	—[g]	—	—	134.	10.0 as measured 5.6 as measured
Toxicity-Chronic: *H. Rufescens*	TUc	600/R-95/136	—	—	—	134.	10.0 as measured

[g] MDL, PQL, and ML are not specified for this parameter.

ATTACHMENT B

DISCHARGE MONITORING REPORT

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

NAME: MORRO BAY, CITY OF AND CAYUCOS SANITARY I
ADDRESS: 160 ATASCADERO ROAD
MORRO BAY, CA 93442
FACILITY: MORRO BAY/CAYUCOS WWTP
LOCATION: 160 ATASCADERO ROAD
MORRO BAY, CA 93442
ATTN: BRUCE KEOGH

CA0047881	001-S
PERMIT NUMBER	**DISCHARGE NUMBER**

MONITORING PERIOD			
	MM/DD/YYYY		MM/DD/YYYY
FROM	01/01/2010	**TO**	06/30/2010

DMR Mailing ZIP CODE: 93442
MAJOR
(SUBR 03)
DISCHARGE 001/ SEMIANNUALLY
External Outfall
No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Nitrogen, nitrate total (as N)	SAMPLE MEASUREMENT	******	******	******	******	******	*NODI(B)*	*mg/L*	0	*Semi-annual*	*Grab*
00620 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	Req. Mon. DAILY MX	mg/L		Semiannual	GRAB
Cyanide, total (as CN)	SAMPLE MEASUREMENT	******	******	******	*0.0057*	*0.0057*	*0.0057*	*mg/L*	0	*Semi-annual*	*Comp24*
00720 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	.13 6 MO MED	.54 DAILY MX	1.34 INST MAX	mg/L		Semiannual	COMP24
Silica, dissolved (as SiO2)	SAMPLE MEASUREMENT	******	******	******	******	******	*12.1*	*mg/L*	0	*Semi-annual*	*Grab*
00955 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	Req. Mon. DAILY MX	mg/L		Semiannual	GRAB
Arsenic, total recoverable	SAMPLE MEASUREMENT	******	******	******	*NODI(Q)*	*NODI(Q)*	*NODI(Q)*	*mg/L*	0	*Semi-annual*	*Comp24*
00978 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	.67 6 MO MED	3.89 DAILY MX	10.3 INST MAX	mg/L		Semiannual	COMP24
Selenium, total recoverable	SAMPLE MEASUREMENT	******	******	******	*NODI(Q)*	*NODI(Q)*	*NODI(Q)*	*mg/L*	0	*Semi-annual*	*Comp24*
00981 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	2.01 6 MO MED	8.04 DAILY MX	20.1 INST MAX	mg/L		Semiannual	COMP24
Chromium, hexavalent (as Cr)	SAMPLE MEASUREMENT	******	******	******	*NODI(B)*	*NODI(B)*	*NODI(B)*	*mg/L*	0	*Semi-annual*	*Comp24*
01032 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	.27 6 MO MED	1.07 DAILY MX	2.68 INST MAX	mg/L		Semiannual	COMP24
Nickel, total recoverable	SAMPLE MEASUREMENT	******	******	******	*NODI(Q)*	*NODI(Q)*	*NODI(Q)*	*mg/L*	0	*Semi-annual*	*Comp24*
01074 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	.67 6 MO MED	2.68 DAILY MX	6.7 INST MAX	mg/L		Semiannual	COMP24

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE
Bruce Keogh Wastewater Division Manager	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		(805)772-6272		02/05/2010
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

~~AFTER SCREENING PERIOD FOR CHRONIC TOXICITY TESTING, REPORT "NODI(9)" FOR SPECIES NOT TESTED.~~
Total chromium is reported for hexavalent chromium.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

NAME: MORRO BAY, CITY OF AND CAYUCOS SANITARY I
ADDRESS: 160 ATASCADERO ROAD
MORRO BAY, CA 93442
FACILITY: MORRO BAY/CAYUCOS WWTP
LOCATION: 160 ATASCADERO ROAD
MORRO BAY, CA 93442
ATTN: BRUCE KEOGH

CA0047881	001-S
PERMIT NUMBER	**DISCHARGE NUMBER**

MONITORING PERIOD			
	MM/DD/YYYY		MM/DD/YYYY
FROM	01/01/2010	**TO**	06/30/2010

DMR Mailing ZIP CODE: 93442
MAJOR
(SUBR 03)
DISCHARGE 001/ SEMIANNUALLY
External Outfall
No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Silver total recoverable	SAMPLE MEASUREMENT	******	******	******	NODI (B)	NODI (B)	NODI (B)	mg/L	0	Semi-annual	Comp24
01079 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	.07 6 MO MED	.35 DAILY MX	.92 INST MAX	mg/L		Semiannual	COMP24
Zinc, total recoverable	SAMPLE MEASUREMENT	******	******	******	0.059	0.059	0.059	mg/L	0	Semi-annual	Comp24
01094 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	1.62 6 MO MED	9.66 DAILY MX	25.7 INST MAX	mg/L		Semiannual	COMP24
Cadmium, total recoverable	SAMPLE MEASUREMENT	******	******	******	NODI (Q)	NODI (Q)	NODI (Q)	mg/L	0	Semi-annual	Comp24
01113 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	.13 6 MO MED	.54 DAILY MX	1.34 INST MAX	mg/L		Semiannual	COMP24
Lead, total recoverable	SAMPLE MEASUREMENT	******	******	******	NODI (Q)	NODI (Q)	NODI (Q)	mg/L	0	Semi-annual	Comp24
01114 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	.27 6 MO MED	1.07 DAILY MX	2.68 INST MAX	mg/L		Semiannual	COMP24
Copper, total recoverable	SAMPLE MEASUREMENT	******	******	******	0.022	0.022	0.022	mg/L	0	Semi-annual	Comp24
01119 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	.14 6 MO MED	1.34 DAILY MX	3.75 INST MAX	mg/L		Semiannual	COMP24
Phosphate, ortho (as P)	SAMPLE MEASUREMENT	******	******	******	******	******	3.6	mg/L	0	Semi-annual	Grab
04175 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	Req. Mon. DAILY MX	mg/L		Semiannual	GRAB
Urea	SAMPLE MEASUREMENT	******	******	******	******	******	0.098	mg/L	0	Semi-annual	Grab
71800 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	Req. Mon. DAILY MX	mg/L		Semiannual	GRAB

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE
Bruce Keogh Wastewater Division Manager	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		(805)772-6272		02/05/2010
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

~~AFTER SCREENING PERIOD FOR CHRONIC TOXICITY TESTING, REPORT "NODI(9)" FOR SPECIES NOT TESTED.~~

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

NAME: MORRO BAY, CITY OF AND CAYUCOS SANITARY I
ADDRESS: 160 ATASCADERO ROAD
MORRO BAY, CA 93442
FACILITY: MORRO BAY/CAYUCOS WWTP
LOCATION: 160 ATASCADERO ROAD
MORRO BAY, CA 93442
ATTN: BRUCE KEOGH

CA0047881	001-S
PERMIT NUMBER	**DISCHARGE NUMBER**

MONITORING PERIOD			
	MM/DD/YYYY		MM/DD/YYYY
FROM	01/01/2010	TO	06/30/2010

DMR Mailing ZIP CODE: 93442
MAJOR
(SUBR 03)
DISCHARGE 001/ SEMIANNUALLY
External Outfall
No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Mercury, total recoverable	SAMPLE MEASUREMENT	******	******	******	*NODI(B)*	*NODI(B)*	*NODI(B)*	*µg/L*	0	*Semi-annual*	*Comp24*
71901 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	5.29 6 MO MED	21.4 DAILY MX	53.5 INST MAX	ug/L		Semiannual	COMP24
Static 48Hr Chronic Macrocystis Pyrifera	SAMPLE MEASUREMENT	******	******	******	******	******	*10.0*	*TUc*	0	*Semi-annual*	*Comp24*
TTK1D 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	134 DAILY MX	tox chronic		Semiannual	COMP24
Static 48Hr Chronic Haliotis Rufescens	SAMPLE MEASUREMENT	******	******	******	******	******	*10.0*	*TUc*	0	*Semi-annual*	*Comp24*
TTK3R 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	134 DAILY MX	tox chronic		Semiannual	COMP24

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE
Bruce Keogh Wastewater Division Manager	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		(805)772-6272		02/05/2010
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

AFTER SCREENING PERIOD FOR CHRONIC TOXICITY TESTING, REPORT "NODI(9)" FOR SPECIES NOT TESTED.
The germination endpoint of the Macrocystis chronic bioassay is reported above. It was higher than the growth endpoint (5.6 TUc).

ATTACHMENT C
LABORATORY REPORTS

BC Laboratories, Inc.
Environmental Testing Laboratory Since 1949

Date of Report: 01/27/2010

Doug Coats

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

RE: Semi-Annual Eff
BC Work Order: 1000588
Invoice ID: B074691

Enclosed are the results of analyses for samples received by the laboratory on 1/13/2010. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Contact Person: Tina Green
Client Services Manager

Authorized Signature

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information			
1000588-01	**COC Number:**	---	**Receive Date:**	01/13/2010 18:00
	Project Number:	---	**Sampling Date:**	01/13/2010 10:30
	Sampling Location:	---	**Sample Depth:**	---
	Sampling Point:	Composite Effluent	**Sample Matrix:**	Water
	Sampled By:	---		

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (General Chemistry)

BCL Sample ID: 1000588-01 **Client Sample Name:** Composite Effluent, 1/13/2010 10:30:00AM

Constituent	Result	Units	PQL	MDL	Method	Prep Date	Run Date/Time	Analyst	Instru-ment ID	Dilution	QC Batch ID	MB Bias	Lab Quals
Total Cyanide	0.0057	mg/L	0.0050	0.0028	EPA-335.4	01/18/10	01/19/10 16:46	TDC	KONE-1	1	BTA1094	ND	

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (Metals)

BCL Sample ID: 1000588-01 **Client Sample Name:** Composite Effluent, 1/13/2010 10:30:00AM

Constituent	Result	Units	PQL	MDL	Method	Prep Date	Run Date/Time	Analyst	Instru-ment ID	Dilution	QC Batch ID	MB Bias	Lab Quals
Total Cadmium	**0.64**	**ug/L**	**10**	**0.57**	**EPA-200.7**	**01/15/10**	**01/19/10 19:10**	**JRG**	**PE-OP1**	**1**	**BTA0888**	**ND**	**J**
Total Chromium	ND	ug/L	10	0.80	EPA-200.7	01/15/10	01/19/10 19:10	JRG	PE-OP1	1	BTA0888	ND	
Total Copper	**22**	**ug/L**	**10**	**1.5**	**EPA-200.7**	**01/15/10**	**01/19/10 19:10**	**JRG**	**PE-OP1**	**1**	**BTA0888**	**ND**	
Total Mercury	ND	ug/L	0.20	0.016	EPA-245.1	01/18/10	01/19/10 10:54	MEV	CETAC1	1	BTA0920	ND	
Total Nickel	**3.7**	**ug/L**	**10**	**1.5**	**EPA-200.7**	**01/15/10**	**01/20/10 14:55**	**JRG**	**PE-OP1**	**1**	**BTA0888**	**ND**	**J**
Total Silver	ND	ug/L	10	1.9	EPA-200.7	01/15/10	01/19/10 19:10	JRG	PE-OP1	1	BTA0888	ND	
Total Zinc	**59**	**ug/L**	**50**	**2.1**	**EPA-200.7**	**01/15/10**	**01/19/10 19:10**	**JRG**	**PE-OP1**	**1**	**BTA0888**	**ND**	
Total Recoverable Arsenic	**1.3**	**ug/L**	**2.0**	**1.1**	**EPA-200.8**	**01/19/10**	**01/25/10 17:35**	**JDC**	**PE-EL1**	**1**	**BTA1018**	**ND**	**J**
Total Recoverable Lead	**0.99**	**ug/L**	**1.0**	**0.19**	**EPA-200.8**	**01/19/10**	**01/25/10 17:35**	**JDC**	**PE-EL1**	**1**	**BTA1018**	**ND**	**J**
Total Recoverable Selenium	**1.0**	**ug/L**	**2.0**	**0.54**	**EPA-200.8**	**01/19/10**	**01/25/10 17:35**	**JDC**	**PE-EL1**	**1**	**BTA1018**	**ND**	**J**

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (General Chemistry)

Quality Control Report - Precision & Accuracy

Constituent	Batch ID	QC Sample Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
Total Cyanide	BTA1094	Duplicate	1000464-01	ND	ND		mg/L			10		
		Matrix Spike	1000464-01	ND	0.087210	0.10000	mg/L		87.2		90 - 110	Q03
		Matrix Spike Duplicate	1000464-01	ND	0.090085	0.10000	mg/L	3.2	90.1	20	90 - 110	

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (Metals)

Quality Control Report - Precision & Accuracy

Constituent	Batch ID	QC Sample Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
Total Cadmium	BTA0888	Duplicate	1000588-01	0.63638	ND		ug/L			20		
		Matrix Spike	1000588-01	0.63638	216.70	200.00	ug/L		108		75 - 125	
		Matrix Spike Duplicate	1000588-01	0.63638	217.43	200.00	ug/L	0.3	108	20	75 - 125	
Total Chromium	BTA0888	Duplicate	1000588-01	ND	ND		ug/L			20		
		Matrix Spike	1000588-01	ND	213.40	200.00	ug/L		107		75 - 125	
		Matrix Spike Duplicate	1000588-01	ND	216.54	200.00	ug/L	1.5	108	20	75 - 125	
Total Copper	BTA0888	Duplicate	1000588-01	21.781	20.400		ug/L	6.6		20		
		Matrix Spike	1000588-01	21.781	469.41	400.00	ug/L		112		75 - 125	
		Matrix Spike Duplicate	1000588-01	21.781	462.00	400.00	ug/L	1.7	110	20	75 - 125	
Total Nickel	BTA0888	Duplicate	1000588-01	3.7224	3.3423		ug/L	10.8		20		J
		Matrix Spike	1000588-01	3.7224	430.44	400.00	ug/L		107		75 - 125	
		Matrix Spike Duplicate	1000588-01	3.7224	432.10	400.00	ug/L	0.4	107	20	75 - 125	
Total Silver	BTA0888	Duplicate	1000588-01	ND	ND		ug/L			20		
		Matrix Spike	1000588-01	ND	109.30	100.00	ug/L		109		75 - 125	
		Matrix Spike Duplicate	1000588-01	ND	108.85	100.00	ug/L	0.4	109	20	75 - 125	
Total Zinc	BTA0888	Duplicate	1000588-01	58.928	58.551		ug/L	0.6		20		
		Matrix Spike	1000588-01	58.928	592.55	500.00	ug/L		107		75 - 125	
		Matrix Spike Duplicate	1000588-01	58.928	609.05	500.00	ug/L	3.0	110	20	75 - 125	
Total Mercury	BTA0920	Duplicate	1000558-01	ND	ND		ug/L			20		
		Matrix Spike	1000558-01	ND	1.0075	1.0000	ug/L		101		70 - 130	
		Matrix Spike Duplicate	1000558-01	ND	1.0575	1.0000	ug/L	4.8	106	20	70 - 130	
Total Recoverable Arsenic	BTA1018	Duplicate	1000593-01	ND	ND		ug/L			20		
		Matrix Spike	1000593-01	ND	104.48	100.00	ug/L		104		70 - 130	
		Matrix Spike Duplicate	1000593-01	ND	103.44	100.00	ug/L	1.0	103	20	70 - 130	
Total Recoverable Lead	BTA1018	Duplicate	1000593-01	ND	ND		ug/L			20		
		Matrix Spike	1000593-01	ND	93.855	100.00	ug/L		93.9		70 - 130	
		Matrix Spike Duplicate	1000593-01	ND	92.562	100.00	ug/L	1.4	92.6	20	70 - 130	

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (Metals)

Quality Control Report - Precision & Accuracy

Constituent	Batch ID	QC Sample Type	Source Sample ID	Source Result	Result	Spike Added	Units	RPD	Percent Recovery	Control Limits RPD	Control Limits Percent Recovery	Lab Quals
Total Recoverable Selenium	BTA1018	Duplicate	1000593-01	ND	ND		ug/L			20		
		Matrix Spike	1000593-01	ND	102.74	100.00	ug/L		103		70 - 130	
		Matrix Spike Duplicate	1000593-01	ND	100.48	100.00	ug/L	2.2	100	20	70 - 130	

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (General Chemistry)

Quality Control Report - Laboratory Control Sample

Constituent	Batch ID	QC Sample ID	QC Type	Result	Spike Level	PQL	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
Total Cyanide	BTA1094	BTA1094-BS1	LCS	0.14177	0.15000	0.0050	mg/L	94.5		90 - 110		

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (Metals)

Quality Control Report - Laboratory Control Sample

Constituent	Batch ID	QC Sample ID	QC Type	Result	Spike Level	PQL	Units	Percent Recovery	RPD	Control Limits Percent Recovery	Control Limits RPD	Lab Quals
Total Cadmium	BTA0888	BTA0888-BS1	LCS	224.01	200.00	10	ug/L	112		85 - 115		
Total Chromium	BTA0888	BTA0888-BS1	LCS	224.41	200.00	10	ug/L	112		85 - 115		
Total Copper	BTA0888	BTA0888-BS1	LCS	437.43	400.00	10	ug/L	109		85 - 115		
Total Nickel	BTA0888	BTA0888-BS2	LCS	438.64	400.00	10	ug/L	110		85 - 115		
Total Silver	BTA0888	BTA0888-BS1	LCS	111.60	100.00	10	ug/L	112		85 - 115		
Total Zinc	BTA0888	BTA0888-BS1	LCS	560.47	500.00	50	ug/L	112		85 - 115		
Total Mercury	BTA0920	BTA0920-BS1	LCS	1.0250	1.0000	0.20	ug/L	102		85 - 115		
Total Recoverable Arsenic	BTA1018	BTA1018-BS1	LCS	103.45	100.00	2.0	ug/L	103		85 - 115		
Total Recoverable Lead	BTA1018	BTA1018-BS1	LCS	101.22	100.00	1.0	ug/L	101		85 - 115		
Total Recoverable Selenium	BTA1018	BTA1018-BS1	LCS	101.77	100.00	2.0	ug/L	102		85 - 115		

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (General Chemistry)

Quality Control Report - Method Blank Analysis

Constituent	Batch ID	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
Total Cyanide	BTA1094	BTA1094-BLK1	ND	mg/L	0.0050	0.0028	

Marine Research Specialists
3140 Telegraph Road, Suite A
Suite A
Ventura, CA 93003-3238

Project: Semi-Annual Eff
Project Number: [none]
Project Manager: Doug Coats

Reported: 01/27/2010 8:27

Water Analysis (Metals)

Quality Control Report - Method Blank Analysis

Constituent	Batch ID	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
Total Cadmium	BTA0888	BTA0888-BLK1	ND	ug/L	10	0.57	
Total Chromium	BTA0888	BTA0888-BLK1	ND	ug/L	10	0.80	
Total Copper	BTA0888	BTA0888-BLK1	ND	ug/L	10	1.5	
Total Nickel	BTA0888	BTA0888-BLK2	ND	ug/L	10	1.5	
Total Silver	BTA0888	BTA0888-BLK1	ND	ug/L	10	1.9	
Total Zinc	BTA0888	BTA0888-BLK1	ND	ug/L	50	2.1	
Total Mercury	BTA0920	BTA0920-BLK1	ND	ug/L	0.20	0.016	
Total Recoverable Arsenic	BTA1018	BTA1018-BLK1	ND	ug/L	2.0	1.1	
Total Recoverable Lead	BTA1018	BTA1018-BLK1	ND	ug/L	1.0	0.19	
Total Recoverable Selenium	BTA1018	BTA1018-BLK1	ND	ug/L	2.0	0.54	

Marine Research Specialists	Project: Semi-Annual Eff	**Reported:** 01/27/2010 8:27
3140 Telegraph Road, Suite A	Project Number: [none]	
Suite A	Project Manager: Doug Coats	
Ventura, CA 93003-3238		

Notes And Definitions

J	Estimated Value (CLP Flag)
MDL	Method Detection Limit
ND	Analyte Not Detected at or above the reporting limit
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
Q03	Matrix spike recovery(s) is(are) not within the control limits.

BC Laboratories, Inc.

Chain of Custody Form

PLEASE COMPLETE: BCL QUOTE ID:

59119

Page ____ of ____

Report To: Client: Marine Research Specialists	Project #:
Attn: Dr. Doug Coats	Project Name:
Street Address: 3140 Telegraph Rd Suite A	Project Code:
City, State, Zip: Ventura Ca. 93003	Sampler(s):
Phone: 805-644-1180 Fax:	
Email Address: Doug.coats@MRSENV.com	
Submittal #: 10-00588	

Analysis Requested

Comments: * See Attached Sheet *

Are there any tests with holding times less than or equal to 48 hours? ☐ Yes ☐ No

* Standard Turnaround = 15 work days

Sample #	Description	Date Sampled	Time Sampled	10 metals	Cyanide	Soil	Sludge	Drinking Water	Ground Water	Waste Water	Other	Turnaround # of work days*	Notes
1	Composite Effluent	1/13/10	10:30	X	X					X			1 at P.E. 1 GTR

CHK BY [signature] DISTRIBUTION SUB-OUT ☐

SHORT HOLDING TIME: Cr^{+6} NO_2 NO_3 OP SS DO Cl_2 BOD MBAS COT

JWN 1-13-10

Billing ☐ Same as above

Client:

Address:

City: State Zip

Attn:

PO#:

Report Drinking Waters on State Form? ☐ Yes ☐ No

Send Copy to State of CA? ☐ Yes ☐ No

Sample Disposal: ☐ Return to Client ☐ Disposal by lab ☐ Archive: Months____

Special Reporting: ☐ QC ☐ WIP ☐ Raw Data

	Date	Time		Date	Time
1. Relinquished By [signature]	1-13-10	11:50	1. Received By [signature]	1-13-10	1150
2. Relinquished By [signature]	1-13-10	1800	2. Received By [signature]	1-13-10	1800
3. Relinquished By			3. Received By		

10-00588

Analysis Effluent Samples to be collected from the Morro Bay Wastewater Treatment Plant on Wednesday, January 13, 2010

Analysis	Sample	Method
Level IIA QC Report concentrations that are detected above the MDL, but are below the PQL		
[redacted]	[redacted]	[redacted]
10 Metals:		
Ag Silver	Composite	EPA 200.7
As Arsenic	Composite	EPA 200.8
Cd Cadmium	Composite	EPA 200.7
Cr Chromium (Total)	Composite	EPA 200.7
Cu Copper	Composite	EPA 200.7
Hg Mercury	Composite	EPA 245.1
Ni Nickel	Composite	EPA 200.7
Pb Lead	Composite	EPA 200.8
Se Selenium	Composite	EPA 200.8
Zn Zinc	Composite	EPA 200.7
Cyanide	Composite	EPA 335.3

Invoice and Report to be sent to:
Dr. Douglas A. Coats (Doug.Coats@mrsenv.com)
Marine Research Specialists
3140 Telegraph Rd., Suite A
Ventura, CA 93003
Telephone: (805) 644-1180

Samples to be collected from:
Morro Bay Wastewater Treatment Plant
160 Atascadero Rd.
Morro Bay, CA 93442
Telephone: (805) 772-6272

BC LABORATORIES INC. SAMPLE RECEIPT FORM Rev. No. 12 06/24/08 Page 1 Of 1

Submission #: 10 00588

SHIPPING INFORMATION

Federal Express ☐ UPS ☐ Hand Delivery ☐
BC Lab Field Service ☑ Other ☐ (Specify)_____

SHIPPING CONTAINER

Ice Chest ☑ None ☐
Box ☐ Other ☐ (Specify)_____

Refrigerant: Ice ☑ Blue Ice ☐ None ☐ Other ☐ Comments:

Custody Seals Ice Chest ☐ Intact? Yes ☐ No ☐ Containers ☐ Intact? Yes ☐ No ☐ None ☑ Comments:

All samples received? Yes ☑ No ☐ All samples containers intact? Yes ☑ No ☐ Description(s) match COC? Yes ☑ No ☐

COC Received ☒ YES ☐ NO

Emissivity: 0.98 Container: PTPE Thermometer ID: TH163

Temperature: A 0.3 °C / C 0.3 °C

Date/Time 1/13 1505

Analyst Init SM

SAMPLE CONTAINERS	SAMPLE NUMBERS 1	2	3	4	5	6	7	8	9	10
QT GENERAL MINERAL/ GENERAL PHYSICAL										
PT PE UNPRESERVED										
QT INORGANIC CHEMICAL METALS	A									
PT INORGANIC CHEMICAL METALS										
PT CYANIDE	B									
PT NITROGEN FORMS										
PT TOTAL SULFIDE										
2oz. NITRATE / NITRITE										
PT TOTAL ORGANIC CARBON										
PT TOX										
PT CHEMICAL OXYGEN DEMAND										
P1A PHENOLICS										
40ml VOA VIAL TRAVEL BLANK										
40ml VOA VIAL	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
QT EPA 413.1, 413.2, 418.1										
PT ODOR										
RADIOLOGICAL										
BACTERIOLOGICAL										
40 ml VOA VIAL- 504										
QT EPA 508/608/8080										
QT EPA 515.1/8150										
QT EPA 525										
QT EPA 525 TRAVEL BLANK										
100ml EPA 547										
100ml EPA 531.1										
QT EPA 548										
QT EPA 549										
QT EPA 632										
QT EPA 8015M										
QT AMBER										
8 OZ. JAR										
32 OZ. JAR										
SOIL SLEEVE										
PCB VIAL										
PLASTIC BAG										
FERROUS IRON										
ENCORE										

Comments:

Sample Numbering Completed By: JDW Date/Time: 1-13-10 1844

A = Actual / C = Corrected

[H:\DOCS\WP80\LAB_DOCS\FORMS\SAMREC2.WPD]

MBAS
MONTEREY BAY ANALYTICAL SERVICES
PRECISION • ACCURACY • DEPENDABILITY
4 Justin Court Suite D, Monterey, CA 93940
831.375.MBAS
montereybayanalytical@usa.net

Dr. Doug Coats
Marine Research Specialists
3140 Telegraph Road Suite A
Ventura CA, 93003

ELAP Certification Number: 2385

 Wednesday, January 27, 2010

Lab Number: AA63352

Collection Date/Time:	1/13/2010	9:00	Sample Collector:	ASCHENBRENER,
Submittal Date/Time:	1/14/2010	12:00	Sample ID	

Sample Description: Morro Bay, Grab Eff A.R.S.

Analyte	Method	Unit	**Result**	Qual	PQL	Date Analyzed
Nitrate as NO3-N	300.0	mg/L	**Not detected**		0.1	1/15/2010
o-Phosphate-P	300.0	mg/L	**3.6**		0.1	1/15/2010
Silica as SiO2, Dissolved	4500-SI-E	mg/L	**12.1**		0.05	1/27/2010
Urea-N	Mulvenna&Savid	ug/L	**98**		10	1/26/2010

Sample Comments:

Report Approved by:

David Holland
Laboratory Director

mg/L: Milligrams per liter (=ppm) ug/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit
H = Analyzed ouside of hold time E = Analysis performed by External Laboratory; See External Laboratory Report attachments.
D = Method deviates from standard method due to insufficient sample for MS/MSD J = Result is less than PQL

LABORATORY REPORT

Aquatic Testing Laboratories
"dedicated to providing quality aquatic toxicity testing"
4350 Transport Street, Unit 107
Ventura, CA 93003
(805) 650-0546 FAX (805) 650-0756
CA DOHS ELAP Cert. No.: 1775

Date: January 19, 2010

Client: Marine Research Specialists
3140 Telegraph Road, Suite A
Ventura, CA 93003
Attn: Doug Coats

Laboratory No.: A-10011302-001
Sample I.D.: Morro Bay Effluent

Sample Control: The samples were received by ATL within the recommended hold time, in a chilled state, and with the chain of custody records attached.

Date Sampled:	01/12/10 (composite)
Date Received:	01/13/10
Temp. Received:	1.3°C
Chlorine (TRC):	0.0 mg/l
Dates Tested:	01/13/10 to 01/15/10

Sample Analysis: The following analyses were performed on your sample:

Abalone Larval Development Short-Term Toxicity Test (EPA 600/R-95/136),
Giant Kelp Germination and Growth Short-Term Toxicity Test (EPA 600/R-95/136).

Attached are the test data generated from the analysis of your sample.

Result Summary:

Test	NOEC	TUc
Abalone Development:	10%	10.0
Kelp Germination:	10%	10.0
Kelp Growth:	18%	5.6

Quality Control: Reviewed and approved by:

Joseph A. LeMay
Laboratory Director

Aquatic
Testing
Laboratories

Abalone Larval Development Short-Term Toxicity Test

1. Test and Results Summary

2. Raw Data

3. Statistical Analyses

ABALONE LARVAL DEVELOPMENT
SHORT-TERM TOXICITY TEST

Lab No.: A-10011302-001
Client/ID: Morro Bay WWTP

Date tested: 01/13/10 - 01/15/10

TEST SUMMARY

Species: *Haliotis rufescens*.
Protocol: EPA/600/R-95/136.
Test type: Static.
Test chamber: glass beakers.
Temperature: 15 +/- 1°C.
Number of embryos per chamber: 1600 (approx.).
QA/QC Batch No.: RT-100113 (ran concurrently)

Source: The Cultured Abalone.
Dilution water: Lab seawater.
Endpoints: NOEC.
Test volume: 200 ml.
Aeration: None.
Number of replicates: 5.

RESULTS SUMMARY

Sample Concentration	Percent Normal Development	
Control (Brine)	94.6%	
Control (Dilution)	94.4%	
3.2%	95.3%	
5.6%	94.2%	
10.0%	94.0%	
18.0%	79.9%	*
32.0%	0.0%	*
* Statistically significantly less than control at P = 0.05 level		

CHRONIC TOXICITY

NOEC	10%
TUc	10

QA/QC TEST ACCEPTABILITY

Parameter	Result
Average control normality ≥80%	PASSED (94.4%)
%MSD <20% relative to control	PASSED (%MSD = 7.1%)
Please see RT-100113 report for additional test acceptability criteria.	

Abalone Larval Development Test-Proportion Normal

Start Date:	1/13/2010 14:30	Test ID:	10011302a	Sample ID:	Morro Bay
End Date:	1/15/2010 15:00	Lab ID:	CAATL-Aquatic Testing Labs	Sample Type:	EFF1-POTW
Sample Date:	1/12/2010 10:30	Protocol:	WCCH-EPA-600-R-95-136	Test Species:	HR-Haliotis rufescens

Comments:

Conc-%	1	2	3	4	5
B-Control	0.9712	0.9314	0.9020	0.9524	0.9712
D-Control	0.9515	0.9208	0.9806	0.9619	0.9038
3.2	0.9706	0.9314	0.9902	0.9806	0.8911
5.6	0.9804	0.8846	0.9135	0.9608	0.9714
10	0.9626	0.8654	0.9626	0.9314	0.9804
18	0.7156	0.7767	0.8679	0.7736	0.8627
32	0.0000	0.0000	0.0000	0.0000	0.0000

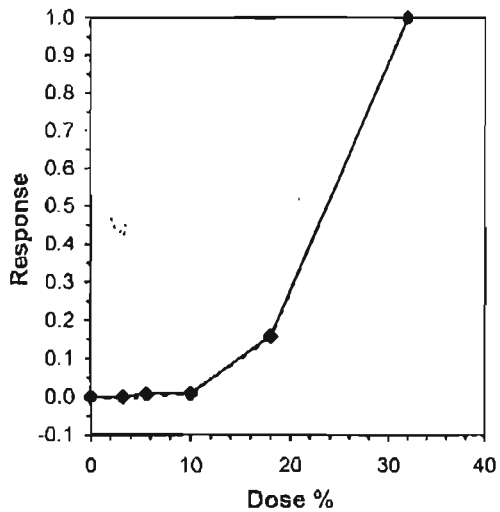
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
B-Control	0.9456	1.0020	1.3418	1.2523	1.4001	4.741	5				0.9494	1.0000
D-Control	0.9437	1.0000	1.3390	1.2555	1.4310	5.233	5					
3.2	0.9528	1.0096	1.3683	1.2345	1.4716	7.061	5	-0.492	2.300	0.1236	0.9494	1.0000
5.6	0.9421	0.9983	1.3398	1.2242	1.4303	6.556	5	0.037	2.300	0.1236	0.9420	0.9922
10	0.9405	0.9966	1.3367	1.1951	1.4303	6.784	5	0.095	2.300	0.1236	0.9406	0.9908
*18	0.7993	0.8470	1.1104	1.0083	1.1989	7.407	5	4.308	2.300	0.1236	0.7985	0.8410
32	0.0000	0.0000	0.0500	0.0500	0.0500	0.000	5				0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.91962	0.918	-0.42	-1.1415
Bartlett's Test indicates equal variances (p = 0.95)	0.68536	13.2767		
The control means are not significantly different (p = 0.95)	0.06669	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs B-Control	10	18	13.4164	10	0.06771	0.07138	0.05662	0.00722	5.7E-04	4, 20

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	12.178	1.179	7.525	13.483	-1.9307
IC10	14.850	1.120	12.358	17.629	0.3675
IC15	17.521	1.016	14.482	18.904	-0.4828
IC20	18.683	0.506	16.979	19.581	-0.7450
IC25	19.516	0.423	18.362	20.357	-0.2466
IC40	22.012	0.338	21.090	22.686	-0.2466
IC50	23.677	0.282	22.908	24.238	-0.2466



ABALONE CHRONIC BIOASSAY

Aquatic Testing Laboratories

Lab No.: A-10011302-001
Client ID: MRS - Morro Bay Effluent

Start Date: 01/13/2010

WATER QUALITY READINGS

Sample	Initial Readings				Final Readings			
	Temp (°C)	DO (mg/l)	pH	Salinity (o/oo)	Temp (°C)	DO (mg/l)	pH	Salinity (o/oo)
Control (brine)	14.7	7.7	8.2	34	15.8	7.8	8.1	34
Control (lab)	14.8	7.6	8.1	34	15.6	7.7	8.1	34
3.2%	14.7	7.6	8.2	34	15.8	7.9	8.1	34
5.6%	14.6	7.7	8.2	34	15.5	7.7	8.2	34
10%	14.8	7.7	8.2	34	15.8	7.9	8.2	34
18%	14.6	7.6	8.2	34	14.9	7.7	8.2	34
32%	14.8	7.7	8.2	34	14.8	7.7	8.2	34

Sample as received: Chlorine: 0 mg/l; pH: 7.7; Salinity: 0 ppt; Temp: 13 °C; DO: 5.4 mg/l.

Initial readings: [signature] Date/Time: 1-13-10 1430 Final readings: [signature] Date/Time: 1-15-10 1500

MICROSCOPIC EXAMINATION

Beaker No.	Sample Conc.	Number Normal	Number Abnormal	Beaker No.	Sample Conc.	Number Normal	Number Abnormal	Beaker No.	Sample Conc.	Number Normal	Number Abnormal
1	10	103	4	13	C	93	8	25	C	101	4
2	C	98	5	14	32	0	100	26	32	0	100
3	5.6	100	2	15	5.6	95	9	27	3.2	101	2
4	3.2	99	3	16	18	92	14	28	18	82	24
5	18	78	31	17	B	92	10	29	3.2	90	11
6	B	101	3	18	10	103	4	30	10	100	2
7	32	0	100	19	C	101	2	31	B	101	3
8	3.2	95	7	20	32	0	100	32	18	88	14
9	10	90	14	21	3.2	101	1	33	5.6	102	3
10	B	95	7	22	10	95	7	34	32	0	100
11	5.6	92	12	23	B	100	5	35	C	94	10
12	18	80	23	24	5.6	98	4				

Microscopic examination: Analyst: [signature] Date: 1-16-10 Time: 1000

ABALONE CHRONIC BIOASSAY

Aquatic Testing Laboratories

Lab No.: A-10011302-001
Client ID: MRS - Morro Bay Effluent

Start Date: 01/13/2010

RANDOMIZATION WORKSHEET

Beaker No.	Sample Conc.	Beaker No.	Sample Conc.	Beaker No.	Sample Conc.
1	10	13	C	25	C
2	C	14	3.2	26	3.2
3	5.6	15	5.6	27	3.2
4	3.2	16	18	28	18
5	18	17	B	29	3.2
6	B	18	10	30	10
7	3.2	19	C	31	B
8	3.2	20	3.2	32	18
9	10	21	3.2	33	5.6
10	B	22	10	34	3.2
11	5.6	23	B	35	C
12	18	24	5.6		

Notes

✓

Add 1600 fertilized eggs per 200 ml test volume.

Analyst: [signature] Date: 1-13-10 Time: 1100

Aquatic
Testing
Laboratories

Giant Kelp Germination and Germ Tube Growth Short-Term Toxicity Test

- *Test and Result Summary*
- *Data Summary and Statistical Analysis*
- *Raw Test Data: Water Quality & Test Organism Measurements*

GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

Aquatic Testing Laboratories

Lab No.: A-10011302-001
Client/ID: MRS - Morro Bay Comp. Effluent

Date Tested: 01/13/10 - 01/15/10

TEST SUMMARY

Species: *Macrocystis pyrifera*.
Protocol: EPA Method 1009.0.
Test type: Static.
Test chamber: glass beaker.
Temperature: 15 +/- 1°C.
Number of spores per ml: 7,500 (approx.).
QA/QC Batch No.: RT-100113 (ran concurrently).

Source: Field collected.
Dilution water: Lab seawater.
Endpoints: NOEC, IC25 at 48 hrs.
Test volume: 200 ml.
Aeration: None.
Number of replicates: 5.

RESULTS SUMMARY

Sample Concentration	Percent Germination		Mean Germ Tube Length (μm)	
Control (Brine)	84.1%		14.55	
Control (Dilution)	85.1%		14.40	
3.2%	84.6%		14.50	
5.6%	83.5%		14.75	
10%	84.3%		14.80	
18%	73.7%	*	12.45	
32%	30.1%	*	8.40	*
* Statistically significantly less than control at P = 0.05 level				

CHRONIC TOXICITY

END POINT	GERMINATION	GERM TUBE LENGTH
NOEC	10%	18%
TUc (100/NOEC)	10.0	5.6

QA/QC TEST ACCEPTABILITY

Parameter	Result
Mean control germination ≥70%	Yes (85.1%)
Mean control germination tube length >10 μm	Yes (14.40 μm)
Please see RT-100113 report for additional test acceptability criteria.	

Macrocystis Germination and Growth Test-Proportion Germinated

Start Date:	1/13/2010 14:30	Test ID:	10011302k	Sample ID:	Morro Bay
End Date:	1/15/2010 15:00	Lab ID:	CAATL-Aquatic Testing Labs	Sample Type:	EFF1-POTW
Sample Date:	1/12/2010 10:30	Protocol:	WCCH-EPA-600-R-95-136	Test Species:	MP-Macrocystis pyrifera

Comments:

Conc-%	1	2	3	4	5
B-Control	0.8190	0.8137	0.8627	0.8058	0.9020
D-Control	0.8173	0.8515	0.8654	0.8119	0.9109
3.2	0.8529	0.8529	0.8020	0.8317	0.8911
5.6	0.9020	0.8462	0.8000	0.8252	0.8020
10	0.7921	0.9020	0.8462	0.8317	0.8447
18	0.6990	0.5825	0.8100	0.7900	0.8039
32	0.1509	0.6040	0.2661	0.1048	0.3805

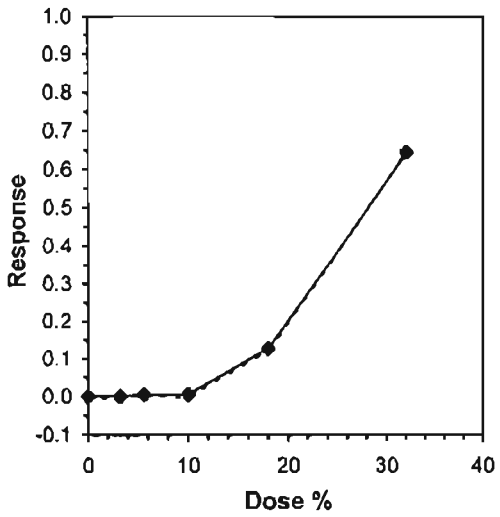
			Transform: Arcsin Square Root					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
B-Control	0.8407	0.9874	1.1628	1.1145	1.2523	5.017	5	*		0.8433	1.0000
D-Control	0.8514	1.0000	1.1779	1.1222	1.2677	4.995	5				
3.2	0.8461	0.9938	1.1693	1.1096	1.2345	3.916	5	28.00	16.00	0.8433	1.0000
5.6	0.8351	0.9808	1.1553	1.1071	1.2523	5.162	5	25.50	16.00	0.8394	0.9953
10	0.8433	0.9905	1.1662	1.0973	1.2523	4.792	5	28.50	16.00	0.8394	0.9953
*18	0.7371	0.8658	1.0370	0.8683	1.1198	10.395	5	16.00	16.00	0.7362	0.8730
*32	0.3013	0.3538	0.5651	0.3296	0.8901	39.486	5	15.00	16.00	0.2996	0.3553

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.91693	0.927	0.56229	3.36651
Bartlett's Test indicates unequal variances (p = 7.75E-03)	15.7025	15.0863		
The control means are not significantly different (p = 0.70)	0.40635	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test Treatments vs B-Control	10	18	13.4164	10

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	12.965	2.219	8.991	19.675	-0.2999
IC10	16.235	1.944	11.742	20.287	0.0133
IC15	18.622	1.580	13.695	21.354	-0.7235
IC20	19.974	1.358	15.826	22.780	-0.6740
IC25	21.326	1.318	17.792	24.729	-0.3175
IC40	25.383				
IC50	28.087				



Macrocystis Germination and Growth Test-Growth-Length

Start Date:	1/13/2010 14:30	Test ID:	10011302k
End Date:	1/15/2010 15:00	Lab ID:	CAATL-Aquatic Testing Labs
Sample Date:	1/12/2010 10:30	Protocol:	WCCH-EPA-600-R-95-136
Comments:			

Sample ID:	Morro Bay				
Sample Type:	EFF1-POTW				
Test Species:	MP-Macrocystis pyrifera				

Conc-%	1	2	3	4	5
B-Control	15.000	14.000	14.750	14.250	14.750
D-Control	14.250	13.750	14.000	15.500	14.500
3.2	14.750	14.000	14.250	14.250	15.250
5.6	14.500	15.250	14.750	14.750	14.500
10	15.000	14.500	15.000	14.500	15.000
18	10.500	9.000	16.250	13.000	13.500
32	8.000	8.500	7.250	8.000	10.250

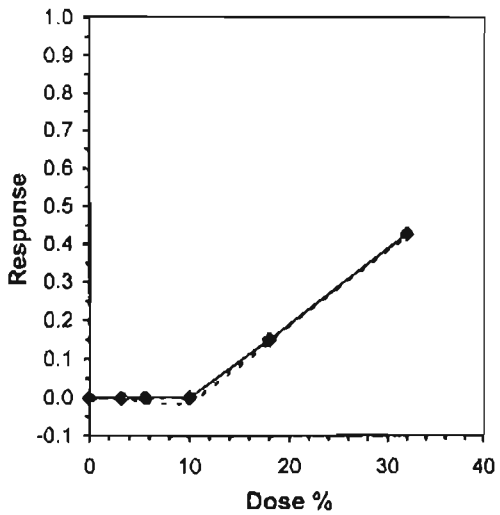
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
B-Control	14.550	1.0104	14.550	14.000	15.000	2.823	5	*		14.650	1.0000
D-Control	14.400	1.0000	14.400	13.750	15.500	4.691	5				
3.2	14.500	1.0069	14.500	14.000	15.250	3.448	5	26.50	16.00	14.650	1.0000
5.6	14.750	1.0243	14.750	14.500	15.250	2.076	5	30.00	16.00	14.650	1.0000
10	14.800	1.0278	14.800	14.500	15.000	1.850	5	32.50	16.00	14.650	1.0000
18	12.450	0.8646	12.450	9.000	16.250	22.558	5	20.00	16.00	12.450	0.8498
*32	8.400	0.5833	8.400	7.250	10.250	13.409	5	15.00	16.00	8.400	0.5734

Auxillary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.84392	0.927	0.3002	5.58901
Bartlett's Test indicates unequal variances (p = 6.44E-06)	31.8218	15.0863		
The control means are not significantly different (p = 0.68)	0.42426	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test Treatments vs B-Control	18	32	24	5.55556

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	12.664	2.317	10.908	21.593	1.4329
IC10	15.327	2.506	11.935	22.911	0.6118
IC15	17.991	2.569	12.952	24.476	0.1991
IC20	20.523	2.654	13.976	26.094	-0.1145
IC25	23.056	2.587	14.999	27.878	-0.5530
IC40	30.652				
IC50	>32				



GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

Aquatic Testing Laboratories

Lab No.: A-10011302-001

Start Date: 01/13/2010

Dish No.	Sample Conc.	Total Number Counted	Number Germin.	Number Non-Germin.	Germ Tube Lengths (micrometer units)									
					A	B	C	D	E	F	G	H	I	J
1	5.6	102	92	10	6	7	5	6	6	5	7	4	6	6
2	B	105	86	19	5	7	6	6	5	6	7	7	6	5
3	3.2	102	87	15	5	5	6	7	7	6	5	6	7	5
4	18	103	72	31	4	6	4	5	4	4	3	4	3	5
5	C	104	85	19	5	6	7	7	6	7	5	4	6	4
6	10	101	80	21	6	6	7	6	6	5	6	7	7	4
7	32	106	16	90	4	3	4	5	3	2	2	3	4	2
8	C	101	86	15	6	5	6	4	4	5	7	7	6	5
9	3.2	102	87	15	6	6	7	4	5	7	6	6	4	5
10	18	103	60	43	3	4	4	3	2	4	4	3	4	5
11	5.6	104	88	16	5	6	7	7	6	5	6	6	7	6
12	10	102	92	10	6	5	7	6	5	5	6	7	6	5
13	B	102	83	19	6	5	7	7	4	7	7	5	4	4
14	32	101	61	40	4	3	2	2	4	3	3	4	5	4
15	C	104	90	14	5	7	6	5	5	6	7	5	4	6
16	10	104	88	16	6	7	7	6	5	6	5	6	6	6
17	5.6	100	80	20	6	5	5	6	7	7	6	5	6	6
18	18	100	81	19	7	8	7	6	7	7	5	5	6	7
19	3.2	101	81	20	5	5	6	7	6	5	4	7	6	6
20	32	109	29	70	4	2	2	3	4	4	3	3	2	2

Comments:

Micrometer conversion factor: 1 unit = 2.5 um at 400X power

GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

Aquatic Testing Laboratories

Lab No.: A-10011302-001

Start Date: 01/13/2010

Dish No.	Sample Conc.	Total Number Counted	Number Germin.	Number Non-Germin.	Germ Tube Lengths (micrometer units)									
					A	B	C	D	E	F	G	H	I	J
21	C	101	82	19	6	7	5	7	6	6	7	6	7	5
22	18	100	79	21	6	5	6	7	4	4	5	6	4	5
23	5.6	103	85	18	6	5	7	6	5	7	7	6	5	5
24	B	102	88	14	7	6	6	5	5	7	6	6	5	6
25	10	101	84	17	5	7	4	4	7	7	6	5	7	6
26	B	103	83	20	6	7	5	5	5	6	7	4	6	6
27	32	105	11	94	2	4	3	3	4	5	4	2	2	3
28	3.2	101	84	17	6	5	5	4	7	7	6	5	6	6
29	32	113	43	70	4	7	4	3	7	3	3	4	2	4
30	C	101	92	9	7	4	4	6	7	5	6	7	6	6
31	10	103	87	16	6	7	5	7	7	6	5	6	6	5
32	3.2	101	90	11	7	6	7	5	7	6	6	5	6	6
33	18	102	82	20	6	5	6	7	4	6	5	4	5	6
34	5.6	101	81	20	5	6	7	7	6	5	5	4	7	6
35	B	102	92	10	6	7	7	5	5	5	5	6	7	6
36														
37														
38														
39														
40														

Comments:

Micrometer conversion factor: 1 unit = 2.5 um at 400X power

GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

Aquatic Testing Laboratories

Lab No.: A-10011302-001
Client ID: MRS - Morro Bay Effluent

Start Date: 01/13/2010

WATER QUALITY READINGS

	Initial Readings				Final Readings			
Sample	Temp (°C)	DO (mg/l)	pH	Salinity (o/oo)	Temp (°C)	DO (mg/l)	pH	Salinity (o/oo)
Control	14.7	7.7	8.2	34	15.1	7.9	8.1	34
Brine Control	14.8	7.6	8.1	34	15.6	7.7	8.1	34
3.2%	14.7	7.6	8.2	34	15.2	7.5	8.1	34
5.6%	14.6	7.7	8.2	34	15.1	7.8	8.2	34
10%	14.8	7.7	8.2	34	15.3	7.7	8.2	34
18%	14.6	7.6	8.2	34	15.0	7.8	8.2	34
32%	14.8	7.7	8.2	34	15.7	7.7	8.2	34

Sample as received: Chlorine: 0 mg/l; pH: 7.7; Salinity: 0 ppt; Temp: 13 °C; DO: 5.4 mg/l; NH_3-N: 32 mg/l..

Brine Control contains equivalent amount of artificial sea salts as highest effluent concentration.

Initial readings: Analyst: _____ Date: 1-13-10 1440 Time: 1440

Final readings: Analyst: _____ Date: 1-15-10 1500 Time: 1500

GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

Aquatic Testing Laboratories

Lab No.: A-10011302-001
Client ID: MRS - Morro Bay Effluent

Start Date: 01/13/2010

RANDOMIZATION WORKSHEET

Beaker No.	Sample Conc.	Beaker No.	Sample Conc.	Beaker No.	Sample Conc.	Beaker No.	Sample Conc.	Notes
1	5.6	11	5.6	21	C	31	10	
2	B	12	10	22	18	32	3.2	
3	3.2	13	B	23	5.6	33	18	
4	18	14	3.2	24	B	34	5.6	
5	C	15	C	25	10	35	B	
6	10	16	10	26	B	36		
7	3.2	17	5.6	27	3.2	37		
8	C	18	18	28	3.2	38		
9	3.2	19	3.2	29	3.2	39		
10	18	20	3.2	30	C	40		

Need 7500/ml x 200 ml = 1,500,000 spores.

Add 1.0 ml spore stock of 6 spores per 5x5 hemacytometer grid

Analyst: 1-13-10 Date: 1-13-10 Time: 12:00

Aquatic
Testing
Laboratories

CHAIN OF CUSTODY

CHAIN OF CUSTODY

Client: City of Morro Bay

Address: Wastewater Treatment Plant
160 Atascadero Road
Morro Bay, CA 93442

Project Manager: Doug Coats - MRS

Phone: (805) 644-1180

Fax: (805) 289-3935

Purchase Order No:

Aquatic Testing Laboratories

4350 Transport St., Unit 107
Ventura, CA 93003
(805) 650-0546 Fax (805) 650-0756

Sample ID	Sample Date	Sample Time	Sample Type *	Chlorine (TRC)**	Number of Containers	Testing Requested
Comp. Eff.	12 Jan 10	10:30	E	.02 mg/L	1 (one gallon)	Giant Kelp Chronic

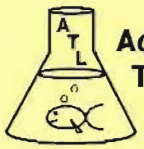
Special Instructions:

**** Note: Total residual chlorine must be taken immediately after sample collection if sample is a chlorinated effluent.**

* L - Liquid, S - Solid, SS - Semi-Solid/sludge, RW - Receiving Water, GW - Ground Water, E - Effluent

CUSTODY TRANSFERS

Relinquished by (signature)	Received by (signature)	Date (mm/dd/yy)	Time (hh:mm)	Seals Intact? (Yes, No, NA)	Temperature Received (°C)
		12 JAN 10	1430	Yes	1.3
		1-13-10	0940	NA	1.3



Aquatic
Testing
Laboratories

REFERENCE TOXICANT DATA

Aquatic
Testing
Laboratories

Abalone Larval Development Short-Term Toxicity Test

1. Test and Results Summary

2. Raw Data

3. Statistical Analyses

ABALONE LARVAL DEVELOPMENT
SHORT-TERM TOXICITY TEST
* REFERENCE TOXICANT *

Aquatic Testing Laboratories

QA/QC Batch No.: RT-100113

Date tested: 01/13/10 - 01/15/10

TEST SUMMARY

Species: *Haliotis rufescens*.
Protocol: EPA/600/R-95/136.
Test type: Static.
Test chamber: Plastic beakers.
Temperature: 15 +/- 1°C.
Number of embryos per chamber: 1600 (approx.).
Reference Toxicant: $ZnSO_4(7H_2O)$.

Source: The Cultured Abalone.
Dilution water: Lab seawater.
Endpoints: NOEC, IC25 at 48 hrs.
Test volume: 200 ml.
Aeration: None.
Number of replicates: 5.
Ref. Tox. source: Mallinckrodt.
Lot No.: 8872 KCXG

RESULTS SUMMARY

SAMPLE CONCENTRATION	PERCENT NORMAL DEVELOPMENT
Control	94.9%
10 µg/l	95.1%
18 µg/l	94.2%
32 µg/l	18.2% *
56 µg/l	0% *
100 µg/l	0% *

* Statistically significantly less than control at P = 0.05 level

CHRONIC TOXICITY

NOEC	18 µg/l
IC25	22.2 µg/l

QA/QC TEST ACCEPTABILITY

Parameter	Result
Average control normality ≥80%	Yes (94.9%)
56 µg/l treatment response significantly less than control response	Yes (NOEC = 18 µg/l)
%MSD <20% relative to control	Yes (%MSD = 7.2%)

Abalone Larval Development Test-Proportion Normal

Start Date:	1/13/2010 14:30	Test ID:	RT100113a	Sample ID:	REF-Ref Toxicant
End Date:	1/15/2010 15:00	Lab ID:	CAATL-Aquatic Testing Labs	Sample Type:	ZNSO-Zinc sulfate
Sample Date:	1/13/2010	Protocol:	WCCH-EPA-600-R-95-136	Test Species:	HR-Haliotis rufescens

Comments:

Conc-ug/L	1	2	3	4	5
D-Control	0.9307	0.9615	0.8932	0.9806	0.9806
10	0.9712	0.9712	0.9406	0.9020	0.9703
18	0.9010	0.9802	0.9714	0.8857	0.9709
32	0.2545	0.2685	0.1048	0.1980	0.0841
56	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000

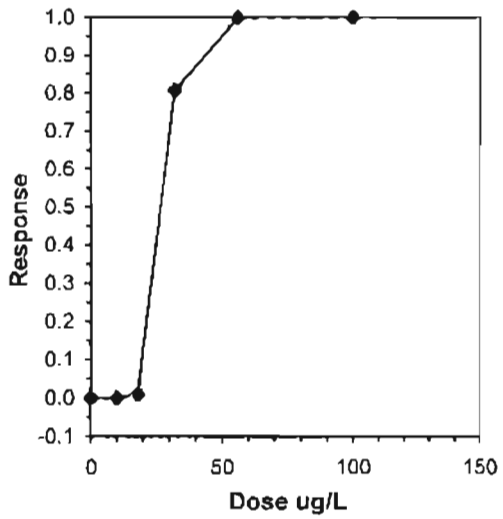
			Transform: Arcsin Square Root					Rank	1-Tailed	Isotonic	
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	0.9493	1.0000	1.3555	1.2379	1.4310	6.190	5			0.9503	1.0000
10	0.9510	1.0018	1.3550	1.2523	1.4001	4.861	5	27.00	17.00	0.9503	1.0000
18	0.9418	0.9921	1.3413	1.2259	1.4296	7.096	5	25.00	17.00	0.9417	0.9910
*32	0.1820	0.1917	0.4317	0.2942	0.5447	26.510	5	15.00	17.00	0.1827	0.1922
56	0.0000	0.0000	0.0500	0.0500	0.0500	0.000	5			0.0000	0.0000
100	0.0000	0.0000	0.0500	0.0500	0.0500	0.000	5			0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.88549	0.905	-0.4144	-1.4602
Bartlett's Test indicates equal variances (p = 0.77)	1.1227	11.3449		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	18	32	24	
Treatments vs D-Control				

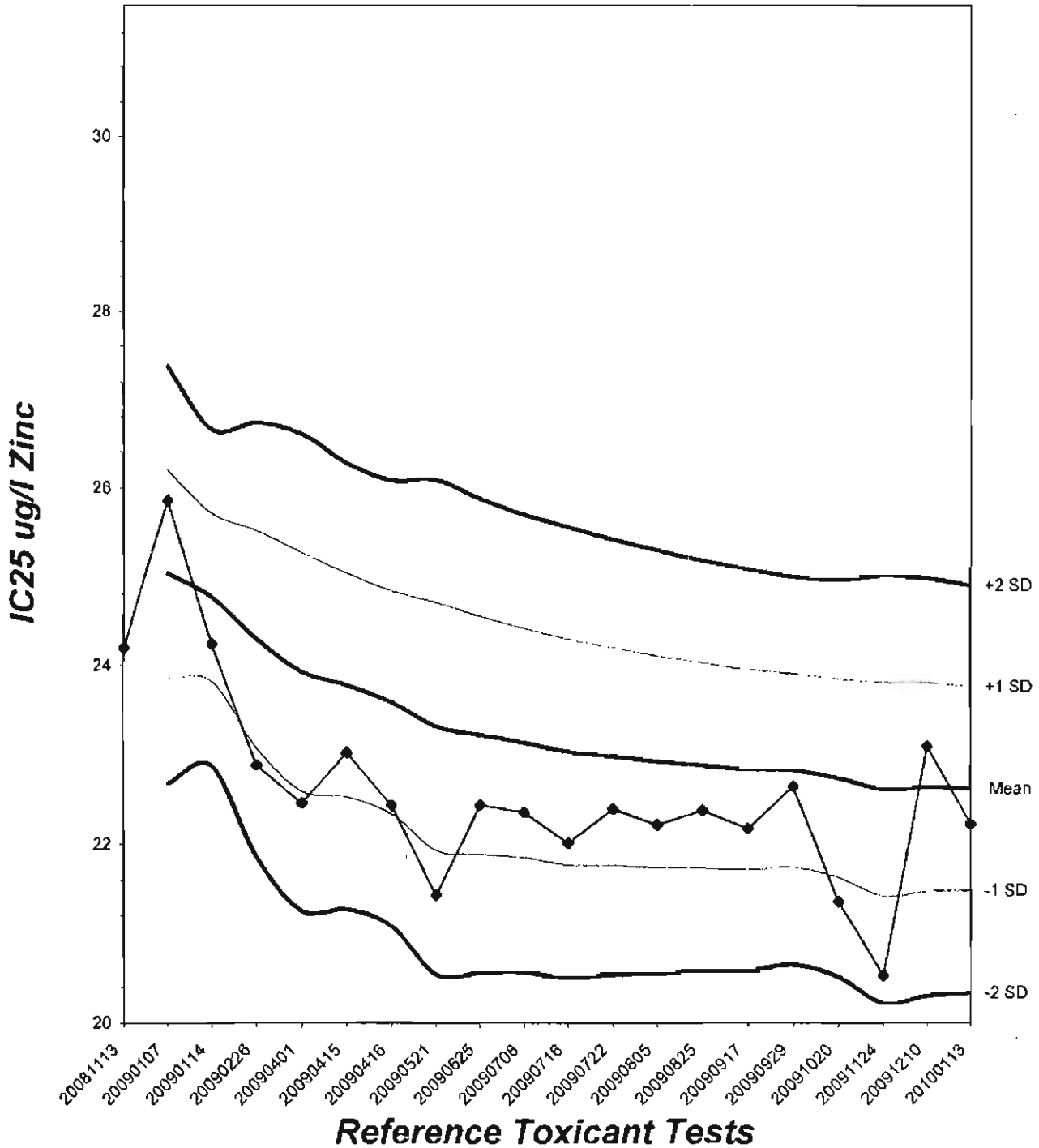
Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew
IC05	18.719	0.580	15.712	19.001	-4.1085
IC10	19.595	0.272	18.454	19.943	-0.7809
IC15	20.471	0.263	19.412	20.894	-0.6473
IC20	21.348	0.261	20.372	21.839	-0.4631
IC25	22.224	0.267	21.332	22.818	-0.2612
IC40	24.853	0.322	23.968	25.727	0.1655
IC50	26.606	0.379	25.597	27.683	0.2715



Abalone Larval Development Laboratory Control Chart

CV% = 5.04



ABALONE CHRONIC BIOASSAY
Reference Toxicant - Zinc Sulfate

Aquatic Testing Laboratories

QA/QC No.: RT-100113

Start Date: 01/13/2010

WATER QUALITY READINGS

Sample	Initial Readings				Final Readings			
	Temp (°C)	DO (mg/l)	pH	Salinity (o/oo)	Temp (°C)	DO (mg/l)	pH	Salinity (o/oo)
Control	14.8	7.6	8.1	34	15.8	7.8	8.1	34
10 µg/l Zn	14.7	7.7	8.1	34	15.6	7.7	8.1	34
18 µg/l Zn	14.8	7.7	8.1	34	14.8	7.8	8.1	34
32 µg/l Zn	14.7	7.5	8.1	34	15.0	7.9	8.1	34
56 µg/l Zn	15.0	7.6	8.1	34	15.2	7.8	8.1	34
100 µg/l Zn	15.2	7.5	8.1	34	14.9	7.7	8.1	34

Control and dilutions made with laboratory reference seawater filtered to 0.2 µm.

Initial readings: [signature] Date/Time: 1-13-10 1430 Final readings: [signature] Date/Time: 1-15-10 1500

MICROSCOPIC EXAMINATION

Beaker No.	Sample Conc.	Number Normal	Number Abnormal	Beaker No.	Sample Conc.	Number Normal	Number Abnormal	Beaker No.	Sample Conc.	Number Normal	Number Abnormal
1	56	0	100	11	C	100	4	21	10	92	10
2	10	101	3	12	100	0	100	22	32	20	81
3	32	28	82	13	C	92	11	23	C	101	2
4	C	94	7	14	18	102	3	24	100	0	100
5	18	91	10	15	56	0	100	25	56	0	100
6	100	0	100	16	10	95	6	26	C	101	2
7	10	101	3	17	32	11	94	27	18	100	3
8	56	0	100	18	100	0	100	28	100	0	100
9	18	99	2	19	18	93	12	29	32	9	98
10	32	29	79	20	56	0	100	30	10	98	3

Microscopic examination: Analyst: [signature] Date: 1-16-10 Time: 0900

ABALONE CHRONIC BIOASSAY
Reference Toxicant - Zinc Sulfate

Aquatic Testing Laboratories

QA/QC No.: RT 120113 Start Date: 1-13-12

RANDOMIZATION WORKSHEET

Beaker No.	Sample Conc.	Beaker No.	Sample Conc.	Beaker No.	Sample Conc.
1	56	11	C	21	10
2	10	12	100	22	32
3	32	13	C	23	C
4	C	14	18	24	100
5	18	15	56	25	56
6	100	16	10	26	C
7	10	17	32	27	18
8	56	18	100	28	100
9	18	19	18	29	32
10	32	20	56	30	10

Notes

Number Males used: 4

Number females used: 6

Time H_2O_2 added: 10:25

Time water changed: 13:00

Time spawned: ♂ 13:45 ♀ 1400

Time placed in test: 14:30

Add 1600 fertilized eggs per 200 ml..

Time glutaraldehyde added: 1500

Analyst: JA Date: 1-13-12 Time: 1100

Aquatic Testing Laboratories

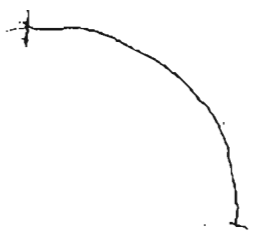
Test Temperature Chart

Test No: RT-100113

Date Tested: 01/13/10 to 01/15/10

Acceptable Range: 15+/- 1°C

1-13-10
"A"
Bath



Aquatic
Testing
Laboratories

Giant Kelp Germination and Germ Tube Growth Short-Term Toxicity Test

- *Test and Result Summary*
- *Data Summary and Statistical Analysis*
- *Raw Test Data: Water Quality & Test Organism Measurements*

GIANT KELP GERMINATION AND GROWTH TEST
REFERENCE TOXICANT - COPPER

Aquatic Testing Laboratories

QA/QC Batch No.: RT-100113

Date Tested: 01/13/10 - 01/15/10

TEST SUMMARY

Species: *Macrocystis pyrifera*.
Protocol: EPA/600/R-95/136.
Test type: Static.
Test chamber: Plastic beakers.
Temperature: 15 +/- 1°C.
Number of spores per ml: 7,500 (approx.).
Standard toxicant: Copper chloride.
Lab seawater: 0.2 um filtered seawater.

Source: Field collected.
Dilution water: Lab seawater.
Endpoints: NOEC, IC25 at 48 hrs.
Test volume: 200 ml.
Aeration: None.
Number of replicates: 5.
Ref. tox. source: Mallinckrodt.
Preservative: none.

RESULTS SUMMARY

Sample Concentration	Percent Germination		Mean Germ Tube Length (µm)	
Control	83.7%		14.45	
10 µg/l	84.0%		14.85	
18 µg/l	84.2%		14.30	
32 µg/l	73.0%	*	11.25	*
56 µg/l	45.0%	*	9.00	*
100 µg/l	16.4%	*	6.75	*
180 µg/l	4.9%	*	5.45	*
* Statistically significantly less than control at P = 0.05 level				

CHRONIC TOXICITY

Germination NOEC	18 µg/l
Germination IC25	40.5 µg/l
Germ Tube Growth NOEC	18 µg/l
Germ Tube Growth IC25	34.8 µg/l

QA/QC TEST ACCEPTABILITY

Parameter	Result
Mean control germination ≥70%	Yes (83.7%)
Mean control germination tube length > 10 µm	Yes (14.45 µm)
Germination tube growth NOEC <35 µg/l Copper	Yes (18 µg/l)
%MSD <20% relative to control (germination & growth)	Yes (germ = 9.7%, growth = 8.6%)

Macrocystis Germination and Growth Test-Proportion Germinated

Start Date:	1/13/2010 14:30	Test ID:	RT100113k	Sample ID:	REF-Ref Toxicant
End Date:	1/15/2010 15:00	Lab ID:	CAATL-Aquatic Testing Labs	Sample Type:	CUCL-Copper chloride
Sample Date:	1/13/2010	Protocol:	WCCH-EPA-600-R-95-136	Test Species:	MP-Macrocystis pyrifera

Comments:

Conc-ug/L	1	2	3	4	5
D-Control	0.8317	0.8654	0.8431	0.8039	0.8416
10	0.8447	0.8585	0.8137	0.8491	0.8317
18	0.8333	0.8544	0.8137	0.8544	0.8544
32	0.6226	0.8039	0.7921	0.6893	0.7426
56	0.4495	0.4955	0.2745	0.4352	0.5941
100	0.1667	0.2079	0.1607	0.1743	0.1089
180	0.0741	0.0098	0.0556	0.0388	0.0660

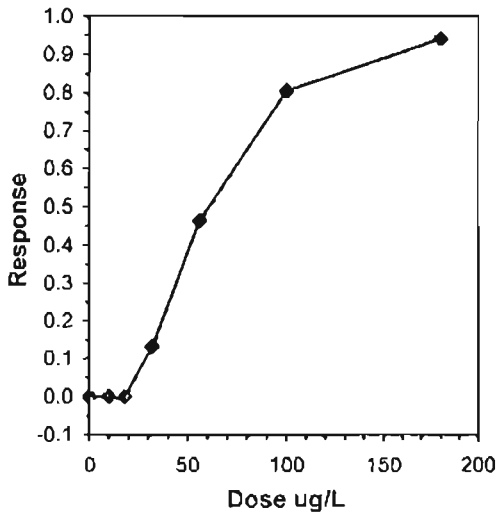
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8371	1.0000	1.1561	1.1121	1.1951	2.599	5				0.8397	1.0000
10	0.8395	1.0028	1.1590	1.1245	1.1851	2.023	5	-0.071	2.409	0.1012	0.8397	1.0000
18	0.8420	1.0058	1.1625	1.1245	1.1793	2.121	5	-0.154	2.409	0.1012	0.8397	1.0000
*32	0.7301	0.8721	1.0274	0.9093	1.1121	8.204	5	3.063	2.409	0.1012	0.7290	0.8682
*56	0.4498	0.5373	0.7335	0.5515	0.8800	16.277	5	10.060	2.409	0.1012	0.4501	0.5360
*100	0.1637	0.1956	0.4147	0.3363	0.4735	11.992	5	17.651	2.409	0.1012	0.1638	0.1951
*180	0.0489	0.0584	0.2142	0.0992	0.2756	32.935	5	22.424	2.409	0.1012	0.0493	0.0588

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.93777	0.934	-0.7327	2.28525
Bartlett's Test indicates equal variances (p = 0.01)	16.2794	16.8119		

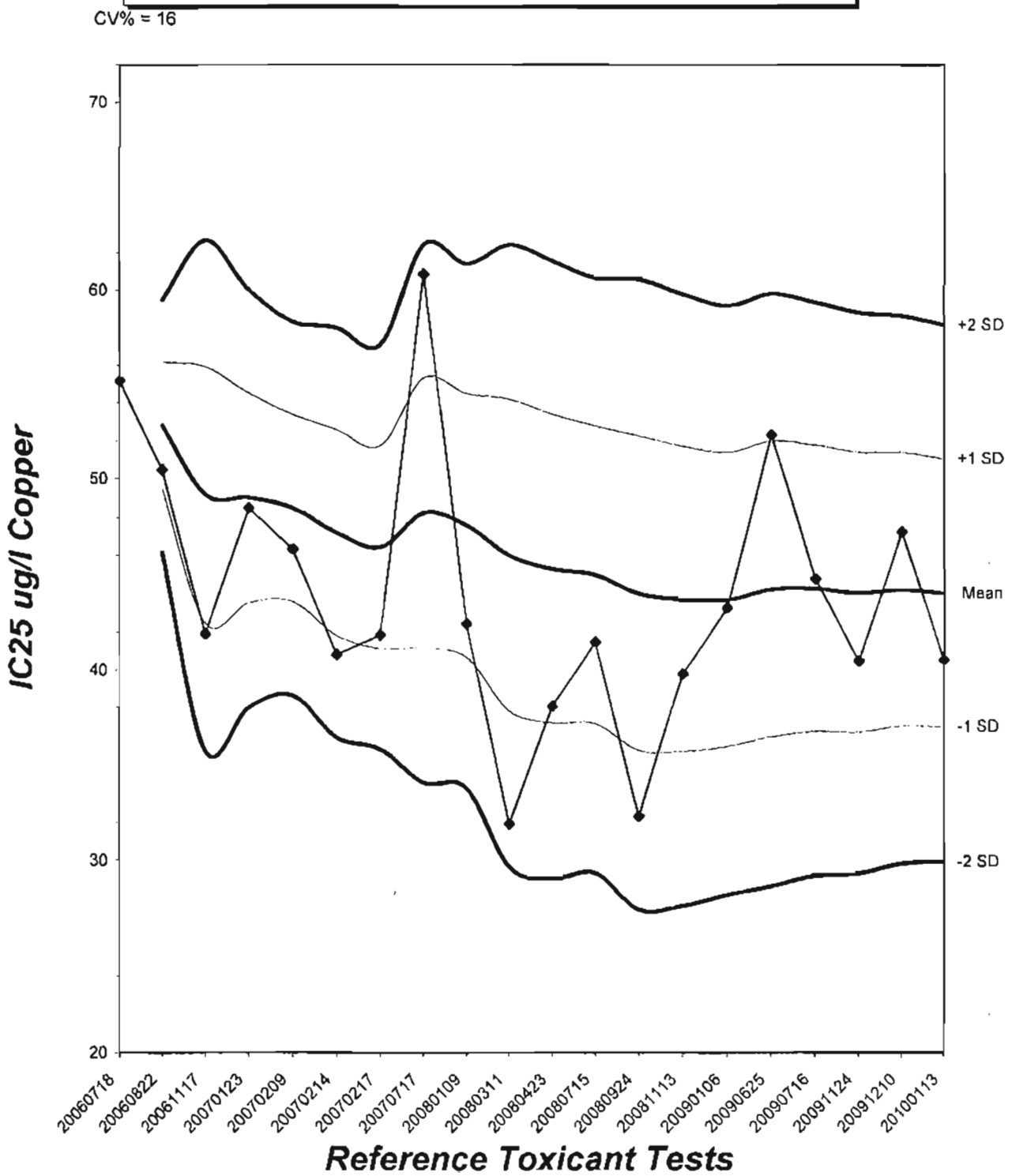
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs D-Control	18	32	24		0.08099	0.0967	0.77051	0.00441	7.4E-21	6, 28

Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew
IC05	23.313	2.090	19.512	31.159	1.3286
IC10	28.626	2.832	22.655	37.098	0.3076
IC15	33.318	2.541	26.268	40.282	-0.1704
IC20	36.930	2.391	29.999	43.725	-0.1662
IC25	40.542	2.340	33.994	47.616	0.0682
IC40	51.379	3.301	43.060	63.594	0.5247
IC50	60.651	4.978	47.301	73.164	-0.0131



Giant Kelp Germination Laboratory Control Chart



Macrocystis Germination and Growth Test-Growth-Length

Start Date:	1/13/2010 14:30	Test ID:	RT100113k	Sample ID:	REF-Ref Toxicant
End Date:	1/15/2010 15:00	Lab ID:	CAATL-Aquatic Testing Labs	Sample Type:	CUCL-Copper chloride
Sample Date:	1/13/2010	Protocol:	WCCH-EPA-600-R-95-136	Test Species:	MP-Macrocystis pyrifera

Comments:

Conc-ug/L	1	2	3	4	5
D-Control	14.250	14.750	14.750	14.500	14.000
10	15.250	14.750	15.000	14.250	15.000
18	14.750	14.500	14.250	13.250	14.750
32	11.750	10.750	12.250	10.750	10.750
56	8.250	8.500	8.500	7.500	12.250
100	7.000	6.500	6.750	6.750	6.750
180	5.750	5.250	5.500	5.250	5.500

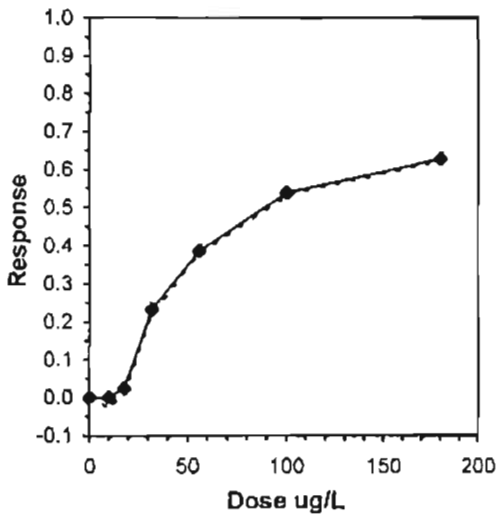
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	14.450	1.0000	14.450	14.000	14.750	2.256	5			14.650	1.0000
10	14.850	1.0277	14.850	14.250	15.250	2.553	5	35.50	16.00	14.650	1.0000
18	14.300	0.9896	14.300	13.250	14.750	4.353	5	27.00	16.00	14.300	0.9761
*32	11.250	0.7785	11.250	10.750	12.250	6.285	5	15.00	16.00	11.250	0.7679
*56	9.000	0.6228	9.000	7.500	12.250	20.694	5	15.00	16.00	9.000	0.6143
*100	6.750	0.4671	6.750	6.500	7.000	2.619	5	15.00	16.00	6.750	0.4608
*180	5.450	0.3772	5.450	5.250	5.750	3.838	5	15.00	16.00	5.450	0.3720

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.8028	0.934	2.28085	10.5833
Bartlett's Test indicates unequal variances (p = 3.13E-05)	30.5235	16.8119		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	18	32	24	
Treatments vs D-Control				

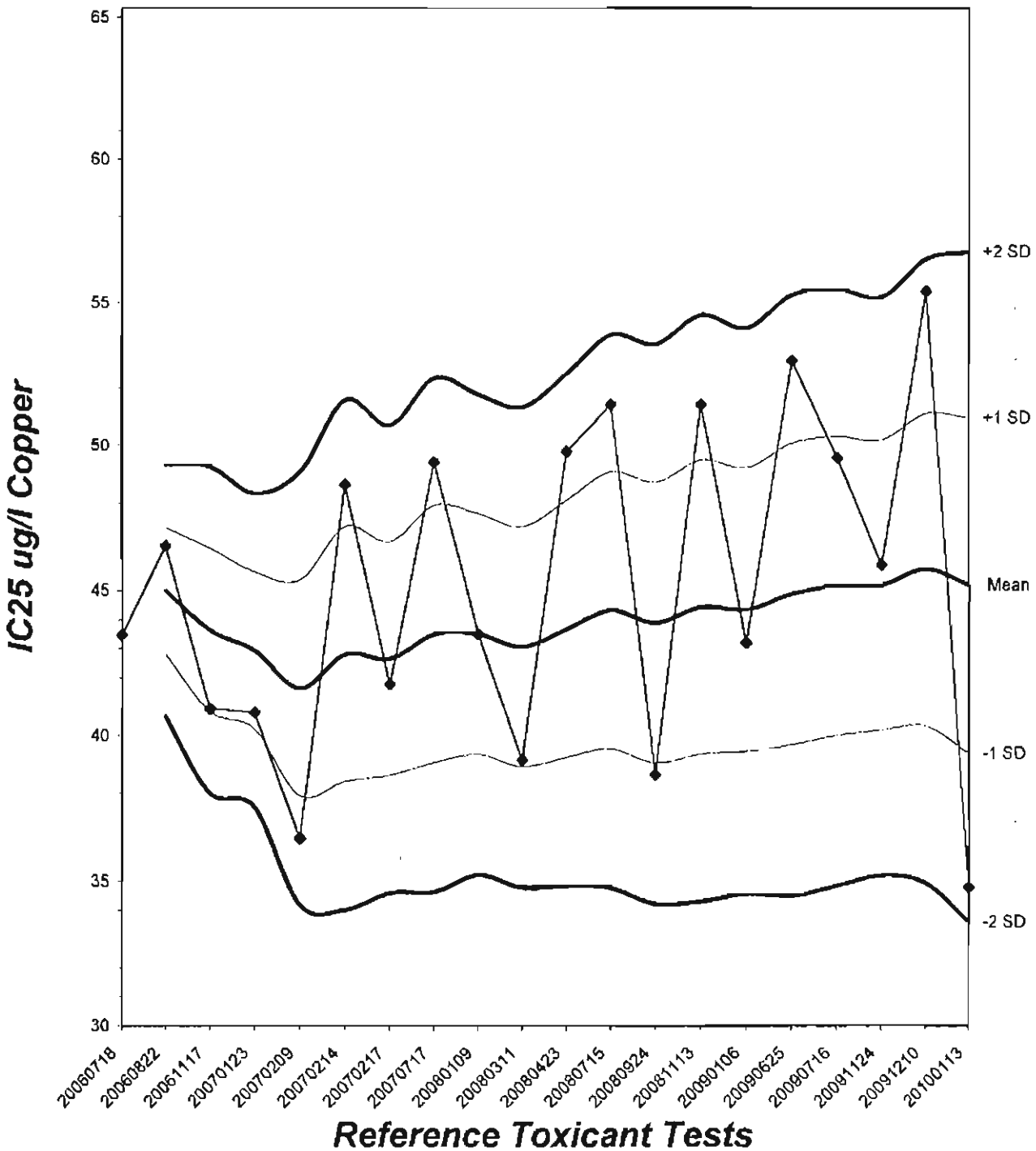
Linear Interpolation (200 Resamples)

Point	ug/L	SD	95% CL(Exp)		Skew
IC05	19.756	1.210	14.904	22.260	-1.2465
IC10	23.118	0.989	19.639	25.807	-0.3654
IC15	26.480	1.044	23.763	29.768	0.2314
IC20	29.843	1.315	27.065	34.880	0.6712
IC25	34.800	3.996	29.088	49.216	2.2849
IC40	60.107	8.533	44.341	85.782	0.2956
IC50	88.756	4.584	70.362	96.555	-0.8398



Giant Kelp Germ Tube Growth Laboratory Control Chart

CV% = 12.8



GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

Aquatic Testing Laboratories

QA/QC No.: RT-100113

Start Date: 01/13/2010

Dish No.	Sample Conc.	Total Number Counted	Number Germin.	Number Non-Germin.	Germ Tube Lengths (micrometer units)									
					A	B	C	D	E	F	G	H	I	J
1	18	108	90	18	6	5	6	7	5	7	6	6	6	5
2	32	106	66	40	5	4	5	4	6	6	4	4	4	5
3	10	103	87	16	7	6	5	7	6	6	7	5	6	6
4	56	109	49	60	3	2	4	3	3	4	4	3	3	4
5	C	101	84	17	5	7	6	6	5	7	4	6	6	5
6	180	108	8	100	2	2	2	3	3	2	2	2	3	2
7	10	108	18	90	4	3	2	2	2	3	4	4	2	2
8	10	106	91	15	6	7	4	5	5	7	7	6	6	6
9	32	102	82	20	5	4	4	5	4	5	4	3	4	5
10	10	101	21	80	3	2	2	2	3	4	3	3	2	2
11	C	104	90	14	6	7	5	5	7	6	6	4	7	6
12	56	111	55	56	4	3	3	5	4	2	3	4	3	3
13	18	103	88	15	5	7	6	6	5	7	6	6	5	5
14	180	102	1	101	2	3	2	2	2	2	2	2	2	2
15	10	102	83	19	7	5	6	6	7	5	6	7	6	5
16	56	102	28	74	4	3	4	5	2	4	3	3	4	2
17	32	101	80	21	5	4	5	6	6	4	4	5	4	6
18	18	102	83	19	7	6	5	5	4	6	6	7	5	6
19	180	108	6	102	2	3	2	2	2	2	3	2	2	2
20	C	102	86	16	6	5	5	6	7	5	6	6	7	6

Comments:

Micrometer conversion factor: 1 unit = 2.5 um at 400X power

GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

Aquatic Testing Laboratories

QA/QC No.: RT-100113

Start Date: 01/13/2010

Dish No.	Sample Conc.	Total Number Counted	Number Germin.	Number Non-Germin.	Germ Tube Lengths (micrometer units)									
					A	B	C	D	E	F	G	H	I	J
21	100	112	18	104	3	2	2	2	3	4	2	3	3	3
22	C	102	82	20	5	6	6	7	6	6	4	6	6	6
23	56	108	47	61	3	4	2	4	2	2	3	4	4	2
24	10	106	90	16	6	5	6	7	5	5	4	7	6	6
25	100	109	19	90	3	4	2	3	2	2	2	3	3	3
26	18	103	88	15	6	5	5	5	4	7	4	5	6	6
27	180	103	4	99	2	3	2	2	2	2	2	2	2	2
28	32	103	71	32	4	3	3	5	4	5	6	6	3	4
29	18	103	88	15	5	7	6	6	5	6	6	7	6	5
30	100	101	11	90	3	2	4	3	3	3	2	3	2	2
31	C	101	85	16	5	6	6	4	6	6	5	7	6	5
32	56	101	60	41	4	5	4	6	6	5	4	4	6	5
33	32	101	75	26	4	3	4	6	6	5	3	3	5	4
34	10	101	84	17	5	7	6	6	7	7	5	6	6	5
35	180	106	7	99	2	2	2	2	2	3	2	2	3	2
36														
37														
38														
39														
40														

Comments:

Micrometer conversion factor: 1 unit = 2.5 um at 400X power

GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

Aquatic Testing Laboratories

QA/QC No.: RT-100113

Start Date: 01/13/2010

WATER QUALITY READINGS

	Initial Readings				Final Readings			
Sample	Temp (°C)	DO (mg/l)	pH	Salinity (o/oo)	Temp (°C)	DO (mg/l)	pH	Salinity (o/oo)
Control	15.6	7.6	8.1	34	15.2	7.8	8.1	34
10 µg/l	15.2	7.7	8.1	34	15.1	7.7	8.1	34
18 µg/l	15.7	7.5	8.1	34	15.0	7.8	8.1	34
32µg/l	15.6	7.6	8.1	34	15.1	7.8	8.1	34
56 µg/l	15.7	7.6	8.1	34	15.6	8.0	8.1	34
100 µg/l	15.4	7.5	8.1	34	15.7	7.9	8.1	34
180 µg/l	15.3	7.7	8.1	34	14.8	7.8	8.1	34

Comments:

Reference toxicant: Copper chloride.

All dilutions made with reference lab seawater.

Illumination (16 hr light / 8 hr dark at 50 ± 10 uE/m²/s) at 5 locations in incubator: (four corners and center): 43, 46, 42, 47, 43 uE/m²/s.

Initial readings: Analyst: _____ Date: 1-13-10 Time: 1400

Final readings: Analyst: _____ Date: 1-15-10 Time: 1500

Aquatic Testing Laboratories

GIANT KELP GERMINATION AND GROWTH SHORT-TERM TOXICITY TEST

QA/QC No.: RT-100113

Start Date:01/13/2010

RANDOMIZATION WORKSHEET

Beaker No.	Sample Conc.	Beaker No.	Sample Conc.	Beaker No.	Sample Conc.	Beaker No.	Sample Conc.	Notes
1	18	11	C	21	100	31	C	Need 7500/ml x 200 ml = 1,500,000 spores. Add 1.0 ml spore stock of 6 spores per 5x5 hemacytometer grid
2	32	12	56	22	C	32	56	
3	10	13	18	23	56	33	32	
4	56	14	180	24	10	34	10	
5	C	15	10	25	100	35	180	
6	180	16	56	26	18	36		
7	100	17	32	27	180	37		
8	10	18	18	28	32	38		
9	32	19	180	29	18	39		
10	100	20	C	30	100	40		

Analyst: [signature] Date: 1-13-10 Time: 1100

Aquatic Testing Laboratories

Test Temperature Chart

Test No: RT-100113

Date Tested: 01/13/10 to 01/15/10

Acceptable Range: 15+/- 1°C

1-13-10
"A"
Bates