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Chemical and Toxicological Characterization of Tidal Freshwater Areas in the James River, Virginia from Jamestown Island to Jordan Point

Chesapeake Bay Program

A Watershed Partnership

Chemical and Toxicological Characterization of Tidal Freshwater Areas in the James River, Virginia from Jamestown Island to Jordan Point

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FOREWORD

This study was designed to characterize the tidal freshwater portion of the James River, Virginia, continuing a long series of studies by various organizations aimed at toxicological and chemical characterization of the Chesapeake Bay and its tributaries, all prepared under the auspices of the EPA Chesapeake Bay Program. It represents the coordinated effort of a team of scientists from the Virginia Institute of Marine Science of the College of William and Mary, the Virginia Department of Environmental Quality, the Division of Consolidated Laboratory Services, Coastal Bioanalysts, Inc., and Old Dominion University. The Chesapeake Bay Program Office of the U.S. EPA provided the basic funding for the project with substantial matching funds coming from the Virginia Department of Environmental Quality.

ABSTRACT

This study consisted of three separate activities. First, there was a substantial effort to characterize the tidal freshwater portion of the James River using chemical, toxicological and benthic community measures. Second, there was a study of the effect of salinity change on measurement of toxicity, questioning the common practice of adjusting salinity of samples before measuring toxicity. Third, the use of *in situ* deployments of animals was used in an attempt to evaluate the effect of stormwater on biota.

The intent was to characterize the river from the limit of saltwater intrusion (approximately Jamestown Island) to the fall line (at Richmond). However, no random stations were identified in the reach upriver from Jordan Point (at Hopewell). At this point, the river narrows dramatically, so the area represented is greatly lessened.

Within the Jamestown Island to Jordan Point reach, ambient conditions were characterized at 20 stations during October 2000. Ambient water was examined for total and dissolved metals and for toxicity to freshwater crustaceans and fish. At the most downstream stations, there was salt water intrusion that required use of estuarine crustacean species. There were no exceedances of Virginia water quality standards for any metal nor was there any measurable toxicity in terms of acute lethal or sublethal effects.

In addition, sediment was examined at 19 stations within the reach. The concentrations of various organic materials (SVOCs, organochlorine and organophosphate pesticides, PCBs, and herbicides) were below the Effects Range Median, though there were some exceedances of the Effects Range Low. Kepone, released into the James River at Hopewell during the early and mid 1970s, was below the detection limit at all except one station about 10 miles downstream of the release site. No toxic effects were observed at any station in a battery of sediment toxicity tests.

A subset of 12 stations was sampled for analysis of the benthic community. Communities at 11 stations had a Benthic Index of Biological Integrity (B-IBI) of 3 or better, indicating that cleanup goals were achieved. At the twelfth station, the B-IBI was 2.7, which indicates marginal degradation. This station was located near the mouth of the Chickahominy.

In summary, there was no evidence of degradation of the water or sediment in this reach of the James River. The area most vulnerable to industrial impacts, located just downstream of Hopewell, a major industrial area, seemed no more impacted by the measures used than the more rural downstream area.

The study of effects of salinity adjustment on toxic responses was determined in a protocol using two known doses of a mixture of metals that were each added to two sediments differing in texture (one sandy and one silty). After an acclimation period, the sediments were subjected to salinity changes of pore water (without physical mixing). Two amphipod species were used for

these tests: *Hyalella azteca* (a freshwater species with substantial salinity tolerance) and *Leptocheirus plumulosus* (an estuarine species tolerant of near fresh water to polyhaline salinities). Metal content had a major effect on amphipod responses, but there was a clear metal x salinity interaction effect as well as a salinity main effect. Effects of changes in ammonia concentration and other possible factors were minimal.

There were three *in situ* tests involving the amphipod *Hyalella azteca* deployed in four sets of twenty at each of the stations. The first test involved four stations in the Richmond area during late September 2000. During this test there were several substantial rainfalls. Rainfall varied substantially over the study area. Nevertheless, no effect of rainfall was observed at any location during the 14-day deployment.

The second test involved four stations in the Hopewell area lasting 28 days during October 2000. No rainfall was observed during this study. A mass mortality at one station was apparently related to an unspecified industrial impact from one of 4 or more operations impinging on the location. A replacement station was established for the second half of this deployment (since the intent was not to detect the effect of industrial activity). No other mass mortalities were observed.

The third test involved the four stations at Hopewell for 14 days during May 2001. Only traces of rainfall were observed during this test. Survival rates were high at all locations. Substantial reduced oxygen concentrations were observed at two stations (both in Bailey Creek) but no impacts were observed on the survival of the amphipods at any station.

ACKNOWLEDGMENTS

As with any project of this complexity, we are indebted to a number of people and organizations for help. If we fail to mention anyone, we apologize in advance.

The project was funded by U.S. Environmental Protection Agency, Chesapeake Bay Office as part of the Toxics Subcommittee effort to accumulate information to permit a characterization of the "health" of various strata in the Chesapeake Bay Watershed. The Virginia Department of Environmental Quality provided substantial matching support allowing significant expansion of the basic project. To both organizations we are most grateful.

Within EPA Chesapeake Bay Program Office, we thank Gary Shenk and Mike Fritz for their efforts as Science Officers for the project. Most especially we thank Kelly Eisenman for her role as liaison with the Toxics Subcommittee under whose auspices this project was carried out. Kelly's timely action on requests for input is greatly appreciated.

Colleagues at VIMS who contributed to the project include Kate Staron who was laboratory/field technician for the *in situ* tests. She was uncomplaining over early departure times in all kinds of weather and a reliable performer of all tasks in laboratory and field. Several individuals served as vessel captains during the *in situ* tests: Sharon Miller and Charles Machen of Vessel Operations, George Vadas of the Department of Environmental Sciences, and Steve Snyder, Robert Gammish, Sam Wilson, and Wayne Reisner of the Department of Physical Sciences. It was a pleasure to work with all these individuals who made strong personal commitments to the success of this portion of the project. The last four are especially commended for their effort that involved transporting two boats, one for use in navigating up Bailey Creek with its many fallen trees to the mouth of Bear Creek. And lastly, Dr. Michael Unger and his staff analyzed sediment samples for Kepone as part of the Chemical Characterization portion of the study.

Technical support for the ambient toxicity tests of water and sediment and the experimental work to evaluate effects of salinity change in sediment pore water on animal responses was provided by Giorgi Briggs, Mike Harrison, Susanna Drumheller and Stephanie Day.

Mark Alling of DEQ provided advice on locations for the *in situ* tests and supported the sampling of water and sediment for the chemical and toxicological characterization. Rick Hoffman, Cindy Johnson, and Gary Du of DEQ helped one or more times with water and sediment collection for the EPA stations. Dr. Don Smith provided the DEQ Station Designations for each sampling point.

Joe Winfield, formerly of AMRL at ODU and now with the DEQ, provided advice on laying out grids for sediment sampling. Joe has on many occasions shared his insights regarding ambient toxicity testing.

The benthic community samples were collected by Bud Rodi of ODU and analyzed by Dr Dan Dauer, also of ODU. Bud and several assistants are to be especially commended for their commitment, hard work and long hours collecting sediment for chemical and toxicological analysis for the DEQ stations.

The Division of Consolidated Laboratory Services performed the chemical samples of water and sediment. We especially appreciate the effort of Ed Shaw and David Clark to reanalyze sediment samples for SVOCs and various pesticides when the first analyses were found unacceptable.

Lastly, we thank Charles McFadden, Librarian at VIMS, for kindly scanning the many pages of bench sheets, chain of custody forms, and statistical analyses for inclusion in the appendices.

TABLE OF CONTENTS

FOREWORD		ii
ABSTRACT		iii
ACKNOWLEDGMENTS		v
TABLE OF CONTENTS		vii
TABLE OF TABLES		xi
TABLE OF FIGURES		xv
1.0	INTRODUCTION	1
1.1	Need for Regional Characterization	1
1.2	Concern about Salinity Adjustments Used in Many Protocols	2
1.3	Application of *in situ* Testing to Evaluate Effects of Rain Events	2
1.4	Objectives	3
2.0	METHODS	4
2.1	Ambient Water and Sediment Characterization	4
2.1.1	Study Areas	4
2.1.2	Navigation and Sampling	4
2.1.3	Ambient Water Column Toxicity Tests	5
2.1.3.1	Design	5
2.1.3.2	Test Organisms	6
2.1.3.3	Sample Preparation and Characterization	6
2.1.3.4	Toxicity Tests	7
2.1.3.5	Data Analysis	7
2.1.3.6	Quality Control	8
2.1.4	Ambient Water Contaminant Analysis	8
2.1.5	Ambient Sediment Toxicity Tests	8
2.1.5.1	Test Organisms	8
2.1.5.2	Sediment Preparation and Characterization	9
2.1.5.3	Toxicity Tests	9
2.1.5.4	Data Analysis	10
2.1.5.5	Quality Control	11
2.1.6	Ambient Sediment Contaminant Measurements	11
2.1.7	Benthic Index of Biological Integrity	12
2.1.7.1	Sample Collection	12
2.1.7.2	Laboratory Processing	13
2.1.7.3	Identification and Enumeration	13
2.1.7.4	Index of Biological Integrity Calculations	13

2.1.8	Characterization of Water and Sediment Quality	13
2.1.8.1	Water Characterization	13
2.1.8.2	Sediment Triad Analysis	14
2.2	Evaluation of Salinity Adjustment for Sediment Toxicity Tests	14
2.2.1	Design	14
2.2.2	Sediment Collection, Characterization and Storage	15
2.2.3	Methods Development	16
2.2.3.1	Sediment Spiking – Preliminary Tests	16
2.2.3.2	Sediment Spiking – Definitive Tests	17
2.2.3.3	Salinity Adjustment – Preliminary Tests	17
2.2.3.4	Salinity Adjustment – Definitive Tests	18
2.2.4	Definitive Toxicity Tests	19
2.2.5	Data Analysis	20
2.2.6	Quality Control	20
2.3	*in situ* Test Methods	21
2.3.1	Site Selection and Description of Upland Areas	21
2.3.1.1	Richmond Reach	21
2.3.1.1.1	Gillie Creek	21
2.3.1.1.2	Almond Creek	22
2.3.1.1.3	Falling Creek	22
2.3.1.1.4	Cornelius Creek	23
2.3.1.2	Hopewell Reach	23
2.3.1.2.1	Bailey Creek	23
2.3.1.2.2	Gravelly Run / Bear Creek	24
2.3.1.2.3	Cabin Creek	25
2.3.1.2.4	Eppes Creek	25
2.3.2	Equipment and Procedures	25
2.3.3	Data Collection	26
2.3.3.1	Biological	26
2.3.3.2	Water Quality	27
2.3.3.3	Rainfall	27
3.0	RESULTS	49
3.1	Characterization of Ambient Water	49
3.1.1	Ambient Water Quality of Sampling Stations	49
3.1.2	Water Column Sample Tests	49
3.1.2.1	Toxicity Data	49
3.1.2.2	Toxicity Test QA/QC	50
3.1.2.3	Water Quality Data during Toxicity Tests	51
3.1.3	Ambient Water Contaminants	51
3.2	Characterization of Ambient Sediment	52
3.2.1	Sediment Texture	52

3.2.2	Sediment Sample Tests	53
3.2.2.1	Toxicity Data	53
3.2.2.1.1	DEQ Stations	53
3.2.2.1.2	EPA Stations	54
3.2.2.2	Reference Chemical Test Results	56
3.2.3	Sediment Contaminants	56
3.2.4	Benthic Community Description	57
3.2.5	Characterization	58
3.2.5.1	Water	58
3.2.5.2	Sediment	58
3.2.5.2.1	Sediment Quality Triad	58
3.3	Salinity Effects Experiment	59
3.3.1	Sediment Texture	59
3.3.2	Toxicity Data	59
3.3.2.1	*Leptocheirus plumulosus*	59
3.3.2.2	*Hyalella azteca*	60
3.3.3	Quality Control, Reference Toxicant Data	60
3.3.4	Sediment Texture and Quality	61
3.3.5	Contaminants Data	61
3.4	*in situ* Tests	63
3.4.1	Richmond Study	63
3.4.1.1	Water Quality and Weather Conditions	63
3.4.1.2	Rainfall Data	63
3.4.1.3	Survival and Weight Data	63
3.4.2	Hopewell Study	64
3.4.2.1	Fall 2000 Deployment	64
3.4.2.1.1	Water Quality and Weather Conditions	64
3.4.2.1.2	Rainfall Data	64
3.4.2.1.3	Survival and Weight Data	64
3.4.2.2	Spring 2001 Deployment	65
3.4.2.2.1	Water Quality and Weather Conditions	65
3.4.2.2.2	Rainfall Data	65
3.4.2.2.3	Survival and Weight Data	65
4.0	DISCUSSION	115
4.1	Ambient Toxicity in Tidal Freshwater James River	115
4.1.1	Ambient Aqueous Toxicity and Water Quality	115
4.1.2	Sediment Quality Triad Evaluation for Region	115
4.2	Effect of Salinity Adjustment on Apparent Toxicity of Sediment	116
4.2.1	Evaluation of Protocols Used	116
4.2.2	Implications of Toxicity Characterization for Sediment	116

4.3 Effect of Rainfall on Water Quality from Tributary Urbanized Creeks 118
4.3.1 Conceptual Comparison of Alternative Test Methods 120
4.3.2 Comparative Utility of Ambient Toxicity Tests Versus *in situ* Tests 120

4.4 Future Research Needs 122
4.4.1 Characterization of the Hopewell to Richmond Reach 122
4.4.2 Alternative Test Species for Toxicity Tests of Water in the Oligohaline Regions 122
4.4.3 Improvement to *in situ* Testing Methods 122

5.0 REFERENCES 124

Appendix A James River Sediment Toxicity Survey. Stations 12.12, 44.08, 46.73, 50.55, 52.52, 56.12, 66.35, 67.56, 68.49, 73.63 and 74.25. 8/22/00 to 8/24/00 Sampling Period. Final report from Coastal Bioanalysts, Inc., Gloucester, VA 23061 A1

Appendix B James River Sediment and Water Column Toxicity Survey. Sediment Stations: JMS040.03, JMS042.46, JMS047.33, JMS065.81, JMS068.68 and JMS074.29. Water Column Stations: JMS040.03, JMS042.46, JMS047.33, JMS065.81, JMS068.68, JMS072.08 and JMS074.29. 10/17/00 to 10/25/00 Sampling Period. Final report from Coastal Bioanalysts, Inc., Gloucester, VA 23061 B1

Appendix C Quality Control/Quality Assurance Data for Chemical Analyses C1

Appendix D Benthic Community Analysis of the Upper and Middle James River in Support of Ambient Toxicity Characterizations. Final report from Department of Biological Sciences, Old Dominion University, Norfolk, Virginia 23529 D1

Appendix E Evaluation of Salinity Adjustment for Sediment Toxicity Tests. Final report from Coastal Bioanalysts, Inc., Gloucester, VA 23061 E1

LIST OF TABLES

2.1 Station locations for water and sediment sampling for ambient toxicity tests. 28

2.2 Control waters used for ambient water toxicity tests. (MHSFW = moderately hard synthetic freshwater, SW = artificial seawater, salinity indicated in g/kg). 29

2.3 Required conditions for 8-day ambient water toxicity test with
a *Pimephales promelas* 30
b *Ceriodaphia dubia* 31
c *Cyprinodon variegatus* 32
d *Mysidopsis bahia.* 33

2.4 Control water characteristics (Mean and (Std. Dev.)) during tests. 34

2.5 Required conditions for 10-day sediment toxicity tests with
a *Pimephales promelas* embryos 35
b *Hyallela azteca.* 36

2.6 Analyte lists for classes of organic chemicals sought in sediment samples 37

2.7 Required conditions for salinity experiment protocol for
a *Leptocheirus plumulosus* 41
b *Hyallela azteca*. 42

2.8 Design for salinity adjustment experiments. 43

2.9 Metals toxicity data for *H. azteca* taken from literature. 43

2.10 Results of range-finding tests. 43

2.11 Spiking regime for definitive experiment (volume per liter sediment). 44

2.12 Station locations for *in situ* tests. 44

3.1 Water quality at each sampling site measured at the time of collection (except as noted). All stations are in the James River except 2-CHK012.12, located in the Chickahominy River. 66

3.2 Ambient water test results with freshwater species. 67

3.3 Ambient water test results with estuarine species. 68

3.4 Reference toxicant test results for freshwater and estuarine species (Reference Toxicant: KCl, Sigma “Ultra”; values in mg/l). 68

3.5 Surface water sample characteristics on arrival at testing laboratory and during test exposure for freshwater and estuarine species (Mean and (Std. Dev.)). 69

3.6 Total metals in ambient water samples collected from 8 stations in the lower tidal freshwater reach from Jamestown Island to Jordan Point. 70

3.7 Dissolved metals in ambient water samples collected from 8 stations in the lower tidal freshwater reach from Jamestown Island to Jordan Point. 71

3.8 Total and dissolved trace elements (in µg/l) in water samples from James River stations. 72

3.9 Nutrient concentrations (mg/l) in ambient water samples from James River stations. 72

3.10 Sediment characteristics at each station from samples collected in August and October 2000. Each river mile station is represented by 3 replicates selected randomly from within a grid centered on the station coordinates. No samples were analyzed from Station 2-JMS072.08 because most attempts to collect a sample failed because of a high sand content. 73

3.11 Survival and final weight of *Hyallela azteca* exposed to sediment from DEQ stations. 75

3.12 Percent hatch, percent post hatch survival and percent total survival for *Pimephales promelas* exposed to sediment from DEQ stations. 76

3.13 Survival and final weight of *Hyallela azteca* exposed to sediment from EPA stations. 77

3.14 Percent hatch, percent post hatch survival and percent total survival for *Pimephales promelas* exposed to sediment from EPA stations. 78

3.15 Reference toxicant test results in aqueous media for species used in sediment toxicity tests (Reference toxicant: KCl, Sigma “Ultra” lot #29H00321; values in mg/l). 78

3.16 Bulk metal concentrations (µg/g) in sediment samples collected from the James River in 2000. 79

3.17 Sediment acid volatile sulfide and simultaneously extracted metals (µmole/g wet weight) for sediments collected from the James River during late summer and fall of 2000. 80

3.18 SVOC concentrations (ng/g) in sediment samples collected from the James River in 2000. 81

3.19 Organophosphate pesticides in sediment samples collected from the James River in 2000. 87

3.20 Organochlorine pesticides in sediment samples collected from the James River in 2000.90

3.21 Polychlorinated biphenyl (PCB) congeners (ng/g, dry weight basis) in sediment samples collected from the James River in 2000. The presence of each congener was confirmed using GC/MS Selective Ion Monitoring. 92

3.22 Herbicide concentrations in sediment samples collected from the James River in 2000. 95

3.23 Descriptive parameters for the benthic community in the lower tidal freshwater James River, August 2000. 97

3.24 Survival, final weight, and number emergent for *Leptocheirus plumulosus* exposed to sediments spiked with heavy metals at 8 or 15 g/kg pore water salinity. 97

3.25 ANOVA for survival, final weight and emergence of *Leptocheirus plumulosus* exposed to metal contaminated sediment after salinity adjustment (p-values in bold significant at 0.05 level). 98

3.26 Survival, final weight, and number emergent for *Hyalella azteca* exposed to sediments spiked with heavy metals at 8 or 15 g/kg pore water salinity. 98

3.27 ANOVA for survival, final weight and emergence of *Hyalella azteca* exposed to metal contaminated sediment after salinity adjustment (p-values in bold significant at 0.05 level). 99

3.28 Reference toxicant test results in aqueous media for species used in sediment toxicity tests (Reference Toxicant: KCl, Sigma “Ultra” Lot #129H00079; values in mg/l). 99

3.29 Sediment texture measured on experimental control (blank). 99

3.30 Sediment quality data. 100

3.31 Measured stock solution composition. 100

3.32 Comparison of spiking concentrations and SEM concentrations for cadmium. 101

3.33 Comparison of spiking concentrations and SEM concentrations for copper. 101

3.34 Comparison of spiking concentrations and SEM concentrations for nickel. 102

3.35 Comparison of spiking concentrations and SEM concentrations for zinc. 102

3.36 Comparison of spiking concentrations, SEM and SEM/AVS for total metals. 103

3.37 Water quality and atmospheric conditions during Richmond deployment, September 2000. 104

3.38 Amphipod survival and size during the *in situ* test at the Richmond stations.
a Gillie Creek 105
b Almond Creek 105
c Falling Creek 105
d Cornelius Creek 105

3.39 Water quality and atmospheric conditions during Hopewell deployment, October 2000.107

3.40 Amphipod survival and size during the *in situ* test at the Hopewell stations, October 2000
a Bailey Creek 109
b Gravelly Run (relocated to Bear Creek) 110
c Cabin Creek 110
d Eppes Creek. 111

3.41 Water quality and atmospheric conditions during Hopewell deployment, May 2001. 112

3.42 Amphipod survival and size during the *in situ* test at the Hopewell stations, May 2001
a Bailey Creek 113
b Bear Creek 113
c Cabin Creek 113
d Eppes Creek. 114

LIST OF FIGURES

2.1 James River from Jamestown Island upstream to Jordan Point (Benjamin Harrison Bridge). DEQ stations are black circles labeled in white on black rectangles. EPA stations are white triangles labeled in black on white rectangles. Areas with >75% sand are shaded. 46

2.1 Field stations for the *in situ* study in the vicinity of Richmond, VA 47

2.3 Field stations for the *in situ* study in the vicinity of Hopewell, VA 48

1.0 INTRODUCTION

1.1 Need for Regional Characterization

For over a decade, the Chesapeake Bay Program, through its Toxics Subcommittee, has supported a series of studies designed to characterize sections of the Bay from both a chemical and toxicological perspective. Beginning with the pilot studies of Hall *et al.* (1991, 1992, 1994 and 1997) and continuing through the ambient toxicity reports of 2000 (Hall *et al.* 1998a, 1998b, 2000a, 2000b, Roberts *et al.* 2000, McGee *et al.* 2001), much of the Bay system has been characterized from the mouth to the tidal limits. In a characterization report for the Chesapeake Bay (U.S. EPA, 1999), some significant areas were identified as lacking sufficient data to be characterized. Included among these areas in Virginia were the tidal freshwater portions of the James River upstream of Jamestown Island, and the Pamunkey and Mattaponi Rivers that form the York River at West Point. McGee et al (2001) occupied some stations in this region, but the amount of data was limited and the area of the tidal freshwater James River covered by the study was very limited. In addition, there were areas identified in Maryland that also remained incompletely characterized.

For many studies of ambient toxicity in the Bay (Hall *et al.*1991, 1992, 1994, 1997, 1998a, 1998b, 2000a, 2000b, Roberts *et al.* 2000, McGee *et al.* 2001) and elsewhere, salinity was adjusted to a fixed level before performing toxicity tests. The intent was to evaluate the toxicity under standardized conditions and with a consistent set of test species to avoid concerns about salinity tolerances and differing sensitivities to toxic chemicals among test species. Even for nearly freshwater systems under these protocols, salinity of both ambient water and sediment samples was adjusted to 15 g/kg, and samples were then tested with the same estuarine species as used for naturally saline stations. For strictly freshwater systems, freshwater species were used for water samples, but saline species were used for freshwater sediments after salinity adjustment (Hall *et al*. 1991).

Studies by other organizations also pertain to the Bay and yield data that can be used for characterization. NOAA has for several years been conducting assessments of the benthos of the Bay. In their studies, three sections of the Bay were subdivided into a series of strata based on sediment particle size, depth distribution, erosional/depositional characteristics and other geochemical factors that play a major role in defining benthic communities. Sediment samples were collected from a series of randomly selected stations within each stratum and analyzed for anthropogenic chemicals. Subsamples were subjected to a battery of toxicity tests. All toxicity tests were performed under a standard set of conditions with standard species. In these studies, the salinity of all sediments was adjusted to 25 g/kg and tested with a high salinity species (*Ampelisca abdita*). Additionally, benthic community analyses were performed on subsamples from each station.

A final major source of information is work by the MAIA program (U.S. EPA, 1997). Like the NOAA characterization, the MAIA effort involves chemical and toxicity characterization of sediment, and benthic community analysis. This program used much the same protocols as those used for the NOAA studies. These protocols have been widely used by these agencies in estuaries across the United States. As in the Chesapeake Bay Program effort, there has been a strong and commendable commitment to using consistent protocols over all studies despite criticisms related to the effects of salinity.

1.2 Concern about Salinity Adjustments Used in Many Protocols

The salinity gradient within estuaries such as Chesapeake Bay ranges from fresh (0 g/kg) to nearly oceanic (>30 g/kg). Depending on estuary morphology and other factors, the salinity of overlying water may change greatly over the course of a tidal cycle but pore water of underlying sediments will exhibit lesser temporal changes in salinity. In a recent review of sediment contamination in estuaries, Chapman and Wang (2001) emphasized the controlling role of salinity and acknowledged that the importance of salinity is often ignored in sediment toxicity testing surveys. The use of standardized test conditions often takes precedence over concerns regarding organism salinity tolerance and effects of salinity adjustment on bioavailability of toxicants. These authors were unable to identify studies in which the effects of salinity adjustment on bioavailability or toxicity had been directly assessed.

The effects of salinity on toxicity test results and interpretation involve issues of bioavailability and species sensitivity at differing salinities. Salinity effects on toxicity of various metals as well as a number of organic chemicals on water column animals are well documented (Sunda, 1978; Coglianese, 1982; Bryant *et al.*, 1984a,b; DeLisle, 1989; De Lisle and Roberts, 1988; Mayer *et al.*, 1989; DeLisle and Roberts, 1993; Breken-Folse *et al.*, 1993). If salinity adjustment produces pH changes in pore water analogous to those reported by Borgman (1994) for increased hardness, there might also be pH-induced changes in concentration of toxic ammonia species resulting in adverse effects. Embedded in any evaluation of the effect of salinity change on sediment toxicity are the effects of sulfide levels that also affect bioavailability of metals (DiToro et al. 1990, 1992). The differences in bioavailability of metals and other chemicals result from speciation effects, differences in bonding, and routes of uptake.

A direct comparison of the toxic effects of salinity adjusted sediment with that of virgin sediment using *Leptocheirus* in the first case and *Hyalella* in the second case were included in this study. Since the native sediment may lack those compounds most likely to be changed in bioavailability and hence adverse effects, a metals mixture was used to spike native sediments differing in grain size and total organic carbon before salinity adjustment.

1.3 Application of *in situ* Testing to Evaluate Effects of Rain Events

Agricultural and sylvan shorelines border much of the James River upstream of Jamestown Island. However, there are two major urban areas, the cities of Richmond and Hopewell. Water column toxicity in both agricultural and urban areas may be closely related to rain events resulting in short term pulses of acute toxicity. Such events can easily be overlooked during ambient toxicity studies using a design that involves a limited number of fixed sampling times.

Costs associated with the logistics of discrete sampling of post-rain event periods or the use of automatic composite sampling devices designed to be triggered by rainfall exceeding some specified amount make such approaches to deal with this problem rather unattractive and cost prohibitive.

In situ tests such as those described by Scott *et al.* (1990) from studies in coastal South Carolina and used by Luckenbach *et al.* (1996; Roberts *et al.*, 2000) on the Eastern Shore of Virginia are an alternative to specialized sampling approaches. These studies involved individually caged adult grass shrimp, *Palaemonetes pugio*, as the test animal. While extremely salinity tolerant, this species is not suited to most locations in the tidal freshwater James River. The related freshwater species of the same genus, *P. kadiakensis* and *P. paludosus*, are not known to be locally collectable in sufficient numbers for *in situ* tests. Other invertebrates that have been used for *in situ* tests include *Chironomus riparius* (midge) (Crane *et al*. 2000), or daphnids such as *Ceriodaphnia dubia* as the test animal (Sasson-Brickson and Burton, 1991). *In situ* tests with *Chironomus* and *Ceriodaphnia* were designed to evaluate effects of contaminated sediment rather than water.

Past experience indicates that the effect of rain events in agricultural areas is rapid (within 24 hours) and brief (typically no further mortality is evident after 48 hours). In an urban setting, effects from rain events can be detected, though the time to and duration of effect are less defined (Geoff Scott, personal communication).

1.4 Objectives

- Characterize ambient water and sediment toxicity in the tidal freshwater portion of the James River from Jamestown Island upstream to Richmond
- Determine the effect of salinity adjustment for sediment samples on measured toxicity
- Measure *in situ* toxicity in mouths of selected urban creeks as a function of rain events
- Characterize ambient toxicity by the sediment triad approach

2.0 METHODS

2.1 Ambient Water and Sediment Characterization

2.1.1 Study Areas

A total of 20 stations (19 in the James River proper and 1 in the Chickahominy River) were identified for this study of the tidal freshwater James River (Table 2.1, Figure 2.1). Eight stations (hereafter called the EPA stations and represented as triangles in Figure 1) were selected from a set of 16 random sites identified by the EPA MAIA Workgroup (Kevin Summers). Versar Corporation selected twelve more random stations (represented as squares in Figure 1) for the benthic-monitoring program of the Chesapeake Bay Program (hereafter called the DEQ Stations). Each station was labeled with a DEQ designation consisting of the river (or water body) abbreviation (e.g. James River is designated JMS) followed by the miles from the mouth of the river to the nearest hundredth. Each station is also identified by a unique latitude longitude (NAD83).

The tidal freshwater region of the James River stretches from Hogg Island and Jamestown Island to Richmond. The station array in this study covered only the portion from Jamestown Island to Jordan Point just east of Hopewell, a 35-mile reach of the river. At Hopewell, the river narrows resulting in a lower area per unit length than east of Hopewell, which presumably explains why no random stations were identified from Hopewell west.

The EPA stations were sampled for chemical and toxicological characterization of water and sediment. The DEQ stations were sampled for chemical, toxicological and benthic community characterization of sediment. Two stations in each random set were in close proximity to stations in the other set (JMS068.49 – JMS068.68 and JMS074.25 – JMS074.29). These near coincident locations provide some opportunity for direct comparison of chemical and toxicological results, although the stations differed in depth and sediment type. Together, the twenty stations provide a reasonably comprehensive snapshot of the river segment from Jamestown Island to Jordan Point.

2.1.2 Navigation and Sampling

To locate stations in the field, hand-held GPS units were used. All water and sediment samples from the EPA stations were collected from a DEQ vessel with DEQ personnel and all sediment and benthic community samples from the DEQ stations were collected from an ODU vessel with ODU personnel. In both cases, the vessel was anchored to hold position while sampling was accomplished.

Composite ambient water samples were collected on October 18, 21 and 24 from all EPA stations. Equal amounts of water from 0.5 m below the surface, 0.5 m above the bottom, and midway between were obtained with a pump, composited in a high-density polyethylene (HDPE)

carboy with spigot, and dispensed into cubitainers for ambient water toxicity tests. In addition, samples for metals analysis were collected using the clean metal technique as implemented by DEQ. At the time of sampling, surface water temperature, conductivity, dissolved oxygen, salinity, and pH were measured with a Hydrolab Datasonde.

All samples were immediately placed in cooler chests with ice. At the debarkation point, custody of all samples for toxicity tests was transferred to a representative from VIMS who then transported them to the testing laboratory. All samples for chemical analysis were transported to Richmond by DEQ staff and delivered to the analytical laboratory. Since samples could not be delivered after hours on the day of collection, they were maintained on ice until the following morning for delivery to the testing laboratories.

Ambient sediment samples were collected on separate dates, with 2 or more stations being sampled on a given day. Sediment samples from the DEQ stations were collected between 22 August and 24 August 2000 by the ODU team who also collected sediment samples at these 12 stations on 1 August and 7 August 2000 for a benthic community analysis. Sediment samples from the EPA stations were collected between 19 October and 25 October 2000 by a DEQ team.

The samples from all 20 stations were collected from randomly chosen points within a 100 by 100 m grid centered on the station coordinate. The upper 2 cm of sediment were retained for toxicological tests. Multiple grabs were made at each point with a Ponar grab until sufficient sediment had been collected. Sediment was then homogenized and distributed among the sample containers. At each station, 3 separate sediment samples were collected for toxicity studies in order to evaluate field variability. Samples for particle size and TOC from each sampling site were stored and analyzed separately. AVS/SEM samples were collected and stored separately, but composited under nitrogen before analysis.

Sediment samples for chemical analysis were stored in accordance with the project QA/QC plan. Sediment samples for the toxicity tests were stored at 4°C until ready to prepare for the test. Samples from both sets of stations were tested for toxicity within the 14-day holding time specified for the project.

An excess of sediment from two EPA stations (2-JMS065.81 and 2-JMS040.03) was collected on 26 and 27 October 2000 for use in the salinity effect experiments (Task 2) and stored at 4°C until ready to perform the experiment. These stations were selected for sampling based on grain size and TOC during a June 2000 reconnaisance trip. The holding time requirement was not adhered to in this case, but all sediments used were of the same age at the time of each preliminary or final test (discussed in detail later).

2.1.3 Ambient Water Column Toxicity Tests

2.1.3.1 Design: Salinity within the study area was expected to be zero within this freshwater stratum of the river, so only freshwater species were initially selected for these tests. *Pimephales promelas* was selected as the fish species and *Ceriodaphnia dubia* as a sensitive invertebrate. Tests with both species were initiated with <24 h old animals. These species, widely used for

toxicity tests of fresh water and known to be sensitive to a variety of contaminants, were selected to avoid concerns about salinity adjustment.

The salinity of samples from stations 2-JMS040.03, 2-JMS042.46, 2-JMS047.33 and 2-JMS047.81 required a modification of the original test design. The modification described below was discussed with and approved by the Toxics Subcommittee. A major principle underlying the design was meeting the requirement that sample salinity not be altered.

The objective of the modified design was to provide both a vertebrate and an invertebrate test species with a salinity tolerance appropriate for each sample. Because the sample salinities at four stations were rather low (1.2 to 4.8) for most standard estuarine test species, but high for freshwater species, it was recognized that salinity stress might interfere with interpretation of toxicity test results. Because *Cyprinodon variegatus* (sheepshead minnow) is tolerant of freshwater whereas the salinity (as NaCl) tolerance of *P. promelas* is limited (7-d NOEC 1-2 g/l NaCl, LOEC 2-4 g/l; U.S. EPA 1991), *C. variegatus* was selected as the vertebrate species for the saline samples. Based on a 144-h TL50 value of 4.9 g/kg salinity for *Mysidopsis bahia* (De Lisle and Roberts, 1986), it was anticipated that the mysid might tolerate the salinities of samples from 2-JMS040.03 and 2-JMS042.46 but not 2-JMS047.33 and 2-JMS047.81. Conversely, the chronic salinity (as NaCl) tolerance data for *C. dubia* (NOEC 1 g/l, LOEC 2 g/l; U.S. EPA 1991) suggested that this species might tolerate the salinity range of samples from 2-JMS047.33 and 2-JMS047.81 but not 2-JMS040.03 and 2-JMS042.46. Based on this information, samples were tested with an appropriate species for the sample salinity. Each species was also tested in a control with a salinity based on the upper or lower salinity of the initial sample (Table 2.2). Individual controls for each sample were not tested for the sake of economy.

2.1.3.2 Test Organisms: Fathead minnows (*Pimephales promelas*, <24 h old) were obtained from Chesapeake Cultures, Hayes, VA and were hand delivered to the testing laboratory. Mysids (*Mysidopsis bahia*, 7 d old), sheepshead minnows (*Cyprinodon variegatus*, <24 h old) and *Ceriodaphnia dubia* (<24 h old) were obtained from in-house cultures of Coastal Bioanalysts, Inc. Fish embryos were obtained by natural spawning of cultured stock. Animals were fed *Artemia* nauplii (mysids and fish) or YCT/*Selenastrum capricornutum* (*C. dubia*) during the holding period prior to tests.

2.1.3.3 Sample Preparation and Characterization: Sample arrival temperature, conductivity or salinity, hardness, alkalinity, pH and ammonia-nitrogen were measured on each new water sample received in the laboratory from 18 to 24 October 2000. In preparation for testing, an aliquot of each sample was filtered (60 µm mesh) to remove any predators or interfering organisms, warmed to test temperature and aerated as necessary to reduce the oxygen concentration to saturation. Since water at 4°C holds more oxygen at saturation than water at the test temperature, newly warmed water is supersaturated with oxygen. Exposure of animals to supersaturated water causes air embolisms in the blood of fish and invertebrates leading to death. Minimal aeration after warming water returns the water to oxygen saturation. There is a risk that volatile toxic chemicals will be removed from water samples in this process. The remainder of the sample was stored at 2-4°C until used in renewal of toxicity tests. Water to be used for media replacement was raised to the test temperature and degassed to remove excess oxygen before exposing animals.

2.1.3.4 Toxicity Tests: Toxicity tests were conducted in accordance with the outlines of the test methods provided in Tables 2.3a-d. Copies of test bench sheets and chain-of-custody / sample collection forms are provided in Appendix A. Water and animals were added to exposure chambers on 18 October 2000. Solutions did not require aeration to maintain adequate oxygen concentrations. A laboratory control water of appropriate salinity was included in each 8-day test.

The age of the test animals at the start of the test was $\leq$24 hr for all species except *M. bahia*. Seven-day-old mysids, rather than neonate animals, were used so that sufficient maturation could occur within the test period to allow measurement of a reproduction end point (i.e. egg production) as well as growth and survival end points to estimate chronic toxicity. These "short-term chronic" methods were developed by EPA in the late 1980s (e.g. Lussier et al., 1987). There is no evidence that starting with younger animals would significantly increase the sensitivity of the test. For these reasons, initiating tests with 7-day old *M. bahia* has become the standard for this species.

P. promelas larval and *C. dubia* tests were conducted as daily renewal tests. This deviation from the protocols provided in Tables 3a and 3b was decided upon because of the need to clean the test chambers with fish larvae to avoid fungal infestations and chambers with daphnids to remove neonates for counting. Tests with *M. bahia* and *C. variegatus* were renewed with each new sample as per the protocols. Each day the number of live fish or offspring (*C. dubia*) was tallied. All test chambers were fed *Artemia* nauplii or YCT/ *Selenastrum capricornutum* at the rate specified. Tests were terminated by counting the final number of surviving animals in each chamber, microscopically evaluating animals for sexual development (mysids) and sacrificing animals for dry weight measurement (fish and mysids) on test day 8. Dry weights were measured after drying animals 24 h at 100°C; weights were measured to the nearest 0.01 mg.

Laboratory control waters consisted of: 1) moderately hard synthetic freshwater (SFW) prepared using ACS reagent-grade chemicals and ASTM Type I deionized water for freshwater controls, 2) SFW plus artificial sea salts (hw Marine Mix) for low salinity control water and 3) artificial sea salts reconstituted in ASTM Type I water for 20 g/kg control water. Water quality parameters for control waters are summarized in Table 2.4.

2.1.3.5 Data Analysis: Test data were analyzed using the Minitab (1995; version 10Xtra) statistical software package. Proportionate data (e.g. survival) were transformed as the arcsine of the square root of the proportion to attain a more normal distribution. Growth data were transformed using the $\log_{10}$ transformation as necessary in order to normalize data. Data were tested for normality and homogeneity of variance using the Ryan-Joiner (similar to Shapiro-Wilk) and Bartlett's tests ($p = 0.01$), respectively, prior to hypothesis testing to determine if the assumptions of the test method were met. The following hypotheses were tested:

H_o (#1): Toxicity of Laboratory Control < Toxicity of Field Sample
H_o (#2): All Stations and Laboratory Replicates have Equal Toxicity

H_o (#1) was tested using Dunnett's test (p = 0.05) where all samples were compared against the primary control water (SFW or 20 g/kg salinity artificial seawater) and, with non-applicable data excluded, against the control water appropriate for the sample set (i.e. 1.2, 1.6 or 4.3 g/kg salinity seawater).

H_o (#2) was tested using one-way ANOVA and Tukey's test (p = 0.05) to identify significant pairs. In the case of station comparisons in which only two groups were assessed (e.g. mysid tests) a two-sample t-test was used. For both hypotheses, non-parametric data sets were tested using the Kruskal-Wallis test.

Endpoints were total proportion surviving (number survivors/number exposed in replicate) for all species, dry weight (pooled replicate dry weight/number survivors in replicate) for fish and mysids, number of offspring produced per female for *Ceriodaphnia* and proportion females with eggs in the marsupium or oviducts for mysids.

2.1.3.6 Quality Control: A reference toxicant test was conducted concurrently with each toxicity test using the same lot of organisms to assess organism sensitivity. Potassium chloride was used as the reference toxicant. Tests were static and 48 h in duration. LC50 values of the concurrent reference toxicant tests were compared with the mean value and 95% confidence limits of reference toxicant tests conducted previously in the testing lab using the same species and exposure duration. The reference toxicant tests were independent of the characterization tests that included a negative control to access animal health and to demonstrate capability of conducting the test (i.e. laboratory dilution water controls).

2.1.4 Ambient Water Contaminant Analysis

Total and dissolved metals were determined on water samples collected from each EPA station. Water samples were collected using a "clean metals" technique. An aliquot of each sample was filtered to 0.45 µm in the field. The remainder of the sample was submitted for total metals analysis. In the laboratory, each filtered sample was acidified and analyzed using ICP-MS. Total metal samples were acidified and digested in the sample bottle.

Samples were analyzed for Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Hg, Ni, Se, Ag, Th, and Zn. Samples with concentrations ranging from 0. 1 to 10.0 ug/l were determined utilizing an ultrasonic nebulizer in conjunction with the ICP-MS. Samples analyzed for As, Se, and Sb were first hydridized. Mercury was measured by cold vapor atomic fluorescence spectroscopy. QA/QC data is provided in Appendix B.

2.1.5 Ambient Sediment Toxicity Tests

2.1.5.1 Test Organisms: Fathead minnows (*Pimephales promelas*) and amphipods (*Hyalella azteca*) were obtained from Chesapeake Cultures, Inc. (Hayes, VA). Both species were hand delivered to the testing laboratory. Fish embryos were obtained by natural spawning of cultured stock. Spawning tiles were collected in the afternoon of 25 October 2000 to insure that fish embryos less than 48-h old were used to initiate tests on 27 October 2000. Amphipods in the 7-

14 day-old age range were collected using stacked 710 µm and 500 µm mesh stainless steel sieves. The animals retained on the 500-µm screen, 2-3 mm in length, correspond to this age class (U.S. EPA, 1994). Amphipods were fed maple leaves, rabbit pellets and YCT *ad libitum* during the holding period prior to use in tests.

2.1.5.2 Sediment Preparation and Characterization: DEQ Station samples (collected in the last week of August) were tested in September, EPA Station samples in October. Laboratory control sediment was collected twice, once in September and again in October. The control sediment was obtained from the freshwater/non-tidal portion of an unnamed tributary of the Severn River (Featherbed Lane (Rt. 614) 0.25 mile east of U.S. Rt. 17, White Marsh, VA 37°20'36.7"N, 76°29'38.8"W). These sediments were analyzed for TOC, grain size, percent water, pore water pH and ammonia nitrogen, and ability to support the test animal (the minimum characterization requirements defined by EPA (EPA, 1999a, sect. 8.4). The quality of the control sediment is performance based (EPA, 1999a, sect. 9.14.2).

For each set of stations, sediment samples were homogenized upon receipt, large debris (e.g. sticks and shell) removed and aliquots of sample were collected for measurement of total organic carbon and grain size distribution (analysis by VIMS), pore water pH and ammonia nitrogen, and percent water (analysis by CBI). An aliquot (ca 250 ml) was also examined for the presence of indigenous organisms that might interfere with the test. This aliquot was wet sieved using stacked 1000, 500 and 250 µm mesh sieves. The remainder of the sediment sample was stored at 2-4°C until used in toxicity tests.

On the day prior to beginning tests (test day –1), sediments were removed from cold storage, warmed to test temperature and homogenized. Sediments from DEQ stations 2-JMS044.08, 2-JMS068.49 and 2-JMS068.64 were press sieved through a 500 µm mesh sieve prior to use to remove indigenous *Cyathura polita*, a potential predator of amphipods found during the sieving process described above. Similarly, sediments from EPA stations 2-JMS065.81 and 2-JMS068.68 were press sieved to remove indigenous *Cyathura polita.* Approximately 200 ml of sediment was placed into each 1-l glass test chamber. The sediment surface was then smoothed by gently tapping the chamber prior to addition of approximately 750 ml of dilution water.

2.1.5.3 Toxicity Tests: Toxicity tests were conducted as summarized in Tables 2.5a-b. After adding sediment and water to test chambers, aeration was initiated in each chamber at a rate of *ca.*100 bubbles/min using Pasteur pipets with tips positioned at approximately mid-depth in the water column. Aeration was necessary because sediment removes oxygen from the overlying water, creating conditions unsuitable for the test animals. It is generally desirable in toxicity tests to maintain oxygen levels above 40% of saturation to minimize stress. In sediment tests, strict adherence to providing this level of oxygen saturation cannot be achieved without risking the rejection of an otherwise acceptable test. Increased aeration rates would increase the likelihood that volatile toxic materials would be removed. The 40% of saturation specification was selected as a reasonable balance between the risk for rejecting a test inappropriately and stressing the animals by oxygen depression.

All tests were started by the random addition of test organisms to exposure chambers. The fish test is started with embryos in conformity with the original test design of Hall et al. (1991, 1992,

1994; Hall and Alden, 1997. Embryos up to 48 hr post fertilization are used to allow time for shipment from a hatchery and to allow an assessment of percent fertilization based on visual evidence of a developing embryo. The *Hyalella* test was initiated with 7-14 day old animals as stipulated in ASTM (1999, Designation E1706). Use of 7-14 day old animals allows pretest evaluation of survival. The range in initial ages allowed reflects uncertainties about neonate age based on the method used to obtain neonates and the method used to isolate test animals after a 7 day culture period.

Fathead minnow embryo tests were conducted with daily renewal of overlying water. Embryos were exposed in egg baskets consisting of 3" diameter PVC pipe with 200 µm Nitex solvent-welded to one end to allow contact with sediments. The embryo baskets were gently placed, screen side down, on the sediment surface. Each day, until all eggs had hatched and prior to 50% renewal of the overlying water, the baskets were removed from the exposure chamber and placed in a dish of clean dilution water to observe egg viability and to rinse eggs of any debris. The baskets were returned to the test chambers immediately after solution renewal. After all eggs had hatched and daily cleaning of eggs was no longer necessary, baskets were left in the chambers during renewal of the test solution. The old test media was siphoned from outside the baskets to avoid loss of fish. Each day the number of viable eggs and fish were tallied. Fish in all test chambers were fed *Artemia* nauplii at a rate of 0.1 g/chamber on test days 1-6 and a rate of 0.15 g/chamber on test days 7-9. On day 10, the final number of surviving fish in each chamber was determined.

Amphipod tests were conducted as static tests. Amphipods were impartially distributed to portion cups containing *ca*. 20 ml of dilution water until each cup contained twenty animals. To start the test, amphipods in one cup were poured into each test chamber. Initial amphipod weights were obtained for three groups of twenty animals each selected from the beginning, middle and end of the portion cup array. Amphipods were fed 0.5 ml 0.5 ml YCT/chamber/day in the August tests. This ration was increased to 0.75 ml YCT/chamber/day for the October tests to provide for greater growth of organisms during the test. Each day the number of emergent or dead amphipods on the sediment surface were noted. The test was terminated by wet sieving the entire contents of each chamber using a 410-µm mesh sieve. Live amphipods were counted and transferred to plastic portion cups containing a small amount of dilution water. Animals were sacrificed by the addition of several drops of 6 N HCl to each cup and immediately transferred to pre-weighed aluminum foil pans (6-8 mg). After drying for 24 h at 100°C, dry weights were measured to the nearest 0.01 mg.

Laboratory control water consisted of moderately hard synthetic freshwater prepared using ACS reagent-grade chemicals and ASTM Type I deionized water. Ranges of water quality parameters for batches of water used for setup and renewals were: Hardness: 92-100 mg/l as $CaCO_3$, Alkalinity: 57-58 mg/l as $CaCO_3$, Conductivity: 274-285 µMHOS, pH: 7.92-8.12 S.U.

2.1.5.4 Data Analysis: Test data were analyzed using the Minitab (1995; version 10Xtra) statistical software package. Proportionate data (e.g. survival) were transformed as the arcsine of the square root of the proportion to attain a more normal distribution. Amphipod growth data, which did not exhibit a normal distribution in the untransformed state, were transformed using the base 10 logarithm. Amphipod data were analyzed both with and without values for

treatments in which survival was likely affected by the presence of indigenous predators (2-JMS040.031-replicate 1, 2-JMS042.461-replicates 1 & 2, 2-JMS042.462-replicates 1 & 2).

Data were tested for normality and homogeneity of variance using the Ryan-Joiner (similar to Shapiro-Wilk) and Bartlett's tests ($p = 0.01$), respectively, prior to hypothesis testing to determine if the assumptions of the test method were met. The following hypotheses were tested:

H_o (#1): Toxicity of Laboratory Control < Toxicity of Field Sample
H_o (#2): All Stations and Laboratory Replicates have Equal Toxicity

H_o (#1) was tested using Dunnett's test ($p = 0.05$) in which all samples were compared against the laboratory control sediment (in the case of non-parametric data, the Kruskal-Wallis rank test was used). H_o (#2) was tested using a nested one-way ANOVA (field replicates within stations) and Tukey's test to identify significant pairs in cases where ANOVA indicated significance ($p < 0.05$) at the station level. Parametric data sets with unbalanced designs resulting from the exclusion of treatments because of the presence of indigenous predators, which preclude a nested ANOVA, were tested using a simple one-way ANOVA and Tukey's test. Non-parametric data sets were tested using the Kruskal-Wallis test. Printouts of statistics are included in Appendices A and B

Endpoints were total proportion surviving (number survivors/number exposed in replicate) for both species, dry weight (pooled replicate dry weight/number survivors in replicate) and total number observed emergent animals (a measure of sediment avoidance) for amphipods, and proportion hatching (cumulative number hatched/initial number exposed in replicate) and hatched (post hatch) proportion surviving (number survivors/number eggs hatched in replicate) for fish. Proportion hatching was examined on test days 2 through 6. While no eggs hatched on test day 1, by test day 6 hatching was complete.

2.1.5.5 Quality Control: A reference toxicant test was conducted concurrently with each sediment toxicity test using the same lot of organisms. Potassium chloride was used as the reference toxicant. Reference tests were static aqueous exposures lasting 48 h (*P. promelas*) or 96 h (*H. azteca*). LC50 values for the concurrent reference toxicant tests were compared with the mean value and 95% confidence limits of reference toxicant tests conducted previously in the CBI lab using the same species and exposure duration.

2.1.6 Ambient Sediment Contaminant Measurements

Sediment samples were oven dried, weighed, and digested in nitric and hydrochloric acids by microwave technology. After cooling, the samples were brought up to 50 ml volume, mixed and allowed to settle overnight prior to analysis. From the digested sample, metals are analyzed by ICPMS. The following elements are analyzed by this method: Al, Sb, As, Be, Cd, Cr, Cu, Co, Fe, Pb, Mn, Hg, Ni, Se, Ag, Th, and Zn. In addition, acid volatile sulfides and simultaneously extractable metals (AVS/SEM) were determined on sediment samples using the methods of Leonard et al. (1996).

Various organic chemicals in sediments were determined including semi volatile organic compounds (SVOC), organophosphate pesticides, organochlorine pesticides, polychlorinated biphenyls (PCB as congeners), and herbicides (Table 2.6). For SVOCs, sediment samples were ground with anhydrous sodium sulfate and Soxhlet extracted with methylene chloride for 18 to 24 hours. The extracts were concentrated and the sulfur content reduced using high performance GPC on porous styrene-divinylbenzene copolymer gel. The extracts were then concentrated and fractionated on a semipreparative aminosilane HPLC using step gradients; this resulted in three fractions containing broad compound classes ranging from aliphatic to polar. The fractionated extracts were then analyzed by capillary gas chromatography / mass spectrometry.

Organic compounds were isolated for analysis by mixing sediment samples with a drying agent and Soxhlet extraction. The extracts were subjected to gel permeation chromatography to remove extraneous materials. The extracts were then concentrated to volume and analyzed by gas chromatography. A flame photometric detector (FPD) operating in the phosphorous mode was used to identify and quantitate organophosphates. A halogen specific detector (XSD) was used to measure organochlorine pesticides and polychlorinated biphenyls (PCB). Portions of the extracts were subjected to water/ methylene chloride partitioning to remove residual acid and water-soluble interferences. The extracts are then methylated, concentrated to volume, and analyzed by gas chromatography utilizing a halogen specific detector (XSD) to identify and quantitate herbicides. The laboratory methods used to measure organic compounds were based on the guidelines in SW846 (US EPA).

For Kepone analyses, dried sediment samples were extracted using Soxhlet apparatus. The extracts were cleaned up with Florisil chromatography prior to gas chromatographic analysis. This method is based on Moseman et al. (1997).

QA/QC data for all sediment contaminant analyses are provided in Appendix C.

2.1.7 Benthic Index of Biological Integrity

2.1.7.1 Sample Collection

Sediment samples for the benthic index of biological integrity (B-IBI) were collected on 1 August and 7 August, 2-3 weeks in advance of the sediment collections for chemical and toxicological characterization. The sediment samples for B-IBI were collected with a Young grab from the grid center for benthic community analysis. Bottom temperature, salinity, and dissolved oxygen were measured at the time of sampling.

Benthic samples were transferred to a 0.5 mm sieve bucket. The bottom of the sieve bucket was immersed in a 30-gallon trashcan filled with ambient water, and shaken and swirled to suspend the larger material, allowing fine sands, silts and clays to pass through the sieve screen. The residual material on the sieve screen was washed into labeled cloth bags. After sieving, any organisms found on the sieve were removed with dissecting forceps and placed into the appropriate cloth bag. Dilute isopropyl alcohol was added to relax the animals before fixation in a 10% buffered ambient water-formalin solution (with 1% Rose Bengal stain).

2.1.7.2 Laboratory Processing

Each sample bag was placed on a 0.5 mm screen and rinsed with fresh water to remove the formalin. The bag was then emptied onto the sieve and rinsed to remove any remaining fine material. The formalin-free residue was then emptied into a white enamel pan.

Sandy sediments were placed into white enamel pans and washed with a stream of water to remove and concentrate small organisms from the sediment and captured on a 0.5 mm screen. This process was continued for approximately five minutes, after which both elutriate and coarse fractions were examined. Usually only large bivalves and gastropods remain in the coarse fraction. For silty sediments, sediment washing was not required.

All macrobenthic specimens including broken parts were removed and placed into pre-labeled vials containing 70% isopropyl alcohol. Binocular dissecting microscopes were used in this sorting process.

2.1.7.3 Identification and Enumeration

All specimens were identified to the lowest practical taxonomic level. Juvenile specimens are often difficult to identify to the specific level because they have not developed all of the characteristics used to identify adults. This was most often a problem with bivalves and oligochaetes (for which reproductive organs are the primary specific characters). In tidal freshwater areas, insect larvae (e.g. Chironomidae) are often poorly known and therefore identification is to the generic level.

Parts of individuals are identified, when possible, which allowed inclusion in subsamples for biomass analysis. Broken tail ends of annelids and dropped appendages of crustaceans can often be identified as belonging to a dominant species. All species counts were recorded separately for each sample.

2.1.7.4 Index of Biological Integrity Calculations

For each station, the Index of Biological Integrity (Weisberg et al. 1997) was calculated. To characterize the section of the river as a whole, the mean and variance of the B-IBIs were estimated and the confidence intervals for estimates of percent area exceeding the Benthic Restoration Goals were derived from the binomial distribution using the formula of Hollander and Wolfe (1973).

2.1.8 Characterization of Water and Sediment Quality

2.1.8.1 Water Characterization

The metals data were examined for exceedances of Water Quality Criteria. The toxicity data were examined to determine whether there exist correlations between mortality, growth, or reproductive endpoints and observed exceedances. It is recognized that such correlations do not

reflect cause and effect relationships, and that further study targeted at identifying specific causes of toxicity at stations that have been identified as impaired would be required.

Based on exceedances of water quality criteria and the occurrence of adverse effects at any stations, a determination was made of the character of ambient water at stations within the stratum of the river under study, namely the reach from Jamestown Island to the Benjamin Harrison Bridge at Jordan Point just downstream of Hopewell, VA.

2.1.8.2 Sediment Triad Analysis

For the twelve stations at which chemical, toxicological, and benthic community characterizations were done, each parameter was examined independently. Chemical results for each analyte were compared to the ER-M if one existed (Long et al. 1998) and any exceedances were noted. As a further estimate of potential biological effect based on chemical characterization, the concentration for each analyte for which there exists an ER-M was divided by the ER-M, and the mean ER-M-quotient (MERM-Q) was calculated (McGee et al. 1999).

The toxicological data were examined for values significantly different from the reference data for each endpoint used for each species. The stations at which toxicity was determined by lethality or sublethal endpoints were identified and compared to those stations identified as likely to exhibit toxicity based on MERM.

Lastly, the B-IBI values were examined to identify those stations at which the benthic community was degraded and these were compared to the MERM and toxicity data. Concurrence of these three measures is circumstantial evidence of a toxicity related effect, but neither identifies a particular toxicant responsible for the response nor rules out the possibility that the effects result from stressors other than toxic substances.

2.2 Evaluation of Salinity Adjustment for Sediment Toxicity Tests

2.2.1 Design

The purpose of this portion of the study was to examine the effects of salinity adjustment on the toxicity of metals-contaminated sediments. To examine the effect of salinity adjustment on metals-contaminated sediment, a saline-tolerant freshwater species and a reduced-salinity tolerant estuarine species were used as test organisms. Differences in toxicity observed by exposing these two species to salinity-adjusted sediments with known contaminants reflect effects of salinity on bioavailability of metals in the sediments independent of osmotic/ionic stress on the test organisms.

The estuarine species used was *Leptocheirus plumulosus* and the freshwater species was *Hyalella azteca*. *L. plumulosus* inhabits oligohaline, mesohaline and polyhaline portions of Chesapeake Bay (Feeley and Wass, 1971; Jordan and Sutton, 1984). Laboratory tests with *L. plumulosus* have demonstrated no significant differences in survival following 10-d static exposures to salinities ranging from 1.5 to 32 g/kg (Schlekat *et al.* 1992). In addition, *L. plumulosus* tolerates a wide variety of sediments from >90% silt-clay to >95% sand-gravel (Pinkney *et al.* 1991;

Schlekat *et al.* 1992). Similarly, the freshwater test organism selected, *Hyalella azteca,* is relatively tolerant of brackish water and a wide range of grain sizes; *H. azteca* has been used successfully at salinities as high as 15 g/kg (Nebeker and Miller, 1988; U.S. EPA, 2000). Details of the animal procedures are provided in Table 7a-b.

Two sediments were used to characterize the effects of salinity adjustment over the range of sediment types frequently encountered in ambient testing: sandy sediment low in total organic carbon (TOC) and relatively fine sediment high in TOC. To insure that toxic effects were registered, and to better understand potential mechanisms, natural sediments known to be non-toxic were spiked in the laboratory with a mixture of metals. Two concentrations with equitoxic unit proportions of nickel, cadmium, zinc, copper and selenium were added to the sediments one week prior to salinity adjustment and the start of 10-d toxicity tests. Equivalent toxic units (TU = metal concentration/LC50) were determined based on data available in the literature for *H. azteca*. Although lead was initially chosen to be one of the five metals, it was excluded because of the high LC50 for this metal (i.e. > 5400 ug/l; Schubauer-Berigan *et al.*, 1993) and selenium was used instead. Toxic units were benchmarked against *H. azteca* rather than *L. plumulosus* because of the greater amount of toxicity data available. Since reference toxicant tests with cadmium indicate similar sensitivities for the two amphipods (Schlekat *et al.* 1992), the chosen benchmark is reasonable. The basic experimental design is described in Table 2.8.

Because sediment characteristics such as particle size, TOC, sulfides, etc. may greatly affect metal toxicity, it is not possible to predict with certainty, based on literature information, spiking levels that will elicit an appropriate response. Ideally “partial kills” (e.g. 20 to 80% mortality) are desired to better measure degree of response, especially in factorial designs where adding test concentrations results in geometric increases in the number of treatments to be tested. Preliminary studies were therefore conducted to establish suitable spiking levels and salinity adjustment procedures.

2.2.2 Sediment Collection, Characterization and Storage

Sediments for the salinity adjustment study were collected immediately after samples for ambient sediment toxicity tests (26 and 27 October 2000). Sediments from 2-JMS065.81 and 2-JMS040.03 were selected to provide a high organic carbon, fine grain sediment and a low organic carbon, sandy sediment respectively. Sediment grain size and total organic carbon content were confirmed by analysis of aliquots from homogenized sediment prior to testing.

Separate freshwater and estuarine laboratory control sediments were used for *H. azteca* and *L. plumulosus* respectively. These sediments were not part of the experimental design *per se* (i.e. un-spiked sediments from the two stations served as the experimental controls) but were incorporated to evaluate the health of the test organisms. Both sediments have been used in previous studies and are known to support survival and growth of the test species; the estuarine sediment is also routinely used for laboratory culture of *L. plumulosus*. Freshwater laboratory control sediment was collected from the freshwater/non-tidal portion of an unnamed tributary of the Severn River-Chesapeake Bay (off Featherbed Lane (Rt. 614), 0.25 mile east of U.S. Rt. 17, White Marsh, VA, 37°20’36.7”N, 76°29’38.8”W). Estuarine laboratory control sediment was

collected from Oldhouse Creek (37°21’23.9”N, 76°26’52.1”), a tributary of Ware River-Chesapeake Bay.

Sediments were stored in the dark at 2-4° C. Prior to use, all sediments were homogenized, picked free of large debris (e.g. sticks and shell) and pressed through a 500 µm mesh sieve to remove indigenous *Cyathura polita* (observed in other samples from these stations) and other potential predators of amphipods. Because of anticipated changes during storage and spiking/salinity adjustments, pore water pH, salinity and ammonia nitrogen were measured on the day of test initiation; percent total solids was measured immediately prior to spiking to determine the volume of stock solution to add to achieve the desired TU metals in the pore water.

2.2.3 Methods Development

2.2.3.1 Sediment Spiking – Preliminary Tests

The objective of preliminary range-finding tests was to determine two test concentrations for use in the definitive study: one that would provide low mortality (e.g. 30%) to gauge increased bioavailability resulting from salinity adjustment and one that would produce high mortality (e.g. 80%) to gauge decreased bioavailability. Sediment from 2-JMS065.81 was used for preliminary tests. The TOC and grain-size characteristics of this sediment were predicted to result in less bioavailability of metals compared to station 2-JMS040.03 sediment. Preliminary range-finding toxicity tests were performed using reduced replication, animal number and sediment/water volume to conserve resources. However, all factors were scaled down proportionately so that sediment:water volumes and surface areas, animal loading and feeding would be similar to that of the definitive test method

Toxicity data were selected from the literature to determine equivalent toxic units. Data for water-only exposures of *H. azteca* were examined and selected on the basis of exposure conditions comparable to that of sediment pore water conditions (i.e. for sediment 2-JMS065.81 hardness 396 mg/l as $CaCO_3$, pH 7.1). Based on the data obtained from the literature (Table 2.9), a 1000 TU mixture of the five metals (i.e. 200 TU of each metal) was prepared using ASTM Type I deionized water and ACS reagent grade salts of the metals. Metal salts used were $ZnCl_2$, Na_2SeO_3, Na_2SeO_4, $CuSO_4$, $CdCl_2$ and $NiCl_2 \cdot 6H2O$. Selenate and selenite were added on an equimolar basis, the presumed basis of the mixture used by Halter and coworkers (1980). The stock was acidified to pH ~2 with trace-metal grade HNO_3 to minimize losses due to sorption or precipitation.

Sediments were spiked using volumes from 138 µl to 11.98 ml stock per 200 ml of sediment to yield doses 1, 10, 20, 40 and 80 TU. These stock additions resulted in corresponding increases in pore water volume of 0.1% to 8.7%. Sediments were stirred daily with a plastic spoon and stored in the dark at 2-4° C until used in tests.

The preliminary toxicity test was started a week after sediment spiking using two replicates per concentration each consisting of 100 ml of sediment, 400 ml of water and 10 amphipods. Dissolved oxygen and pH range were recorded at the beginning and end of the test. Each day chambers were checked for emergent and dead amphipods and fed (YCT, 375 µl/beaker). Tests

were ended on day 10 by wet sieving sediments (410 µm mesh) and counting the number of live amphipods.

Based on the results of the first preliminary experiment, which exhibited only 25% mortality at even the highest dose (Table 2.10), a second range-finding test was applied to better identify appropriate doses. A new stock solution consisting of 4000 TU (i.e. 800 TU/metal) was prepared to spike sediments at higher concentrations without increasing pore water amounts. Sediments were spiked to provide test concentrations of 40, 80, 160 and 320 TU. Stock additions ranged from 695 µl to 6 ml per 100 ml of sediment resulting in pore water volume increases of 1.0% to 8.7%. Toxicity tests were started using two replicates of 50 ml sediment, 200 ml water and 7 amphipods in 300 ml tall-form beakers. Each day test chambers were checked for dead amphipods and fed at a rate of 250 µl YCT/beaker/d.

Data from the second range-finding test (Table 2.10) were used to determine doses for the definitive toxicity tests. Proportion mortality was regressed on $\log_{10}$ TU to provide the predictive equation:

$$Y = -1.9916 + 1.12342X \qquad r^2 = 0.844$$

where Y is proportion dead
X is $\log_{10}$ TU

Data for 40 TU, which were essentially identical to those for 80 TU, were not used in the regression to provide the best linear fit of the data in the region of response. Solving for Y = 0.8 (80% mortality) and 0.3 (30% mortality) yields doses of 305 TU and 110 TU respectively.

2.2.3.2 Sediment Spiking – Definitive Tests

Based on pore water compositions of 64.8% for sediment 2-JMS065.81) and 55.1% for sediment 2-JMS040.03, sediments were spiked with 4000 TU stock solution or deionized water (controls) as described in Table 2.10. Stock solution metals concentrations were confirmed (by Universal Laboratories, Hampton, VA) by flame or (for Se) graphite furnace atomic absorption spectrometry. These doses for both sediments resulted in a 2.8% increase in pore water volume for the low dose and an 8.3% increase in pore water volume for the high dose and control. Sediments were spiked using calibrated 10 ml and 1 ml adjustable pipets. After spiking, sediments were stored in the dark at 2-4°C and stirred daily with a nylon spatula. Sediment-metal mixtures were allowed to equilibrate for one week before adjusting salinity and using in toxicity tests.

2.2.3.3 Salinity Adjustment – Preliminary Tests

Salinity adjustment procedures were evaluated to accomplish two objectives. First, sediment collected from station 2-JMS040.03 was found to have a pore water salinity of 5-6 g/kg. This pore water salinity needed to be adjusted to < 0.5 g/kg prior to spiking with metals. Second, a method providing consistent, predictable adjustment of pore water salinity, with minimal

addition of water to sediments, was needed for the experiment examining the effect of salinity adjustment on toxicity.

Lowering of pore water salinity for station 2-JMS040.03 sediment was accomplished by placing 2 liter of sediment in an 11-liter plastic bin (26 cm x 40 cm) and carefully overlaying 8 liter of moderately-hard standard synthetic freshwater. In a preliminary test the water was renewed after 7 d when the conductivity of the overlying water reached 1709 µS/cm (initial conductivity was 288 µS/cm); after another 10 d the overlying water (conductivity 885 µS/cm) was decanted off, the sediment was homogenized and the pore water salinity measured. Because the pore water salinity (1 g/kg) was still above the target value of < 0.5 g/kg this method was modified slightly to adjust sediment salinity prior to use in the definitive tests. Sediment was placed in several bins with overlying synthetic freshwater as in the preliminary test but water changes were performed more frequently to maximize the osmotic gradient between the overlying water and sediment pore water. Three water changes over a 14-d period resulted in final conductivity values of 379-454 µS/cm in the overlying water and 860 µS/cm (i.e. < 0.5 g/kg salinity) in pore water from the homogenized composite sediment in the bins. As a result of this adjustment the pore water salinities of the two sediments prior to spiking with metals were similar (860 µS/cm for 2-JMS040.03 and 780 µS/cm for 2-JMS065.81).

A preliminary test of the method used to adjust pore water salinity upward for metal-spiked sediments consisted of adding brine to a volume of sediment, mixing, placing in a beaker with overlying water of corresponding salinity and measuring pore water and overlying water salinity the following day. Brine solutions were prepared using hw Marinemix sea salts (Hawaiian Marine Imports, Houston, TX) and ASTM Type I deionized water. Two brine solutions were prepared so that the same volume would be added for each desired salinity: a 100-g/kg solution for adjustment to 8 g/kg and 200 g/kg for adjustment to 15 g/kg. Because the 200-g/kg brine exceeded the solubility of the sea salts, a slurry was prepared by applying a conversion factor to account for hydration of the sea salts. The conversion factor (0.85) was obtained from the measured volume of water and mass of salts necessary to prepare the 100-g/kg brine. The 200 g/kg slurry was thus prepared by adding 235 g/l salt and was kept in suspension during use by a magnetic stir bar and stirrer. Aliquots of sediment from station 2-JMS040.03 (adjusted to < 0.5 g/kg salinity; see above) received 10.5 ml of brine/200 ml of sediment. Both pore water and overlying water salinity were found to be at target values after 24 h of equilibration, indicating the procedure was successful.

2.2.3.4 Salinity Adjustment – Definitive Tests

Salinity adjustment for definitive toxicity tests was performed by adding 52.4 ml of deionized water, 100 g/kg brine or 200 g/kg brine per liter of sediment for station 2-JMS065.81 and 44.7 ml of deionized water or brine per liter of sediment for 2-JMS040.03. These additions resulted in an 8.1% increase in pore water for all treatments. All sediments had been spiked with metals or deionized water a week earlier. Prior to both spiking and brine addition, sediment from station 2-JMS040.03 was adjusted to a pore water salinity of <0.5 g/kg (i.e. 860 µS/cm) as described above. After addition of brine or deionized water, samples were stirred with a nylon spatula prior to addition of sediments to test chambers.

2.2.4 Definitive Toxicity Tests

The metal spiking regime is outlined in Table 2.11. Sediment and water were added to exposure chambers on day -1. All tests were started by the addition of 20 randomly selected test organisms to each exposure chamber on day 0.

Juvenile amphipods were collected using stacked stainless steel sieves to obtain animals in the 3-5 mm length range (*L. plumulosus*) or 2-3 mm length range (*H. azteca*). Amphipods were fed maple leaves, rabbit pellets and YCT ad *libitum (H. azteca)* or Tetramin slurry (*L. plumulosus)* during the holding period preceding the tests. Amphipods were divided into two (*L. plumulosus*) or three (*H. azteca*) groups 3 d prior to the tests and acclimated to test salinities in a step-wise fashion. The maximum change in salinity was 3-4 g/kg per 12 h period and test organisms were held at the test salinity for at least 24 h prior to the tests. Initial salinity changes were performed in the culture facility (Chesapeake Cultures, Inc., Hayes, VA). No significant mortality was observed in cultures during the period of salinity acclimation prior to testing.

Amphipod tests were conducted as static tests. Amphipods were impartially distributed to portion cups containing ca. 20 ml of dilution water until each cup contained twenty animals. To initiate the test, the contents of one randomly chosen cup was poured into each test chamber containing approximately 200 ml of sediment and 750 ml of water. Initial amphipod weights were obtained for three groups of twenty animals each selected from the beginning, middle and end of the portion cup array. Aeration was provided to each chamber throughout the test at a rate of about 100 bubbles/min using Pasteur pipets with tips positioned at approximately mid-depth in the water column. Amphipods were fed 0.75 ml YCT/chamber/d. Each day the number of emergent or dead amphipods on the sediment surface was noted. The test was terminated by wet sieving the entire contents of each chamber using a 410-µm mesh sieve. Live amphipods were counted and transferred to plastic portion cups containing a small amount of dilution water. Animals were sacrificed by the addition of several drops of 6 N HCl to each cup and were immediately transferred to pre-weighed aluminum foil pans (6-8 mg). After drying for 24 h at 100°C, dry weights were measured to the nearest 0.01 mg.

Laboratory control water consisted of moderately hard synthetic freshwater prepared using ACS reagent-grade chemicals and ASTM Type I deionized water or artificial seawater prepared with hw Marinemix sea salts (Hawaiian Marine Imports, Houston, TX) and ASTM Type I deionized water. For saline test treatments, water column pH, salinity, dissolved oxygen and temperature were measured daily and ammonia-nitrogen was measured at the beginning and end of the test. pH, conductivity, dissolved oxygen and temperature were measured daily for non-saline treatments; hardness, alkalinity and ammonia-nitrogen were measured at the beginning and end of the test.

Dissolved oxygen was measured using a YSI Model 51B meter (Yellow Springs Instrument Co., Yellow Springs, OH) calibrated against air. pH was measured using a CP DigiSense pH meter (Cole Parmer, Chicago, IL) calibrated with NIST-traceable pH 7.00 and 10.00 buffers. Salinity measurements were performed using an AquaFauna Model ABMTC temperature compensated refractometer (AquaFauna BioMarine, Hawthorne, CA) calibrated with deionized water. Conductivity was measured with a Horiba Model ES-12 conductivity meter with a platinum

electrode (Horiba, Ltd., Kyoto, Japan) calibrated with NIST-traceable conductivity standards. Hardness and alkalinity were measured by EDTA and H_2SO_4 titration respectively. Ammonia nitrogen was measured using a Fisher Accumet ion-selective electrode (Fisher Scientific, Suwannee, GA) and a Beckman Model 390 pH/ISE meter (Beckman Coulter, Inc., Fullerton, CA).

Sediment samples for SEM/AVS analysis were collected at the same time sediments were added to test chambers. Two 30-ml aliquots of homogenized sediment were placed into plastic scintillation vials and stored at 4°C until delivery to DEQ/Richmond. Samples were placed in the vials and gently tapped to remove all bubbles, topped off and capped to minimize headspace during storage. The Division of Consolidated Laboratory Services (Richmond, VA) performed the SEM/AVS analyses.

2.2.5 Data Analysis

Test data were analyzed using the Minitab (1995; version 10Xtra) statistical software package. Endpoints were total proportion surviving (number survivors/number exposed in replicate), dry weight (pooled replicate dry weight/number survivors in replicate) and total number observed emergent animals (a measure of sediment avoidance). Proportionate data (e.g. survival) were transformed as the arcsine of the square root of the proportion to attain a more normal distribution. Amphipod growth or emergence data, which did not exhibit a normal distribution in the untransformed state, were transformed using the base 10 logarithm or square root transformation respectively.

Data were tested for normality and homogeneity of variance using the Ryan-Joiner (similar to Shapiro-Wilk) and Levene's tests ($p = 0.01$), respectively, prior to hypothesis testing to determine if the assumptions of the test method were met. Levene's test was used because it is more robust than Bartlett's test in the case of small sample sizes. Differences between 0 TU test sediments ("blanks" in printouts) and laboratory control sediments were tested using ANOVA/Dunnett's test or, in the case of non-parametric data, tested using the Kruskal-Wallis rank test ($p = 0.05$). Interactive effects of sediment and salinity were examined using a balanced 3-way ANOVA. In the case of weight data for *L plumulosus*, where empty cells (due to 100% mortality) precluded use of a balanced ANOVA, a regression-based approach, using the ANOVA general linear model, was used to examine interactive effects.

2.2.6 Quality Control

A reference toxicant test was conducted concurrently with each sediment toxicity test using the same lot of organisms. Potassium chloride (Sigma "Ultra" grade, Sigma Chemical Co., St. Louis, MO) was used as the reference toxicant. Tests were static water-only exposures and 96 h in duration. LC50 values of the concurrent reference toxicant tests were compared with the mean value and 95% confidence limits of reference toxicant tests conducted previously in this lab using the same species and exposure duration.

2.3 *in situ* Test Methods

2.3.1 Site Selection and Description of Upland Areas

2.3.1.1 Richmond Reach

The James River below Richmond in the 8 miles between the most upstream and downstream study sites is a narrow, relatively deep river passing between beautiful wooded banks. Just upland from the shoreline, there is intense industrial activity involving petroleum transfer and storage, sand and gravel transport, a commercial seaport, rail yards, and major chemical manufacturing sites. A more obvious indication of intense human activity in the region is the amount of garbage floating down the river. The contrast between the peacefulness of the wooded banks, the floating debris, the occasional glimpse of tall buildings and construction cranes, and the odors (tobacco, sewage, etc.) in some areas is dramatic.

Four creeks located in this reach ranging from just below the city locks to a point about 8 miles downstream were selected for study. These creeks differ greatly in length and type of land use in the watershed. Gillie Creek was selected because it receives combined stormwater runoff. Almond and Falling Creeks were selected because they drain industrial or residential/commercial areas of the city. Cornelius Creek was selected as a reference site. It passes through mixed wooded and agricultural lands with few residences and no known industry. Tests at these stations occurred between 13 and 27 September.

2.3.1.1.1 *Gillie Creek*

Gillie Creek arises ENE of southern East Richmond from a pond near Oakleys Center Industrial Park in Henrico County. It flows WSW roughly parallel to I 64 through residential areas until it passes under I64 as the highway turns NW. From I64 to Government Road (US60) within the city, the creek passes through an undeveloped area. Just before entering the city limits, Stony Run joins the creek from the north. Stony Run is about 2 3 miles long, arising from a small pond and passing through low-density residential and undeveloped land. Gillie Creek is channelized after it passes under Stony Run Road. From this point to the mouth there is little water in Gillie Creek except during and after significant rain events.

Within the city, the channelized creek passes between low density residential and wooded or park lands, where it receives combined stormwater sewage inflows from urban areas before crossing the highly industrialized (though rundown) area extending about 3 mile inland from the shore of the James. In that last quarter mile, the creek passes under the railroad line to Williamsburg - Newport News near a major freight yard. As it enters the James River on the north shore, and within sight of the canal locks, it passes under Route 5, a spur rail line, and between the abandoned city pier and warehouse and an active Lehigh Cement facility. The total creek length is slightly over 5 miles.

At its mouth, water flows over remnants of cofferdams. The experiment was deployed in about 0.45 m (1.5 ft) of water (MLW) just in front of the mouth of the creek (Table 2.12, Fig 2.2). Tidal amplitude at this point is about 1.2m (4 ft). The river bottom was loose gravel and sand.

Fragments of *Apotomogeton* sp. and *Vallisneria* sp. were frequently observed, but there were no major submerged aquatic plant beds visible near the study site. The station, though located as close to the creek mouth as possible, was strongly influenced by the main river flow.

2.3.1.1.2 *Almond Creek*

Almond Creek enters the James about 1 mile downstream of Gillie Creek on the north shore. Arising near Darbytown Road just south of the railroad, it flows WNW in a wooded ravine that parallels the railroad to New Osborne Turnpike. It turns west to Old Osborne Turnpike (Route 5). As it passes under Route 5, there is industrial activity on the north bank. The creek then turns SW to the James. The south shore appears to be well wooded from Route 5 to the James.

The mouth of the creek is today quite shallow and sanded in. However, a tug boat captain, who pushes sand and gravel barges in this reach of the river, reported that he formerly pushed one barge a week to a manufacturing site about 3 mile upstream in Almond Creek. It was not clear how long ago that was, but it does indicate that the creek shoreline has long been industrialized. Changing patterns of transportation have made use of the creek for commercial transport obsolete, and the creek channel has shoaled. At its mouth, there is a sand and gravel terminal to the north and a wooded shoreline to the south. The creek receives drainage from the rail yard to the north along much of its 2 2 mile length.

The Almond Creek study site was located in about 0.39 m (1.3 ft) of water (MLW) just off the mouth of the creek (Table 2.12, Figure 2.2). A short stone jetty juts from the shore on the south side of the creek mouth. Barges were often grounded immediately to the north of the creek mouth throughout the study period. The jetty and barges in some sense extended the creek mouth, but the station was still strongly influenced by the main river flow.

2.3.1.3 *Falling Creek*

Falling Creek enters the James on the south bank about 5 miles downstream of Almond Creek. The intervening wooded banks of the river are interspersed with sand and gravel operations and petroleum transfer sites, the Port of Richmond wharf, and Spruance Dupont Industrial Park. Falling Creek is dammed in its upper reaches to form Falling Creek Reservoir that is located on the boundary between South Richmond and Chesterfield County. The creek meanders approximately 2 2 miles SW to Chippenham Parkway and another a mile to just west of US1/301 where it turns east and continues about another mile before entering the James about c mile east of I95. Over much of its length, the creek passes through low to moderate density residential land. The Chesterfield County Falling Creek WWTP discharges into Falling Creek about 3 miles upstream of the mouth. A new bridge spanning the James River for Rte I895 is under construction about 2 miles upstream. One interconnection with Rte I95 will cross Falling Creek immediately adjacent to the Rte I95 Bridge. On the south bank of the creek at its mouth is a derelict vessel adjacent to a small barging operation. The land on the north bank is wooded with a small park just upstream. A derelict wooden barge is recognizable only from a few remaining wooden timbers.

The Falling Creek study site was located on the north bank across from the derelict ship and adjacent to the derelict wooden barge (Table 2.12, Figure 2.2). The site was about 0.45 m (1 2 ft) deep at low tide, and slightly overhung by trees. This was the only station in the Richmond reach actually located within the creek mouth.

2.3.1.4 *Cornelius Creek*

Cornelius Creek enters the James on the north bank about 1 2 miles downstream of Falling Creek. As one progresses downstream from Falling Creek, the banks gradually change to wooded backed by corn/soybean/wheat fields rather than industrial/commercial land uses. The creek arises about 4 : miles north of the James, passes south under New Market Road (Route 5) and then parallels Route 5 to the new Rte I895 (under construction), then parallels the new highway to Eaves Lake where it turns directly south to the James, joining with Coles Run along the way. The area has little residential development and is wooded agricultural in use, although residential development is beginning.

The mouth of the creek is extremely shallow and partially blocked by large fallen tree trunks. The study site was therefore located slightly more channel-ward than desired in about 0.38 m (1 3 ft) of water (MLW) adjacent to large fallen trees (Table 2.12, Figure 2.2).

2.3.1.2 Hopewell Reach

Hopewell, VA is located at the confluence of the Appomatox and James Rivers, which form two boundaries of the city. Four creeks were selected in this area, three draining the city (Bailey Creek, Gravelly Run, and Cabin Creek), and one draining a portion of Shirley Plantation on the north shore of the river across from the southern edge of Hopewell (Eppes Creek). The city waterfront facing the James River is highly industrialized with chemical manufacturers, a paper mill, and a fuel tank field. The shoreline is extensively hardened from north of Gravelly Run to Poithress Creek near City Point. Several piers allow large ships to moor. In contrast, the city waterfront facing the Appomatox is wooded with large residential homes on the bluff. Two marinas are located along this shore. A railroad bridge crosses the Appomatox east of the western city limit. These creeks were occupied during the periods 3 through 31 October 2000, and 2 through 16 May 2001.

2.3.1.2.1 *Bailey Creek*

Bailey Creek forms the southern city border with Prince George County. Though seemingly undisturbed with wooded bog on both shores, major chemical industries are located only yards from the creek on the city side. On the opposite shore, the upland is wooded and agricultural with minimal residential development. Arising on the Ft Lee Army Base, the creek meanders through largely wooded shores to the James, passing under a series of roads, some urbanized on the Hopewell side.

This creek is guarded by a sand bar off the mouth, but deepens upstream toward the Route 10 Bridge. The bridge crosses the creek about 0.8 miles from its confluence with the James River. For the next 2 miles upstream, the creek passes through a wooded bog with numerous tree falls.

About 2.5 miles upstream at the confluence with Cattail Creek, Bailey Creek is still 20-30 ft wide and 4-6 ft deep at high tide. Cattail Creek originates in a commercial/industrial district of Hopewell. It receives street and parking lot runoff before passing adjacent to the Hercules property near its confluence with Bailey Creek. On the Hercules property, there are industrial lagoons that one might expect to discharge from time to time into Cattail Creek or the smaller Bear Creek about ½ mile downstream.

The station in Bailey Creek was established about 0.9 miles from the creek mouth (about 500 yards upstream from the Rte 10 Bridge) on the south shore (Table 2.12, Fig. 2.3). Water depth at this site is estimated to be 0.2 m (0.6 ft) at MLW. This site could only be accessed readily at times near high tide because of the shallow creek entrance. This site is well within the creek proper, but elevated temperature at this station indicates some influence from Gravelly Run that serves as the discharge canal for a heated effluent from the Hopewell Plastics plant. The site was occupied for 28 days in Fall 2000 and 14 days in Spring 2001.

2.3.1.2.2 *Gravelly Run / Bear Creek*

Gravelly Run is a small creek draining the eastern industrialized portion of the city of Hopewell. At its headwaters it receives cooling water from the Hopewell Plastics Plant. The creek passes eastward parallel to Rte 10 adjacent to the Honeywell and Stone Container properties. On the northern shore at the mouth, Stone Container has a large retention pond. On the southern shore just upstream from the mouth, the Hopewell Regional Water Treatment Plant discharges into the creek. Wooded along much of its length, the creek mouth is choked with fallen trees.

The Gravelly Run station was established at the confluence with the James River in a location subject to wave action when the wind was from the northeast (Table 2.12, Fig. 2.3). Unseen when first deployed, the station was within a tangle of tree falls that made access to the station difficult. For reasons discussed in the results section, this station was abandoned after 14 days deployment in Fall 2000 and replaced by a station at the mouth of Bear Creek.

During the second half of the deployment period for the Fall 2000 study, a station was established in the mouth of Bear Creek as a replacement for the station at the mouth of Gravelly Run. Bear Creek is located about 1 mile upstream from the Bailey Creek station (about 2 miles upstream of the Bailey Creek mouth (Table 2.12, Fig 2.3). The intent was to set the station in the mouth of Cattail Creek, but we lacked an adequate map and geographic coordinates at the time of station placement.

The station was located about 75 ft upstream in one of the deltaic exits into Bailey Creek in about 0.9 m (3 ft) of water (when occupied). The tidal amplitude at the James River tide stations located at Jordan Point and at City Point is about 3-4 ft suggesting that the gear might be grounded on low tide. However, there was no evidence of the deployed equipment contacting the substrate in the creek. Presumably, the tidal amplitude in Bailey and Bear Creeks is substantially reduced as compared to the tide stations. The station was occupied for the second 14-day period in Fall 2000 and 14 days in Spring 2001.

2.3.1.2.3 *Cabin Creek*

Cabin Creek drains the residential area on the west side of the city. Bordered along much of its length by wooded areas and a wooded and grassy park, it passes under several major and minor thoroughfares before dipping to the Appomatox shore, passing through a swampy area adjacent to a CSX railroad line. Just east of the creek mouth, the railroad crosses the Appomatox.

The Cabin Creek station was established about 1000 ft upstream of the creek mouth (Table 2.12, Figure 2.3). On the north shore there is a large residence on a well-wooded lot, the only residence between the railroad line and the creek. Water depth at the fall 2000 study site was 0.33m (1.1 ft) at MLW; the depth at the spring 2001 study site was 0.45m (1.5 ft). The site is within a freshwater marsh between steep wooded banks on both sides. The site was occupied for 28 days in Fall 2000 and 14 days in Spring 2001.

2.3.1.2.4 *Eppes Creek*

This creek forms one side of so-called Eppes Island (though the land is not fully surrounded by water). The shoreline on both sides is densely wooded, with upland developed for agriculture to the north. The creek enters the James along the northern shore just west of the Benjamin Harrison Bridge. Large residences have been developed along the nearby James River shore in the last decade or so. As a result, many trees have been removed, and grass extends to the edge of the bluff.

The Eppes Creek station was established about 0.25 miles upstream of the creek mouth along the southern shore (Table 2.12, Figure 2.3). The water depth at the fall 2000 study site was 0.8 m (2.7 ft) at MLW; the depth at the spring 2001 study site was 0.48m (1.6 ft). The site is well removed from the residences at the mouth of the creek. The site was occupied for 28 days in Fall 2000 and 14 days in Spring 2001.

2.3.2 Equipment and Procedures

The Richmond stations were occupied for two weeks from 13-27 September 2000. The stations were visited every other day throughout the period. The Hopewell stations were occupied for four weeks from 3-31 October 2000, and again for two weeks from 2-16 May 2001. In both these deployments, the stations were visited every other day.

At each location, two bamboo canes were pushed into the substrate about 10-15 ft apart (In the spring deployment, 1 inch PVC pipe was used instead of bamboo canes). The position of each study site was determined with a hand-held GPS (Garmin Model 48). The latitude and longitude were measured on the day of deployment and confirmed on the next visit. A PVC ring float, 21 by 11 inches ID, was moored between the canes with nylon rope and allowed to float up and down with the tide. The test chamber holders consisted of two pieces of 2 by 4 notched to partially wrap each of four replicate chambers, and hinged on one end. On the other end, a hasp was attached with a quick snap to secure the holder. A wooden test chamber holder hung about

12 inches below the ring float. Each test chamber held 20 test animals, *Hyalella azteca*. On one pole, a garden type rain gauge was attached to allow measurement of the amount of rain falling over consecutive 48-hour periods.

The exposure chambers were made of 2 ½ inch PVC pipe with a 200 µm mesh screen permanently solvent welded to one end and a similar screen temporarily held on the other end with a PVC ring cut from PVC couplers. The volume of each chamber was about 300 ml, comparable to the water volume often used in laboratory tests with the test species. Neonates of *Hyalella* were shown in preliminary tests to be fully retained by this mesh, and no immigration of amphipods into the chambers observed.

Amphipods for the tests were produced in laboratory cultures at VIMS similar to those used to produce the test animals for the ambient toxicity tests at CBI. One or more cultures were passed through a screen series. Those animals passing all screens (neonates) were returned to the cultures. Animals used to initiate *in situ* tests were retained on a 500-µm mesh but passed through a 1000 µm mesh screen. In the laboratory, sixteen groups of 20 juveniles were counted out randomly into specimen cups, held overnight, and transported in coolers to the study sites. At the study site, the amphipods in a specimen cup were rinsed into each test chamber. Four chambers were placed in a holder and the holder attached to the ring float. Thus a total of 80 amphipods were placed at each station. Four additional groups of 20 amphipods each were set aside to make initial weight measurements as an estimate of initial amphipod size at the time of deployment.

Four sets of 20 replacement animals were taken on each trip along with replacement chambers and a spare holder so that if a chamber was damaged or lost, it could be immediately replaced. Only one spare set of twenty animals was used during the Richmond study. In that case, the screen mesh of one chamber was torn, allowing the animals to escape. Another set was used during the spring 2001 set in the Hopewell study for the same reason.

Animals were never deployed for more than 14 days. In the 28-day fall study at Hopewell, a complete new set of amphipods was placed in the chambers after 14 days, and the survivors were returned to the laboratory for measurement of final weight.

2.3.3 Data Collection

2.3.3.1 *Biological*

Every other day, the test chambers were removed from the holder and placed in a shallow pan of water from the study site. Each chamber was rinsed clean of silt and debris. Indigenous amphipods were rinsed from the outside of the chambers and discarded. Once cleaned, each chamber was opened and the study amphipods rinsed into a 4-inch finger bowl. The amphipods were then counted as they were pipetted back into the exposure chamber. The number of survivors was noted on the field log sheets along with the numbers observed dead or missing and the number of neonates if any. Few dead were ever observed, presumably because any animal that died decayed too rapidly to be observed during the visits.

As noted above, those animals surviving a two-week deployment were counted into plastic specimen cups and returned to the laboratory for weight measurement. In the laboratory, the amphipods were counted into tared aluminum weigh pans, dried at 102°C for 48 hr, cooled, and weighed on a semi-analytical balance. The mean weight per amphipod was calculated from the number of amphipods per sample and total weight.

2.3.3.2 *Water quality*

During each visit, the water temperature, conductivity, dissolved oxygen concentration, and pH were measured. Temperature was measured with a stem thermometer. Conductivity was measured with an YSI Model 51 environmental meter. An YSI Model 57 was used to measure dissolved oxygen. pH was measured during the first few visits to the Richmond sites using an Orion Model 290A pH meter. That meter failed on the fourth visit, preventing further pH measurements during this deployment. Attempts to borrow a field meter were unsuccessful because of the field schedules of others. A new Model IQ150 (I.Q. Scientific Instruments, Inc.) pH meter was used at the start of the fall 2000 Hopewell deployment and thereafter.

2.3.3.3 *Rainfall*

When each station was visited, the amount of water in the rain gauge was recorded to the nearest 0.1 cm. These measurements provide point estimates of the amount of rain falling at each station in each 48-hour period, but do not provide an estimate of the rainfall in the headwaters of each creek.

The rainfall recorded at the Richmond International Airport was obtained for Fall 2000 as an indication of the rainfall in the region. Additional data from Hopewell, VA weather station was obtained for Fall 2000 and Spring 2001. These data do not, however, provide an accurate picture of rainfall in each creek watershed as witnessed by the differences in rainfall amount at each study site.

Table 2.1. Station locations for water and sediment sampling for ambient toxicity tests.

Study	Station Designation	Latitude	Longitude	Major Landmarks	Depth at MLW (ft)
DEQ Richmond					
	2-CHK012.12	37°21’37.3”	76°54’6.8”	Between Big Marsh Point & Old Neck on north shore	1.7
	2-JMS044.08	37°13’17.9”	76°48’34.4”	Buoy R60 east of EPA CBP Station 47.81	22.9
	2-JMS046.73	37°13’38.1”	76°51’22.6”	South of Barrets Point	9.8
	2-JMS050.55	37°13’11.2”	76°55’26.4”	East of Buoy G69	22.5
	2-JMS052.52	37°14’31.1”	76°56’59.3”	Sandy Point Wharf	2.2
	2-JMS056.12	37°16’41.3”	76°59’08.6”	Trees Point	2.3
	2-JMS066.35	37°18’35.5”	77°04’44.5”	South of Queens Creek along row of stakes	3.7
	2-JMS067.56	37°18’29.1”	77°06’23.8”	East of Buoy G89	27.0
	2-JMS068.49	37°18’27.2”	77°07’25.6”	Southeast of Buckets Point (West of Windmill Point)	10.0
	2-JMS068.64	37°18’02.6”	77°07’20.8”	East of G91 (West of Windmill Point)	19.9
	2-JMS073.63	37°19’23.3”	77°12’30.5”	North bank west of Charles Lake Dam	3.0
	2-JMS074.25	37°19’11.1”	77°13’15.4”	North channel edge east of Benjamin Harrison Bridge	5.0
EPA CBP					
	2-JMS040.03	37°11’01.3”	76°45’15.6”	South of Lower Point between R54 & R52	16.8
	2-JMS042.46	37°12’09.7”	76°47’31.2”	East of Swanns Point	6.9
	2-JMS047.33	37°13’02.6”	76°51’55.3”	South of channel between G61 and G63	26.4
	2-JMS047.81	37°13’33.1”	76°52’28.0”	Northwest of R64	8.9
	2-JMS065.81	37°18’07.0”	77°04’55.0”	South of G81 (east of Windmill Point)	27.8
	2-JMS068.68	37°18’01.4”	77°07’23.9”	East of G91 (west of Windmill Point)	30.7
	2-JMS072.08	37°18’28.0”	77°11’02.2”	West of G97 along channel	21.0
	2-JMS074.29	37°19’00.0”	77°13’18.0”	South channel edge east of Benjamin Harrison Bridge	29.7

Table 2.2. Control waters used for ambient water toxicity tests. (MHSFW = moderately hard synthetic freshwater, SW = artificial seawater, salinity indicated in g/kg)

	Station (1st sample salinity, g/kg)							
Species	**40.03 (4.8)**	**42.46 (3.1)**	**47.33 (1.6)**	**47.81 (1.2)**	**65.81 (0)**	**68.68 (0)**	**72.08 (0)**	**74.29 (0)**
C. dubia			MHSFW 1.6 SW	MHSFW 1.6 SW	MHSFW	MHSFW	MHSFW	MHSFW
P. promelas					MHSFW	MHSFW	MHSFW	MHSFW
M. bahia	4.3 SW 20 SW	4.3 SW 20 SW	1.2 SW 20 SW	1.2 SW 20 SW				
C. variegatus	4.3 SW 20 SW	4.3 SW 20 SW	1.2 SW 20 SW	1.2 SW 20 SW				

Table 2.3a. Required conditions for 8-day ambient water toxicity test with *Pimephales promelas*

TEST TYPE:	Static renewal
RENEWAL FREQUENCY:	With each new sample, 3 samples total for initiation & renewal
TEST SOLUTIONS:	100% ambient sample plus control
REPLICATES:	4 with 10 animals each (i.e. 40 animals/sample tested)
RANDOMIZATION:	Test chambers oriented in randomized block (by replicate) design
TEST CHAMBERS:	1000 ml beakers, borosilicate glass
TEST VOLUME:	500 ml
TEMPERATURE:	25 ± 1°C (23.5-26.4°C)
CONTROL WATER:	Synthetic freshwater, moderately hard
PHOTOPERIOD:	16 h light/8 h darkness
LIGHT INTENSITY:	10-20 $\mu E/m^2/s$ (50-100 ft-c) (ambient laboratory illumination)
AGE:	$\leq$ 24 h old [1]
DISSOLVED OXYGEN:	$\geq$4.0 mg/l, otherwise aerate all chambers, 100 small bubbles/min.
FEEDING:	Newly hatched (<24 h) *Artemia* nauplii; 0.15 g/replicate before renewal and at end of work day
CLEANING:	Siphon excess food and other debris daily and during renewal
WATER QUALITY MEASURMENTS:	Temperature, conductivity, pH, D.O. daily in one replicate and in one replicate of both "old" and "new" solution on renewal days
TEST DURATION:	8 days
TEST TERMINATION:	Tally survival, dry 60°C for 24 h.
EFFECTS MEASURED:	Survival, growth
ACCEPTABILITY CRITERIA:	Control survival and growth: 80% and 0.25 mg dry wt. avg.
SAMPLE HOLDING TIME:	36 h before first use

[1] A concurrent acute reference test using the same batch of animals is performed using KCl as the reference toxicant.

Table 2.3b. Required conditions for 8-day ambient water toxicity test with *Ceriodaphnia dubia*

TEST TYPE:	Static renewal
RENEWAL FREQUENCY:	With each new sample, 3 samples total for initiation & renewal
TEST SOLUTIONS:	100% ambient sample plus control
REPLICATES:	10 with 1 animal each (i.e. 10 animals/sample tested)
RANDOMIZATION:	Test chambers oriented in randomized block (by replicate/parentage) design
TEST CHAMBERS:	30 ml, borosilicate glass
TEST VOLUME:	15 ml
TEMPERATURE:	25 $\pm$ 1°C (23.5-26.4°C)
CONTROL WATER:	Synthetic fresh water
PHOTOPERIOD:	16 h light/8 h darkness
LIGHT INTENSITY:	10-20 µE/m^2/s (50-100 ft-c) (ambient laboratory illumination)
AGE:	$\leq$ 24 h ($\pm$ 4 h) [1]
DISSOLVED OXYGEN:	Never aerated to avoid entrapping animals on the water surface. Adverse effects of low oxygen concentration are never observed.
FEEDING:	0.1 ml YCT + 0.1 ml *Selenastrum* (@ ca. 3.5E^7 cells/ml) per 15 ml/day
CLEANING:	N/A (animals transferred to new chamber w/ fresh solution during renewal)
WATER QUALITY MEASUREMENTS:	Temperature, conductivity, pH, D.O. of both “old” and “new” solution on renewal days
TEST DURATION:	8 days
TEST TERMINATION:	Tally survival, number of offspring, note presence of any males
EFFECTS MEASURED:	Survival, reproduction
ACCEPTABILITY CRITERIA:	Control survival $\geq$80%, $\geq$ 60% controls 3 or more broods, $\geq$ 15 offspring/surviving control female
SAMPLE HOLDING TIME:	36 h before first use

[1] A concurrent acute reference test using the same batch of animals is performed using KCl as the reference toxicant.

Table 2.3c. Required conditions for 8-day ambient water toxicity test with *Cyprinodon variegatus*

TEST TYPE:	Static renewal
RENEWAL FREQUENCY:	With each of 3 new samples: initiation & 2 renewals
TEST SOLUTIONS:	100% ambient sample plus control
REPLICATES:	5 with 10 animals each (i.e. 50 animals/sample tested)
RANDOMIZATION:	Test chambers in randomized block (by replicate) design
TEST CHAMBERS:	1000 ml beakers, borosilicate glass
TEST VOLUME:	750 ml
TEMPERATURE:	25 ± 1°C (23.5-26.4°C)
CONTROL WATER:	Artificial sea water
SALINITY:	Ambient for samples, controls ± 3 g/kg of sample salinity[1]
PHOTOPERIOD:	16 h light/8 h darkness
LIGHT INTENSITY:	10-20 µE/m^2/s (50-100 ft-c) (ambient laboratory illumination)
AGE:	≤ 24 h old [2]
DISSOLVED OXYGEN:	≥4.0 mg/l, otherwise aerate all chambers, 100 small bubbles/min.
FEEDING:	Newly hatched (<24 h) *Artemia* nauplii; 0.1 g/replicate days 0-2; 0.15 g/replicate days 3-7
CLEANING:	Siphon excess food and other debris daily and during renewal
WATER QUALITY MEASUREMENTS:	Temperature, salinity, pH, D.O. daily in one replicate; in one replicate of both "old" and "new" solution on renewal days
TEST DURATION:	8 days
TEST TERMINATION:	Tally survival, dry 60°C for 24 h.
EFFECTS MEASURED:	Survival, growth
ACCEPTABILITY CRITERIA:	Control survival and growth: 80% and 0.60 mg dry wt. Avg.
SAMPLE HOLDING TIME:	36 h before first use

[1]Samples should range in salinity by no more than 10 g/kg; test organisms will be acclimated to one or two intermediate salinities so that no more than a 3-g/kg difference between acclimation and test salinity exists.

[2]A concurrent acute reference test using the same batch of animals is performed using KCl as the reference toxicant.

Table 2.3d. Required conditions for 8-day ambient water toxicity test with *Mysidopsis bahia*

TEST TYPE:	Static renewal
RENEWAL FREQUENCY:	With each of 3 new samples: initiation & 2 renewals
TEST SOLUTIONS:	100% ambient sample plus control
REPLICATES:	5 with 10 animals each (i.e. 50 animals/sample tested)
RANDOMIZATION:	Test chambers in randomized block (by replicate) design
TEST CHAMBERS:	1000 ml beakers
TEST VOLUME:	500 ml
TEMPERATURE:	25 ± 1°C (23.5-26.4°C)
CONTROL WATER:	Artificial sea water
SALINITY:	Ambient for samples, controls ± 3 g/kg of sample salinity[1]
PHOTOPERIOD:	16 h light/8 h darkness
LIGHT INTENSITY:	10-20 $\mu E/m^2/s$ (50-100 ft-c) (ambient laboratory illumination)
AGE:	7 days old [2]
DISSOLVED OXYGEN:	≥4.0 mg/l, otherwise aerate all chambers, 100 small bubbles/min.
FEEDING:	Newly hatched (<24 h) *Artemia* nauplii; 150/mysid; 1/2 twice/day
CLEANING:	Siphon excess food and other debris daily and during renewal
WATER QUALITY MEASUREMENTS:	Temperature, salinity, pH, D.O. daily in one replicate and in one replicate of "old" and "new" solution on renewal days
TEST DURATION:	8 days
TEST TERMINATION:	Tally survival, examine individuals microscopically, and dry 60°C for 24 h.
EFFECTS MEASURED:	Survival, growth, % females with eggs in oviduct or marsupium
ACCEPTABILITY CRITERIA:	Control survival and growth: 80% and 0.25 mg dry wt. Avg.
SAMPLE HOLDING TIME:	36 h before first use

[1] Samples should range in salinity by no more than 10 g/kg; test organisms will be acclimated to one or two intermediate salinities so that no more than a 3-g/kg difference between acclimation and test salinity exists.

[2] A concurrent acute reference test using the same batch of animals is performed using KCl as the reference toxicant.

Table 2.4. Control water characteristics (Mean and (Std. Dev.)) during tests

Parameter	Freshwater Species Tests		Estuarine Species Tests		
	Synthetic Freshwater	**1.6 g/kg Artificial Seawater**	**4.3 g/kg Artificial Seawater**	**1.2 g/kg Artificial Seawater**	**20 g/kg Artificial Seawater**
Temperature (^{o}C)	24.3 (0.2)	24.8 (0.4)	25.4 (0.3)	25.5 (0.2)	25.6 (0.1)
Conductivity (µMHOS)	277.4 (4.0)	2735.0 (76.3)	N.D.	N.D.	N.D.
Salinity (g/kg)	N.D.	1.6 (0.0)	4.5 (0.2)	1.2 (0.0)	20.0 (0.0)
pH (S.U.)	8.0 (0.1)	7.9 (0.1)	7.8 (0.1)	7.9 (0.1)	7.7 (0.0)
D.O. (mg/l)	8.2 (0.0)	8.1 (0.0)	8.1 (0.0)	8.1 (0.0)	7.4 (0.0)
Hardness (mg/l $CaCO_3$)	98.4 (1.6)	459.1 (13.6)	N.D.	N.D.	N.D.
Alkalinity (mg/l $CaCO_3$)	60.4 (2.6)	58.1 (1.4)	N.D.	N.D.	N.D.

N.D. = not determined (Data was not collected for some parameters in fresh or salt water as inappropriate to the medium.)

Table 2.5a. Required conditions for 10-day sediment toxicity test with *Pimephales promelas* embryos.

TEST TYPE:	Static renewal, whole sediment
RENEWAL FREQUENCY:	Daily renew 50% of overlying water
REPLICATES:	3 with 10 animals each (i.e. 30 animals/sample tested)
RANDOMIZATION:	Test chambers arranged in randomized block (by replicate) design
TEST CHAMBERS:	1000 ml beakers, borosilicate glass & PVC-Nitex egg baskets
SEDIMENT VOLUME:	200 ml sediment
OVERLYING WATER VOLUME:	750 ml
OVERLYING WATER:	Synthetic freshwater, moderately hard
TEMPERATURE:	25 $\pm$ 1°C (23.5-26.4°C)
PHOTOPERIOD:	16 h light/8 h darkness
LIGHT INTENSITY:	10-20 $\mu E/m^2/s$ (50-100 ft-c) (ambient laboratory illumination)
AGE:	$\leq$ 48 h post-fertilization[1]
DISSOLVED OXYGEN:	Aerate all chambers at a rate of 100 small bubbles/min.
FEEDING:	Newly hatched (<24 h) *Artemia* nauplii; 0.1 g/replicate days 3-6 (earlier if hatching occurs); 0.15 g/replicate days 7-9
AERATION:	Overnight before start of test, and throughout test; trickle-flow aeration maintains >40% saturation of dissolved oxygen
CLEANING:	Siphon excess food and other debris daily and during renewal
WATER QUALITY MEASUREMENTS:	Temperature, conductivity, pH, D.O. daily in one replicate of both "old" and "new" solution
TEST DURATION:	10 days
TEST TERMINATION:	Tally survival
ENDPOINTS:	Embryo and fry survival, egg hatching
ACCEPTABILITY CRITERIA:	Control survival 80%
SAMPLE HOLDING TIME:	2 weeks
TEST TREATMENTS:	Site, control, and reference sediment

[1]A concurrent acute reference test using the same batch of animals is performed using KCl as the reference toxicant.

Table 2.5b. Required conditions for 10-day sediment toxicity test with *Hyallela azteca.*

TEST TYPE:	Whole sediment toxicity test
RENEWAL FREQUENCY:	None for sediment or overlying water
REPLICATES:	3 with 20 animals each
RANDOMIZATION:	Test chambers arranged in randomized block (by replicate) design
TEST CHAMBERS:	1000 ml glass beakers
SEDIMENT VOLUME:	200 ml
OVERLYING WATER VOLUME:	750 ml
OVERLYING WATER:	Synthetic freshwater, moderately hard
TEMPERATURE:	23 $\pm$ 1°C
PHOTOPERIOD:	16 h light: 8 h darkness
LIGHT INTENSITY:	10-20 $\mu E/m^2/s$ (500-1000 ft-c) (ambient laboratory illumination)
SIZE AND LIFE STAGE OF AMPHIPODS:	3-5 mm, no mature males or females
DISSOLVED OXYGEN:	Aerate all chambers at a rate of 100 small bubbles/min
FEEDING:	0.5 ml YCT/chamber/day (August tests), 0.75 ml (October tests)
AERATION:	Overnight before start of test, and throughout test; trickle-flow aeration maintains $\geq$40% saturation of dissolved oxygen concentration
CLEANING:	None
WATER QUALITY MEASUREMENTS:	Total water quality (hardness, alkalinity, ammonia, pH, conductivity, D.O., temperature) days 0 and 9 or 10 each treatment; temperature and D.O. daily on one replicate/treatment.
TEST DURATION:	10 days
TEST TERMINATION:	Tally survival, pool animals for each replicate, dry and weigh
ENDPOINTS:	Survival, growth (dry weight)
ACCEPTABILITY CRITERIA:	Control survival 80%
SAMPLE HOLDING TIME:	2 weeks
TEST TREATMENTS:	Site, control, and reference sediment

[1]A concurrent acute reference test using the same batch of animals is performed using KCl as the reference toxicant.

Table 2.6. Analyte lists for classes of organic chemicals sought in sediment samples.

Semi-volatile Organic Compounds (SVOCs)	
	1,4-Dichlorobenzene
	Isophorone
	Dibenzofuran
	Bis [2-ethylhexyl] phthalate
	Butylbenzyl phthalate
	Di-N-butyl phthalate
	Diethyl phthalate
	2-Methylnaphthalene
	Acenaphthylene
	Acenaphthene
	Anthracene
	Fluorene
	Naphthalene
	Phenanthrene
	Benzo [a] anthracene
	Benzo [b] fluoranthene
	Benzo [k] fluoranthene
	Benzo [e] pyrene
	Benzo [a] pyrene
	Benzo [g,h,I] perylene
	Chrysene
	Dibenzo [a,h] anthracene
	Fluoranthene
	Indeno [1,2,3-cd] pyrene
	Perylene
	Pyrene
Organophosphate Pesticides	
	Dichlorvos
	Mevinphos
	TEPP
	Thionazion
	Demeton
	Ethoprop
	Tributylphosphate SS
	Naled
	Dicrotophos
	Sulfotep + Phorate
	Monocrotophos
	Dimethoate
	Terbufos
	Monophos

Table 2.6 (cont). Analyte lists for classes of organic chemicals sought in sediment samples.

	Diazinon
	Disulfoton+Phosphamidon +Dichlorofenthion
	Chlorpyrifos(methyl)
	Parathion(methyl)
	Ronnel
	Fenitrothion
	Malithion
	Chlorpyrifos+Aspon
	Fenthion
	Parathion
	Trichlornate
	Chlorfenvinphos
	Crotoxyphos
	Tetrachlorvinphos
	Tokuthion
	Folex
	Fensulfothion
	Ethion
	Carbophenothion
	Bolstar
	Famfur
	Triphenylphosphate SS
	Phosmet
	EPN
	Leptophos
	Guthion(methyl)
	Guthion
	Coumaphos
	Dioxathion
Organochlorine Pesticides	
	HCCP
	a-BHC & HCB & Diallate
	b-BHC & g-BHC
	d-BHC
	Heptachlor
	Aldrin
	Isodrin
	Heptachlor Epoxide
	g-Chlordane
	Endosulfan I & a-Chlordane
	Dieldrin
	DDE

Table 2.6 (cont). Analyte lists for classes of organic chemicals sought in sediment samples.

	Endrin & Endosulfan II
	Chlorbenzylate
	DDD
	Endrin Aldehyde & Kepone
	Endosulfan Sulfate
	DDT
	Endrin Ketone
	Methoxychlor
	Kepone
Polychlorinated Biphenyls (PCB)	
	PCB-001
	PCB-005+008
	PCB-018
	PCB-028+031
	PCB-52
	PCB-44
	PCB-101
	PCB-66
	PCB-81+77
	PCB-110
	PCB-87
	PCB-151
	PCB-118
	PCB-105
	PCB-153
	PCB-141
	PCB-126
	PCB-138
	PCB-187
	PCB-183
	PCB-128
	PCB-156
	PCB-169
	PCB-180
	PCB-170
	PCB-195
	PCB-206
Herbicides	
	3,5-DBCA
	Dicamba
	MCPA

Table 2.6 (cont). Analyte lists for classes of organic chemicals sought in sediment samples.

	MCPP
	Dichlorprop
	2,4-D
	2,4-DB
	Pentachloroanisole
	2,4,5-TP
	Chloramben
	2,4,5-T
	Bentazon
	Picloram
	DCPA
	Acifluorfen

Table 2.7a. Required conditions for salinity experiment protocol for *L. plumulosus*

TEST TYPE:	Whole sediment
RENEWAL FREQUENCY:	None for sediment or overlying water
REPLICATES:	3 with 20 animals each
TEST CHAMBERS:	1000 ml glass beakers
SEDIMENT VOLUME:	200 ml (2 cm)
OVERLYING WATER VOLUME:	750 ml
OVERLYING WATER:	Clean seawater, synthetic
TEMPERATURE:	25 $\pm$ 1°C
SALINITY:	7.5-15 g/kg
PHOTOPERIOD:	16 hr light: 8 hr dark
LIGHT INTENSITY:	10-20 $\mu E/m^2/s$ (500-1000 ft-c) (ambient laboratory illumination
WATER QUALITY MEASUREMENTS:	Measure total water quality (ammonia, pH, salinity, D.O., temperature) days 0 and 9 or 10 each treatment; temperature, D.O. pH, salinity daily on one replicate/treatment.
SIZE AND LIFE STAGE OF AMPHIPODS:	3-5 mm, no mature males or females
FEEDING:	YCT 0.75 ml/beaker/day
AERATION:	Overnight before start of test, and throughout test; trickle-flow aeration that maintains $\geq$90% saturation of dissolved oxygen concentration
TEST DURATION:	10 days
SAMPLE HOLDING TIME:	Samples held in excess of 2 weeks because of nature of test
TEST TREATMENTS:	Experimental and control sediment
ENDPOINTS:	Survival and growth (dry weight)

Table 2.7b. Required conditions for salinity experiment protocol for *H. azteca*

TEST TYPE:	Whole sediment toxicity test
RENEWAL FREQUENCY:	None for sediment or overlying water
REPLICATES:	3 with 20 animals each
TEST CHAMBERS:	1000 ml glass beakers
SEDIMENT VOLUME:	200 ml (2 cm)
OVERLYING WATER VOLUME:	750 ml
OVERLYING WATER:	Clean seawater, synthetic
TEMPERATURE:	23 $\pm$ 1°C
PHOTOPERIOD:	16 hr light: 8 hr dark
LIGHT INTENSITY:	10-20 $\mu E/m^2/s$ (500-1000 ft-c) (ambient laboratory illumination
WATER QUALITY MEASUREMENTS:	Measure total water quality (ammonia, pH, salinity, D.O., temperature) days 0 and 9 or 10 each treatment; temperature, D.O. pH, salinity daily on one replicate/treatment.
SIZE AND LIFE STAGE OF AMPHIPODS:	3-5 mm, no mature males or females
FEEDING:	YCT 0.75 ml/beaker/day
AERATION:	Overnight before start of test, and throughout test; trickle-flow aeration that maintains $\geq$90% saturation of dissolved oxygen concentration
TEST DURATION:	10 days
SAMPLE HOLDING TIME:	Samples held in excess of 2 weeks because of nature of test
TEST TREATMENTS:	Experimental and control sediment
ENDPOINTS:	Survival and growth (dry weight)

Table 2.8. Design for salinity adjustment experiment

	H. azteca			*L. plumulosus*	
Salinity (g/kg):	0	7.5	15	7.5	15
Low TOC, Sandy Sediment	Control	Control	Control	Control	Control
	Low [1]	Low	Low	Low	Low
	High [1]	High	High	High	High
High TOC, Fine-grain Sediment	Control	Control	Control	Control	Control
	Low	Low	Low	Low	Low
	High	High	High	High	High

[1] Low and High refer to metals concentrations

Table 2.9. Metals toxicity data for *H. azteca* taken from literature

Metal	**96-h LC50 (µg/l)**	**Hardness (mg/l as $CaCO_3$)**	**pH (S.U.)**	**Reference**
Cd	<25*	275-300	7.0-7.5	Schubauer-Berigan *et al.*, 1993
Cu	24	275-300	7.0-7.5	Schubauer-Berigan *et al.*, 1993
Ni	1900	275-300	7.0-7.5	Schubauer-Berigan *et al.*, 1993
Se	340	329	7.3	Halter *et al.*, 1980
Zn	1500	275-300	7.0-7.5	Schubauer-Berigan *et al.*, 1993

*25-ug/l value used as 1.0 TU because value obtained at pH 7-7.5 was bracketed by LC50 values of 5 ug/l at pH 8-8.5 and 230 ug/l at pH 6-6.5.

Table 2.10. Results of range-finding tests.

Dose (TU)	**% Survival (Test 1)**	**% Survival (Test 2)**
0 (Control)	95	93
1	95	
10	100	
20	100	
40	80	93
80	75	86
160		71
320		7

Table 2.11. Spiking regime for definitive experiment (volume per liter sediment).

Treatment	**Sediment 2-JMS065.81**	**Sediment 2-JMS040.03**
Control	53.5 ml deionized water	45.5 ml deionized water
110 TU	18.3 ml stock	15.6 ml stock
305 TU	53.5 ml stock	45.5 ml stock

Table 2.12. Station locations for *in situ* tests

Richmond, Fall 2000

Creek	Classification	Station Designation	Latitude	Longitude	Major Landmarks	Depth at MLW (ft)
Gillie Creek	Stormwater, sewage inflow, urban drainage	2-JMS109.50	37°31’19.7”	77°25’03.7”	Old Richmond Pier and Railroad	1.5
Almond Creek	Industrial drainage	2-JMS108.50	37°30’11.2”	77°25’06.6”	Sand/Gravel transfer mooring	1.3
Falling Creek	Industrial drainage	2-JMS103.11	37°26’12.1”	77°25’39.5”	Wooden barge wreck across from derelict vessel	1.5
Cornelius Creek	Reference creek, wooded/agricultural drainage	2-JMS101.41	37°25’28.3”	77°24’34.7”	Off wooded mouth of creek near submerged logs	1.4

Hopewell, Fall 2000

Creek	Classification	Station Designation	Latitude	Longitude	Major Landmarks	Depth at MLW (ft)
Bailey Creek	Industrial drainage to west, agricultural drainage to east	2-BLY000.90 (2-JMS074.50)	37°17’14.8”	77°15’39.4”	Upstream of Rt 10 Bridge	0.6
Gravelly Run Creek	Industrial drainage	2-xxx000.00 (2-JMS075.00)	37°17’50.0”	77°15’21.6”	Across creek mouth from Stone Container pond	0.6
Bear Creek	Commercial and Industrial drainage	2-BRC000.00 (2-BLY002.00)	37°16’49.5”	77°16’17.9”	Mouth of creek about 50 ft from Bailey Creek	0.7
Cabin Creek	Urban (residential and commercial) drainage	2-CBC000.20 (2-APP002.10)	37°18’23.8”	77°19’21.3”	At first bend in creek upstream of mouth	1.1
Eppes Creek	Reference creek, wooded/agricultural drainage	2-EPP000.25 (2-JMS073.15)	37°19’40.1”	77°14’06.7”	Island side of creek about 0.25 mi from mouth	2.7

Table 2.12. (con't.) Station locations for *in situ* tests

Hopewell, Spring 2001

Creek	Classification	Station Designation	Latitude	Longitude	Major Landmarks	Depth at MLW (ft)
Bailey Creek	Industrial drainage to west, agricultural drainage to east	2-BLY000.90 (2-JMS074.50)	37°17'14.8"	77°15'39.4"	Upstream of Rt 10 Bridge	0.6
Bear Creek	Commercial and Industrial drainage	2-BRC000.00 (2-BLY002.00)	37°16'49.5"	77°16'17.9"	Mouth of creek about 50 ft from Bailey Creek	-0.7
Cabin Creek	Urban (residential and commercial) drainage	2-CBC000.20 (2-APP002.10)	37°18'23.8"	77°19'21.3"	At first bend in creek upstream of mouth	1.5
Eppes Creek	Reference creek, wooded/agricultural drainage	2-EPP000.25 (2-JMS073.15)	37°19'40.1"	77°14'06.7"	Island side of creek about 0.25 mi from mouth	1.6

Figure 2.1. James River from Jamestown Island upstream to Jordan Point (Benjamin Harrison Bridge). DEQ stations are black circles labeled in white on black rectangles. EPA stations are white triangles labeled in black on white rectangles. Areas with >75% sand are shaded.

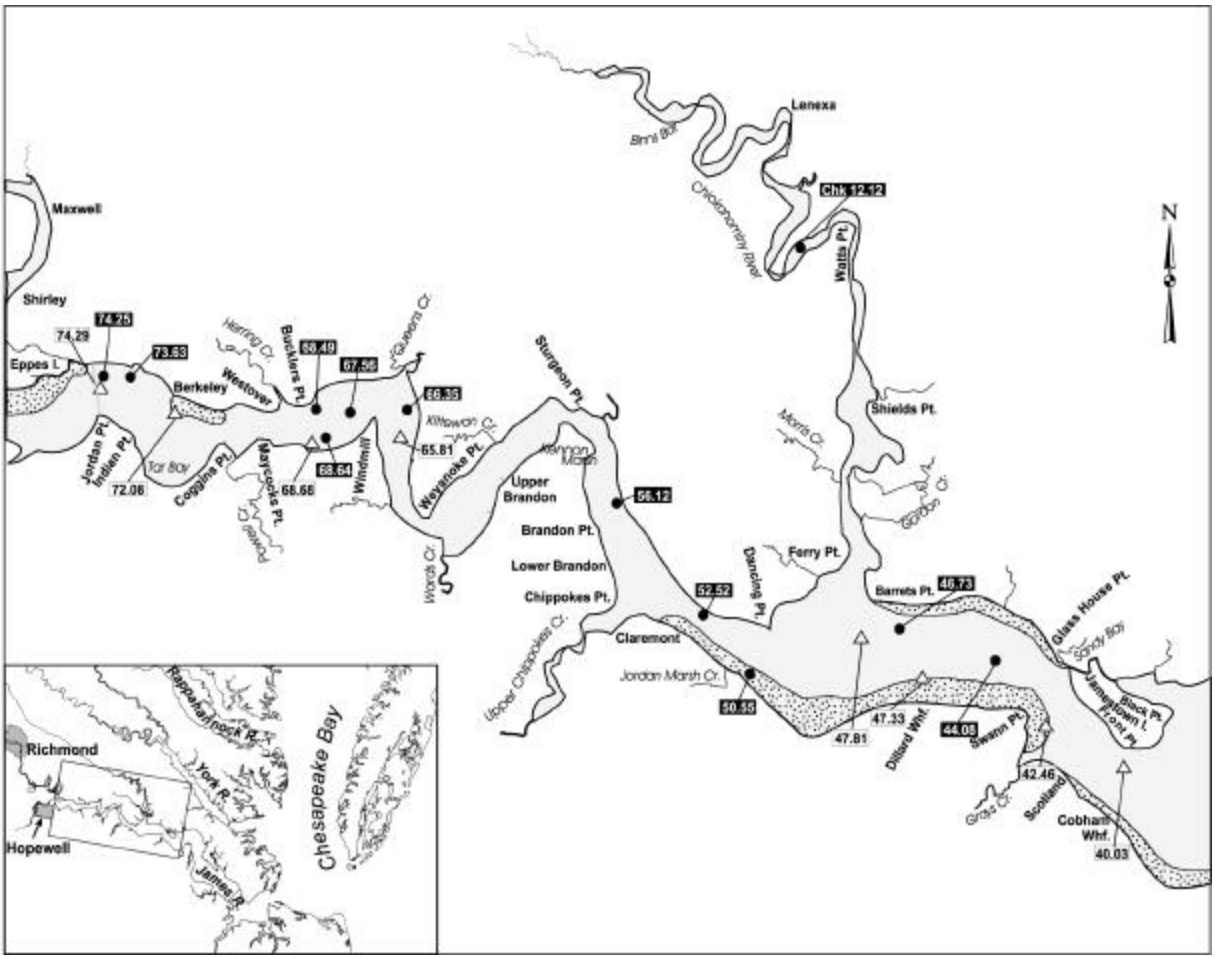


Figure 2.2 Field stations for the *in situ* study in the vicinity of Richmond, VA

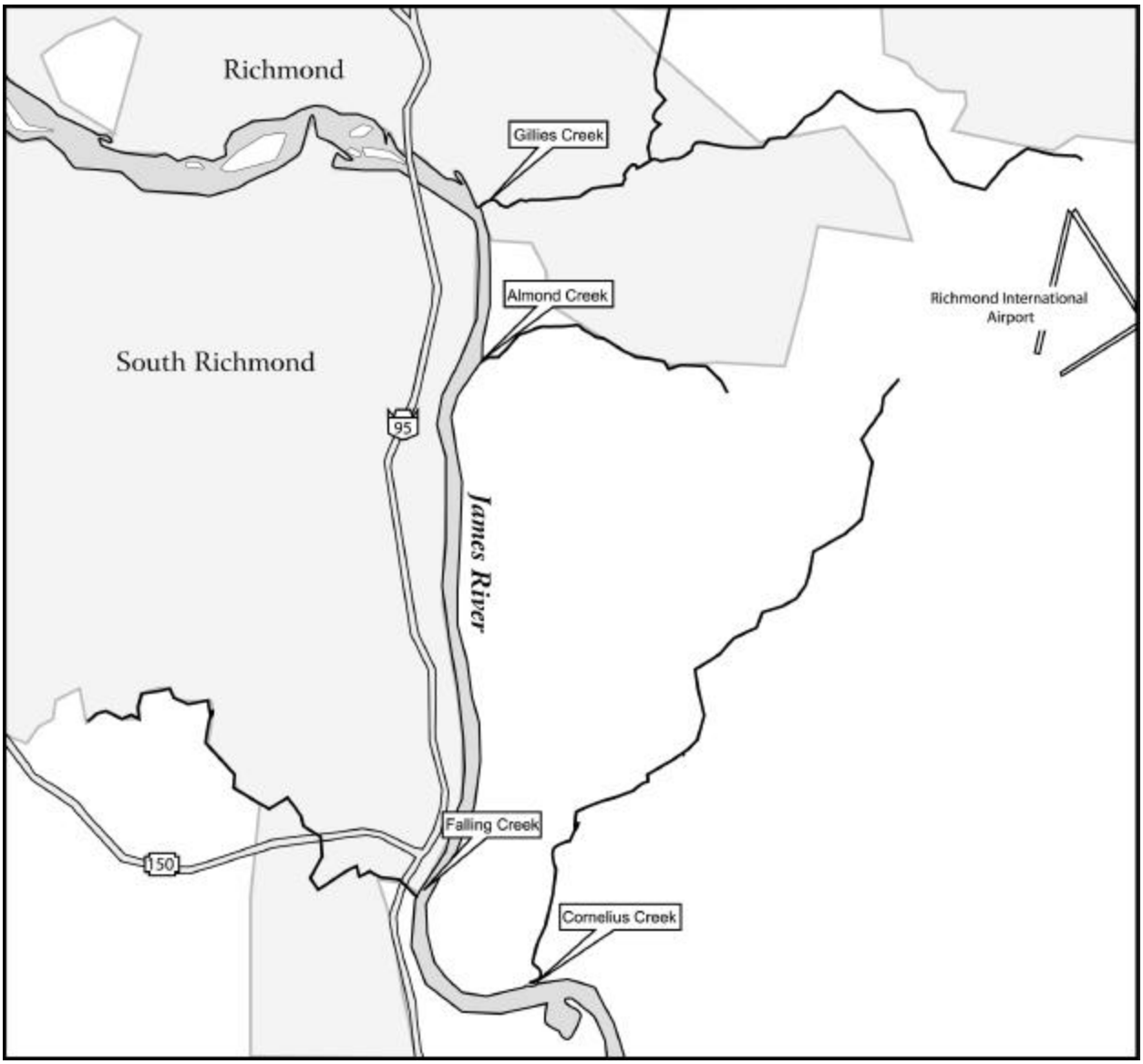
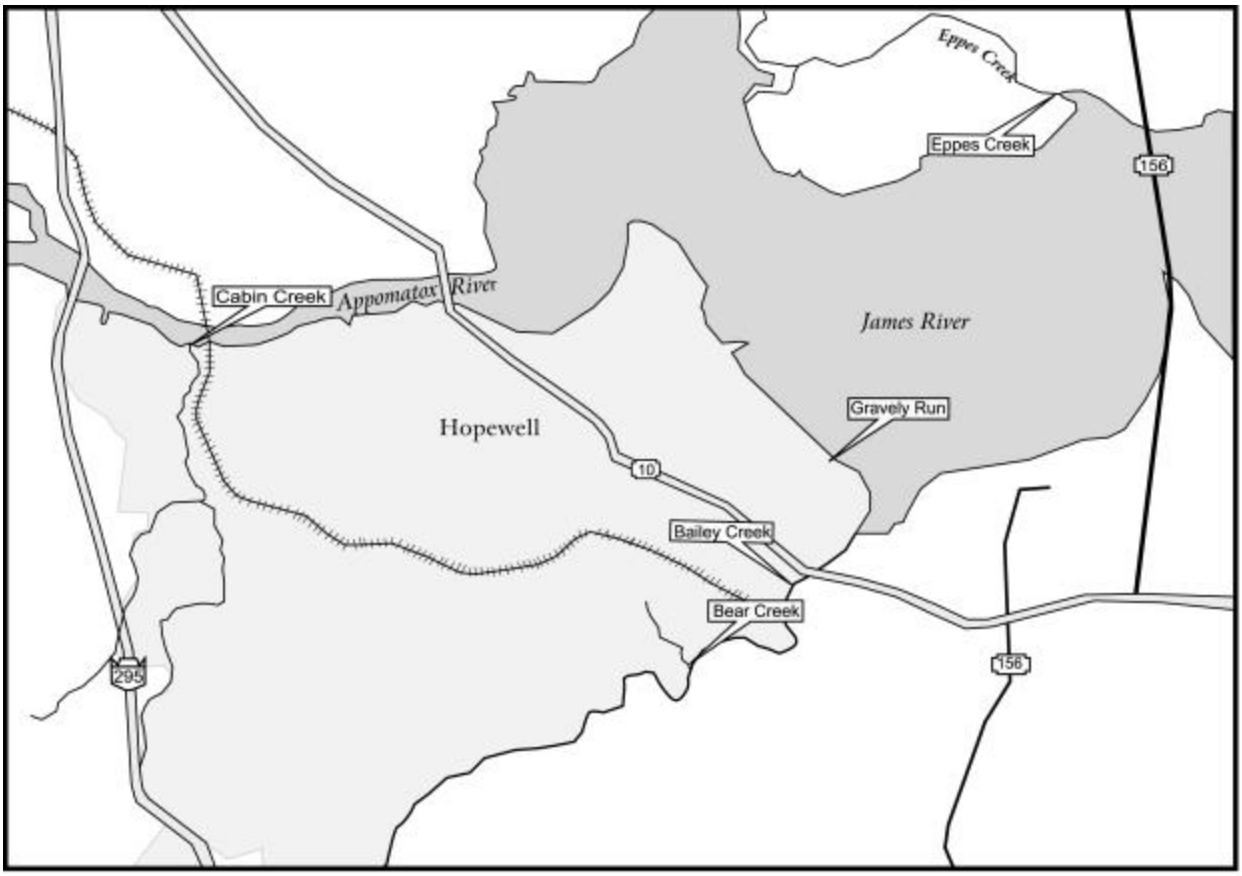


Figure 2.3. Field stations for the *in situ* study in the vicinity of Hopewell, VA



3.0 RESULTS

3.1 Characterization of Ambient Water

3.1.1 Ambient Water Quality at Sampling Stations

Bottom water temperatures in August were about 10°C higher than the depth average temperature in mid to late October (Table 3.1). In both time periods, the measured temperatures were typical of the season. In August, all stations upstream of station 2-JMS056.12 had salinity at or below 0.1 g/kg, whereas in October, all stations upstream of station 2-JMS047.81 had salinity at or below 0.1 g/kg. At comparable distances upstream, average bottom salinity was higher in October than bottom salinity in August. In October, the difference between surface and bottom salinity was approximately 0.5 g/kg.

Dissolved oxygen concentrations were always above 7 mg/l except at the Chickahominy station and station 2-JMS050.55 in both August and October. Dissolved oxygen concentration was generally higher in October than August, consistent with the lower water temperature. pH, measured only in October, ranged from 6.9 to 8.7, with most measurements between 7.5 and 8.7.

3.1.2 Water Column Sample Tests

3.1.2.1 Toxicity Data

The water samples from all 8 stations were non-toxic (Tables 3.2 and 3.3). Fathead minnows, which were tested only with the non-saline samples from stations 2-JMS074.29, 2-JMS072.08, 2-JMS068.68 and 2-JMS065.81, exhibited nearly perfect survival with a slight growth enhancement compared to the control animals. The growth enhancement was greater at the upstream stations near Jordan Point than at the downstream stations near Windmill Point. The growth enhancement may be a result of indigenous food. The growth effect was statistically significant for the sample from station 2-JMS072.08.

Ceriodaphnia were tested at the four strictly freshwater stations and at two slightly saline stations near the mouth of the Chickahominy River. Survival was 100% in samples from all 6 stations. Except for station 2-JMS047.33, the mean number of offspring was not significantly different in station comparisons with either controls or among stations. Suppression of reproduction in water from station 2-JMS047.33 may have resulted from salinity stress. The second and third samples used for this exposure had higher salinities than the first sample (i.e. 2.0 and 5.3 g/kg versus 1.6 g/kg). Because it is not possible to predict salinity of future samples at the start of the test and a singular control water was used to evaluate more than one sample, the extent of salinity stress cannot be determined. Reproduction of animals exposed to water from station 47.33 for 6 days (i.e. prior to renewal with the 5.3 g/kg salinity sample) was significantly less than that of the 1.6-g/kg salinity controls (t-test, $p = 0.02$). However, the

salinity of the second sample, used for test days 3-5, was 2.0 g/kg, equivalent to the LOEC for NaCl (EPA, 1991).

Cyprinodon survival and growth did not differ significantly in waters from the two most saline stations and the 20, 4.3 or 1.2 g/kg salinity controls (Table 3.3). Survival was slightly suppressed in water from stations 2-JMS047.81 and 2-JMS047.33 (Table 3.3). In both groups this was the result of a single replicate with 90% mortality (compared to 90-100% survival in the other replicates of the same treatment). Although there is no other supporting evidence, such replicate-specific mortality in surface water and effluent toxicity tests is often associated with the presence a fish pathogen in the sample.

Exposure of mysids to the low salinity (1.2 g/kg) control water and corresponding station 47.81 and station 2-JMS047.33 waters (1.2-1.6 g/kg salinity) resulted in 100% mortality within 24 h, indicating toxicity was the result of hypo osmotic stress. Similarly survival in the 4.3 g/kg salinity control was poor (Table 3.3). Survival on test day 6 (42%, 144 h) agrees well with 144-h TL_{50} value of 4.9 g/kg reported elsewhere (De Lisle and Roberts, 1986).

Mortality in water from Station 2-JMS042.46 occurred primarily during the first 24 h of exposure; 96% of the 47 animals that died in this treatment died in the first 24 h. The salinity of the first water sample for station 2-JMS042.46 (3.1 g/kg) was intermediate to the 1.2 g/kg and 4.3 g/kg salinity controls, which suggests mortality was salinity related. The higher salinity of the second and third water samples for this station (7.0 and 4.1 g/kg respectively) may have been tolerable for the few animals able to survive the initial osmotic shock. From previous work with this species, we know that mortality from salinity stress plateaus quickly and a few survivors may live for extended periods (144 h) even at salinities as low as 2 g/kg (De Lisle and Roberts, 1986). Survivorship in water from Station 2-JMS040.03 was significantly greater than that of the corresponding 4.3 g/kg control group but less than that of the 20-g/kg salinity control (Table 3.2). The slightly higher salinity of water samples from station 2-JMS040.30 (7.3 g/kg) may explain the difference between this treatment and the 4.3-g/kg controls. A salinity effect on survival in low salinity control treatments precludes analysis of growth and egg production in the ambient water samples from these stations.

In summary, the effects observed on reproduction in *C. dubia* exposed to water from station 2-JMS047.33 and survival in *M. bahia* exposed to water from Stations 2-JMS042.46, 2-JMS040.03, 2-JMS047.81 and 2-JMS047.33 are likely the results of salinity stress. Performance of animals in these samples was predictable based on performance in control waters of similar composition in these tests as well as published tolerance data. While fish species are available that are both tolerant of low salinity water and widely used in toxicity testing (e.g. *C. variegatus, Menidia spp.*), there is no obvious non-benthic invertebrate species that meets both criteria. Identification of an appropriate oligohaline invertebrate species and validation of use as a "standard" test organism would aid in the monitoring of oligohaline waters.

3.1.2.2 Toxicity Test QA/QC

LC50 values for reference toxicant tests with these species fell within the 95% confidence limits of values for tests previously conducted in the testing laboratory (Table 3.4). Survival, growth

and reproduction (as appropriate) for the several test species met the QA requirements specified in the test protocols.

3.1.2.3 Water Quality Data during Toxicity Tests

Water quality data for test samples, control waters and test chamber solutions are provided in Tables 3.5, 3.2, and 3.3 and Appendix B. Except for salinity, values for all parameters were within the expected tolerance limits of the test organisms. Salinity during the tests was consistent with salinity measured in the field at the time of sampling (Table 3.1).

3.1.3 Ambient Water Contaminants

The principle contaminants of concern in water samples are heavy metals, all of which are highly soluble. Organic chemicals are either of low solubility (PAH, organochlorine pesticides, PCBs) or are unlikely to be present in the fall of the year (organophosphate pesticides, pyrethroids, etc.). The primary agricultural crops are corn, soybeans and wheat in rotation. In this part of Virginia, pesticides are applied to crops predominantly in the spring and early summer. Pesticides therefore might be found in water samples collected in the spring and early to mid summer, but are unlikely to be present in water during the mid fall. Therefore no investment was made in measuring analytes other than metals. In total metal analyses, aluminum, antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver thallium and zinc were detected (Table 3.6). The same metals were detected in the dissolved metal fraction (Table 3.7). The only metal analyte not found in any sample was beryllium. No dissolved metal was present in an amount approaching the acute water quality criteria as appropriate for fresh- or saltwater samples.

Both dissolved and total trace elements were measured on all samples (Table 3.8). All these parameters were within normal ranges. For calcium, magnesium, potassium and sodium, the dissolved fraction approximated the total fraction, whereas for iron, the dissolved fraction was at or below detection, and most iron was present in particulate form. Calcium and magnesium were more abundant in saline than strictly fresh waters.

Throughout the Bay and its tributaries, nutrients (orthophosphate, total phosphate, ammonia, nitrite-nitrate, and total Kjeldahl nitrogen) are often in excess of acceptable levels. The nutrient parameters, measured on samples collected for this study, were within acceptable levels (Table 3.9). In no case were the ammonia or nitrite+nitrate concentrations toxicologically significant.

3.2 Characterization of Ambient Sediment

3.2.1 Sediment Texture

Twenty stations were selected for study but one of these could not be sampled because the sediment was compacted sand. While the center point of the grid at Station 2-JMS072.08 had a testable mixture of sand and silt-clay, randomly selected points in the grid had compacted sand only, and therefore no samples were collected for toxicity tests or chemical analysis of sediment.

The grain size characteristic (Table 3.10) was measured separately on each replicate point in the sampling grid at each station. During August (but not October), samples were also taken at the grid center for benthic community analysis, resulting in 4 measurements of grain size per station. For October samples, only 3 measurements were made at the EPA stations for which no benthic community analysis was done. Percent total organic carbon (TOC) and pore water ammonia were measured on each replicate used for toxicity tests for both sampling periods, whereas sulfide and percent moisture were measured on equivolume composites of the three replicates.

The station with the highest measured sand content was 2-JMS042.46 with a mean sand content of 76.9%. Eight stations had a sand content <10%: 2-JMS044.08, 2-JMS046.73, 2-JMS047.33, 2-JMS047.81, 2-JMS050.55, 2-JMS065.81, 2-JMS066.35, and 2-JMS068.68. Some of the ODU stations had significantly higher or lower sand content at the center point than in the random replicates used for toxicity tests (2-JMS044.08, 2-JMS056.12, and 2-JMS067.56). However, the variation among the random replicates suggests that these apparent differences actually emphasize the heterogeneity of sediment conditions at these stations and the importance of evaluating the toxicity of field replicates.

The surface textures observed during this study are generally consistent with the description of Nichols *et al*. (1991) for the James River. The region covered in this study is the upper half of the Estuary Funnel as defined by Nichols *et al*. (1991). They described this region as having margins with a high sand content (≥75%), and channels with a high clay content (>50%) with a clay:silt ratio of ca. 2:1. Of the 10 stations outside the channel (less than 3.5 m depth), only one had a sand content ≥75%. However, only that station fell within the sandy margin of Nichols (see Fig. 4b of Nichols *et al*., 1991). Seven stations had sand content between 10 and 50%, and two stations had sand content <10%. Some channel margin stations had 20% sand and one station (2-JMS072.08) was never successfully sampled because most of the 20 random points preselected in the station grid had compacted sand impenetrable with a Ponar grab. That particular station appears to fall within a sand area as plotted by Nichols *et al.* (1991). The deepest stations had minimal sand (<7%). Clay content at most stations exceeded 40% but the clay:silt ratio was in only one instance 2:1, contrary to the finding of Nichols *et al.* (1991).

The absence of stations with >75% sand in the present study reflects in part rejection of some sites (all margin locations) based on the criterion of too much sand. The difference also reflects variability of sediment texture in very shallow margin areas that Nichols *et al.* (1991) described as having a high sand content (see Fig. 4b of Nichols, *et al*., 1991).

TOC content of the sediments ranged from 0.63 to 3.1% and was consistently below 2.5% except at 2-CHK012.12 with ca. 3.0% TOC. Given the limited range in TOC values, it is not surprising that there was no correlation between TOC and percent sand. Moisture content was consistently between 43.5 and 69%. Sulfide concentrations ranged from 0.002 to 7.6 µmoles/g. Sulfide content exceeded 2 µmoles/g at three stations only: 2-JMS044.08, 2-JMS052.52, and 2–JMS066.35. There was no obvious relationship between sulfide content and percent sand or percent TOC. Ammonia-nitrogen concentrations in pore water varied from 0.1 to 32.4 µg/l, with most values between 1 and 10 µg/l. There was no clear correlation between pore water ammonia and grain size or TOC.

3.2.2 Sediment Sample Tests

3.2.2.1 Toxicity Data

Of the twenty stations selected for this study, sediment samples from 19 (12 collected in August and 7 in October) were evaluated for toxicity. The toxicity tests were performed on each group of sediment samples at different times. Results are reported by sediment sample group (DEQ and EPA samples) to account for use of different control groups and other variations that may relate to the sample group rather than the specific sampling locations. There was no evidence of acute or chronic effects on the test species.

3.2.2.1.1 DEQ Stations

Sediments from stations 2-JMS044.08, 2-JMS068.49 and 2-JMS068.64 contained large numbers of the isopod *Cyathura polita* (identified by R. Diaz, VIMS). Consequently these sediments were press sieved through a 500-µm mesh sieve prior to use. No other potential predators or species similar to the test species were found in any samples; therefore the remaining samples were tested without sieving. Sediment pore water pH and ammonia values (Table 3.10) and water column pH, ammonia and dissolved oxygen concentrations (Appendix A) were within the expected tolerance limits of the test organisms.

Survival of *H. azteca* ranged from 90 to 100% for all sediments tested (Table 3.11). Control survival for this sample set was 97%. Emergence rate was low, ranging from 0 to 5 animals. Mean growth ranged from 0.068 to 0.115 mg/animal; control sediment was 0.096 mg/animal. There were no statistically significant differences in amphipod survival, emergence or weight between control sediments and test sediments. Comparison among stations indicated significant differences for amphipod weight but not survival or emergence. However, pair-wise comparisons of weight using Tukey's test were not significant. Mean amphipod weights ranged from 0.077 mg for Station 2-JMS0 68.64 to 0.106 mg for Station 2-JMS067.56.

Although no minimum growth requirement is specified in any available standard method for 10-day *Hyalella* tests, comparison of animal final weights with initial weights (0.112-0.113 mg; determined from three groups of 20 animals at the beginning of the test) indicates the animals did not grow during the exposure period. The feeding level for these tests (0.5 ml YCT/chamber/day) was based on a compromise between the 1.5 ml/chamber/day recommended for flow-through testing (e.g. ASTM 1999, EPA 1994) and the need to prevent bacterial/fungal fouling of

sediment surfaces in static tests in which none of the YCT is flushed from the chamber. Higher feeding levels or the use of foods not prone to fouling (e.g. pulverized maple leaves) might have produced better growth.

For *Pimephales promelas*, percent hatch ranged from 90 to 100% with 100% hatch of control embryos (Table 3.12). Despite variability in the time to first hatch, the rate of successful hatch on day 4 was equal in all groups including the controls. Post hatch survival for embryos exposed to sediment from 2-JMS044.08 replicate 3 (78.7%) and 2-JMS068.49 replicate 2 (80.0%) was significantly less than controls even though post-hatch survival exceeded or equaled total survival for both of these samples. Hatch rates for all exposure periods, post-hatch survival and total survival among stations were statistically equivalent although significant within-station (i.e. among field replicates) variation in post-hatch survival occurred.

A few fish embryos hatched on test days 1 and 2, corresponding to an incubation time of 72 to 96 h. The majority of the fish embryos hatched on test days 3 and 4; this incubation time (5-6 days) is typical for fathead minnows at 25°C. No obvious fungal or bacterial growth was noted on any of the eggs or sediment surfaces.

Examination of fish hatch and survival presents several problems: 1) although total (i.e. embryo and fry stages) exposure time is the same for all fish, exposure times for fish fry vary depending upon the time of hatch of individual eggs, and 2) it is not possible to discriminate with certainty whether dead fish occurring in the chambers since the previous 24-h check are the result of an unsuccessful hatch or are post-hatch fish which subsequently died. Because of this it is not possible to compare the time of exposure with mortality for fish and cumulative hatch rate must be expressed as the maximum number of live fish observed over the test period within each chamber.

Test acceptability criteria were met for both species in all tests. Control group survival well exceeded minimum acceptability requirements.

3.2.2.1.2 EPA Stations

There was no evidence of toxicity for either test species exposed to sediments from these stations. Differences in survival were attributable to the presence of predators, notably *Cyathura polita.* Growth and reproduction were similar at all stations.

Sediments from all field replicates of stations 2-JMS065.81 and 2-JMS068.68 had large numbers of the isopod *Cyathura polita* when examined prior to testing. Consequently these sediments were press sieved through a 500-µm mesh sieve prior to use. No other potential predators or species similar to the test species were found in any of the other sample aliquots, which were examined before testing. Sediment pore water pH and ammonia values (Table 3.10) and water column pH, ammonia and dissolved oxygen concentrations (Appendix B) were within the expected tolerance limits of the test organisms.

Survival of *H. azteca* ranged from 53 to 100% for sediments tested from EPA Stations (Table 3.13). Control survival for this sample set was 95%. Low mean survival rates were observed in field replicates 2-JMS040.03 replicate 1, 2-JMS042.46 replicate 2 and 2-JMS042.46 replicate 3. Since no *C. polita* or other predator was detected in the preliminary examination in all cases, these samples were not sieved. At the end of the test, however, *C. polita* was found in all three, and a small *Callinectes sapidus* was found in sediment from Station 2-JMS042.46 replicate 2. In the laboratory replicates that did not have a predator, survival was high and consistent with all other treatments and replicates.

Amphipod data analyzed with all replicates including those with predators present showed a significant reduction in survival, but not weight or emergence, when compared to controls or between stations. However, when these replicates were excluded from analysis, there were no statistically significant differences in amphipod survival, weight or emergence between control sediments and test sediments or among stations.

Emergence rate for amphipods was low, ranging from 0 to 5 animals. Mean size in each field replicate ranged from 0.077 to 0.136 mg/animal; mean size in control sediment was 0.103 mg/animal. There were no statistically significant differences in amphipod emergence or weight between control sediments and test sediments.

Although no minimum growth requirement is specified in any available standard method for 10-day *Hyalella* tests, comparison of mean control animal weight (0.103 mg/ animal) with mean initial weight (0.084 mg/animal) indicates a weight gain of approximately 23% over the course of the test. The feeding level for these tests (0.75 ml YCT/chamber/day) was increased above that used for the DEQ samples but still based on a compromise between the 1.5 ml/chamber/day recommended for flow-through testing (e.g. ASTM 1999, EPA 1994) and the need to prevent bacterial/fungal fouling of sediment surfaces in static tests in which none of the YCT is flushed from the chamber. Previous testing using a feeding rate of 0.5 ml/chamber/day did not result in a measurable increase in growth over the 10-day test. The difference in observed growth rate is believed to result strictly from the difference in feeding rate.

Percent hatch of *P. promelas* ranged from 60 to 100% with 96.7% hatch of control embryos (Table 3.14). A few fish embryos hatched on test day 2, corresponding to an incubation time of 96 h. The majority of the fish embryos hatched on test days 3 and 4; this incubation time (5-6 days) is typical for fathead minnows at 25°C. No invertebrate predators were observed in any of the fish exposure baskets. No obvious fungal or bacterial growth was noted on any of the eggs or sediment surfaces.

Test acceptability criteria were met for both species in all tests. Control group survival well exceeded minimum acceptability requirements.

As with the DEQ sediment samples, examination of fish hatch and survival presents several problems: 1) although total (i.e. embryo and fry stages) exposure time is the same for all fish, exposure times for fish fry vary depending upon the time of hatch of individual eggs, and 2) it is not possible to discriminate with certainty whether dead fish occurring in the chambers since the previous 24-h check are the result of an unsuccessful hatch or are post-hatch fish which

subsequently died. Therefore, it is not possible to compare the time of exposure with mortality for fish and cumulative hatch rate must be expressed as the maximum number of live fish observed over the test period within each chamber.

For all test days during which most hatching occurred the rate of successful hatch in all groups equaled that of controls. Post hatch survival and total survival also did not differ significantly from controls. Hatch rates for all exposure periods, post-hatch survival and total survival among stations were statistically equivalent.

3.2.2.2 Reference Chemical Test Results

LC50 values for concurrent reference toxicant tests performed in parallel to both sample groups for amphipods and fish fell within the 95% confidence limits of values for tests previously conducted in this laboratory with these species (Table 3.15).

3.2.3 Sediment Contaminants

Bulk metal concentrations for Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, Ag, Th, and Zn were measured in sediment from 19 of the 20 James River stations (as noted previously, one station (2-JMS072.08) was too sandy to sample effectively with a petit Ponar grab). These data are compiled in Table 3.16 along with sediment effect concentrations (SEC) from Long *et al*. (1995), Ingersoll *et al*. (1996), and MacDonald *et al*. (2000). Of the metals for which there are SECs, the detection limit equaled or exceeded the ER-L or TEC for Cd, and Ag, and was only slightly lower than the ER-L and TEC for Hg.

The ER-M was exceeded only for Mn (as noted in Table 3.16). Slight exceedances of the ER-M were observed for Mn at three stations, all in the James River, and the ER-L was exceeded at 17 of 19 stations. The ER-L was exceeded slightly for As (1 station), Cr (6), Cu (9), Pb (7), Hg (3), Ni (14), and Zn (14). These exceedances of the ER-L were minimal and did not approach the ER-M. Since the detection limits for Ag exceeded the ER-L and in some cases the ER-M, no statements can be made about exceedances for Ag.

One frequently used way to evaluate the bioavailability of metals is to compare the concentration of acid volatile sulfides (AVS) with the concentrations of simultaneously extracted metals (SEM). For sediments at the stations in the James River, AVS ranged from 0.0005 to 7.5862 µmoles/g wet weight (Table 3.17). The sum SEM (Cd, Cu, Hg, Ni, Pb, and Zn) ranged from 0.4693 to 1.2966 µmoles/g wet weight. If one subtracts the SEM from AVS, a negative number implies an excess of SEM that may be considered bioavailable, and a positive number implies an excess of AVS that may be considered available to bind additional metals. In the present case, the SEM exceeded the AVS at seven stations with a maximum excess SEM of 1.1 µmole/g at station 2-JMS042.46. Stations with substantial apparent ability to bind additional SEM were 2-JMS044.08 (5.0 µmole/g), 2-JMS052.52 (4.9 µmole/g) and 2-JMS066.35 (6.2 µmole/g).

The SVOC analyses (Table 3.18) revealed small amounts of phthalates above the quantitation limit. These were uniformly distributed in sediment over the region, and may be a laboratory artifact. In any case, these are likely of no toxicological significance. Other SVOCs included low

molecular weight PAHs and high molecular weight PAHs. None of these materials occurred at concentrations approaching or above the ERM, although there were a few exceedances of the ERL. In general, the concentration of total PAH increased from downstream to upstream, which is consistent with the industrial nature of the City of Hopewell, just upstream of the study area.

The organophosphate (Table 3.19) and organochlorine (Table 3.20) pesticides, PCB (Table 3.21) and acidic herbicides (Table 3.22) all occurred at concentrations below the quantitation limit with the exception of PCBs and Kepone at station 2-JMS068.49. At this station, a few PCB congeners reached 12 ng/g. Since most values at this and other stations were below the detection limit, no PCB total was calculated. Kepone at this station was found to be 60 ng/g, a concentration believed to be below toxicological significance. This pesticide, released into the river at Hopewell, VA in the early to mid 1970's has gradually declined in tissues of fish in the river and is generally not observed in environmental samples at this time.

3.2.4 Benthic Community Description

The total number of species at each station ranged from 5 to 14 (Table 3.23). The lowest species numbers were observed at Station 2-CHK012.12 (muddy sand flat), 2-JMS052.52 (sandy mud) and 2-JMS056.12 (muddy). The highest species number was observed at Station 2-JMS066.35 (sandy mud).

The individuals/m^2 ranged from 1542.2 to 11340.0. There was no relationship between total species and individuals/m^2 or with sediment texture. High total biomass/m^2 was largely due to the presence of bivalves, and independent of sediment texture. Biomass without bivalves was more uniform, ranging from 0.249 to 1.746 g/m^2.

The B-IBI was above 3.0 at all but one station. Station 2-JMS044.08 had a B-IBI of 2.7, slightly below 3.0, the generally accepted lower criterion for a good assemblage rating.

Species lists are included in Appendix C, Table 5. A few points are noteworthy. These communities were all dominated by a few opportunistic species. This is typical of oligohaline and freshwater communities. One of the test species, the amphipod *Leptocheirus plumulosus*, was one of the dominant species at the three most downstream (oligohaline) stations, but curiously was also present in the Chickahominy and just downstream of Windmill Point (strictly freshwater). Lastly, the carnivorous isopod, *Cyathura polita* that was problematic in the toxicity tests occurred at 7 of the 12 stations and was among the dominant species at stations 2-JMS068.49 and 2-JMS068.64. This species, often thought to be oligohaline, is known to establish resident populations in tidal freshwater regions of various estuaries well upstream of saltwater influence (Simpson, *et al*., 1985).

3.2.5 Characterization

3.2.5.1 Water

The dissolved concentration for each metal was below the acute and chronic Virginia Water Quality Criteria for that metal. As a result, no toxicity was expected based on survival, growth or reproductive endpoints. This was true for those stations at which the salinity was strictly 0 g/kg and those stations at which the salinity was above 1 g/kg.

For the four stations at which the salinity was zero (and therefore testable with *P. promelas*) and the six stations at which the salinity was below three (and therefore testable with *C. dubia*), there was no significant mortality response. For *C. dubia*, there was a decrease in mean number of offspring compared to the appropriate control only for station 2-JMS047.33, and this reproductive deficiency was clearly a salinity effect.

For the four saline stations tested with *C. variegates* and *M. bahia*, there were effects on mortality and reproduction (*M. bahia* only). These effects, both survival and egg production, were likely an effect of the reduced salinity that was at or below the tolerance limit for the species. There were no effects that appear to reflect the presence of a toxic material.

3.2.5.2 Sediment

3.2.5.2.1 Sediment Quality Triad

To synthesize the characterization of sediment based on the chemical, toxicological, and benthic community, the analytical data were examined to identify those chemicals that exhibited an exceedance of the relevant ER-M. In addition, the quotient of the observed concentration and the ER-M was determined. From these values, the mean ER-M quotient (MERM-Q) was calculated. This calculation involved all organic chemicals and dissolved metals for which an ER-M exists.

At every station, the MERM-Q was less than 0.3, indicating that there was little likelihood of an acute toxic effect. Survival of *H. azteca* exceeded 80% in all replicates at all stations, and generally exceeded 90%. Similarly for *P. promelas* embryos, embryo survival through hatch exceeded 90% in all but 2 replicates at 2-JMS044.08 and 1 replicate at 2-JMS046.73 and at 2-JMS050.55. There were no significant differences among the replicates at each station to indicate acute mortality. This is consistent with the chemical characterization for all stations.

The benthic community exhibited B-IBI values of 3.0 or above at all stations except 2-JMS044.08 where the B-IBI was 2.7. Values of 3.0 and above meet the quality criterion goal. A value of 2.7 is considered marginal. Again, this is consistent with the chemical characterization for each station.

3.3 Salinity Effects Experiment

3.3.1 Sediment Texture

Two types of sediments were selected for the experiment, one with high-TOC, high clay-silt and one with low-TOC, low clay-silt. The high-TOC high clay-silt sediment was collected from station 2-JMS065.81 and the low-TOC, high sand sediment was collected from station 2-JMS040.03. The texture of these sediments will be described in more detail below.

3.3.2 Toxicity Data

3.3.2.1 *Leptocheirus plumulosus*

Survival, emergence, and final weight of animals exposed to un-spiked test sediments (i.e. experimental controls) did not differ significantly from those of animals exposed to laboratory control sediment. Survival and emergence in control treatments was essentially the same for both salinity regimes (Table 3.24). Final weight was consistently higher in the 15 g/kg salinity treatments than the 8 g/kg treatments within all spiking doses and sediments.
Survival was only slightly lower in 110 TU treatments than controls but decreased to $\leq$ 23% in 305 TU treatments. Survival was greatest in the 305 TU exposures at 8 g/kg salinity in both sediments, suggesting an interactive effect of salinity on metal toxicity. Because overall survival data departed significantly from a normal distribution (a requirement for analysis of interactive terms by ANOVA), individual components of the model (sediment, TU) were analyzed for normality in an attempt to identify sources of non-normality. Elimination of the experimental control group (0 TU spike) produced a near-normal distribution amenable to analysis by ANOVA. The resulting analysis of survival data for spiked-only treatments indicated significant terms for simple metals effects as well as salinity x metal and sediment x metal interactive effects (Table 3.25). Re-analysis with the experimental controls included (assuming model robustness was adequate) indicated significant effects of metal ($p = 0.000$) and salinity x metal ($p = 0.002$) but not sediment x metal ($p = 0.113$) interaction terms, supporting the general findings of the reduced-treatment ANOVA.

Although metal toxicity (in terms of survival) decreased with decreasing salinity, growth data suggest animals may have been stressed in the lower test salinity. Growth data exhibited a significant salinity effect ($p = 0.000$) but were unaffected by metal exposure or sediment type (Table 3.25). Comparison of initial weights (mean 0.136 mg) with final weights in each of the four experimental control groups (8 g/kg and 15 g/kg salinity x two sediments) indicated that there was a significant increase in weight only in the 15 g/kg salinity controls (ANOVA / Dunnett's test, $p < 0.05$).

Transformation of emergence data was not successful in producing a normal distribution but the $\log_{10}$ transformation produced skewness and kurtosis values closest to zero. Because the data were homoscedastic a tentative analysis with ANOVA was performed in addition to analysis for independent metal and sediment effects using the non-parametric Kruskal-Wallis test. Although ANOVA indicated a significant effect of sediment and sediment x metal on emergence these results may be spurious due to departure of data from a normal distribution. Analysis by the

non-parametric method found no significant independent effect of sediment ($p = 0.080$) but a highly significant effect of metal exposure ($p = 0.000$).

3.3.2.2 *Hyalella azteca*

Survival and emergence of animals exposed to experimental control sediments (all salinities) did not differ from those exposed to laboratory control sediment. However, growth of animals exposed to experimental control sediment (all salinities) was significantly less than that of animals exposed to laboratory control sediment (ANOVA / Dunnett's test, $p < 0.05$). When only freshwater control animals are compared, final weight of animals in un-spiked sediment from station 2-JMS065.81, but not station 2-JMS040.03, was equal to that of animals exposed to laboratory control sediment. The difference in final weight may be due to the lower TOC content of sediment from station 2-JMS040.06 (see description of sediment texture below). Survival and weight appeared to decrease with increasing salinity in both the un-spiked and spiked sediments (Table 3.26). Although survival decreased with salinity addition to 15 g/kg in un-spiked sediment (ANOVA/Dunnett's test, $p < 0.05$), the lowest survival rate (75%) was near the recommended test acceptability criterion of 80% for laboratory control sediments (EPA, 2000). Emergence exhibited a similar salinity response and generally increased with increasing salinity. The effect of spiking was only apparent in the 305 TU treatments.

Survival was reduced significantly by the simple effects of sediment type ($p = 0.003$), salinity ($p = 0.000$) and metal ($p = 0.001$) as well as by the interaction of all three components, sediment x salinity x metal ($p = 0.043$, Table 3.27). The simple effect of sediment type is not apparent when only the freshwater, un-spiked sediment results are examined but when survival is compared between each corresponding salinity-metal combination of the two sediments a general negative difference is seen for sediment from station 2-JMS040.03. Both salinity ($p = 0.000$) and metal exposure ($p = 0.001$) exerted a simple negative effect on growth. Although emergence was not affected by any factor ($p \geq 0.140$) there appeared to be a qualitative, but inconsistent, increase with increasing salinity. Because data for emergence could not be normalized by transformation the non-parametric Kruskal-Wallis test was used to evaluate the independent effects of salinity and metal exposure; the results of this test confirmed that there was no significant effect of either salinity ($p = 0.120$) or metal exposure ($p = 0.906$) on emergence.

3.3.3 Quality Control, Reference Toxicant Data

Test acceptability criteria were met for all tests and LC50 values for concurrent reference toxicant tests fell within the 95% confidence limits of values for tests previously conducted in this laboratory with these species (Table 3.28). Control group survival well exceeded minimum acceptability requirements. Although no minimum growth requirement is specified in any available standard method for 10-d *Hyalella* tests, comparison of mean laboratory control animal weight (0.110 mg) with mean initial weight (0.075) indicates a weight gain of approximately 47% over the course of the test. Similarly the *L. plumulosus* laboratory control animals increased in weight from 0.136 mg to 0.246 mg (81%) over the course of the test. Water column pH, ammonia and dissolved oxygen concentrations (Appendix D) were within the expected tolerance limits of the test organisms.

3.3.4 Sediment Texture and Quality

Experimental sediments were of two types, one with high-TOC, high clay-silt and one with low-TOC, low clay-silt (Table 3.29). It was anticipated that the high-TOC, silty sediment (2-JMS065.81) would provide a high AVS-binding sediment and the low-TOC, sandy sediment (2-JMS040.03) would provide a low AVS-binding test sediment

Pore water salinity values agreed well with nominal values (Table 3.30). Pore water pH was only slightly higher in sediment from station 2-JMS065.81 and was consistent among both salinity and spiking treatments within sediments. Pore water ammonia appeared to increase with increasing salinity. Mean pore water ammonia nitrogen in sediment from station 2-JMS040.03 increased 60% from 19.1 mg NH_4-N/l at 0 g/kg salinity to 30.4 mg NH_4-N /l at 15 g/kg salinity. Similarly, mean pore water ammonia in sediment from station 2-JMS065.81 increased 120% from 2.5 mg NH_4-N /l at 0 g/kg salinity to 5.5 mg NH_4-N /l at 15 g/kg salinity. In the case of sediment 2-JMS065.81, this increase might be due to displacement of sorbed ammonium ions by sodium and other seawater cations. The initial saline nature of sediment from station JMS040.03 would seem to lessen any effects of salt addition on ammonia liberation but ammonia produced by biological activity after salinity adjustment of this sediment to 0 g/kg and subsequently adsorbed to sediment particles might have been exchanged with seawater cations.

3.3.5 Contaminants Data

Measured concentrations of metals in the stock solutions ranged from 76 to 110% of nominal values (Table 3.31). Differences between measured and nominal values were likely due in part to errors associated with multiple dilutions performed by the toxicology lab (the stock sample sent to the analytical lab consisted of a 10X dilution with deionized water) and the analytical lab (to obtain concentrations within instrument calibration range).

Although all metals were spiked in equivalent toxic units, the mass of metals added varied by nearly two orders of magnitude because of the difference in toxicity of the least toxic metal (Ni) and most toxic metal (Cd). Therefore, when one compares the spiked metal concentrations of each metal to the corresponding SEM concentrations for that metal, there were two relationships observed. For those metals with low spike concentrations, there was no apparent relationship between the spike concentration and the SEM concentration. In contrast, for those metals with high spike concentrations, there was a monotonically increasing slope of SEM concentration against spike concentration.

Though no cadmium SEM (Table 3.32) was detected, the spike added ranged from less than the analytical detection limit to approximately twice the detection limit. Consequently if half of the Cd added were not extractable as SEM (e.g. see below) then the remaining half would be at or below the detection limit.

In the case of copper (Table 3.33), sufficient background metal existed in the sediments to be measurable as SEM even though the spike was equal to or less than the SEM detection limit. When background copper (i.e. the reported SEM value in 0 TU sediment) is subtracted from the reported SEM for each treatment, the differences between the corrected SEM and the copper

spike concentration range from +225% to –38%. These apparent differences may reflect in part increased analytical variance at concentrations near the detection limit. If the detection limit reported for the freshwater laboratory control (0.0441 μM/g) is typical, then all spikes were below the detection limit and the highest measured concentration is only four times the detection limit.

In the case of nickel and zinc, which were spiked at much higher concentrations, a more consistent relationship is noted (Tables 3.34 and 3.35). The difference between the metal spike and measured SEM (adjusted for background in the case of Zn but not for Ni because the background was less than the detection limit) is relatively constant with mean values of –51% for Ni and -45.6% for Zn. Samples collected from these two sites concurrent with the ambient monitoring portion of the study had total metal concentrations of 0.4052 (re-expressed in μmoles/g) Ni (station 2-JMS065.81), 0.3728 (re-expressed in μmoles/g) Ni (station 2-JMS040.03), 2.3558 (re-expressed in μmoles/g) Zn (station 2-JMS065.81) and 1.9122 (re-expressed in μmoles/g) Zn (station 2-JMS040.03) suggesting that most of the sediment-associated metal is not available as SEM. Similarly, although total copper concentrations (Table 28) were 0.5770 (re-expressed in μmoles/g) for station 2-JMS040.03 and 0.4343 (re-expressed in μmoles/g) for station 2-JMS065.81, Cu SEM was 0.0555 (re-expressed in μmoles/g) and 0.0376 (re-expressed in μmoles/g) for station 2-JMS040.03, approximately one tenth of the total.

Comparison of total spiked metals (less Se which was not analyzed in the SEM method) with measured SEM for spiked metals only, or with total measured SEM (i.e. including the analyzed metals Pb and Hg which were not part of the spiking mixture), yields results similar to that observed for Zn and Ni (Table 3.36). This is because the spiking concentrations of these two metals were much greater than all the other metals combined (spiked and background). Quantitative recovery of spiked metals may not have occurred for a variety of reasons. Some metals (Ni, Cu) form sulfides that are not very soluble under SEM/AVS methods (e.g. Allen *et al.*, 1993; Leonard *et al.*, 1999). Also, adding one metal to a sediment when the AVS capacity has been exhausted may displace other metals (Simpson *et al.*, 2000). As discussed above the total metal concentration of the sediments exceeds the SEM/AVS component.

In general, the toxicity data agreed with the notion that toxicity should not occur when SEM/AVS is less than 1.0 (i.e. AVS-SEM <0) (e.g. Di Toro *et al.*, 1992; Ankley *et al.*, 1996; Berry *et al.*, 1996). Although the SEM/AVS criterion is primarily a “no effect value” (i.e. values < 1.0 predict no toxicity but toxicity may or may not be present if SEM/AVS is > 1.0) one might expect similar SEM/AVS ratios for the same sediment to yield similar degrees of toxicity. However, the relationship between SEM/AVS and observed toxicity was not consistent within the same sediment. For example, similar SEM/AVS ratios within sediment from 2-JMS040.03 yielded different degrees of toxicity and as SEM/AVS decreased between 8 g/kg salinity and 15 g/kg salinity in sediment from 2-JMS065.81, toxicity increased. SEM/AVS ratios varied within sediment primarily due to changes in AVS rather than SEM. There was no apparent relationship between salinity or metal spiking and measured AVS values. Surprisingly, AVS was higher, by nearly an order of magnitude, in the low-TOC, sandy sediment from 2-JMS040.03 than in the high-TOC, silty sediment from 2-JMS065.81. The low AVS reported for the saltwater laboratory control sediment resulted in a high SEM/AVS ratio in spite of relatively low SEM.

3.4 *in situ* Tests

3.4.1 Richmond Study

3.4.1.1 Water Quality and Weather Conditions

The temperature during the study period declined from 26.5-28°C to 18.5-19.5°C, a normal seasonal decline (Table 3.37). The dissolved oxygen concentration increased somewhat at Gillie and Almond creeks, but remained relatively constant at the other creeks. The pH was almost neutral for the period for which data was collected.

The air temperature declined from 25.0-27.0°C to 14.0-17.0°C during the study period. Throughout the period, the weather was generally cloudy with minimal wind speed (<5 over half the time). These conditions are typical of the fall season in this area.

3.4.1.2 Rainfall Data

During the study period, there was little rainfall at Gillie Creek, the site where the greatest impact was expected (Table 3.37). The highest rainfall was during the 48 hour period ending 27 September (2.4 cm). Similarly, the amount of rainfall at Almond Creek was modest, with the highest rainfall occurring during the periods ending 25 September and 27 September (1.3 and 1.8 cm respectively). Heavier rainfall occurred at both Falling Creek and Cornelius Creek during the first and last periods of the study with 3.5 to 5.0 cm at each site during both periods.

3.4.1.3 Survival and Weight Data

The before and after counts for each two-day period were generally consistent, with the same or fewer animals observed at the end of the period than at the beginning of the period (Table 3.38). In those cases in which this was not true, there is no evidence that the apparent increase in number resulted from immigration of indigenous amphipods. At all study sites, the indigenous species was *Gammarus fasciatus*, a species readily distinguished macroscopically in shape and size from *Hyalella azteca*. The chambers were constructed in such a manner during the Richmond (and the fall Hopewell) study that small amphipods could move into pockets in the glue surface where they could not be seen and from which they were not always flushed during the counting procedure. Therefore, when a day with a low count was followed by a day with a high count, the high count was assumed to be correct for the preceding day. The difference in count was generally only 1 animal (5%),

The survival rate over each two-day period ranged from 88.8% to 100% at all four Richmond study sites (excluding the 70% estimate on day 6 at the Gillie Creek site resulting from the loss of all animals in one replicate due to tearing of the screen) (Table 3.38). The cumulative survival at the end of the deployment was 68.8% at Gillie Creek, 71.3% at Almond Creek, and 72.5% at Falling Creek compared to 81.3% at Cornelius Creek. There was no significant difference in cumulative survival rate over the study period though survival at Cornelius Creek was higher than at any other site over the 14- day study period.

There was no significant relationship between survival and rainfall at any of the study sites. The apparent low survival after the 6th day of exposure corresponds with the total loss of amphipods in one replicate as a result of a tear in the screen mesh of the exposure chamber. A much larger rainfall (2.4 cm) during the final 48 hours than during the 48 hours ending on day 6 (0.4 cm) produced no effect on survival. At the remaining sites, there was no correlation between rainfall and amphipod survival.

3.4.2 Hopewell Study

3.4.2.1 Fall 2000 Deployment

3.4.2.1.1 Water Quality and Weather Conditions

The water temperature during the study period declined from ca. 20°C at the beginning of the month to 12-13°C at the end in Bear, Cabin and Eppes Creek (Table 3.39). Bailey Creek was consistently warm, varying between 17 and 24.5°C during the month. This can be explained by the elevated temperature water entering from the nearby Gravelly Run where temperatures ranged from 29-32°C during the first two weeks of the month. The dissolved oxygen concentration was highly variable in Bailey Creek, ranging from 3.8 to 9.4 mg/l. In Gravelly Run and Bear Creek, the dissolved oxygen was more consistent, ranging between 4.6 and 6.2 mg/l and 3.5 and 5.9 mg/l respectively. In Cabin and Eppes Creeks, the dissolved oxygen concentration was nearly double and more nearly 100% of saturation. The pH ranged from 6.5 to 7.8 in Bailey Creek, 7.0-7.1 in Gravelly Run, and 5.5 to 7.2 in Bear Creek, whereas pH was 7.0 to 9.3 in Cabin and Eppes Creeks.

The air temperature declined from 18-20°C at the beginning of October to 7-9°C at the end of the month. The exception to this was Cattail Creek, where elevated air temperatures were observed throughout the month except on October 23, the coldest day on all creeks except Bailey. During the study period, the days were usually clear to cloudy, and wind velocities were low.

3.4.2.1.2 Rainfall Data

During the entire 4 weeks in October, there was no rainfall at any site in Hopewell. Therefore any changes in biological parameters cannot be attributed to rainfall events.

3.4.2.1.3 Survival and Weight Data

Survival at the Bailey, Cabin, and Eppes Creek sites was uniformly high throughout the four week study period, with 2-day survival exceeding 92.5% most of the time (Table 3.40). The only exception was in Bailey Creek after the first 48 hours when survival was only 87.5%. Cumulative survival for each 14 day observation period ranged from 81.2 (period 1) in Bailey Creek to 90% (period 2) in Cabin Creek.

During the first two weeks of the study period, survival was markedly lower at the Gravelly Run station than elsewhere. Survival after the first 48 hours was only 77.5%. For the next three

observation periods, survival exceeded 93 percent, but then dropped to 62.5-74.1 per 2-days. Cumulative survival was only 20% on the final observation day.

The Gravelly Run station was terminated at the end of the first study period, and replaced by a station at the mouth of Bear Creek. Survival at the new site was consistently greater than 93% over each 2-day period with a cumulative survival rate of 82.5%, all within the range of responses at the Bailey, Cabin and Eppes Creek sites.

3.4.2.2 Spring 2001 Deployment

3.4.2.2.1 Water Quality and Weather Conditions

The water temperature during the May 2001 study period decreased from the mid 20s to just below 20°C (Table 3.41). While the temperature was nearly identical during the first few days (24±1°C), the temperature on the final day was slightly lower in Bear and Eppes Creeks (17 and 19.5°C) than Bailey and Cabin Creeks (20.5 and 22.0°C). The dissolved oxygen concentration was generally high (7.0-11.0 mg/l), though there was a decline after the first week to as low as 2.7 mg/l in Bailey and Bear creeks. The pH was between 6.3 and 7.8 at all four study sites. The air temperature was above 20°C for the first 10 days of the period, declining to 12°C and rising to 19°C over the last 4 days. During the study period, the days were clear to cloudy and wind speeds were generally low.

3.4.2.2.2 Rainfall Data

During the 2 weeks in early May, there was again no significant rainfall at any site in Hopewell. Traces of rainfall were observed twice within the period, but were insufficient to attribute any mortality to stormwater runoff. No rainfall was recorded at the Hopewell weather station.

3.4.2.2.3 Survival and Weight Data

Survival over each 2-day period during the 14-day study period ranged from 91.5 to 100%, comparable to both previous exposure periods (Table 3.42). The overall survival for the 14-day period ranged from 80 to 82.5%, further indicating the lack of response to local conditions.

Mean weight was higher for the amphipods held in Bailey Creek than for those held at other stations. The Bailey Creek site is influenced by water from Gravelly Run as evidenced by higher temperatures than elsewhere, especially during the fall deployment. The thermal difference in the spring does not seem sufficient to explain the weight difference. However, there may have been a greater abundance of food in the water in Bailey Creek.

Mean percent gravid was highest for amphipods in Bailey Creek and lowest for those in Eppes Creek. This is not inconsistent with the speculation that the may have been a greater abundance of food in the water in Bailey Creek. However, the differences in percent gravid are small and probably not significant.

Table 3.1. Water quality at each sampling site at the time of collection (except as noted). All stations are in the James River except 2-CHK012.12, located in the Chickahominy River.

Sampling Date	Station	Temp. (°C)	Conductivity (µmhos/cm)	Salinity (g/kg)	DO (mg/L)	pH	Depth (meters)	Weather Condition
8/1/00*	66.35	28.0	ND	0.1	8.3	ND	1	
	67.56	27.7	ND	0.1	8.0	ND	5	
	68.49	27.4	ND	0.1	7.5	ND	3	
	68.64	27.8	ND	0.1	7.4	ND	7	
	73.63	28.2	ND	0.1	9.8	ND	1	
	74.25	27.6	ND	0.1	9.0	ND	2	
8/7/00*	12.12	27.7	ND	0.1	5.9	ND	1	
	44.08	27.7	ND	0.8	7.1	ND	7	
	46.73	28.5	ND	0.4	8.4	ND	3	
	50.55	27.7	ND	0.2	6.2	ND	7	
	52.52	29.7	ND	0.2	8.4	ND	1	
	56.12	28.7	ND	0.1	7.4	ND	1	
10/17/00	40.03	- - - - -	** 7840	** 4.3	- - - - -	** 7.5	- - - - -	Cloudy
	42.46	- - - - -	** 5080	** 2.7	- - - - -	** 7.7	- - - - -	Cloudy
	47.33	- - - - -	** 3200	** 1.7	- - - - -	** 6.9	- - - - -	Overcast
	47.81	- - - - -	** 2320	** 1.2	- - - - -	** 8.5	- - - - -	Overcast
	65.81	- - - - -	** 200	** 0.1	- - - - -	** 6.9	- - - - -	Overcast
	68.68	- - - - -	** 197	** 0.1	- - - - -	** 8.7	- - - - -	Overcast
	72.08	- - - - -	** 205	** 0.1	- - - - -	** 8.7	- - - - -	Cloudy; E/NE wind
	74.29	- - - - -	** 221	** 0.1	- - - - -	** 8.0	- - - - -	
10/19/00	40.03	18.8	8297	4.6	8.9	8.0	5.3	Sunny; mid 50's
	42.46	18.6	6220	3.3	6.2	8.2	2.6	Sunny, low 70's
	42.46	17.1	5090	2.7	9.2	8.4	2.8	Sunny; low 70's
	47.33	18.9	2290	1.2	9.7	8.0	8	Sunny, low 70's
	47.81	18.8	1965	1.0	6.2	8.1	2.9	Sunny, low 70's
	65.81	19.0	216	0.1	10.3	8.6	7.9	Sunny; low 70's
	68.68	19.2	229	0.1	10.6	8.7	8	Sunny, low 70's
	72.08	19.7	249	0.1	11.1	8.7	5	Sunny, Low 70's
	74.29	19.8	250	0.1	11.0	8.7	8.8	

Table 3.1 (cont.). Water quality at each sampling site at the time of collection (except as noted). All stations are in the James River except 2-CHK012.12, located in the Chickahominy River.

Sampling Date	Station	Temp. (°C)	Conductivity (µmhos/cm)	Salinity (g/kg)	DO (mg/L)	PH	Depth (meters)	Weather Condition
10/23/00	40.03	18.9	10053	5.6	8.5	7.6	5.5	Sunny, N/NW breeze, low 40's
	42.46	18.6	7005	3.8	5.9	7.8	2.8	Sunny; low 50's
	47.33	18.7	6170	3.3	8.8	7.7	8.8	Sunny, N/NW wind; 50's
	47.81	18.9	2320	2.1	6.2	8.1	2.5	Sunny, N/NW wind 50's
	65.81	18.8	226	0.1	9.4	8.4	8.3	Sunny; N/NW Breeze
	68.68	19.0	238	0.1	10.0	8.5	7.4	Sunny; N/NW wind
	72.08	19.1	257	0.1	10.0	8.5	6.6	Sunny; N/NW wind
	74.29	19.5	270	0.1	10.6	8.7	8.5	Sunny; N/NW wind
10/25/00	65.81	18.5	254	0.1	8.3	7.6	7	Sunny, calm
	68.68	18.6	238	0.1	8.6	7.8	6	Sunny; high 60's
	74.29	18.9	275	0.1	9.6	8.1	8	Overcast, 50's, calm

* Sampling dates 8/1/00 and 8/7/00 – Data collected concurrently with benthic community samples. Sediment samples for chemistry and toxicity characterizations were collected on 8/22, 8/23, and 8/24. Water quality parameters were not measured on these dates.

** For sampling date 10/17/00, data were determined in the laboratory

ND = no data collected

Table 3.2. Ambient water test results with freshwater species

		P. promelas		*C. dubia*	
Station	Salinity (g/kg)	% Survival	Mean Dry Wt. (mg)	% Survival	Mean # Offspring
Freshwater Control	0	98	0.688	100	41.9
74.29	0	98	0.803	100	42.2
72.08	0	100	0.863	100	45.6
68.68		98	0.755	100	43.9
65.81	0	100	0.755	100	39.4
Seawater Control	1.6	N.T.[1]	N.T.	100	36.0
47.81	1.8	N.T.	N.T.	100	37.8
47.33	3.0	N.T.	N.T.	100	23.9

[1]Not Tested

Table 3.3. Ambient water test results with estuarine species.

Station	Salinity	*C. variegatus*		*M. bahia*		
		% Survival	Mean Dry Wt. (mg)	% Survival	Mean Dry Wt. (mg)	%Females with Eggs
Seawater	20 g/kg	100	1.310	100	0.304	72.7
Seawater	1.2 g/kg	100	1.184	0	---	---
Seawater	4.3 g/kg	100	1.216	38	0.194	0.0
47.81	1.3 g/kg	82	1.164	0	---	---
47.33	3.0 g/kg	78	1.088	0	---	---
42.46	4.7 g/kg	98	1.220	6	0.273	0.0[1]
40.03	7.3 g/kg	96	1.122	84	0.278	77.8

[1]No females among survivors

Table 3.4. Reference toxicant test results for freshwater and estuarine species (Reference Toxicant: KCl, Sigma "Ultra"; values in mg/l).

Freshwater species

	C. dubia	***P. promelas***
Ref. Test Dates	10/18/00 to 10/20/00	10/19/00 to 10/21/00
48-h LC50 (95% C.L.)	513.0 (478.6-549.9)	854.6 (763.8-956.1)
Control Chart LC50 (95% C.L.)	557.0 (496.7-617.3)	812.3 (625.0-999.7)

Estuarine Species

	M. bahia	***C. variegatus***
Ref. Test Dates	10/18/00 to 10/20/00	10/23/00 to 10/25/00
48-h LC50 (95% C.L.)	555.2 (497.2-619.8)	1200.0 (1041.4-1382.7)
Control Chart LC50 (95% C.L.)	590.0 (518.9-661.0)	1071.3 (930.5-1212.1)

Table 3.5. Surface water sample characteristics on arrival at testing laboratory and during test exposure for freshwater and estuarine species (Mean and (Std. Dev.)).

Parameter	Station							
	74.29	72.08	68.68	65.81	47.81	47.33	42.46	40.03
Arrival Temp. (°C)	3.0 (1.7)	2.8 (1.0)	3.5 (1.8)	4.5 (3.0)	2.9 (0.8)	2.4 (0.6)	1.8 (0.2)	2.4 (0.5)
Conductivity (µMHOS)	277.0 (17.3)	246.7 (14.9)	238.3 (13.8)	226.3 (8.9)	2740.0 (646.7)	3840.0 (1306.7)	N.D.	N.D.
Salinity[1] (g/kg)	N.D.	N.D.	N.D.	N.D.	1.8 (0.9)	3.0 (1.6)	4.7 (1.5)	7.3 (1.7)
Arrival pH (S.U.)	8.5 (0.1)	8.5 (0.3)	8.2 (0.5)	8.0 (0.4)	7.9 (0.3)	8.0 (0.2)	7.6 (0.2)	7.7 (0.2)
Arrival D.O. (mg/l)	12.1 (0.5)	12.0 (0.1)	12.4 (0.4)	12.4 (0.3)	12.3 (0.2)	12.0 (0.3)	12.3 (0.3)	12.0 (0.2)
NH3-N (mg/l)	<1.0 (0.0)	<1.0 (0.0)	<1.0 (0.0)	2.1 (1.0)	<1.0 (0.0)	<1.0 (0.0)	<1.0 (0.0)	2.1 (2.1)
Hardness (mg/l $CaCO_3$)	99.0 (10.7)	109.0 (0.7)	91.7 (9.6)	98.3 (6.4)	468.0 (109.3)	547.3 (110.2)	966.3 (189.1)	1083.3 (304.4)
Alkalinity (mg/l $CaCO_3$)	61.0 (2.7)	61.3 (2.4)	58.7 (6.2)	56.3 (2.4)	56.7 (7.6)	60.0 (6.0)	57.7 (5.8)	63.3 (6.2)
Test Temp. (°C)	25.2 (0.6)	25.0 (0.5)	25.1 (0.5)	25.0 (0.5)	25.2 (0.3)	25.0 (0.4)	25.8 (0.2)	25.9 (0.1)
Test D.O. (mg/l)	8.2 (0.0)	8.2 (0.0)	8.2 (0.0)	8.2 (0.0)	8.2 (0.0)	8.2 (0.0)	8.1 (0.0)	8.1 (0.0)
Test pH (S.U.)	8.0 (0.2)	8.1 (0.2)	8.1 (0.1)	7.9 (0.2)	7.8 (0.1)	7.8 (0.0)	7.7 (0.1)	7.7 (0.2)

[1]Salinity not determined based on conductivity value.
N.D. = not determined

Table 3.6. Total metals in ambient water samples collected from 8 stations in the lower tidal freshwater reach from Jamestown Island to Jordan Point.

Station	Al µg/l	Sb µg/l	As µg/l	Be µg/l	Cd µg/l	Cr µg/l	Cu µg/l	Pb µg/l	Mn µg/l	Hg µg/l	Ni µg/l	Se µg/l	Ag µg/l	Th µg/l	Zinc µg/l
40.03	1230	< 1.0	1.1	NA	< 0.7	NA	2.2	1.4	85	0.00688	1.4	< 1.0	NA	NA	5.3
42.46	950	< 1.0	< 1.0	NA	< 0.7	NA	2	1.1	65	0.0065	1.2	< 1.0	NA	< 10	3.8
47.33	880	< 1.0	< 1.0	NA	< 0.7	NA	2.1	1	110	< 0.0015	1.2	< 1.0	NA	NA	5.5
47.81	1350	< 1.0	< 1.0	NA	< 0.7	NA	1.9	1.1	130	0.0055	1.1	< 1.0	NA	NA	3.9
65.81	2026	0.5	1	NA	< 0.1	5.2	5.1	3.6	174	0.0139	4	0.6	< 0.1	< 10	16.2
68.68	660	0.61	1.28	NA	< 0.1	1.21	2.57	0.94	94.6	0.00476	1.82	< 0.5	< 0.1	< 10	3.62
72.08	650	0.58	1.22	NA	< 0.1	1.39	2.5	0.92	92.6	0.00449	1.9	< 0.5	< 0.1	< 10	4.71
72.08 D	950	0.58	1.2	NA	< 0.1	1.71	2.97	1.39	110	0.00471	2	< 0.5	< 0.1	< 10	6.5
74.29	690	0.5	0.8	NA	< 0.1	2.6	2.7	1.4	96.7	0.00396	2.1	0.6	0.1	< 10	3.6

NA = Not Analyzed
D = Duplicate

Table 3.7. Dissolved metals in ambient water samples collected from 8 stations in the lower tidal freshwater reach from Jamestown Island to Jordan Point.

	Mean Salinity g/kg	Al µg/l	Sb µg/l	As µg/l	Be µg/l	Cd µg/l	Cr µg/l	Cu µg/l	Pb µg/l	Mn µg/l	Hg µg/l	N µg/l	Se µg/l	Ag µg/l	Th µg/l	Zn µg/l
Station																
40.03	4.4	8.1	< 1.0	< 1.0	NA	< 0.7	NA	1.1	< 0.8	6.4	< 0.0015	< 0.8	< 1.0	NA	NA	1.1
42.46	3.14	7.7	< 1.0	< 1.0	NA	< 0.7	NA	1.7	< 0.8	1.6	< 0.0015	< 0.7	< 1.0	NA	NA	< 3.0
47.33	2.05	4.1	< 1.0	< 1.0	NA	< 0.7	NA	1.2	< 0.8	28	< 0.0015	< 0.8	< 1.0	NA	NA	< 3.0
47.81	1.07	6.6	< 1.0	< 1.0	NA	< 0.7	NA	1.1	< 0.8	< 0.8	< 0.0015	< 0.7	< 1.0	NA	NA	< 3.0
65.81	0.1	9.3	0.4	0.6	NA	< 0.1	2.1	1.3	< 0.1	0.7	<0.0015	0.8	< 0.5	< 0.1	< 0.2	< 1.0
68.68	0.1	12.9	0.52	1.35	< 0.1	< 0.1	< 0.1	1.29	< 0.1	0.77	< 0.0015	0.77	< 0.5	< 0.1	< 0.2	< 1.0
72.08	0.1	9.0	0.56	1.32	< 0.1	< 0.1	< 0.1	1.38	< 0.1	0.69	< 0.0015	0.81	< 0.5	< 0.1	< 0.2	2.08
72.08 D	0.1	10.2	0.54	1.36	< 0.1	< 0.1	< 0.1	1.38	< 0.1	< 0.7	< 0.0015	0.82	< 0.5	< 0.1	< 0.2	< 1.0
74.29	0.075	12.4	0.4	0.6	NA	< 0.1	2.3	1.4	0.1	1.6	< 0.0015	0.7	< 0.5	< 0.1	< 0.2	< 1.0
Freshwater WQC																
Acute µg/l		- -	- -	360	- -	2.3	16	11	65	- -	2.4	122	20	1.8	- -	78
Chronic µg/l		- -	- -	190	- -	0.78	11	7.9	7.4	- -	0.012	14	5	- -	- -	71
Saltwater WQC																
Acute µg/l		- -	- -	69	- -	43	1100	5.9	240	- -	2.1	75	300	2.3	- -	95
Chronic µg/l		- -	- -	36	- -	9.3	50	3.8	9.3	- -	0.025	8.3	71	- -	- -	86

Hardness dependant FW WQC based on hardness of 62 mg/l $CaC0_3$
By definition SW WQC only apply to River Mile Stations 40.03 - 47.81
NA = Not Analyzed
D = Duplicate

Table 3.8. Total and dissolved trace elements (µg/l) in water samples from James River stations.

Station	Diss Ca	Total Ca	Diss Fe	Total Fe	Diss Mg	Total Mg	Diss K	Total K	Diss Na	Total Na
2-JMS040.03	65	70	NA	NA	180	200	60	65	1,500	1600
2-JMS042.46	45	45	NA	NA	115	115	40	40	920	870
2-JMS047.33	30	30	NA	NA	65	60	20	20	450	480
2-JMS047.81	25	27	NA	NA	50	50	15	15	350	360
2-JMS065.81	15.5	18.4	< 0.1	2,950	3.2	4.4	NA	NA	NA	NA
2-JMS068.68	22.2	22.2	< 0.1	950	4.5	4.62	NA	NA	NA	NA
2-JMS072.08	21.8	25	< 0.1	990	4.32	5.11	NA	NA	NA	NA
2-JMS072.08D	21.8	24	< 0.1	1,430	4.31	4.91	NA	NA	NA	NA
2-JMS074.29	17.9	20	< 0.1	940	3.4	4.4	NA	NA	NA	NA

NA = not analyzed
D = Duplicate

Table 3.9. Nutrient concentrations (mg/l) in ambient water from James River stations.

Station	Sampling Date	Ortho P	Tot. P	TKN	NH_3	$NO_2 + NO_3$
2-JMS040.03	10/17/00	0.04	0.1	0.5	< 0.04	0.1
2-JMS042.46	10/17/00	0.03	0.08	0.4	< 0.04	0.07
2-JMS047.33	10/17/00	0.03	0.05	0.4	0.04	0.04
2-JMS047.81	10/17/00	0.03	0.1	0.7	< 0.04	< 0.04
2-JMS065.81	10/17/00	0.04	0.15	0.8	< 0.04	0.07
2-JMS068.68	10/17/00	0.03	0.12	0.7	< 0.04	0.05
2-JMS068.68	10/20/00	0.03	0.11	0.9	< 0.04	0.11
2-JMS068.68 FD	10/20/00	0.02	0.12	0.9	< 0.04	0.11
2-JMS072.08	10/17/00	0.04	0.19	1	< 0.04	0.05
2-JMS074.29	10/17/00	0.02	0.11	0.8	< 0.04	0.1

FD = Field Duplicate

Table 3.10. Sediment characteristics at each station from samples collected in August and October 2000. Each station is represented by 3 replicates selected randomly from within a grid centered on the station coordinates. No samples were analyzed from Station 2-JMS072.08 because most attempts to collect a sample failed because of a high sand content.

Stationer	Field Replicate	Percent TOC	Pore Water NH3-N (µg/l)	Acid Volatile Sulfide (composited) (µmoles/kg)	Percent Moisture	Percent Sand	Percent Silt	Percent Clay	ODU Percent Sand	ODU Percent Silt-Clay
2-CHK012.12	A	3.22	7.20	- -		21.06	34.88	44.06	36.87	63.13
	B	3.21	5.90	- -		19.85	33.81	46.35		
	C	2.87	8.00	NA	65.99	43.58	18.95	37.47		
2-JMS040.03	A	1.70	7.0	- -		20.81	28.42	50.78		
	B	1.83	8.7	- -		20.43	29.86	49.71		
	C	1.76	4.9	0.002	57.14	20.80	19	60.2		
2-JMS042.46	A	0.67	2.1	- -		75.80	7.97	16.22		
	B	0.53	1.9	- -		81.97	5.87	12.16		
	C	0.70	2.1	0.010	36.74	73.03	8.56	18.41		
2-JMS044.08	A	2.19	6.20	- -		2.99	42.14	54.87	46.41	53.59
	B	2.22	4.80	- -		5.32	41.47	53.21		
	C	1.73	3.80	5.855	60.62	14.38	44.79	40.83		
2-JMS046.73	A	2.34	18.00	- -		10.85	34.35	54.79	2.57	97.43
	B	2.17	9.20	- -		13.28	32.46	54.26		
	C	2.39	9.70	0.420	69.16	7.67	31.67	60.65		
2-JMS047.33	A	2.39	7.9	- -		1.74	39.00	59.25		
	A (FD)	2.21	- -	- -		1.45	35.17	63.38		
	B	2.29	6.9	- -		1.70	38.63	59.66		
	B (FD)	2.28	- -	- -		1.99	39.87	58.14		
	C	2.42	6.2	0.023	63.74	1.00	39.06	60.52		
	C (FD)	2.18	- -	0.020	62.57	3.31	39.52	57.17		
2-JMS047.81	A	2.04	3.2	- -		8.85	34.46	56.69		
	B	2.17	9.6	- -		1.00	40.09	58.99		
	C	2.05	1.2	0.005	64.20	3.40	39.70	56.91		
2-JMS050.55	A	2.34	15.00	- -		4.96	39.52	55.52	2.94	97.06
	B	2.28	8.00	- -		5.78	37.45	56.77		
	C	2.21	8.00	NA	66.32	6.44	40.04	53.53		
2-JMS052.52	A	1.59	3.10	- -		10.81	40.2	48.99	25.51	74.49
	B	1.87	3.20	- -		31.35	29.76	38.89		
	C	1.44	2.40	5.530	53.72	44.47	22.89	32.64		
2-JMS056.12	A	1.12	0.80	- -		57.75	16.8	25.45	5.03	94.97
	B	1.96	2.80	- -		17.57	32.55	49.88		
	C	1.76	2.80	1.651	57.28	35.27	23.77	40.51		
2-JMS065.81	A	1.27	4.0	- -		2.24	44.24	53.52		
	B	1.56	5.1	- -		3.32	46.32	50.36		
	C	2.13	24.3	0.825	48.67	6.66	43.67	49.67		

FD = Field Duplicate

Table 3.10 (cont.). Sediment characteristics at each station from samples collected in August and October 2000. Each station is represented by 3 replicates selected randomly from within a grid centered on the station coordinates. No samples were

analyzed from Station 2-JMS072.08 because most attempts to collect a sample failed because of a high sand content.

Station	Field Replicate	Percent TOC	Pore Water NH3-N (µg/l)	Acid Volatile Sulfide (composited) (µmoles/kg)	Percent Moisture	Percent Sand	Percent Silt	Percent Clay	ODU Percent Sand	ODU Percent Silt-Clay
2-JMS066.35	A	2.12	4.60	- -		5.09	45.66	49.25	15.33	84.67
	B	2.09	6.70	- -		5.59	37.48	56.94		
	C	2.24	6.80	7.586	61.19	3.99	45.47	50.54		
2-JMS067.56	A	2.71	13.00	- -		20.40	38.03	41.56	7.50	92.50
	B	3.55	24.00	- -		14.99	38.65	46.36		
	C	2.52	19.00	0.808	62.52	24.64	35.24	40.12		
2-JMS068.49	A	1.61	5.30	- -		43.22	32.95	23.83	48.12	51.88
	B	2.01	5.70	- -		19.24	45.19	35.56		
	C	1.61	5.10	NA	43.51	47.57	27.64	24.79		
2-JMS068.64	A	1.65	3.60	- -		8.05	38.06	57.9	10.97	89.03
	B	2.21	5.50	- -		26.96	43.67	29.37		
	C	2.25	2.30	0.730	51.69	11.35	51.92	36.73		
2-JMS068.68	A	2.41	4.9	- -		8.76	46.05	45.19		
	B	1.30	0.1	- -		1.78	38.05	60.17		
	C	1.47	1.9	0.528	49.35	2.99	38.65	58.36		
2-JMS072.08	A					NS	NS	NS		
	B					NS	NS	NS		
	C	NS	NS	NS	NS	NS	NS	NS		
2-JMS073.63	A	1.75	4.80	- -		14.89	55.43	29.68	22.08	77.92
	A (FD)	1.79	- -	- -		14.83	57.67	27.5		
	B	1.79	4.00	- -		20.42	49.97	29.61		
	B (FD)	1.76	- -	- -		21.33	50.63	28.04		
	C	1.62	4.00	1.778	51.40	21.89	50.31	27.8		
	C (FD)	1.69	- -	1.887	50.65	19.45	51.32	29.24		
2-JMS074.25	A	2.17	5.00	- -		23.84	48.17	27.99	30.51	69.49
	B	1.97	4.00	- -		25.17	42.64	32.19		
	C	1.69	2.80	1.145	48.77	29.18	23.16	47.66		
2-JMS074.29	A	2.46	25.3	- -		4.63	44.50	50.87		
	B	0.74	8.4	- -		52.37	23.90	23.73		
	C	2.35	32.4	0.576	55.43	6.13	43.86	50.01		

NA – Not analyzed
NS = No sample (see text for explanation)

Table 3.11. Survival and final weight of *Hyalella azteca* exposed to sediment from DEQ stations.

Station	Survival (%)		Dry Wt. (mg)		Total No. Emergent
	Mean	S.D.	Mean	S.D.	
Control	97	4.4	0.096	0.002	3

12.12A	95	3.3	0.079	0.029	1
12.12B	95	6.7	0.084	0.016	1
12.12C	97	2.2	0.094	0.011	3
44.08A	95	3.3	0.085	0.011	0
44.08B	97	2.2	0.078	0.004	2
44.08C	98	2.2	0.100	0.024	5
46.73A	95	0.0	0.095	0.002	4
46.73B	95	3.3	0.103	0.012	2
46.73C	90	6.7	0.096	0.020	3
50.55A	97	2.2	0.104	0.010	0
50.55B	90	10.0	0.099	0.015	1
50.55C	92	5.6	0.110	0.023	3
52.52A	97	4.4	0.089	0.009	0
52.52B	98	2.2	0.083	0.007	1
52.52C	95	0.0	0.081	0.006	1
56.12A	100	0.0	0.101	0.009	0
56.12B	100	0.0	0.096	0.010	1
56.12C	93	2.2	0.103	0.026	3
66.35A	97	4.4	0.081	0.005	1
66.35B	90	3.3	0.083	0.018	2
66.35C	90	3.3	0.087	0.011	1
67.56A	92	5.6	0.110	0.009	4
67.56B	98	2.2	0.115	0.018	3
67.56C	93	2.2	0.097	0.011	1
68.49A	95	0.0	0.068	0.013	1
68.49B	95	3.3	0.087	0.008	0
68.49C	83	12.2	0.087	0.012	5
68.64A	90	6.7	0.071	0.005	3
68.64B	97	2.2	0.074	0.013	0
68.64C	92	5.6	0.093	0.023	2
73.63A	100	0.0	0.090	0.017	1
73.63B	93	2.2	0.102	0.033	4
73.63C	93	8.9	0.078	0.006	2
74.25A	97	4.4	0.085	0.011	0
74.25B	97	2.2	0.075	0.004	2
74.25C	97	4.4	0.083	0.012	2

Table 3.12. Percent hatch, percent post hatch survival, and percent total survival for *Pimephales promelas* exposed to sediment from DEQ stations.

	Cumulative % Hatch						% Survival	
Station	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Post Hatch	Total
0.000	0.0	0.0	73.3	100.0	100.0	100.0	100.0	100.0
12.12A	0.0	0.0	16.7	73.3	90.0	96.7	96.3	93.3
12.12B	0.0	0.0	53.3	90.0	90.0	90.0	100.0	90.0
12.12C	0.0	6.7	46.7	83.3	93.3	93.3	90.0	83.3
44.08A	3.3	3.3	60.0	70.0	76.7	76.7	93.0	70.0
44.08B	0.0	0.0	50.0	96.7	96.7	96.7	100.0	96.7
44.08C	0.0	0.0	23.3	80.0	86.7	86.7	78.7	70.0
46.73A	0.0	0.0	33.3	80.0	83.3	83.3	100.0	83.3
46.73B	0.0	0.0	66.7	96.7	96.7	96.7	93.3	90.0
46.73C	0.0	3.3	40.0	100.0	100.0	100.0	93.3	93.3
50.55A	0.0	3.3	56.7	90.0	90.0	90.0	95.8	86.7
50.55B	0.0	3.3	63.3	100.0	100.0	100.0	90.0	90.0
50.55C	0.0	0.0	33.3	76.7	76.7	76.7	100.0	76.7
52.52A	0.0	0.0	46.7	90.0	100.0	100.0	96.7	96.7
52.52B	0.0	0.0	50.0	93.3	93.3	93.3	100.0	93.3
52.52C	0.0	0.0	80.0	90.0	96.7	96.7	96.3	93.3
56.12A	0.0	10.0	50.0	93.3	93.3	93.3	92.5	86.7
56.12B	0.0	0.0	50.0	90.0	93.3	93.3	96.3	90.0
56.12C	0.0	0.0	40.0	90.0	96.7	96.7	100.0	96.7
66.35A	0.0	0.0	40.0	90.0	96.7	96.7	96.3	93.3
66.35B	0.0	3.3	63.3	100.0	100.0	100.0	100.0	100.0
66.35C	0.0	0.0	40.0	96.7	100.0	100.0	93.3	93.3
67.56A	0.0	16.7	40.0	86.7	93.7	93.7	96.0	90.0
67.56B	0.0	3.3	50.0	90.0	90.0	96.7	89.6	86.7
67.56C	0.0	0.0	60.0	90.0	93.3	93.3	100.0	93.3
68.49A	0.0	0.0	60.0	96.7	96.7	96.7	96.3	93.3
68.49B	0.0	6.7	36.7	100.0	100.0	100.0	80.0	80.0
68.49C	0.0	10.0	56.7	100.0	100.0	100.0	96.7	96.7
68.64A	13.3	13.3	63.3	93.3	93.3	93.3	100.0	93.3
68.64B	0.0	0.0	10.0	83.3	100.0	100.0	90.0	90.0
68.64C	0.0	3.3	50.0	86.7	90.0	90.0	100.0	90.0
73.63A	0.0	3.3	33.3	100.0	100.0	100.0	100.0	100.0
73.63B	0.0	6.7	40.0	96.7	100.0	100.0	96.7	96.7
73.63C	0.0	0.0	83.3	100.0	100.0	100.0	100.0	100.0
74.25A	0.0	0.0	46.7	80.0	83.3	90.0	95.8	86.7
74.25B	0.0	3.3	43.3	93.3	93.3	93.3	92.5	86.7
74.25C	0.0	0.0	50.0	96.7	96.7	96.7	96.3	93.3

Table 3.13. Survival and final weight of *Hyalella azteca* exposed to sediment from EPA stations.

Station	Survival (%)		Dry Wt. (mg)		Total No. Emergent
	Mean	S.D.	Mean	S.D.	
Control	95	3.3	0.103	0.006	1
40.03A	60[1]	36.7	0.136	0.069	0
40.03B	92	11.1	0.100	0.023	2
40.03C	92	2.2	0.094	0.011	0
42.46A	53[2]	35.6	0.087	0.001	1
42.46B	47[3]	28.9	0.123	0.024	1
42.46C	92	4.4	0.083	0.004	0
47.33A	90	10.0	0.106	0.015	1
47.33B	97	4.4	0.100	0.021	0
47.33C	97	2.2	0.088	0.002	1
47.81A	93	5.6	0.082	0.014	1
47.81B	100	0.0	0.099	0.016	0
47.81C	90	0.0	0.090	0.005	0
65.81A	95	3.3	0.084	0.006	5
65.81B	97	4.4	0.077	0.003	1
65.81C	78	5.6	0.098	0.019	1
68.68A	98	2.2	0.078	0.006	1
68.68B	98	2.2	0.086	0.012	2
68.68C	100	0.0	0.082	0.015	1
74.29A	98	2.2	0.106	0.016	1
74.29B	95	0.0	0.147	0.004	0
74.29C	98	2.2	0.094	0.006	1

[1]Live *C. polita* were found in laboratory replicate 1; survival in this replicate was 5%. Mean survival in the other two laboratory replicates was 88%.

[2] A single live, juvenile *Callinectes sapidus* was found in laboratory replicate 2 and live *C. polita* were found in laboratory replicate 3; survival in these two laboratory replicates was 0 and 60% respectively. Survival in laboratory replicate 1 was 100%.

[3]Live *C. polita* were found in laboratory replicates 1 & 2; survival in these two replicates was 20-30%. Survival in laboratory replicate 3 was 90%.

Table 3.14. Percent hatch, percent post hatch survival, and percent total survival for *Pimephales promelas* exposed to sediment from EPA stations.

Station	Cumulative % Hatch						% Survival	
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Post Hatch	Total
Control	0.0	0.0	33.3	96.7	96.7	96.7	89.6	86.7
40.03A	0.0	0.0	36.7	83.3	90.0	93.3	95.8	90.0
40.03B	0.0	0.0	43.3	76.7	76.7	76.7	96.7	73.3
40.03C	0.0	3.3	83.3	93.3	100.0	100.0	96.7	96.7
42.46A	0.0	3.3	56.7	86.7	93.3	93.3	93.0	86.7
42.46B	0.0	6.7	53.3	63.3	76.7	76.7	96.3	73.3
42.46C	0.0	0.0	50.0	100.0	100.0	100.0	96.7	96.7
47.33A	0.0	0.0	43.3	80.0	93.3	93.3	96.7	90.0
47.33B	0.0	0.0	56.7	90.0	90.0	90.0	93.0	83.3
47.33C	0.0	6.7	43.3	70.0	80.0	80.0	96.7	76.7
47.81A	0.0	3.3	40.0	86.7	86.7	86.7	100.0	86.7
47.81B	0.0	0.0	36.7	66.7	76.7	80.0	95.2	76.7
47.81C	0.0	6.7	36.7	66.7	70.0	70.0	100.0	70.0
65.81A	0.0	3.3	83.3	100.0	100.0	100.0	93.3	93.3
65.81B	0.0	6.7	50.0	90.0	90.0	90.0	96.7	86.7
65.81C	0.0	0.0	36.7	60.0	60.0	60.0	95.8	56.7
68.68A	0.0	0.0	56.7	86.7	100.0	100.0	96.7	96.7
68.68B	0.0	0.0	43.3	90.0	90.0	90.0	96.7	86.7
68.68C	0.0	0.0	70.0	86.7	86.7	90.0	92.6	83.3
74.29A	0.0	3.3	66.7	96.7	96.7	96.7	93.3	90.0
74.29B	0.0	0.0	63.3	96.7	96.7	96.7	86.3	83.3
74.29C	0.0	3.3	40.0	73.3	73.3	73.3	96.3	70.0

Table 3.15. Reference toxicant test results in aqueous media for species used in sediment toxicity tests (Reference toxicant: KCl, Sigma "Ultra" Lot #29H00321; values in mg/l).

DEQ Samples:

	H. azteca	***P. promelas***
Ref. Test Dates	9/1/00 to 9/5/00	9/5/00 to 9/7/00
48-h LC50 (95% C.L.)	499.0 (463.2-538.0)	992.9 (907.7-1085.7)
Control Chart LC50 (95% C.L.)	457.0 (382.7-531.3)	815.6 (627.9-1003.3)

EPA Samples:

	H. azteca	***P. promelas***
Ref. Test Dates	10/30/00 to 11/4/00	10/30/00 to 11/2/00
LC50 (95% C.L.)	478.7 (450.3-508.9)	981.3 (887.0-1085.7)
Control Chart LC50 (95% C.L.)	462.2 (387.4-537.1)	815.1 (627.5-1002.8)

Table 3.16. Bulk metal concentrations (µg/g) in sediment samples collected from the James River in 2000.

Station	Al	Sb	As	Be	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Th	Zn
2-CHK012.12	21,800	<5.0	5.2	<5.0	<1.0	31.1	16.1	32,700	21.0	952	<0.10	18.1	<1.0	<1.0	<5.0	94
2-JMS040.03	24,300	<5.0	6.8	<5.0	<1.0	33.0	27.6	35,600	32.3	1,070	<0.10	21.9	<1.0	<1.0	<5.0	125
2-JMS042.46	8,090	<5.0	5.0	<5.0	<1.0	13.9	9.2	13,100	12.3	297	<0.10	7.6	<1.0	<1.0	<5.0	43
2-JMS044.08	28,400	<5.0	6.9	<5.0	<1.0	39.4	32.7	42,500	37.5	1,550	0.16	27.5	<1.0	<1.0	<5.0	154
2-JMS046.73	41,500	<5.0	7.6	<5.0	<1.0	46.7	34.4	47,500	40.2	1,840	0.11	31.0	<1.0	<1.0	<5.0	164
2-JMS047.33	34,200	<5.0	7.4	<5.0	<1.0	44.8	38.7	46,700	39.7	1,440	<0.10	30.3	<1.0	<1.0	<5.0	169
2-JMS047.33D	23,200	<5.0	6.9	<5.0	<1.0	36.4	36.2	45,500	37.6	1,440	<0.10	24.7	<1.0	<1.0	<5.0	154
2-JMS047.81	26,400	<5.0	7.2	<5.0	<1.0	39.0	37.4	47,000	39.5	1,720	<0.10	26.0	<1.0	<1.0	<5.0	166
2-JMS050.55	29,000	<5.0	6.5	<5.0	<1.0	40.5	36.7	46,400	39.8	1,530	0.12	27.8	<1.0	<1.0	<5.0	165
2-JMS052.52	20,400	<5.0	<5.0	<5.0	<1.0	29.5	26.5	29,200	30.0	628	<0.10	20.0	<1.0	<1.0	<5.0	118
2-JMS056.12	25,500	<5.0	<5.0	<5.0	<1.0	33.7	30.3	35,400	34.9	776	<0.10	22.7	<1.0	<1.0	<5.0	136
2-JMS065.81	26,700	<5.0	10.5	<5.0	<1.0	35.6	36.7	46,800	52.4	1,320	0.30	23.8	<1.0	<1.0	<5.0	154
2-JMS066.35	35,900	<5.0	5.3	<5.0	<1.0	45.7	43.0	43,500	42.1	983	0.20	29.9	<1.0	<1.0	<5.0	213
2-JMS067.56	30,100	<5.0	5.8	<5.0	<1.0	38.5	35.5	40,700	33.6	1,480	0.15	25.9	<1.0	<1.0	<5.0	152
2-JMS068.49	19,300	<5.0	<5.0	<5.0	<1.0	33.5	38.9	31,200	36.3	915	0.19	17.8	<1.0	<1.0	<5.0	171
2-JMS068.64	28,900	<5.0	<5.0	<5.0	<1.0	32.9	16.6	32,800	16.0	1,230	<0.10	25.0	<1.0	<1.0	<5.0	82
2-JMS068.68	34,000	<5.0	<5.0	<5.0	<1.0	37.5	28.8	46,600	21.4	2,060	<0.10	26.0	<1.0	<1.0	<5.0	93
2-JMS072.08	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2-JMS073.63	21,700	<5.0	<5.0	<5.0	<1.0	29.4	29.1	35,500	29.6	775	0.13	21.0	<1.0	<1.0	<5.0	132
2-JMS073.63D	26,400	<5.0	<5.0	<5.0	<1.0	32.7	29.5	37,000	28.6	778	0.13	23.3	<1.0	<1.0	<5.0	135
2-JMS074.25	31,200	<5.0	<5.0	<5.0	<1.0	34.3	26.8	40,000	28.4	858	0.12	22.9	<1.0	<1.0	<5.0	123
2-JMS074.29	23,000	<5.0	<5.0	<5.0	<1.0	30.8	31.3	34,700	26.8	1,250	<0.10	21.4	<1.0	<1.0	<5.0	123
Detection Limit	5	5.0	5.0	5.0	1.0	5.0	5.0	5	5.0	5	0.10	5.0	1.0	1.0	5.0	5
ER-L[a]			8.2		1.2	81	34		46.7		0.15	20.9		1.0		150
ER-M[a]			70.0		9.6	370	270		218		0.71	51.6		3.7		410
ER-L[b]	14,000		13		0.70	39	41	200,000	55	730		24				110
ER-M[b]	58,000		50		3.9	270	190	280,000	99	1700		45				550
TEC[c]			9.79		0.99	43.4	31.6		35.8		0.18	22.7				121
PEC[c]			33		4.98	111	149		128		1.06	48.6				459

[1]nd = no data. Station was excessively sandy, so Ponar grab was ineffective for sampling. Underlined values exceed the relevant ER-M.
D = Duplicate

[a] Long, E.R. *et al*. 1995.
[b] Ingersoll, C.G., *et al*. 1996.
[c] MacDonald, DD, CG Ingersoll and TA Berger. 2000.

Table 3.17. Sediment acid volatile sulfide and simultaneously extracted metals (µmole/g wet weight) for sediments collected from the James River during late summer and fall of 2000.

Station	Acid Volatile Sulfide	Cadmium	Copper	Mercury	Nickel	Lead	Zinc	Sum SEM [1]	AVS-SEM
2-CHK012.12	NA	NA	NA	NA	NA	NA	NA	NA	- -
2-JMS040.03	0.0021	< 0.0136	0.1442	< 0.000038	< 0.2403	0.0737	0.6657	0.8836	-0.8815
2-JMS042.46	0.0103	< 0.0274	0.1936	< 0.000077	< 0.4840	< 0.1484	0.9173	1.1109	-1.1006
2-JMS044.08	5.8549	< 0.0179	0.0948	< 0.000099	< 0.3162	< 0.0969	0.7836	0.8784	4.9765
2-JMS046.73	0.4204	< 0.0125	0.0994	< 0.000034	< 0.2209	0.0677	0.6977	0.8648	-0.4444
2-JMS047.33	0.0234	< 0.0138	0.1345	< 0.000039	< 0.2466	< 0.0776	0.6419	0.7764	-0.7530
2-JMS047.33 D	0.0201	< 0.0136	0.1266	< 0.000040	< 0.2533	< 0.0776	0.6646	0.7912	-0.7711
2-JMS047.81	0.0005	< 0.0136	0.132	< 0.000038	< 0.2400	< 0.0736	0.6416	0.7736	-0.7731
2-JMS050.55	NA	NA	NA	NA	NA	NA	NA	NA	- -
2-JMS052.52	5.5303	< 0.0134	0.0949	< 0.000038	< 0.2372	< 0.0727	0.5301	0.625	4.9053
2-JMS056.12	1.651	< 0.016	0.127	< 0.000045	< 0.2823	< 0.0865	0.7271	0.8541	0.7969
2-JMS065.81	0.825	< 0.0140	0.1987	< 0.000039	< 0.2484	0.1257	0.8932	1.2176	-0.3926
2-JMS066.35	7.5862	< 0.012	0.1376	< 0.000051	< 0.2117	0.0941	1.173	1.4047	6.1815
2-JMS067.56	0.8075	< 0.0132	0.1288	< 0.000037	< 0.2341	< 0.0918	0.6599	0.7887	0.0188
2-JMS068.49	NA	NA	NA	NA	NA	NA	NA	NA	- -
2-JMS068.64	0.7296	< 0.0177	0.1251	< 0.000050	< 0.3128	< 0.0959	0.4256	0.5507	0.1789
2-JMS068.68	0.5279	< 0.0175	0.139	< 0.000049	< 0.309	< 0.0947	0.3303	0.4693	0.0586
2-JMS072.08	NS	NS	NS	NS	NS	NS	NS	NS	- -
2-JMS073.63	1.7779	< 0.0161	0.19999	< 0.000045	< 0.2856	< 0.0875	1.0966	1.29659	0.4813
2-JMS073.63 D	1.8865	< 0.0154	0.1222	< 0.000043	< 0.2716	< 0.0832	0.6731	0.7953	1.0912
2-JMS074.25	1.1452	< 0.0166	0.1757	< 0.000046	< 0.2929	< 0.0898	0.9109	1.0866	0.0586
2-JMS074.29	0.5755	< 0.0133	0.1289	< 0.000037	< 0.2344	< 0.0719	0.5469	0.6758	-0.1003

D = Duplicate

[1] < values (i.e. below detection limit) are not included in sum SEM .

Table 3.18. SVOC concentrations (ng/g) in sediment samples collected from the James River in 2000.

Analyte	ER-L	ER-M	TEC	PEC	2-CHK012.12	2-JMS040.03	2-JMS042.46	2-JMS044.08	2-JMS046.73	2-JMS047.33	2-JMS047.33 Field Dup.	2-JMS047.81	2-JMS050.55
1,4-Dichlorobenzene					< 10	10	< 10	< 10	< 10	< 10	15	< 10	< 10
Isophorone					20	15	< 10	< 10	30	25	15	30	25
Dibenzofuran					< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bis[2-ethylhexyl]phthalate					170	180	290	180	290	430	210	110	260
Butylbenzylphthalate					45	140	85	30	30	50	45	15	< 10
Di-N-octylphthalate					< 10	15	20	35	20	50	30	NA	10
Dimethyl phthalate					< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Di-N-butylphthalate					150	110	310	140	170	270	180	100	110
Diethyl phthalate					< 10	10	60	40	40	45	20	25	20

Table 3.18 (cont.). SVOC concentrations (ng/g) in sediment samples collected from the James River in 2000.

Analyte	ER-L	ER-M	TEC	PEC	2-CHK012.12	2-JMS040.03	2-JMS042.46	2-JMS044.08	2-JMS046.73	2-JMS047.33	2-JMS047.33 Field Dup.	2-JMS047.81	2-JMS050.55
Low Molecular PAHs													
2-Methylnaphthalene	70	670			< 10	< 10	< 10	15	< 10	< 10	15	10	15
Acenaphthylene	44	160			< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acenaphthene	16	500			< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Anthracene	85.3	1100	57.2	845	< 10	< 10	< 10	< 10	< 10	< 10	10	15	< 10
Fluorene	19	540	77.4	536	< 10	< 10	< 10	< 10	15	< 10	< 10	< 10	< 10
Naphthalene	160	2100	176	561	30	45	< 10	40	50	50	60	50	35
Phenanthrene	240	1500	204	1170	< 10	20	< 10	30	< 10	50	40	40	30
Total LM PAHs	552	3160	108	1050	30	65		85	65	100	125	115	80
High Molecular PAHs													
Benzo[a]anthracene	261	1600			< 10	20	20	20	30	55	35	55	30
Benzo[b]fluoranthene					< 10	30	30	30	45	85	45	70	35
Benzo[k]fluoranthene					< 10	20	20	15	35	50	40	40	35
Benzo[e]pyrene					< 10	20	20	15	30	20	30	45	25
Benzo[a]pyrene	430	1600	150	1450	< 10	20	20	20	35	60	40	60	35
Benzo[g,h,i]perylene					< 10	15	15	15	25	60	30	25	25
Chrysene	384	2800	166	1290	< 10	25	25	25	55	75	41	80	40
Dibenz[a,h]anthracene			33	NA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Fluoranthene	600	5100	423	2230	< 10	30	50	45	55	110	65	70	50
Indeno[1,2,3-cd]pyrene	63.4	260			< 10	15	15	15	20	45	25	20	20
Perylene					110	60	120	190	170	120	160	220	170
Pyrene	665	2600	195	1520	25	30	45	55	60	120	80	85	60
Total HM PAHs	1700	9600	NA	NA	135	285	380	445	560	800	591	770	525
Total PAHs	4022	44792	1610	22800	165	350	380	530	625	900	716	885	605

Table 3.18 (cont.). SVOC concentrations (ng/g) in sediment samples collected from the James River in 2000.

	ER-L	ER-M	TEC	PEC	2-JMS052.52	2-JMS056.12	2-JMS065.81	2-JMS066.35	2-JMS067.56	2-JMS068.49	2-JMS068.64	2-JMS068.68
1,4-Dichlorobenzene					< 10	< 10	10	< 10	< 10	30	< 10	< 10
Isophorone					25	15	30	25	30	35	30	20
Dibenzofuran					< 10	< 10	< 10	15	< 10	35	< 10	< 10
Bis[2-ethylhexyl]phthalate					260	170	290	150	190	300	100	80
Butylbenzylphthalate					< 10	20	30	15	30	35	< 10	< 10
Di-N-octylphthalate					10	15	15	NA	NA	NA	NA	NA
Dimethyl phthalate					< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Di-N-butylphthalate					110	120	180	120	140	160	340	170
Diethyl phthalate					20	10	60	25	30	30	25	25

Table 3.18 (cont.). SVOC concentrations (ng/g) in sediment samples collected from the James River in 2000.

Analyte	ER-L	ER-M	TEC	PEC	2-JMS052.52	2-JMS056.12	2-JMS065.81	2-JMS066.35	2-JMS067.56	2-JMS068.49	2-JMS068.64	2-JMS068.68
Low Molecular PAHs												
2-Methylnaphthalene	70	670			15	< 10	< 10	60	30	140	< 10	< 10
Acenaphthylene	44	160			15	< 10	10	45	25	75	< 10	< 10
Acenaphthene	16	500			< 10	< 10	< 10	20	< 10	40	< 10	< 10
Anthracene	85.3	1100	57.2	845	20	10	15	80	35	140	< 10	< 10
Fluorene	19	540	77.4	536	10	< 10	< 10	25	15	55	< 10	< 10
Naphthalene	160	2100	176	561	20	40	25	90	65	190	40	40
Phenanthrene	240	1500	204	1170	95	40	40	180	90	460	10	< 10
Total LM PAHs	552	3160	108	1050	175	90	90	500	235	1100	50	40
High Molecular PAHs												
Benzo[a]anthracene	261	1600			60	40	95	200	160	280	< 10	< 10
Benzo[b]fluoranthene					80	60	120	230	200	290	< 10	< 10
Benzo[k]fluoranthene					50	40	90	110	90	130	< 10	< 10
Benzo[e]pyrene					55	35	90	140	130	190	< 10	< 10
Benzo[a]pyrene	430	1600	150	1450	60	50	140	190	170	240	< 10	< 10
Benzo[g,h,i]perylene					50	35	100	70	65	120	< 10	< 10
Chrysene	384	2800	166	1290	80	50	110	170	140	310	15	< 10
Dibenz[a,h]anthracene			33	NA	10	< 10	20	20	15	30	< 10	< 10
Fluoranthene	600	5100	423	2230	140	65	160	250	150	380	15	< 10
Indeno[1,2,3-cd]pyrene	63.4	260			45	30	80	70	60	100	< 10	< 10
Perylene					320	220	280	630	370	1100	620	450
Pyrene	665	2600	195	1520	220	65	170	400	190	640	15	< 10
Total HM PAHs	1700	9600	NA	NA	1170	690	1455	2480	1740	3810	665	450
Total PAHs	4022	44792	1610	22800	1345	780	1545	2980	1975	4910	715	490

Table 3.18 (cont.). SVOC concentrations (ng/g) in sediment samples collected from the James River in 2000.

Analyte	ER-L	ER-M	TEC	PEC	2-JMS073.63	2-JMS073.63 Field Dup.	2-JMS074.25	2-JMS074.29
1,4-Dichlorobenzene					< 10	10	20	< 10
Isophorone					15	15	15	25
Dibenzofuran					< 10	25	35	< 10
Bis[2-ethylhexyl]phthalate					410	180	280	230
Butylbenzylphthalate					45	< 10	50	< 10
Di-N-octylphthalate					70	< 10	35	NA
Dimethyl phthalate					< 10	< 10	< 10	< 10
Di-N-butylphthalate					240	140	140	140
Diethyl phthalate					25	< 10	15	< 10

Table 3.18 (cont.). SVOC concentrations (ng/g) in sediment samples collected from the James River in 2000.

Analyte	ER-L	ER-M	TEC	PEC	2-JMS073.63	2-JMS073.63 Field Dup.	2-JMS074.25	2-JMS074.29
Low Molecular PAHs								
2-Methylnaphthalene	70	670			20	80	110	20
Acenaphthylene	44	160			< 10	15	65	20
Acenaphthene	16	500			< 10	25	30	< 10
Anthracene	85.3	1100	57.2	845	45	110	160	20
Fluorene	19	540	77.4	536	10	< 10	50	< 10
Naphthalene	160	2100	176	561	40	380	210	60
Phenanthrene	240	1500	204	1170	60	230	270	70
Total LM PAHs	552	3160	108	1050	175	840	895	190
High Molecular PAHs								
Benzo[a]anthracene	261	1600			230	160	450	170
Benzo[b]fluoranthene					300	190	520	210
Benzo[k]fluoranthene					190	140	330	75
Benzo[e]pyrene					180	120	320	90
Benzo[a]pyrene	430	1600	150	1450	290	200	520	150
Benzo[g,h,i]perylene					210	150	300	55
Chrysene	384	2800	166	1290	240	160	420	130
Dibenz[a,h]anthracene			33	NA	40	25	80	< 10
Fluoranthene	600	5100	423	2230	350	230	510	160
Indeno[1,2,3-cd]pyrene	63.4	260			160	110	320	50
Perylene					810	460	820	90
Pyrene	665	2600	195	1520	470	320	610	190
Total HM PAHs	1700	9600	NA	NA	3470	2265	5200	1370
Total PAHs	4022	44792	1610	22800	3645	3105	6095	1560

Table 3.19 Organophosphate pesticides (ng/g dry weight) in sediment samples collected from the James River in 2000.

Compound	2-CHK012.12	2-JMS040.03	2-JMS042.46	2-JMS044.08	2-JMS046.73	2-JMS047.33	2-JMS047.81
Dichlorvos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Mevinphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
TEPP	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Thionazion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Demeton	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ethoprop	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tributylphosphate SS	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Naled	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dicrotophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Sulfotep + Phorate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Monocrotophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dimethoate	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Terbufos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Monophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Diazinon	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Disulfoton+Phosphamidon +Dichlorofenthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorpyrifos(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Parathion(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ronnel	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fenitrothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Malithion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorpyrifos+Aspon	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fenthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Parathion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Trichlornate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorfenvinphos	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Crotoxyphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tetrachlorvinphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tokuthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Folex	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fensulfothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ethion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Carbophenothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Bolstar	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Famfur	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Triphenylphosphate SS	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Phosmet	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
EPN	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Leptophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Guthion(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Guthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Coumaphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dioxathion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0

Table 3.19 (cont.) Organophosphate pesticides (ng/g dry weight) in sediment samples collected from the James River in 2000.

Compound	2-JMS050.55	2-JMS052.52	2-JMS056.12	2-JMS065.81	2-JMS066.35	2-JMS067.56	2-JMS068.49
Dichlorvos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Mevinphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
TEPP	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Thionazion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Demeton	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ethoprop	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tributylphosphate SS	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Naled	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dicrotophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Sulfotep + Phorate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Monocrotophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dimethoate	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Terbufos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Monophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Diazinon	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Disulfoton+Phosphamidon +Dichlorofenthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorpyrifos(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Parathion(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ronnel	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fenitrothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Malithion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorpyrifos+Aspon	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fenthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Parathion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Trichlornate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorfenvinphos	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Crotoxyphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tetrachlorvinphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tokuthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Folex	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fensulfothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ethion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Carbophenothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Bolstar	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Famfur	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Triphenylphosphate SS	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Phosmet	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
EPN	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Leptophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Guthion(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Guthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Coumaphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dioxathion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0

Table 3.19 (cont.) Organophosphate pesticides (ng/g dry weight) in sediment samples collected from the James River in 2000.

Compound	2-JMS068.64	2-JMS068.68	2-JMS073.63	2-JMS074.25	2-JMS074.29
Dichlorvos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Mevinphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
TEPP	< 15.0	< 15.0	< 15.0	< 15.0	< 15.0
Thionazion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Demeton	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ethoprop	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tributylphosphate SS	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Naled	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dicrotophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Sulfotep + Phorate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Monocrotophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dimethoate	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Terbufos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Monophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Diazinon	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Disulfoton+Phosphamidon +Dichlorofenthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorpyrifos(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Parathion(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ronnel	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fenitrothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Malithion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorpyrifos+Aspon	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fenthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Parathion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Trichlornate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorfenvinphos	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Crotoxyphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tetrachlorvinphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Tokuthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Folex	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Fensulfothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Ethion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Carbophenothion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Bolstar	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Famfur	< 9.0	< 9.0	< 9.0	< 9.0	< 9.0
Triphenylphosphate SS	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Phosmet	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
EPN	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Leptophos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Guthion(methyl)	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Guthion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Coumaphos	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dioxathion	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0

All results are reported in ng/g; Quantitation Level $\leq$6 ng/g (dry weight)
TEPP = 15 ng/g (dry weight); Dimethoate = 9 ng/g (dry weight);
Chlorfenvinphos = 9 ng/g (dry weight); Bolstar and Famfur = 9 ng/g (dry weight)

Table 3.20. Organochlorine pesticides (ng/g) in sediment samples collected from the James River in 2000.

Analyte	2-CHK012.12	2-CHK012.12D	2-JMS040.03	2-JMS042.46	2-JMS042.46D	2-JMS044.08	2-JMS046.73	2-JMS047.33	2-JMS047.81	2-JMS050.55	2-JMS052.52
HCCP	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
a-BHC & HCB & Diallate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
b-BHC & g-BHC	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
d-BHC	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Heptachlor	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Aldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Isodrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Heptachlor Epoxide	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
g-Chlordane	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endosulfan I & a-Chlordane	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
DDE	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endrin & Endosulfan II	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorbenzylate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
DDD	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endrin Aldehyde & Kepone	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endosulfan Sulfate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
DDT	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endrin Ketone	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Methoxychlor	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Kepone	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0

Table 3.20 (cont.). Organochlorine pesticides (ng/g) in sediment samples collected from the James River in 2000.

Analyte	2-JMS056.12	2-JMS065.81	2-JMS066.35	2-JMS067.56	2-JMS068.49	2-JMS068.64	2-JMS068.68	2-JMS073.63	2-JMS074.25	2-JMS074.25D	2-JMS074.29
HCCP	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
a-BHC & HCB & Diallate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
b-BHC & g-BHC	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
d-BHC	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Heptachlor	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Aldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Isodrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Heptachlor Epoxide	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
g-Chlordane	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endosulfan I & a-Chlordane	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
DDE	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endrin & Endosulfan II	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Chlorbenzylate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
DDD	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endrin Aldehyde & Kepone	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endosulfan Sulfate	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
DDT	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Endrin Ketone	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Methoxychlor	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
Kepone	< 10.0	< 10.0	< 10.0	< 10.0	60	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0

BQL < 6.0 ng/g
DL Kepone < 10 ng/g

Table 3.21. Polychlorinated biphenyl (PCB) congener concentrations (ng/g, dry weight basis) in sediment samples collected from the James River in 2000. The presence of each congener was confirmed using GC/MS Selective Ion Monitoring.

Compound	2-CHK12.12	2-JMS040.03	2-JMS042.46	2-JMS044.08	2-JMS046.73	2-JMS047.33	2-JSM047.33
PCB-001	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-005+008	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-018	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-028+031	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-52	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-44	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-101	< 3	< 3	< 3	< 3	< 3	< 3	NC
PCB-66	< 3	< 3	< 3	< 3	< 3	< 3	NC
PCB-81+77	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-110	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-87	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-151	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-118	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-105	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-153	< 3	< 3	< 3	< 3	< 3	< 3	NC
PCB-141	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-126	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-138	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-187	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-183	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-128	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-156	< 3	NC	< 3	< 3	< 3	< 3	< 3
PCB-169	NC	< 3	NC	NC	< 3	NC	NC
PCB-180	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-170	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-195	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-206	NC	< 3	< 3	NC	< 3	< 3	NC

Table 3.21 (cont.). Polychlorinated biphenyl (PCB) congener concentrations (ng/g, dry weight basis) in sediment samples from the James River collected in 2000. The presence of each congener was confirmed using GC/MS Selective Ion Monitoring.

Compound	2-JMS047.81	2-JMS050.55	2-JMS052.52	2-JMS056.12	2-JMS065.81	2-JMS066.35	2-JMS067.56	2-JMS068.49
PCB-001	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-005+008	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-018	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-028+031	< 3	< 3	< 3	< 3	< 3	< 3	< 3	9
PCB-52	< 3	< 3	< 3	< 3	< 3	< 3	< 3	12
PCB-44	< 3	< 3	< 3	< 3	< 3	< 3	< 3	9
PCB-101	NC	< 3	< 3	< 3	< 3	< 3	< 3	9
PCB-66	< 3	< 3	< 3	< 3	< 3	< 3	< 3	6
PCB-81+77	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-110	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-87	< 3	< 3	< 3	< 3	< 3	< 3	< 3	12
PCB-151	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-118	< 3	< 3	< 3	< 3	NC	NC	< 3	12
PCB-105	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-153	NC	< 3	< 3	< 3	< 3	< 3	< 3	12
PCB-141	< 3	< 3	NC	< 3	< 3	< 3	< 3	< 3
PCB-126	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-138	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-187	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-183	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-128	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-156	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-169	NC	NC	NC	NC	NC	NC	NC	NC
PCB-180	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-170	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-195	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
PCB-206	NC	< 3	NC	< 3	< 3	< 3	< 3	< 3

Table 3.21 (cont.). Polychlorinated biphenyl (PCB) congener concentrations (ng/g, dry weight basis) in sediment samples from the James River collected in 2000. The presence of each congener was confirmed using GC/MS Selective Ion Monitoring.

Compound	2-JMS068.64	2-JMS068.68	2-JMS073.63	2-JMS074.25	2-JMS074.29
PCB-001	< 3	< 3	< 3	< 3	< 3
PCB-005+008	< 3	< 3	< 3	< 3	< 3
PCB-018	< 3	< 3	< 3	< 3	< 3
PCB-028+031	< 3	< 3	< 3	< 3	< 3
PCB-52	< 3	< 3	< 3	< 3	< 3
PCB-44	< 3	< 3	< 3	< 3	< 3
PCB-101	< 3	< 3	< 3	< 3	NC
PCB-66	< 3	< 3	< 3	< 3	NC
PCB-81+77	< 3	< 3	< 3	< 3	< 3
PCB-110	< 3	< 3	< 3	< 3	< 3
PCB-87	< 3	< 3	< 3	< 3	< 3
PCB-151	< 3	< 3	< 3	< 3	< 3
PCB-118	< 3	< 3	< 3	NC	NC
PCB-105	< 3	< 3	< 3	< 3	< 3
PCB-153	< 3	< 3	< 3	< 3	NC
PCB-141	< 3	< 3	< 3	NC	NC
PCB-126	< 3	< 3	< 3	< 3	< 3
PCB-138	< 3	< 3	< 3	< 3	< 3
PCB-187	< 3	< 3	< 3	< 3	< 3
PCB-183	< 3	< 3	< 3	< 3	< 3
PCB-128	< 3	< 3	< 3	< 3	< 3
PCB-156	< 3	< 3	< 3	< 3	< 3
PCB-169	< 3	< 3	NC	NC	NC
PCB-180	< 3	< 3	< 3	< 3	< 3
PCB-170	< 3	< 3	< 3	< 3	< 3
PCB-195	< 3	< 3	< 3	< 3	< 3
PCB-206	< 3	< 3	< 3	< 3	< 3

NC = Detected but not confirmed
Quantitation Limit (XSD detector) < 3 ng/g, dry weight basis
Results are reported in ng/g.

NOTES:

1. SAMPLE 2-JMS068.49 contains PCB's confirmed by GC/MS (SIM). Analysis is indicative of a sample containing additional PCB's, either Below Quantitation and/or at the Detection Limit, or PCB's not Included on the list of calibrated analytes.

Table 3.22. Herbicide concentrations (ng/g) in sediment samples collected from the James River in 2000.

Compound	2-CHK012.12	2-JMS040.03	2-JMS042.46	2-JMS044.08	2-JMS046.73	2-JMS047.33	2-JMS047.81	2-JMS050.55	2-JMS052.52	2-JMS056.12	2-JMS065.81	2-JMS066.35
3,5-DBCA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Dicamba	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MCPA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MCPP	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Dichlorprop	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2,4-D	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2,4-DB	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Pentachloroanisole	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2,4,5-TP	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chloramben	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2,4,5-T	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bentazon	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Picloram	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
DCPA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acifluorfen	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10

Table 3.22 (Cont). Herbicide concentrations (ng/g) in sediment samples collected from the James River in 2000.

Compound	2-JMS067.56	2-JMS068.49	2-JMS068.64	C2-JMS068.68	2-JMS073.63	2-JMS073.63	2-JMS074.25	2-JMS074.29
3,5-DBCA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Dicamba	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MCPA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MCPP	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Dichlorprop	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2,4-D	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2,4-DB	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Pentachloroanisole	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2,4,5-TP	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chloramben	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2,4,5-T	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bentazon	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Picloram	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
DCPA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Acifluorfen	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10

Quantitation Level < 10 ng/g

Table 3.23. Descriptive parameters for the benthic community in the lower tidal freshwater James River, August 2000.

Station	Total Species	Individuals per m^2	Total biomass (g/m^2)	Ash-free Dry Weight Biomass w/o bivalves (g/ m^2)	B-IBI	Assemblage Condition
2-CHK 012.12	6	2268.0	29.597	0.454	3.500	Meets Goal
2-JMS044.08	10	2472.1	6.645	0.726	2.667	Marginal
2-JMS046.73	10	2336.0	0.295	0.249	5.000	Exceeds Goal
2-JMS050.55	10	2540.2	9.571	0.363	5.000	Exceeds Goal
2-JMS052.52	7	1542.2	55.929	0.476	4.000	Exceeds Goal
2-JMS056.12	12	1859.8	47.991	0.363	4.000	Exceeds Goal
2-JMS066.35	13	3696.8	0.816	0.816	4.500	Exceeds Goal
2-JMS067.56	5	3379.3	0.748	0.748	3.000	Meets Goal
2-JMS068.49	11	4581.4	0.499	0.499	3.500	Meets Goal
2-JMS068.64	10	11340.0	50.340	1.746	5.000	Exceeds Goal
2-JMS073.63	9	3107.2	0.386	0.386	4.000	Exceeds Goal
2-JMS074.25	14	7008.1	0.885	0.885	3.000	Meets Goal

Table 3.24. Survival, final weight and number emergent for *Leptocheirus plumulosus* exposed to sediments spiked with heavy metals at 8 or 15 g/kg pore water salinity.

Station	T.U. Metals	Salinity (g/kg/)	Survival (%)	Mean final weight (mg dry wt/amph)	Total Number Emergent
2-JMS065.81	0	8	95	0.141	2
		15	98	0.225	0
	110	8	88	0.139	1
		15	92	0.191	0
	305	8	22	0.103	17
		15	7	0.145	51
2-JMS040.03	0	8	98	0.149	0
		15	98	0.223	0
	110	8	95	0.159	0
		15	98	0.167	0
		8	23	0.092	15
	305	15	2	0.230	6
Lab Control	0	15	100	0.243	0

Table 3.25. ANOVA for survival, final weight, and emergence of *Leptocheirus. plumulosus* exposed to metal contaminated sediment after salinity adjustment (p-values in bold significant at 0.05 level).

Source of variance [1]	Survival	Final Weight	Emergence
Sediment	0.472	0.426	**0.003***
Salinity	0.079	**0.000**	0.552
Metals	**0.000**	0.118	**0.000**
Sediment x Salinity	0.384	0.655	0.164
Salinity x Metal	**0.002**	0.246	0.749
Sediment x Metal	**0.043**	0.581	**0.019***
Sediment x Salinity x Metal	0.384	0.216	**0.006***

* See explanation in text.

[1] Data for controls excluded in these analyses. See explanation in text.

Table 3.26. Survival, final weight, and number emergent for *Hyallela azteca* exposed to sediments spiked with heavy metals at 8 or 15 g/kg pore water salinity.

Station	T.U. Metals	Salinity (g/kg/)	Survival (%)	Mean final weight (mg dry wt/amph)	Total Number Emergent
2-JMS065.81	0	0	97	0.095	4
		8	90	0.062	8
		15	85	0.067	14
	110	0	98	0.077	4
		8	85	0.068	9
		15	80	0.054	8
	305	0	98	0.065	8
		8	85	0.059	13
		15	68	0.056	22
2-JMS040.03	0	0	100	0.076	10
		8	83	0.067	3
		15	75	0.062	12
	110	0	80	0.076	1
		8	92	0.052	15
		15	77	0.052	16
	305	0	68	0.063	2
		8	77	0.061	6
		15	45	0.056	12
Lab Control	0	0	93	0.110	8

Table 3.27. ANOVA for survival, final weight, and emergence of *Hyallela azteca* exposed to metal contaminated sediment after salinity adjustment (p-values in bold significant at 0.05 level).

Source of variance	Survival	Final Weight	Emergence
Sediment	**0.003**	0.096	0.585
Salinity	**0.000**	**0.000**	0.140
Metals	**0.001**	**0.001**	0.940
Sediment x Salinity	0.115	0.840	0.923
Salinity x Metal	0.362	0.172	0.591
Sediment x Metal	0.065	0.448	0.325
Sediment x Salinity x Metal	**0.043**	0.119	0.609

Table 3.28. Reference toxicant test results in aqueous media for species used in sediment toxicity tests (Reference Toxicant: KCl, Sigma "Ultra" Lot#129H00079; values in mg/l).

	H. azteca	*L. plumulosus*
Ref. Test Dates	1/26/01 to 1/30/01	1/26/01 to 1/30/01
LC50 (95% C.L.)	451.0 (423.8-480.0)	989.5 (700-1400)
Control Chart LC50 (95% C.L.)	464.1 (392.7-535.4)	1025.5 (925.1-1125.9)

Table 3.29. Sediment texture measured on experiment control (blank).

Station	TOC (mg/kg)	Gravel (percent)	Sand (percent)	Silt (percent)	Clay (percent)
2-JMS065.81	2.421	0.00	7.26	46.37	46.37
2-JMS040.03	0.854	0.00	68.56	12.61	18.83

Table 3.30. Sediment quality data.

Station	Salinity (g/kg)	T.U.	Pore Water pH (S.U.)	Pore Water Ammonia (mg NH_4-N/l)	Pore Water Salinity (g/kg)
2-JMS065.81	0	0	7.31	20.3	0
		110	7.17	20.5	0
		305	6.99	16.4	0
	8	0	7.09	32.2	8
		110	7.30	24.0	8
		305	7.02	19.7	7
	15	0	6.96	36.2	15
		110	7.10	33.1	15
		305	7.13	22.0	15
2-JMS040.03	0	0	7.30	3.1	0
		110	7.15	2.3	0
		305	6.84	2.2	0
	8	0	7.35	3.8	8
		110	6.98	3.6	8
		305	6.80	5.0	8
	15	0	6.81	4.6	15
		110	6.88	5.8	15
		305	6.85	6.0	15
Fresh water control	0	0	7.10	8.0	0
Salt Water Control	15	0	7.52	10.0	20

Table 3.31. Measured stock solution composition.

Metal	Nominal Conc. (mg/l)	Measured Conc. (mg/l)
Copper	19.2	15.74
Cadmium	20.0	15.2
Nickel	1520	1596
Selenium	272	230.24
Zinc	1200	1324.4

Table 3.32. Comparison of spiking concentrations and SEM concentrations for cadmium.

Station	Salinity (g/kg)	TU	Cd Spike (µmoles/g)	Cd SEM (µmoles/g)
2-JMS065.18	0	0	0.0000	<0.0105
	0	110	0.0090	<0.0092
	0	305	0.0250	<0.0112
	8	305	0.0250	<0.0119
	15	305	0.0250	<0.0124
2-JMS040.03	0	0	0.0000	<0.0085
	0	110	0.0060	<0.0103
	0	305	0.0167	<0.0089
	8	305	0.0167	<0.0087
	15	305	0.0167	<0.0113
FWC*	0	0	0.0000	<0.0098
SWC	20	0	0.0000	<0.0105

* FWC = Freshwater laboratory control sediment
SWC = Saltwater laboratory control sediment

Table 3.33. Comparison of spiking concentrations and SEM concentrations for copper.

Sediment	Salinity (g/kg)	TU	Cu Spike (µmole/g)	Cu SEM (µmole/g)	Simple* Difference	Adjusted** Difference
2-JMS065.81	0	0	0.0000	0.0555	n/a	n/a
	0	110	0.0153	0.1053	588	225
	0	305	0.0424	0.1287	204	72.6
	8	305	0.0424	0.1571	270	140
	15	305	0.0424	0.1750	312	182
2-JMS040.03	0	0	0.0000	0.0376	n/a	n/a
	0	110	0.0102	0.0546	435	67.6
	0	305	0.0283	0.0552	95.0	-37.8
	8	305	0.0283	0.0616	118	-15.2
	15	305	0.0283	0.0797	181	48.8
FWC	0	0	0.0000	<0.0441	n/a	n/a
SWC	20	0	0.0000	0.0924	n/a	n/a

* Difference between spike and SEM as percent of spike
** Difference between spike and SEM adjusted for background (0 TU) SEM

Table 3.34. Comparison of spiking concentrations and SEM concentrations for nickel.

Station	Salinity	TU	Ni Spike (µmoles/g)	Ni SEM (µmoles/g)	Simple Difference
2-JMS065.81	0	0	0.0000	<0.1850	n/a
	0	110	1.3100	0.4997	-61.8
	0	305	3.6323	1.4787	-59.2
	8	305	3.6323	1.5982	-56.0
	15	305	3.6323	1.7515	-51.8
2-JMS040.03	0	0	0.0000	<0.1503	n/a
	0	110	0.8733	0.4531	-48.1
	0	305	2.4213	1.3819	-42.9
	8	305	2.4213	1.1085	-54.2
	15	305	2.4213	1.5850	-34.5
FWC	0	0	0.0000	<0.1741	n/a
SWC	20	0	0.0000	0.1849	n/a

Table 3.35. Comparison of spiking concentrations and SEM concentrations for zinc.

Station	Salinity	TU	Zn Spike (µmoles/g)	Zn SEM (µmoles/g)	Simple Difference	Adjusted Difference
2-JMS065.81	0	0	0.0000	0.6473	n/a	n/a
	0	110	0.9293	0.9684	4.24	-65.4
	0	305	2.5768	1.7611	-31.6	-56.8
	8	305	2.5768	1.9750	-23.3	-48.5
	15	305	2.5768	2.1576	-16.2	-41.4
2-JMS040.03	0	0	0.0000	0.3872	n/a	n/a
	0	110	0.6195	0.7873	27.0	-35.4
	0	305	1.7177	1.3636	-20.6	-43.2
	8	305	1.7177	1.2127	-29.3	-51.9
	15	305	1.7177	1.7237	0.35	-22.2
FWC	0	0	0.0000	0.2369	n/a	n/a
SWC	20	0	0.0000	0.5929	n/a	n/a

Table 3.36. Comparison of spiking concentrations, SEM and SEM/AVS for total metals.

Sediment	Salinity	TU	Spike (less Se) (µmoles/g)	SEM Spiked Metals (µmoles/g)	Total SEM (Spike + Pb and Hg) (µmoles/g)	AVS (µmoles/g)	SEM/AVS (Total SEM)
2-JMS065.81	0	0	0.0000	0.7028	0.7624	1.6407	0.464680
	0	110	2.2636	1.5734	1.6628	0.1050	15.83619
	0	305	6.2765	3.3685	3.4778	0.0783	44.41635
	8	305	6.2765	3.7303	3.8684	0.0236	163.9153
	15	305	6.2765	4.0841	4.2216	0.0652	64.74847
2-JMA040.03	0	0	0.0000	0.4248	0.4594	0.4225	1.087337
	0	110	1.5090	1.2950	1.3397	0.2382	5.624265
	0	305	4.1840	2.8007	2.8490	0.5601	5.086592
	8	305	4.1840	2.3828	2.3828	0.4997	4.768461
	15	305	4.1840	3.3884	3.3884	0.6169	5.492624
FWC	0	0	0.0000	0.2369	0.2369	0.3250	0.728923
SWC	20	0	0.0000	0.8702	0.9354	0.0967	9.673216

Table 3.37. Water quality and atmospheric conditions during Richmond deployment, September 2000.

		Water				Atmospheric				
Creek	Date	Conduct.	Temp.	Dissolved Oxygen	PH	Temp.	Cloud Cover	Rain (cm)	Wind Speed	Wind Direction
Gillie	9/13/00	280	26.5	8.0	6.87	26.0	Sun	0.0	0	
	9/15/00	175	26.0	7.6	7.38	20.5	Partly Cloud	0.6	<5	NW
	9/17/00	200	23.0	7.4	6.97	18.5	Sun	0	<2	SW
	9/19/00	160	22.3	6.7	*	21.5	Cloud	0.4	5-10	NW
	9/21/00	160	23.5	6.4	*	19.0	Cloud	0.0	5-10	W
	9/23/00	190	23.0	7.6	*	20.0	Cloud	<0.1	<2	N
	9/25/00	220	23.0	8.5	*	17.0	Cloud	1.0	5	N
	9/27/00	210	18.5	8.7	*	17.0	Sun	2.4	<2	N
Almond	9/13/00	185	26.5	7.6	6.80	25.0	Sun	0.0	<5	N
	9/15/00	170	26.5	6.3	7.28	24.0	Partly Sun	1.0	<5	NW
	9/17/00	150	23.5	6.9	7.47	16.0	Sun	0.0	5	N
	9/19/00	140	22.0	6.7	*	20.0	Cloud	0.4	10-15	NW
	9/21/00	170	24.0	7.4	*	20.0	Cloud	0.0	0	
	9/23/00	175	22.5	7.2	*	20.0	Cloud	<0.1	0	
	9/25/00	210	23.0	8.4	*	17.0	Cloud	1.3	5	N
	9/27/00	205	18.5	8.3	*	14.0	Sun	1.8	7.2	N
Falling	9/13/00	115	27.0	6.9	7.16	26.0	Sun	0.0	0	
	9/15/00	92	24.0	7.8	7.24	26.0	Cloud	4.0	<5	N
	9/17/00	150	25.0	6.7	7.55	17.5	Sun	0.0	<5	var
	9/19/00	150	23.0	7.2	*	20.0	Cloud	0.4	5-10	NW
	9/21/00	180	23.5	7.3	*	21.0	Cloud	0.0	<1	S
	9/23/00	195	23.0	7.8	*	20.5	Cloud	0.1	<1	
	9/25/00	195	22.0	7.6	*	17.0	Cloud	0.6	<1	
	9/27/00	110	18.5	6.9	*	15.5	Sun	3.7	<2	N
Cornelius	9/13/00	180	28.0	7.2	6.91	27.0	Partly cloud	0.0	0	
	9/15/00	160	25.0	7.2	7.32	23.0	Partly cloud	3.5	5	SE
	9/17/00	180	26.5	6.6	7.22	18.0	Sun	0.0	5-10	var
	9/19/00	160	24.0	8.0	*	20.0	Cloud	0.4	5	SW
	9/21/00	175	24.0	7.6	*	21.0	Partly sun	0.0	<2	S
	9/23/00	200	23.0	7.6	*	20.5	Cloud	0.1	0	
	9/25/00	225	22.0	8.1	*	17.0	Cloud	0.5	5	N
	9/27/00	205	19.5	7.6	*	15.0	Sun	4.0	<2	N

Table 3.38. Amphipod survival and size during the *in situ* test at the Richmond stations.

a. Gillie Creek

	Exposure Day										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	18	19	17	16	16	15	15	0.280	5	33.3
2	20	16	14	0/20	18	18	15	14	0.221	2	14.3
3	20	18	17	15	15	14	14	14	0.371	2	14.3
4	20	18	17	15	14	13	13	12	0.442	3	25.0
Total	80	70	67	47	63	61	57	55		12	
Percent	100	87.5	95.7	87.0	94.0	96.8	93.4	96.5	0.329	3.0	21.8
Rainfall (cm)		0.6	0.0	0.4	0.0	0.1	1.0	2.4			

b. Almond Creek

	Exposure Day										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	18	15	13	13	13	12	12	0.433	3	25.0
2	20	19	18	15	[14]	[14]	[13]	15	0.367	4	26.7
3	20	19	17	17	17	17	17	17	0.359	3	17.6
4	20	19	19	18	17	16	15	13	0.369	4	30.8
Total	80	75	69	63	62	61	59	57		14	
Percent	100	93.8	92	91.3	98.4	98.4	96.7	96.6	0.382	3.5	24.6
Rainfall (cm)		1.0	0.0	0.4	0.0	0.1	1.3	1.8			

c. Falling Creek

	Exposure Day										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	20	19	19	18	16	[15]	16	0.431	7	43.8
2	20	19	[18]	[18]	[18]	[18]	[18]	19*	0.390	8	42.1
3	20	16	15	14	13	13	12	10	0.430	5	50.0
4	20	19	15	14	[13]	14	14	14	0.414	6	42.9
Total	80	74	68	66	64	61	61	59		26	
Percent	100	92.5	91.9	97.1	97	95.3	100	96.7	0.416	6.5	44.1
Rainfall (cm)		4.0	0.0	0.4	0.0	0.1	0.6	3.7			

* Laboratory count on day 14 was 20

Table 3.38 (cont.). Amphipod survival and size during the *in situ* test at the Richmond stations.

d. Cornelius Creek

	Exposure Day										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	18	18	18	18	18	16	16	0.425	5	31.3
2	20	18	18	17	17	17	[15]	16	0.400	5	31.3
3	20	20	17	17	17	17	16	16	0.450	6	37.5
4	20	19	19	19	18	18	18	17	0.441	7	41.2
Total	80	75	72	71	70	70	66	65		23	
Percent	100	93.8	96	97.3	97.2	100	97.1	98.5	0.429	5.8	35.4
Rainfall (cm)		3.5	0.0	0.4	0.0	0.1	0.5	4.0			

Table 3.39. Water quality and atmospheric conditions during Hopewell deployment, October 2000.

		Water				Atmospheric				
Creek	Date	Conduct.	Temp.	Dissolved Oxygen	pH	Temp.	Cloud Cover	Rain (cm)	Wind Speed	Wind Direction
Bailey	10/3/00	285	21.0	5.8	nd	22	Clear	0	0	
	10/5/00	280	23.0	5.3	nd	18	Clear	0	0	
	10/7/00	290	22.5	6.0	nd	13	Clear	0	5-10	NNE
	10/9/00	450	18.0	7.5	nd	9	Partly Cloudy	0	10-15	NNW
	10/11/00	480	18.0	7.3	nd	14	Clear	0	5	E
	10/13/00	475	18.0	9.4	7.8	22	Clear	0	0	
	10/15/00	490	24.5	7.8	7.3	23	Clear	0	0	
	10/17/00	480	23.0	3.8	7.2	19.5	Cloudy	0	0	
	10/19/00	420	21.0	3.8	7.1	11	Cloudy	0	0	
	10/21/00	nd	18.5	3.8	6.9	14	Clear	0	0	
	10/23/00	600	21.0	5.6	7.2	14.5	Clear	0	10-15	NE
	10/25/00	450	19.0	4.9	6.8	17	Clear	0	0	
	10/27/00	550	23.5	5.7	6.9	21	Partly Sunny	0	<5	NE
	10/29/00	550	21.0	5.5	7.2	10	Clear	0	15	W
	10/31/00	550	17.0	4.7	7.2	9	Clear	0	<5	var
Gravelly Run	10/3/00	410	30.0	5.9	nd	18	Clear	0	0	
	10/5/00	435	32.0	5.2	nd	18.5	Clear	0	0	
	10/7/00	420	32.0	5.5	nd	17	Clear	0	10-15	NNE
	10/9/00	550	29.5	6.2	nd	11	Partly Cloudy	0	10-15	NNW
	10/11/00	700	29.0	5.0	nd	18	Clear	0	0	E
	10/13/00	680	29.5	6.2	7.1	22	Clear	0	0	
	10/15/00	650	31.0	4.7	7.0	20.5	Clear	0	0	
	10/17/00	900	31.0	4.6	7.0	19	Cloudy	0	<5	NE
Bear	10/17/00	325	19.0	3.8	7.0	18	Clear	0	0	
	10/19/00	370	17.0	3.5	6.8	20	Clear	0	0	
	10/21/00	nd	15.0	5.4	7.1	13	Clear	0	5	N
	10/23/00	430	16.0	5.2	5.5	7	Partly Cloudy	0	10-15	NW
	10/25/00	325	16.5	5.6	6.9	14	Clear	0	0	
	10/27/00	400	18.0	5.9	7.0	20	Clear	0	<5	SW
	10/29/00	355	15.5	5.4	6.6	17	Clear	0	<5	var
	10/31/00	280	12.0	4.7	7.2	18	Cloudy	0	<5	NE

Table 3.39 (cont.). Water quality and atmospheric conditions during Hopewell deployment, October 2000.

		Water				Atmospheric				
Creek	Date	Conduct.	Temp.	Dissolved Oxygen	pH	Temp.	Cloud Cover	Rain (cm)	Wind Speed	Wind Direction
Cabin	10/3/00	95	19.5	7.1	nd	20	Clear	0	0	
	10/5/00	120	21.5	8.5	nd	18	Clear	0	0	
	10/7/00	180	21.5	8.9	nd	14	Clear	0	<5	N
	10/9/00	180	18.5	9.5	nd	9	Partly Cloudy	0	10-15	NW
	10/11/00	nd	17.0	8.9	nd	13.5	Clear	0	<5	N
	10/13/00	300	18.5	10.6	8.4	18	Clear	0	<5	SW
	10/15/00	250	18.0	10.4	8.4	21	Clear	0	<5	var
	10/17/00	260	18.0	8.4	7.3	18	Cloudy	0	<5	NE
	10/19/00	310	18.0	10.4	7.6	15	Clear	0	0	
	10/21/00	nd	18.0	9.4	7.8	17	Clear	0	0	
	10/23/00	395	19.0	9.8	8.7	15	Clear	0	5	NE
	10/25/00	340	18.0	11.0	8.4	19	Clear	0	0	
	10/27/00	395	19.5	11.0	8.4	20	Partly Sunny	0	5	SW
	10/29/00	320	17.0	9.5	8.6	10	Clear	0	<	W
	10/31/00	225	13.5	9.3	7.6	8	Clear	0	5-10	N
Eppes	10/3/00	165	20.0	8.4	nd	18	Clear	0	0	
	10/5/00	200	23.0	9.0	nd	20	Clear	0	0	
	10/7/00	200	22.0	11.5	nd	13	Clear	0	2	N
	10/9/00	245	17.0	9.8	nd	7	Partly Cloudy	0	10-15	NW
	10/11/00	255	15.0	10.4	nd	14	Clear	0	0	
	10/13/00	325	18.0	13.6	9.3	20	Clear	0	5	SW
	10/15/00	330	19.0	12.9	9.0	17	Clear	0	<5	var
	10/17/00	295	19.0	9.2	8.4	18	Cloudy	0	<5	NE
	10/19/00	350	18.0	8.3	7.0	15	Clear	0	<5	SE
	10/21/00	nd	18.5	9.2	8.7	17	Clear	0	0	
	10/23/00	400	18.5	9.1	8.9	19	Clear	0	5	SE
	10/25/00	355	18.5	10.2	8.7	18	Hazy	0	5	W
	10/27/00	380	19.0	10.6	8.6	19	Partly Sunny	0	<5	SE
	10/29/00	330	17.0	9.5	8.4	11	Clear	0	<5	W
	10/31/00	270	13.0	7.8	7.7	7	Clear	0	<5	NW

Table 3.40. Amphipod survival and size during the *in situ* test at the Hopewell deployment, October 2000.

a. Bailey Creek

	Exposure Day, Weeks 1-2										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	17	17	16	16	16	16	16	0.431	5	31.3
2	20	18	16	[15]	16	[15]	16	16	0.462	4	25.0
3	20	18	18	[14]	18	18	18	18	0.461	5	27.8
4	20	17	15	15	12	12	12	12	0.458	6	50.0
Total	80	70	66	65	65	65	65	65		20	
Percent	100	87.5	94.3	98.5	100.0	100.0	100.0	100.0	0.453	5.0	30.8
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

	Exposure Day Weeks 3-4										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	[19]	20	[17]	19	19	19	19	0.384	4	21.1
2	20	[17]	[17]	18	18	17	16	16	0.306	6	37.5
3	20	[17]	20	19	19	19	[20]	19	0.379	5	26.3
4	20	20	18	18	18	17	17	16	0.306	1	6.3
Total	80	79	77	74	74	72	71	70		16	
Percent	100	98.8	97.5	96.1	100.0	97.3	98.6	98.6	0.344	4.0	22.9
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

Table 3.40 (cont.). Amphipod survival and size during the *in situ* test at the Hopewell stations, October 2000.

b1. Gravelly Run

	Exposure Day, Week 1-2										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	[15]	16	15	15	14	14	11	0.527	8	72.7
2	20	13	12	[9]	11	10	3	2	0.750	1	50.0
3	20	17	15	[7]	13	11	6	3	0.500	2	66.7
4	20	16	16	[11]	15	15	2	0			
Total	80	62	59	55	54	40	25	16		11	
Percent	100	77.5	95.2	93.2	98.2	74.1	62.5	64	0.592	3.7	68.8
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

b2. Bear Creek

	Exposure Day, Week 3-4										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	[17]	20	20	19	19	[14]	17	0.247	1	5.9
2	20	20	[17]	19	18	17	16	16	0.262	3	18.8
3	20	[18]	20	19	[17]	18	[13]	17	0.282	1	5.9
4	20	19	18	18	[19]	18	16	16	0.269	0	0.0
Total	80	79	77	76	73	72	67	66		5	
Percent	100	98.8	97.5	98.7	96.1	98.6	93.1	98.5		9	
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.271	2.3	9.1

c. Cabin Creek

	Exposure Day, Week 1-2										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	19	19	19	19	19	19	13	0.377	1	7.7
2	20	19	19	19	19	19	19	19	0.374	4	21.1
3	20	19	19	19	18	18	16	14	0.371	4	28.6
4	20	18	16	16	16	16	16	15	0.387	5	33.3
Total	80	75	73	73	72	72	70	67		14	
Percent	100	93.8	97.3	100	98.6	100	97.2	95.7	0.377	3.5	20.9
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

Table 3.40 (cont.). Amphipod survival and size during the *in situ* test at the Hopewell stations, October 2000.

	Exposure Day, Week 3-4										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	19	19	19	19	[17]	18	18	0.350	2	11.1
2	20	19	19	19	19	19	18	18	0.317	3	16.7
3	20	20	20	20	20	[19]	20	19	0.316	2	10.5
4	20	20	18	[17]	18	[17]	18	17	0.318	1	5.9
Total	80	78	76	76	76	75	74	72		8	
Percent	100	97.5	97.4	100	100	98.7	98.7	97.3	0.325	2.0	11.1
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

d. Eppes Creek

	Exposure Day, Week 1-2										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	18	18	18	18	18	18	17	0.429	3	17.6
2	20	19	19	19	19	18	17	17	0.412	6	35.3
3	20	17	17	17	17	17	17	17	0.241	2	11.8
4	20	20	20	[18]	19	19	17	17	0.371	3	17.6
Total	80	74	74	73	73	72	69	68		14	
Percent	100	92.5	100	98.6	100	98.6	95.8	98.6	0.363	3.5	20.6
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

	Exposure Day, Week 3-4										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	[17]	18	18	[17]	18	16	16	0.344	0	0.0
2	20	20	20	20	20	19	19	19	0.353	1	5.3
3	20	20	20	20	[19]	[19]	20	18	0.411	3	16.7
4	20	[19]	20	19	18	17	17	16	0.325	2	12.5
Total	80	79	78	77	76	74	72	69		6	
Percent	100	98.8	98.7	98.7	98.7	97.4	97.3	95.8	0.358	1.5	8.7
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

Table 3.41. Water quality and atmospheric conditions during the Hopewell deployment, May 2001.

		Water				Atmospheric				
Creek	Date	Conduct.	Temp.	Dissolved Oxygen	pH	Temp.	Cloud Cover	Rain (cm)	Wind Speed	Wind Direction
Bailey	5/2/01	430	24.0	7.0	6.8	21.5	clear	0.0	<5	SW
	5/4/01	390	25.5	8.5	6.9	29.5	clear	0.0	<5	variable
	5/6/01	390	25.0	10.2	7.5	22.0	cloudy	0.0	<15	NE
	5/8/01	440	22.0	10.0	6.3	24.5	scattered	0.0	<5	SE
	5/10/01	470	31.0	6.5	6.7	30.5	scattered	0.0	<5	variable
	5/12/01	430	26.0	3.2	6.9	21.5	clear	0.0	<5	SW
	5/14/01	500	23.0	4.3	5.7	12.0	clear	tr	<5	NW
	5/16/01	400	20.5	5.4	6.9	15.0	cloudy	tr	<5	variable
Bear	5/2/01	160	23.0	7.2	7.0	28.0	clear	0	5-10	SW
	5/4/01	160	25.0	6.0	6.7	29.0	clear	0	calm	n/a
	5/6/01	315	22.5	7.2	7.1	21.5	cloudy	0	<15	NE
	5/8/01	270	22.0	7.8	5.7	25.0	scattered	0	<5	SE
	5/10/01	195	25.0	5.5	6.8	28.0	scattered	0	<5	variable
	5/12/01	205	24.0	2.7	6.9	22.0	clear	0	<5	SW
	5/14/01	152	18.5	7.0	5.4	13.0	clear	tr	calm	n/a
	5/16/01	165	17.0	5.5	9.0	15.5	cloudy	tr	calm	n/a
Cabin	5/2/01	92	25.0	9.7	7.3	31.0	scattered	0	<5	S
	5/4/01	122	25.5	11.0	7.8	31.0	clear	0	<5	variable
	5/6/01	120	23.0	8.8	7.2	23.0	overcast	0	<5	NE
	5/8/01	95	22.5	9.4	6.6	25.5	scattered	0	<5	SE
	5/10/01	100	27.0	10.0	7.1	30.0	scattered	0	<5	variable
	5/12/01	110	23.0	8.6	6.9	22.0	scattered	0	<5	SW
	5/14/01	135	22.0	9.3	5.8	14.0	clear	0	<5	NW
	5/16/01	140	22.0	8.2	7.5	17.5	overcast	0	<5	SW
Eppes	5/2/01	190	24.5	6.5	7.5	28.0	partly cloudy	0	<5	SE
	5/4/01	175	24.0	7.5	6.4	23.0	clear	0	5	SE
	5/6/01	170	23.0	7.3	6.8	18.0	cloudy	0	<15	NE
	5/8/01	180	22.5	6.7	6.5	24.0	scattered	0	<5	SE
	5/10/01	180	25.0	5.3	6.8	30.0	scattered	0	light	variable
	5/12/01	195	25.0	4.9	7.2	23.5	scattered	0	light	SW
	5/14/01	180	21.5	5.8	5.8	16.0	clear	tr	<10	NW
	5/16/01	180	19.5	7.4	6.7	19.0	overcast	0	10-15	SW

Table 3.42. Amphipod survival and size during the *in situ* test at the Hopewell stations, May 2001.

a. Bailey Creek

	Exposure Day, Weeks 1-2										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	19	19	18	17	17	15	14	0.700	6	42.9
2	20	18	18	18	17	17	[12]	17	0.724	8	47.1
3	20	19	19	19	19	17	17	16	0.776	5	31.3
4	20	20	20	20	20	[18]	[18]	19	0.769	8	42.1
Total	80	76	76	75	73	70	68	66		27	
Survival	100	95.0	100.0	98.7	97.3	95.9	97.1	97.1	0.742	6.8	40.9
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

b. Bear Creek

	Exposure Day, Weeks 1-2										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	[18]	20	19	18	15	[13]	14	0.593	5	35.7
2	20	20	20	20	18	18	17	17	0.575	3	17.6
3	20	20	[19]	[19]	20	20	18	17	0.575	6	35.3
4	20	20	20	20	19	18	16	16	0.489	3	18.8
Total	80	80	80	79	75	71	65	64		17	
Survival	100	100	100	98.8	94.9	94.7	91.5	97.5	0.546	7.3	29.7
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

c. Cabin Creek

	Exposure Day, Week 1-2										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	20	20	19	16	16	15	15	0.457	5	33.3
2	20	20	18	18	17	17	16	16	0.465	2	12.5
3	20	20	[19]	20	19	18	17	16	0.444	4	25.0
4	20	15	11/20	20	18	[17]	18	18	0.458	9	50.0
Total	80	75	69/78	77	70	69	66	65		20	
Survival	100	100*	96.7	98.7	97.2	98.6	95.7	98.5	0.456	5.0	30.8
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

Table 3.42 (cont.). Amphipod survival and size during the *in situ* test at the Hopewell stations, May 2001.

d. Eppes Creek

	Exposure Day, Week 1-2										
Replicate	0	2	4	6	8	10	12	14	Mean Weight (mg/amph)	No. Gravid	Percent Gravid
1	20	19	19	[18]	[17]	[17]	[17]	19	0.668	2	10.5
2	20	20	20	20	20	19	19	19	0.589	5	26.3
3	20	19	18	15	15	15	14	14	0.564	5	35.7
4	20	20	19	19	15	15	15	14	0.564	5	35.7
Total	80	78	76	75	69	68	67	66		17	
Survival	100	97.5	97.4	96.1	94.5	98.6	98.5	98.5	0.597	4.3	25.8
Rainfall (cm)		0.0	0.0	0.0	0.0	0.0	0.0	0.0			

4.0 DISCUSSION

4.1 Ambient Toxicity in Tidal Freshwater James River

4.1.1 Ambient Aqueous Toxicity and Water Quality

This reach of the river lacked any evidence of toxicity with any endpoint (mortality, growth, or reproduction). This is consistent with the absence of exceedances of regulatory levels for any metal. There is some possibility that organic chemicals could be present in the water, but the low solubility of most and a sampling period outside the normal times for pesticide usage for the corn-soybean-wheat rotation made analysis for such chemicals difficult to justify since toxic concentrations of chemicals are unlikely to occur in the fall. In this reach of the river there are no major chemical industries, supporting a low likelihood of concentrations of toxic materials reaching toxicologically significant levels.

4.1.2 Sediment Quality Triad Evaluation for the Region

In the sediment triad evaluation, there was no evidence from the chemical characterization that there would be any measurable toxicity. There was an increase in the concentration of some chemicals, notably PAHs, with distance upstream. This observation can be attributed to the presence of Hopewell, a highly industrialized community, just upstream of the study region. PAH concentrations did not reach levels that would be major concern. PCB did not show a similar trend. Kepone, a pesticide released into the river at Hopewell in the 1970's, is still measurable in finfish from the river. Kepone was observed at a low concentration at one station near Windmill Point. Kepone concentrations were well below those producing measurable acute toxicity to freshwater fish in laboratory tests (Roberts and Bendl, 1982). No data has been identified to suggest that amphipods or chironomids would be any more sensitive to Kepone than fish.

The analytical results from the DEQ and EPA station pairs were in close agreement. This is supported by the toxicological observations and community analyses.

No toxicological events involving any endpoint tested were detected at any station in this region. This observation is consistent with the chemical characterization of the region as relatively clean. No differences existed in toxicological responses to distinguish the paired DEQ and EPA sampling stations.

The benthic community analysis was limited to the 12 DEQ stations. The B-IBI was 3 or above at all stations except one, indicating good to exceptional community development. The one exception was at Station 2-JMS044.08 with a marginal B-IBI of 2.67. Communities in this freshwater to oligohaline region were characteristically small and dominated by opportunistic species. Nothing about these communities suggested any adverse effect. McGee et al. (2000) who occupied 5 stations around the mouth of the Chickahominy River in the downstream portion

of the study area reported two stations as degraded and one as marginal. The degraded stations were located in the mouth of Grays Creek and just east of Dancing Point. The location with a marginal B-IBI was located directly south of the mouth of the Chickahominy near our Station 2-JMS047.81. This portion of the river was fresh water during the McGee et al. (2000) study, and oligohaline during this study. The B-IBI is not at present suited to distinguishing between toxicological effects and other water quality effects. Suffice it to say, there is limited evidence of benthic community degradation in this part of the river taking both studies together.

4.2 Effect of Salinity Adjustment on Apparent Toxicity of Sediment

4.2.1 Evaluation of Protocols Used

The protocols used for this experimental portion of the study were planned to allow stabilization of the metals with the sediment for a short period following spiking. On the positive side, the metal spike remained in the sediment through all the various salinity adjustments and preparatory steps leading to the exposure of test animals. AVS/SEM analyses indicated all metals present, and when at concentrations above the detection limit, the concentrations seemed appropriate considering the dose as was discussed previously. The salinity adjustment protocols used during the test preparation worked effectively to produce a pore water without significant salt or with the desired salinity depending on the circumstance in the preparation. The salinity was achieved reasonably quickly without mechanical stirring of the sediment and without having an effect on salinity of the overlying water during the test exposure.

On the negative side, these normally rather anaerobic sediments were oxidized repeatedly during the preparation for the experiment, thus at least conceptually promoting a variety of geochemical changes in the sediment of unknown biological or toxicological consequence. Despite these geochemical changes, theoretical or actual, the sediments once overlain with water quickly stratified into a deep anaerobic layer and a shallow aerobic layer before addition of test animals. The animals initially responded to the sediment in essentially the same manner whether spiked with metals or not. For these reasons, the protocols are believed to have been appropriate for the experimental purpose.

4.2.2 Implications on Toxicity Characterization for Sediment

Salinity had an overall effect of increasing the apparent toxicity of spiked sediment. However, there were species-specific differences in the cause of this effect. In the case of the estuarine species, higher toxicity at the elevated salinity may have reflected primarily changes in chemical speciation and/or availability of metals. For the freshwater species, salinity tolerance may have been the reason for decreased survival though chemical speciation and changes in bioavailability may still have played a role.

The contrasting effect of salinity alone on growth of *L. plumulosus* compared with the interactive effect of salinity x metal on survival suggest that while animals are less stressed at the higher salinity, metals are more bioavailable. *L. plumulosus* is a euryhaline species and although it is most frequently found in low salinity regions of Chesapeake Bay, it most likely occurs in these areas as a fugitive species (Feeley and Wass, 1971; Jordan and Sutton, 1984). The notion that these low salinity areas offer refuge from predators or access to resources rather than optimal

physiological salinity is supported by the negative effect of reduced salinity on growth observed in this study. Schlekat and coworkers (1992) observed a significant increase in the number of offspring produced by *L. plumulosus* cultured for 20 days at 25 g/kg as opposed to 5 g/kg and 15 g/kg. Though the differences were not statistically significant, there was still an apparent increase in offspring production in the higher salinity cultures after 28 days.

In contrast, increased pore water salinity alone had a negative effect on both growth and survival of *H. azteca*. The effect in un-spiked sediment at 15 g/kg was highly significant. Salinity still had an effect on metal toxicity but sediment was part of the interactive term. Possibly the higher TOC in sediment from station 2-JMS065.81 contributed to the slightly lower toxicity observed within salinity-metal treatments for this sediment compared to that observed for sediment from station 2-JMS040.03.

One possible explanation for the independent effect of salinity is that acclimation of *H. azteca* was inadequate. While this species has been recommended for use in testing at salinities as high as 15 g/kg, no recommended salinity acclimation procedures are provided (ASTM, 1999; EPA, 2000). In the current study, animals were acclimated by changing the holding water salinity by no more than 3-4 g/kg/12-h period during a 48-hr to 72-hr period prior to testing (i.e. they were held at the test salinity at least 24 h prior to use). Ingersoll *et al*. (1992) cultured *H. azteca* in freshwater and artificial seawater at 10-g/kg salinity for use in testing brackish irrigation water. In 96-h water-only tests animals from both culture groups faired equally well (90% and 80% survival) in brackish samples (19 g/kg). However, the exposure period was less than that of the current study and the ionic composition of the brine was different than that of seawater of equivalent salinity (e.g. higher in calcium and lower in sodium and magnesium). Another group investigating the salinity tolerance of *H. azteca* reported 10-d salinity LC50s of 20.4 g/kg for mature adults and 24.2 g/kg for young adults in water-only exposures; 73% of the animals survived at 15 g/kg and produced a total of 27 offspring compared with 100% survival and 96 offspring in the freshwater control group (Nebeker and Miller, 1988). Although the animals were directly transferred to test solutions from freshwater cultures (i.e. no acclimation), survival was good (93%) at 96 h; much of the mortality that occurred in the treatments $\geq$ 15 g/kg salinity occurred between 96 h and 10 d. Animals exposed to sediments with pore water salinities as high as 27.5 g/kg salinity using a fresh (200 mg/l $CaCO_3$ hardness) dilution water (4:1 v:v water:sediment) exhibited good survival but pore water salinity was probably greatly lowered by the overlying freshwater. In summary, *H. azteca* may be stressed if used for testing samples with salinity of 15 g/kg or higher unless complete acclimation to the test salinity can be achieved. Appropriate acclimation procedures need to be developed. Until then, use of this species at elevated salinities should be restricted to test organisms cultured at the test salinity.

Ammonia increased slightly in sediments following salt addition but the measured concentrations were still well below most toxic values reported in the literature. Ammonia toxicity studies conducted using spiked sediments yielded a 96-h LC50 for *H. azteca* of 117-126 mg NH_4-N/l at pH 6.6-7.4 (Besser *et al.*, 1998) and a 10-d LC50 of 98.8 mg NH_4-N /l for *L. plumulosus* (Moore *et al.*, 1997). In contrast to the results reported by Besser and coworkers, Borgmann (1994) reported a 7-day LC50 of 23 mg NH_4-N /l in water-only exposures. Toxicity values expressed in terms of unionized ammonia were similarly distant between the two studies suggesting that factors other than pH (e.g. water vs. sediment exposure, exposure duration) may be responsible for the disparity.

Ammonia values for the treatments in the present study that exhibited significant toxicity (i.e. 305 TU) ranged from 2.2 to 22.0 mg NH_4-N /l and were generally lower or similar in ammonia concentration to the corresponding un-spiked control. Also, survival of control animals for both species in sediment from station 2-JMS065.81 (15 g/kg salinity) controls (36.2 mg NH_4-N /l ammonia) was equal to or greater than those in sediment from station 2-JMS040.03 (15g/kg salinity) controls (4.6 mg NH_4-N /l ammonia). Mobilization of ammonia by salt addition does not explain the effect of salinity on toxicity.

Increased availability of sediment-sorbed metal with increasing salinity may result from increasing chloride complexation of sorbable metal ions and/or competition for sediment binding sites by seawater cations (Chapman and Wang, 2001). Salinity-induced changes in sediment-metal adsorption are usually reversible and may affect different bound phases of the metals (e.g. Comans and van Dik, 1988; Turner and Millward, 1994). Methods proposed to measure available metal (e.g. SEM/AVS) may be insensitive to these effects of salinity. For example, Turner and Millward (1994) found for sediment-bound Cd and Zn that "exchangeable" metal (defined as extractable in 1 M ammonium acetate) increased with increasing salinity, "leachable" metal (defined as metal extracted in 1 M HCl after extraction in 1 M ammonium acetate) decreased with increasing salinity and the sum of the two (equivalent to SEM) remained relatively constant.

In addition to changes in adsorption of metals to sediments, salinity may also affect the speciation, and hence toxicity, of pore water metals. Salinity effects on toxicity of metals have been demonstrated for a variety of species and have been shown to be primarily related to the differing bioavailability of various forms of the metals such as Me^{2+}, $MeCl^{+}$, $MeCl_2^{o}$, etc. (e.g. Sunda *et al.*, 1978; Sunda *et al.*, 1987; De Lisle and Roberts, 1988; Nugegoda and Rainbow, 1988; De Lisle and Roberts, 1993; Wildgust and Jones, 1998; Roast *et al.*, 2001). However, "residual" salinity effects, presumably of a physiological nature, often exist even after accounting for speciation (Wright, 1995). Net effects of salinity on toxicity of sediment-associated metals are likely dependent on the effects of salinity on both sediment sorption and dissolved phase speciation of the metals as well as organism physiology.

4.3 Effect of Rainfall on Water Quality from Tributary Urbanized Creeks

During the fall of 2000, there were small intense rain events during September. These events were highly localized, as can be seen by the range in rainfall during any 2-day period across the study area. For example, 0.4 to 0.6 cm was collected at Gillie and Almond Creek, and nearly ten times this amount (3.5 to 4.0 cm) at Falling and Cornelius Creeks on 15 September. This compares to 0.43 cm (0.17 in) at the nearby Richmond International Airport (RIC). On the final study date, 27 September, the range in rain amount was less extreme, ranging from 1.8 to 4.0 cm. This compares to 4.0 cm (1.62 in) at RIC during the period. Though the rain events were significant and in excess of 1 cm, there were no mortality events correlated with these rain events.

In a previous study of rain events falling on agricultural land, and specifically tomato fields covered with plastic, rain events such as the heavier events observed in Richmond caused major,

sometimes total, mortality (Luckenbach *et al*. 1996). Scott *et al*. (1987, 1990) reported similar results from agricultural areas in South Carolina.

In the Richmond setting, however, no correlation was observed between survival and rain events. The lack of effect may result from the hardened surfaces having already been washed clean by earlier rain events. If one examines rainfall records from the Richmond International Airport, rainfalls ≥1 cm occurred on August 1, 4, 11, 18, 24, and 27 and September 3. During the 10 days before deployment, there was no rainfall recorded at RIC.

An alternative explanation for lack of mortality response may be the placement of the stations close to but not within the mouths of the study creeks. Dilution of a concentrated effluent from the creeks may have been significant, reducing the effect of the events below a detectable amount.

As noted in the description of the study sites, it was not practical to enter into the mouths of three creeks. Only in Falling Creek was the study site within the creek mouth, and even here, the creek penetration was minimal. The fundamental impediments to penetrating the creeks were the shallow depth and fallen trees.

During the fall deployment in Hopewell, there was no rainfall for the entire 28 days. This observation was confirmed with data from RIC and from the Hopewell weather site (37°18’N, 77°17’W). The sole mass mortality observed during the *in* situ tests occurred at Gravelly Run, and presumably was related to industrial practices upstream rather than rain induced runoff. An excessive thermal increase is one possible explanation, but pH events are also known to occur in this creek (Robert Seidel, personal communication). Reduced oxygen concentration might also occur following an excessive release of organic material.

Again during the spring 2001 deployment in Hopewell, there was virtually no rainfall during a 14-day period. No mass mortalities were observed despite reduced oxygen at the Bailey Creek and Bear Creek sites during a portion of the period. Two-day survival during this deployment was nearly identical to that during the fall deployment. This speaks to the reliability of the deployment methodology, but offers no information concerning the effect of rain events.

The singular mass mortality event during the fall 2000 *in situ* study points out in a very poignant way a major limitation of the present widely used approach to characterize conditions in extensive waterways. This mortality event occurred within one 48-hr period (i.e. in less than 48 hr). Grab water sampling on the three-day schedule used for the characterization portion of this study would likely not have detected such a short-term pulsed event. Therefore to demonstrate a lack of toxicity in such tests does not mean that there was not a short period of high toxicity during the test period. Conversely, detection of toxicity in one of three sampling events does not mean that the region should be characterized as severely contaminated. The characterization methodology serves well only to demonstrate effects of relatively continuous infusion of toxic materials leading to persistently elevated concentrations of one or more toxic materials in the receiving water.

The use of three samples over the course of the aqueous toxicity tests is certainly better than the single sample approach used in a previous study (Roberts *et al*. 2000) and in the extensive

monitoring studies of Californian rivers (de Vlaming *et al.*, 2000). The reason for such abbreviated sampling was related in both cases to logistical problems in collecting and transporting samples at multiple times. Ultimately that translates to a high cost for transportation and personnel. De Vlaming *et al.* (2000) also pointed to the problems of performing a TIE for any location found to be toxic in a preliminary test of one or more samples over a 10-12 day period, an important component of the California monitoring program.

A clear limitation of the present *in situ* study was the lack of a continuous record of water quality conditions at the study site. The objective in the present instance was to demonstrate the presence or absence of an ephemeral biological effect associated with rain events. If a continuous record of general water quality data had been available, it might have been possible to place a better interpretation on the mortality event observed at Gravelly Run in Hopewell. Among the possible explanations excluding a toxic material release are 1) a brief thermal excursion above the already extreme levels, 2) a pH excursion, or 3) a reduced oxygen concentration. These explanations cannot be excluded, and therefore there is no basis for assuming the release of a toxic material.

4.3.1 Conceptual Comparison of Alternative Test Methods

The approach used for this study involved a passive devise deployed in the field. The nature of the device placed limitations on where it can be successfully deployed. There must be a minimum of 12-15 inches of water at the lowest ebb tide lest the test chambers be grounded or beached. There must also be ready access to the site for monitoring survival.

An alternative approach would be deployment of a test chamber into which water is periodically pumped. Katznelson *et al.* (1999) and Katznelson (2000) described one such device. As noted therein, power is generally not available at locations slightly upstream within these urbanized streams. Modern battery technology and judicious design that minimizes the need for power can, however, allow design and deployment of test chambers of this type.

Conceptually, two technologies could be combined to insure that water quality parameters are monitored more continuously and to provide a flow of water through the test chambers. The VIMS Physical Sciences Department has designed and deployed devices to monitor dissolved oxygen and other water quality parameters at frequent predetermined intervals by pumping water from defined depths through measurement cells. Since the analyses do not involve the addition of chemicals, one could pass the return flow through animal exposure chambers at no further energy cost. The major challenges with deploying such devices are access to appropriate study sites, provision of sufficient power, secure placement to prevent removal by water flow or wave action, and protection from vandalism, especially in such urbanized locations as Gillie Creek in Richmond. Using such an approach, there is no risk of beaching. In addition a control treatment could be deployed at each site.

4.3.2 Comparative Utility of Ambient Toxicity Tests Versus *in situ* Tests

The advantage of *in situ* tests, if the technical difficulties with such protocols can be overcome, is the improved likelihood of sampling during a critical period to observe toxicity. Ambient water toxicity is measured with a variety of test animals with approximate exposure durations of 8 to 10 days involving endpoints usually reserved for chronic toxicity tests, namely growth and

reproduction. For tests of ambient water, three sampling events have been used in most work in the Chesapeake Bay (Hall *et al.*, 1991; 1992; 1994; 1997; 1998a; 1998b; 2000a; 2000b; Roberts & De Lisle, 1988). That approach, minimalistic though it is, has been violated on occasion when time, distance, and economics precluded even three sampling events (Roberts et al, 2000; de Vlaming *et al.*, 2000). In situations with substantial ambient toxicity, single sampling studies have provided much useful information, but clearly such protocols are particularly inadequate to detect ephemeral events.

The traditional ambient toxicity tests do have value when point source discharges produce consistent and sufficient concentrations of toxic materials to result in mortality, reduced growth or reproductive failure. Such point source discharges are likely to be more continuous in nature rather than episodic, though certainly industrial practices may also result in pulsed discharges as may perhaps explain the *in situ* mass mortality at Gravelly Run during this study. In the California setting, widespread residential and agricultural application of pesticides also produced reasonably continuous pesticide concentrations that could be detected using the traditional approach (summarized in de Vlaming *et al.*, 2000). In contrast, *in situ* studies in agricultural areas of South Carolina and Virginia have demonstrated the ephemeral nature of pesticide releases in association with rain events, leading to toxicity that would not have been reliably detected using the traditional ambient toxicity protocol.

Further development of protocols and devices for *in situ* studies will allow assessment of pulsed or ephemeral events. Such tools may also have application in assessment of ambient toxicity. The collection of water samples for testing at three or even eight points in time does not adequately evaluate the potential of toxicity in ambient water. Increasing the frequency of sampling and animal transfers would greatly increase the cost of the present ambient toxicity tests. We need to develop protocols that combine these technologies to gain better understanding the toxicity in natural waters, an understanding that will allow better characterizations of conditions in natural waters and better risk assessments.

4.4 Future Research Needs

4.4.1 Characterization of the Hopewell to Richmond Reach

At the end of this study, there remains a need to characterize the remainder of the tidal freshwater portion of the James River from Hopewell to Richmond. Such a further effort should concentrate on characterizing the condition of the sediment rather than water. Though heavily industrialized, the potential point sources are known to have minimal inputs. A substantial expenditure of money to analyze for chemicals or to determine toxicity in the water column is unlikely to result in determinations of toxicity at this time.

Sediment tests in this reach may show effects of historic as well as current industry. It should be noted, however, that the sediment texture is predominantly sand in this reach though there are likely to be pockets of fine sediment texture. One would predict no toxicity in sandy substrates. Certainly one would expect sediment in the Bailey Bay area on the south end of Hopewell to be fine texture, and this is an area where one would predict the presence of toxic chemicals based on the long period of industrial activity along the shoreline of the city.

Such a study was undertaken by VIMS and DEQ during the summer of 2001. A report should be available in the summer of 2002.

4.4.2 Alternative Test Species for Toxicity Tests of Water in the Oligohaline Regions

A major deficiency of the present study was the adequacy of test species for toxicity measurements for water from the oligohaline stations. This issue has remained unresolved for years. Species lists for the water column of oligohaline regions need to be carefully examined to identify candidate species for testing followed by protocol development and evaluation if it is essential to perform toxicity tests in oligohaline waters. Alternatively, one could adopt the use of a species such as *Hyalella azteca*, a benthic invertebrate that performs well in water column tests and tolerates salinities up to and including 15 g/kg. Ironically, the benthic carnivorous isopod, *Cyathura polita*, which interfered with sediment tests, might also be a candidate species because of its ability to exist in both freshwater and oligohaline environments.

For sediment, the species used in the present study are quite suited to oligohaline conditions. No additional benthic species are therefore needed.

4.4.3 Improvement to *in situ* Testing Methods

Three issues need to be addressed. First, the use of chambers with controlled flow of ambient water through them rather than chambers with passive flow exchange would be appropriate. A suitable design could include multiple measurements of temperature, salinity, dissolved oxygen, pH, and possibly other water quality parameters by pumping water past appropriate electrodes before passing the water into the test chamber.

Second, another test species would be desirable. In the present study we elected not to use a species such as *Ceriodaphnia* because of its small size and anticipated difficulties in making

counts under field conditions. The greater sensitivity of the daphnid species over the amphipod and its more appropriate habitat characteristic suggest that effort should be devoted to resolving the potential methodological impediments to its use.

Lastly, a protocol for chemical characterization of water near *in situ* tests needs to be developed. The protocol should allow for focusing on analytes likely to be present during wet weather events and on sample timing to correspond to rain event inflows. One possible approach would be to composite a subsample of water pumped into the test chambers over appropriate short intervals, and then selecting those for analysis that would characterize the pre-rain event condition and those that would document changes during rain events. Clearly one must control cost in this endeavor, but at the same time, one must have some clear understanding of the chemical environment within which the test is performed while focusing on the issue under study, in this case the effect of rain events in urban areas.

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Appendix A

Data Tables from

James River Sediment Toxicity Survey.

Stations 12.12, 44.08, 46.73, 50.55, 52.52, 56.12,
66.35, 67.56, 68.49, 73.63 and 74.25.

8/22/00 to 8/24/00 Sampling Period.

Final report from Coastal Bioanalysts, Inc., Gloucester, VA 23061

To Virginia Institute of Marine Science, Gloucester Point, VA 23062

Table A1. Summary Water Quality – *Hyalella azteca* Test

Station	Temperature (C)		Diss. Oxygen (mg/l)		pH (S.U.)		Conductivity (uS/cm)		Hardness (mg/l as CaCO3)		Alkalinity (mg/l as CaCO3)		NH3-N (mg/l)	
	Mean	S.D.	Mean	S.D.	Mean	S..D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Control	23.4	0.2	8.4	0.1	7.68	0.23	401	99.0	127.0	9.0	59.0	7.0	9.8	5.4
12.121	23.3	0.2	8.4	0.1	7.60	0.04	341	16.5	89.0	7.0	33.0	14.0	0.7	0.3
12.122	23.4	0.2	8.4	0.1	7.62	0.12	306	12.0	108.0	0.0	33.5	13.5	1.1	0.8
12.123	23.4	0.2	8.4	0.1	7.59	0.15	305	9.0	94.0	8.0	34.0	19.0	1.2	0.9
44.081	23.3	0.2	8.4	0.1	7.78	0.11	875	202.0	115.0	11.0	40.0	9.0	3.8	1.0
44.082	23.3	0.2	8.4	0.1	7.79	0.02	1085	240.0	151.0	19.0	40.0	11.0	1.6	0.8
44.083	23.4	0.2	8.4	0.1	7.80	0.04	839	193.0	134.0	2.0	33.0	9.0	0.7	0.3
46.731	23.3	0.2	8.4	0.1	8.01	0.18	645	84.0	89.0	33.0	81.5	1.5	2.6	1.3
46.732	23.4	0.2	8.5	0.1	8.08	0.07	662	102.0	161.0	3.0	78.0	7.0	3.2	1.6
46.733	23.4	0.2	8.4	0.1	8.01	0.21	660	217.5	145.0	3.0	80.5	24.5	1.2	0.9
50.551	23.3	0.2	8.5	0.1	7.93	0.15	510	71.0	130.0	12.0	68.5	2.5	2.5	1.0
50.552	23.3	0.2	8.5	0.1	7.88	0.08	489	58.0	109.0	17.0	58.5	2.5	2.2	0.7
50.553	23.3	0.3	8.5	0.1	7.83	0.23	455	92.5	111.0	21.0	57.0	5.0	1.6	1.3
52.521	23.3	0.1	8.5	0.1	8.01	0.37	394	54.0	117.0	11.0	53.0	0.0	3.0	1.0
52.522	23.4	0.2	8.4	0.1	7.90	0.33	378	42.5	101.0	1.0	48.5	4.5	1.9	1.3
52.523	23.3	0.2	8.4	0.1	7.97	0.33	374	42.5	104.0	8.0	49.0	2.0	2.2	1.7
56.121	23.3	0.2	8.5	0.1	7.82	0.16	324	21.5	115.0	7.0	61.5	4.5	1.1	0.9
56.122	23.4	0.2	8.5	0.1	7.94	0.40	356	43.5	122.0	10.0	55.5	6.5	1.3	1.0
56.123	23.3	0.2	8.4	0.1	7.94	0.13	339	43.0	105.0	1.0	52.0	2.0	0.8	0.4
66.351	23.4	0.2	8.5	0.1	7.70	0.03	277	8.5	90.0	2.0	36.5	11.5	1.2	0.0
66.352	23.4	0.3	8.4	0.1	7.75	0.01	280	2.0	96.0	2.0	42.0	7.0	1.7	0.7
66.353	23.3	0.2	8.4	0.1	7.75	0.00	277	1.0	107.0	17.0	36.5	8.5	1.4	1.1

Table A1 (continued). Summary Water Quality – *Hyalella azteca* Test

Station	Temperature (C)		Diss. Oxygen (mg/l)		PH (S.U.)		Conductivity (uS/cm)		Hardness (mg/l as CaCO3)		Alkalinity (mg/l as CaCO3)		NH3-N (mg/l)	
	Mean	S.D.	Mean	S.D.	Mean	S..D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
67.561	23.4	0.2	8.4	0.1	7.99	0.08	344	2.5	133.0	13.0	79.0	5.0	1.5	1.2
67.562	23.3	0.2	8.5	0.1	7.97	0.21	341	18.0	126.0	16.0	84.5	13.5	2.2	1.8
67.563	23.4	0.2	8.4	0.1	8.12	0.13	397	15.0	152.0	26.0	114.0	4.0	4.2	3.0
68.491	23.4	0.2	8.5	0.1	3.90	5.41	273	2.0	96.0	10.0	51.5	18.5	1.3	0.3
68.492	23.4	0.2	8.5	0.1	7.80	0.04	299	13.5	112.0	0.0	37.0	7.0	1.2	0.9
68.493	23.4	0.2	8.4	0.1	7.76	0.11	273	5.0	129.0	13.0	43.5	0.5	2.1	1.9
68.641	23.4	0.2	8.5	0.1	7.48	0.04	277	0.5	94.0	4.0	44.0	0.0	1.0	0.2
68.642	23.3	0.2	8.4	0.1	7.58	0.22	262	12.5	74.0	10.0	33.5	14.5	0.4	0.1
68.643	23.3	0.2	8.4	0.1	7.49	0.11	270	2.0	106.0	18.0	31.0	10.0	1.2	0.8
73.631	23.4	0.2	8.4	0.1	7.95	0.08	304	0.0	116.0	2.0	54.0	8.0	2.0	1.0
73.632	23.4	0.2	8.4	0.1	7.85	0.04	323	29.0	111.0	3.0	49.5	3.5	0.8	0.5
74.251	23.4	0.3	8.5	0.1	7.84	0.13	284	7.0	131.0	5.0	46.0	5.0	5.0	4.6
74.252	23.3	0.3	8.4	0.1	7.81	0.01	285	0.5	101.0	1.0	48.5	4.5	6.4	1.2
74.253	23.2	0.2	8.4	0.1	7.87	0.01	284	7.0	94.0	2.0	50.0	7.0	2.6	2.2
76.633	23.3	0.2	8.5	0.0	7.94	0.16	304	1.0	94.0	4.0	60.0	7.0	2.5	1.2

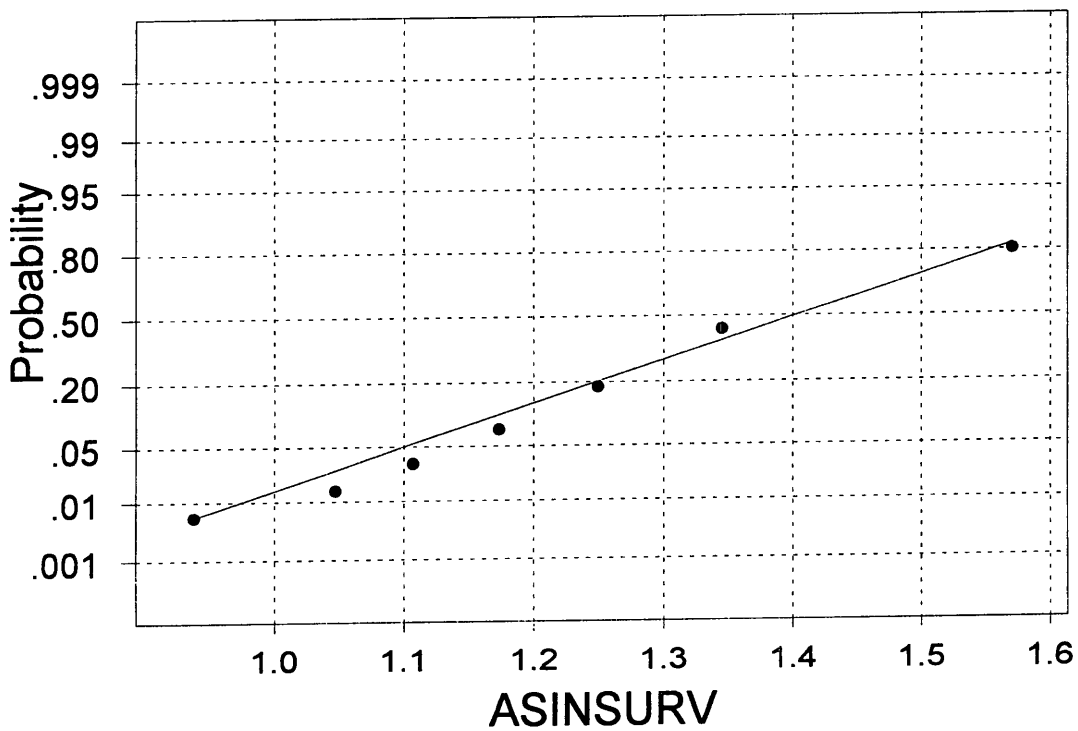
Table A2. Summary Water Quality – *Pimephales promelas* Test

Station	Temperature (C)		Diss. Oxygen (mg/l)		pH (S.U.)		Conductivity (uS/cm)		NH3-N (mg/l)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Control	24.5	0.2	8.1	0.1	7.84	0.13	308	12.6	4.8	2.8
12.121	24.5	0.2	8.1	0.1	7.71	0.07	311	12.4	0.6	0.3
12.122	24.6	0.2	8.1	0.1	7.76	0.11	292	9.1	0.8	0.5
12.123	24.5	0.2	8.0	0.1	7.73	0.07	296	3.6	0.5	0.1
44.081	24.5	0.2	8.1	0.1	7.79	0.09	570	66.6	0.8	0.4
44.082	24.4	0.1	8.0	0.1	7.87	0.05	608	82.0	0.6	0.2
44.083	24.5	0.2	8.0	0.1	7.82	0.08	516	75.1	1.3	1.1
46.731	24.4	0.2	8.1	0.1	7.91	0.10	441	50.0	1.7	0.5
46.732	24.4	0.1	8.0	0.1	7.98	0.05	452	49.8	1.5	1.2
46.733	24.5	0.1	8.0	0.1	7.86	0.14	443	33.4	0.6	0.3
50.551	24.5	0.2	8.1	0.1	7.90	0.10	380	26.9	8.2	5.0
50.552	24.5	0.2	8.1	0.1	7.89	0.08	375	42.2	2.4	1.1
50.553	24.5	0.2	8.1	0.1	7.78	0.09	359	23.0	0.9	0.5
52.521	24.4	0.2	8.1	0.1	7.84	0.11	312	12.1	1.0	0.7
52.522	24.5	0.1	8.1	0.1	7.81	0.09	309	6.4	2.3	0.5
52.523	24.5	0.1	8.0	0.1	7.83	0.06	313	9.1	0.6	0.2
56.121	24.4	0.1	8.1	0.1	7.86	0.10	296	8.0	0.6	0.3
56.122	24.4	0.2	8.1	0.1	7.84	0.05	307	7.5	3.9	3.4
56.123	24.5	0.2	8.1	0.1	7.79	0.10	296	8.4	0.8	0.5
66.351	24.4	0.1	8.1	0.1	7.86	0.08	281	3.1	1.0	0.7
66.352	24.5	0.2	8.1	0.1	7.81	0.11	282	4.6	3.5	2.5
66.353	24.4	0.2	8.1	0.1	7.77	0.06	276	7.9	1.1	0.8

Table A2 (continued). Summary Water Quality – *Pimephales promelas* Test

Station	Temperature (C)		Diss. Oxygen (mg/l)		pH (S.U.)		Conductivity (uS/cm)		NH3-N (mg/l)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
67.561	24.5	0.2	8.1	0.1	7.85	0.12	306	10.5	1.7	0.7
67.562	24.5	0.1	8.1	0.1	7.90	0.09	328	11.5	1.6	0.5
67.563	24.4	0.2	8.1	0.1	8.05	0.06	342	24.0	1.3	0.8
68.491	24.4	0.1	8.0	0.1	7.75	0.08	281	6.2	1.4	0.8
68.492	24.5	0.2	8.0	0.2	7.78	0.14	286	9.9	0.9	0.7
68.493	24.5	0.1	8.1	0.1	7.76	0.10	284	4.3	0.8	0.4
68.641	24.5	0.2	8.1	0.1	7.79	0.16	274	6.3	2.9	1.1
68.642	24.5	0.1	8.1	0.1	7.73	0.12	272	5.0	0.7	0.2
68.643	24.5	0.1	8.0	0.3	7.71	0.10	275	3.7	0.3	0.0
73.631	24.4	0.2	8.1	0.1	7.83	0.11	287	6.0	0.7	0.3
73.632	24.5	0.1	8.1	0.1	7.87	0.11	288	4.4	0.9	0.3
73.633	24.5	0.1	8.1	0.1	7.89	0.10	290	4.3	3.0	0.3
74.251	24.5	0.2	8.1	0.1	7.82	0.09	283	6.9	0.4	0.2
74.252	24.4	0.2	8.1	0.1	7.90	0.04	282	6.6	0.5	0.1
74.253	24.4	0.2	8.1	0.1	7.84	0.10	290	5.6	0.4	0.1

AMPHIPOD SURVIVAL (SAMPLES)

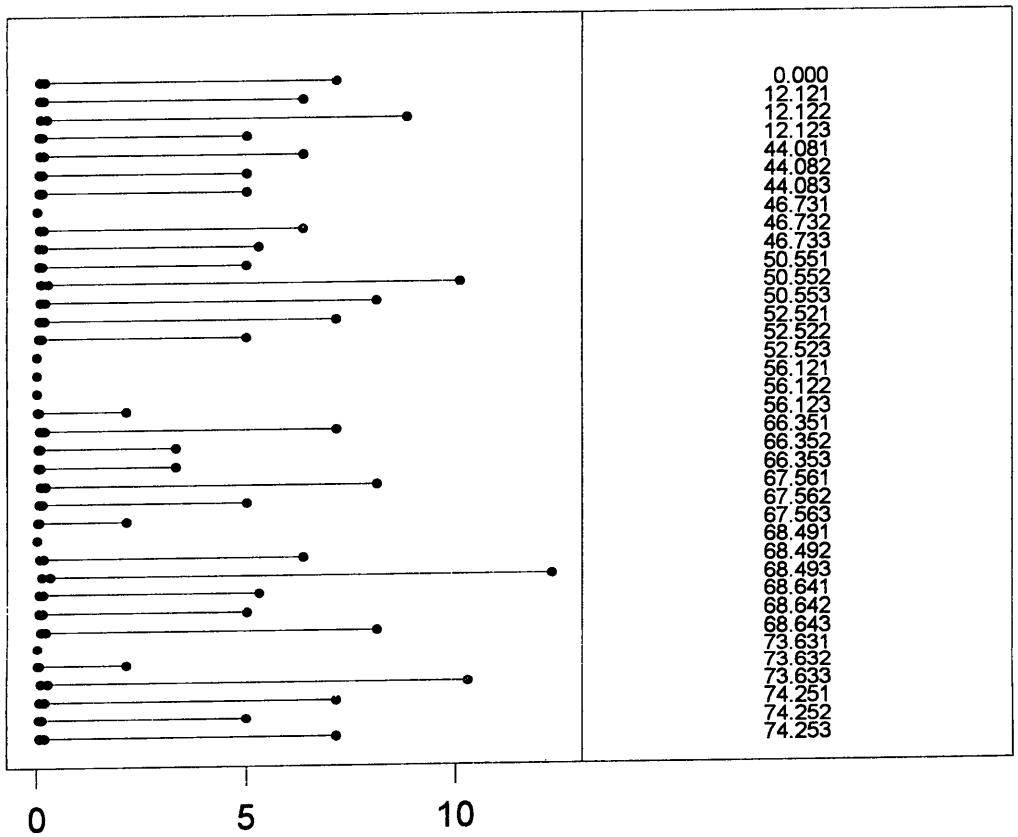


Average: 1.39425
Std Dev: 0.156980
N of data: 111

W-test for Normality
R: 0.9904
p value (approx): > 0.1000

AMPHIPOD SURVIVAL (SAMPLES)

95% Confidence Intervals for Sigmas



Bartlett's Test

Test Statistic: -55.602

p value : 1.000

Levene's Test

Test Statistic: 0.431

p value : 0.997

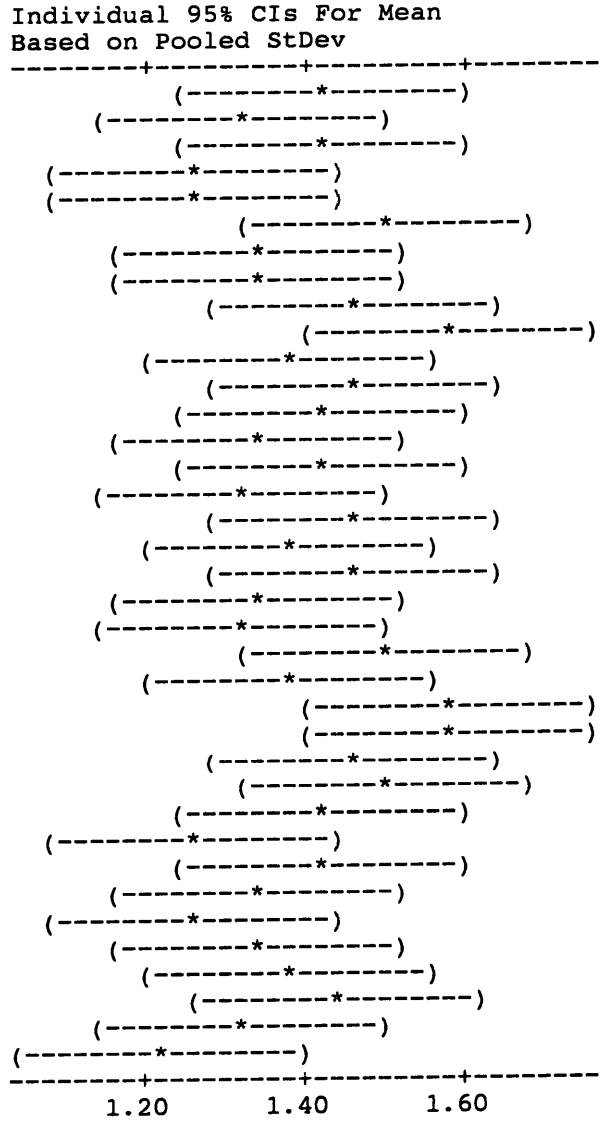
```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VMO2HA.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2HA.MTW
Worksheet was saved on 10/13/2000
MTB > Oneway 'ASINSURV' 'TEST ID';
SUBC>   Dunnett 5 19.
```

One-Way Analysis of Variance

```
Analysis of Variance on ASINSURV
Source     DF        SS        MS        F        p
TEST ID    36    0.8933    0.0248     1.01    0.472
Error      74    1.8174    0.0246
Total     110    2.7107
```

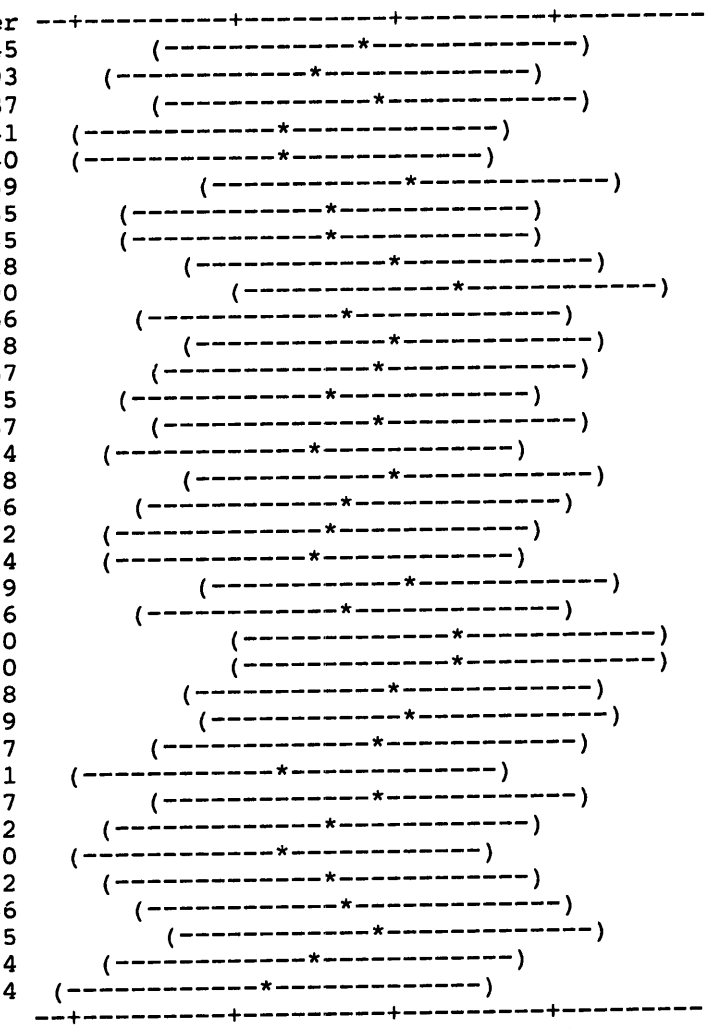
Level	N	Mean	StDev
1	3	1.4162	0.2677
2	3	1.3211	0.2626
3	3	1.4205	0.1302
4	3	1.2659	0.1375
5	3	1.2558	0.0863
6	3	1.4956	0.1302
7	3	1.3453	0.0000
8	3	1.3453	0.0000
9	3	1.4635	0.1858
10	3	1.5708	0.0000
11	3	1.3884	0.1651
12	3	1.4635	0.1858
13	3	1.4205	0.1302
14	3	1.3453	0.0000
15	3	1.4205	0.1302
16	3	1.3132	0.0556
17	3	1.4635	0.1858
18	3	1.3884	0.1651
19	3	1.4635	0.1858
20	3	1.3310	0.2111
21	3	1.3132	0.0556
22	3	1.4956	0.1302
23	3	1.3884	0.1651
24	3	1.5708	0.0000
25	3	1.5708	0.0000
26	3	1.4635	0.1858
27	3	1.4956	0.1302
28	3	1.4205	0.1302
29	3	1.2659	0.1375
30	3	1.4205	0.1302
31	3	1.3310	0.2111
32	3	1.2558	0.0863
33	3	1.3310	0.2111
34	3	1.3884	0.1651
35	3	1.4382	0.2296
36	3	1.3132	0.0556
37	3	1.2272	0.3200

```
Pooled StDev =   0.1567
```



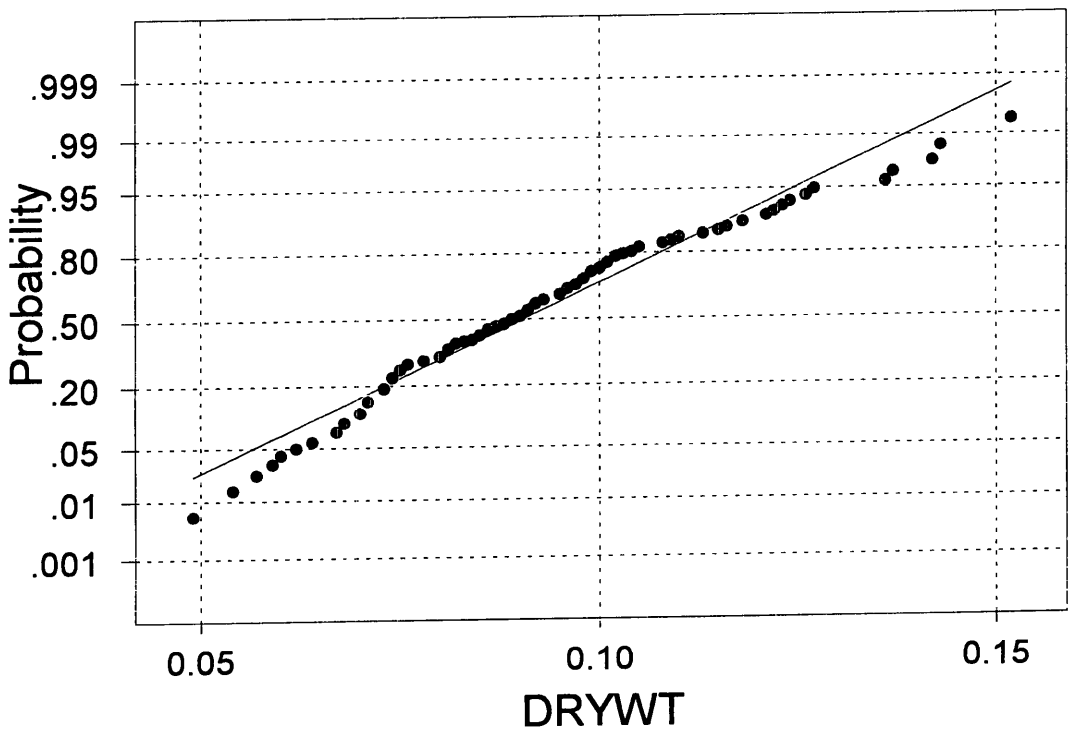

```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

Control = level 19 of TEST ID
```

Level	Lower	Center	Upper
1	-0.4491	-0.0473	0.3545
2	-0.5442	-0.1425	0.2593
3	-0.4449	-0.0431	0.3587
4	-0.5994	-0.1976	0.2041
5	-0.6095	-0.2077	0.1940
6	-0.3697	0.0321	0.4339
7	-0.5200	-0.1183	0.2835
8	-0.5200	-0.1183	0.2835
9	-0.4018	-0.0000	0.4018
10	-0.2945	0.1073	0.5090
11	-0.4770	-0.0752	0.3266
12	-0.4018	-0.0000	0.4018
13	-0.4449	-0.0431	0.3587
14	-0.5200	-0.1183	0.2835
15	-0.4449	-0.0431	0.3587
16	-0.5521	-0.1503	0.2514
17	-0.4018	-0.0000	0.4018
18	-0.4770	-0.0752	0.3266
20	-0.5343	-0.1326	0.2692
21	-0.5521	-0.1503	0.2514
22	-0.3697	0.0321	0.4339
23	-0.4770	-0.0752	0.3266
24	-0.2945	0.1073	0.5090
25	-0.2945	0.1073	0.5090
26	-0.4018	-0.0000	0.4018
27	-0.3697	0.0321	0.4339
28	-0.4449	-0.0431	0.3587
29	-0.5994	-0.1976	0.2041
30	-0.4449	-0.0431	0.3587
31	-0.5343	-0.1326	0.2692
32	-0.6095	-0.2077	0.1940
33	-0.5343	-0.1326	0.2692
34	-0.4770	-0.0752	0.3266
35	-0.4271	-0.0253	0.3765
36	-0.5521	-0.1503	0.2514
37	-0.6381	-0.2363	0.1654



MTB >

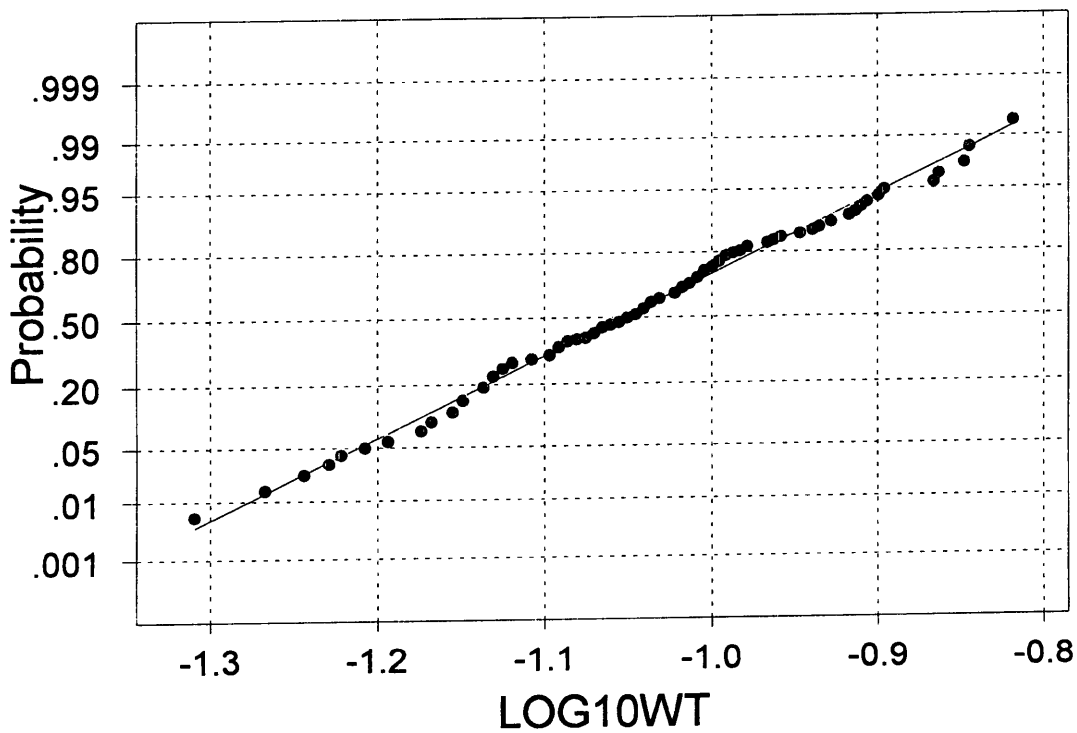
AMPHIPOD WEIGHT (SAMPLES)



Average: 0.0904595
Std Dev: 0.0200942
N of data: 111

W-test for Normality
R: 0.9828
p value (approx): < 0.0100

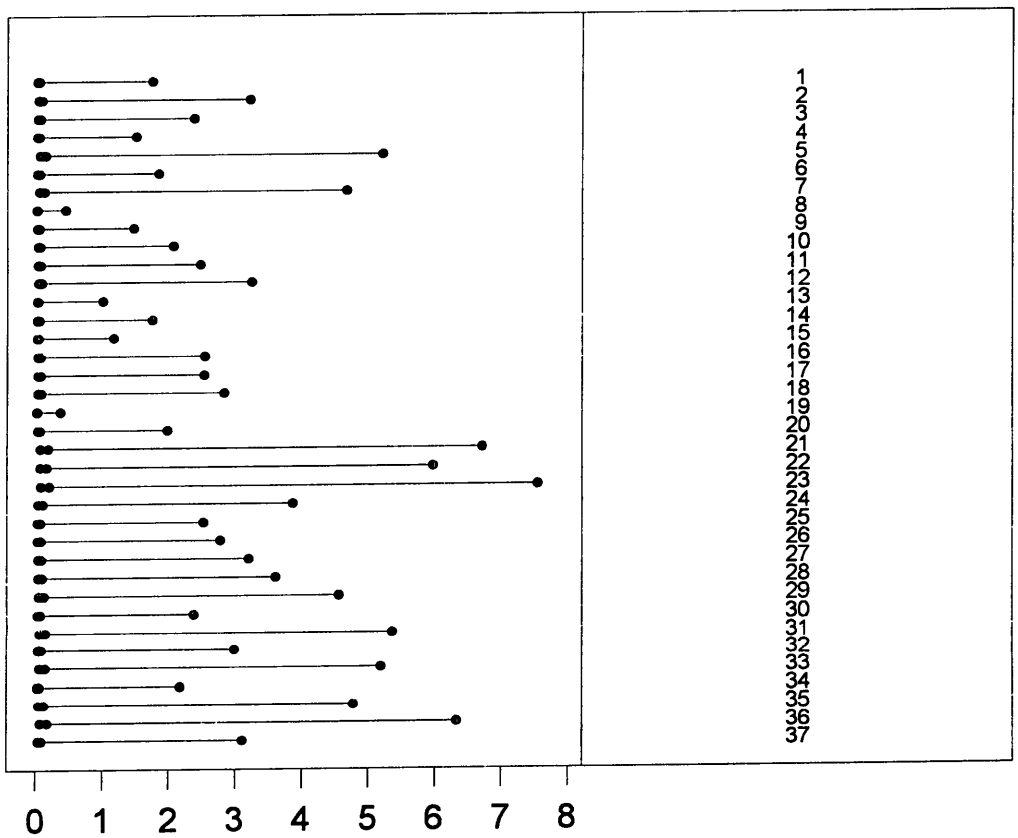
AMPHIPOD WEIGHTS (LOG10) (SAMPLES)



Average: -1.05383
Std Dev: 0.0946711
N of data: 111

W-test for Normality
R: 0.9969
p value (approx): > 0.1000

AMPHIPOD WEIGHT (LOG10) (SAMPLES)



Bartlett's Test

Test Statistic: 39.714

p value : 0.308

Levene's Test

Test Statistic: 0.542

p value : 0.977

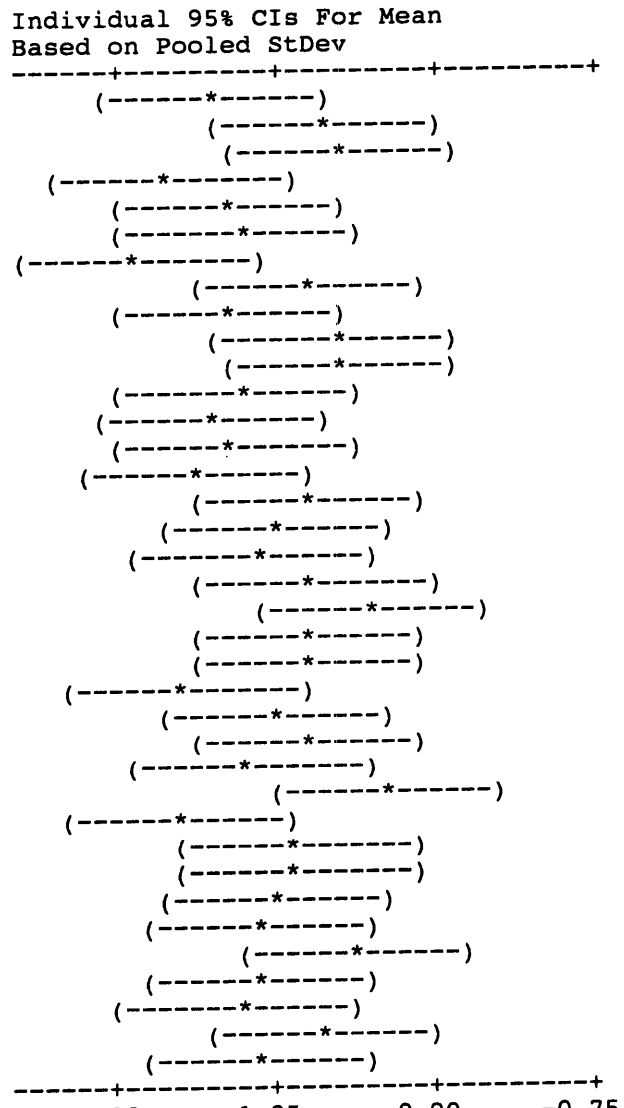
```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VMO2HA.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2HA.MTW
Worksheet was saved on 10/13/2000
MTB > Oneway 'LOG10WT' 'TEST ID';
SUBC>   Dunnett 5 19.
```

One-Way Analysis of Variance

```
Analysis of Variance on LOG10WT
Source     DF        SS        MS        F        p
TEST ID    36   0.33027   0.00917     1.04    0.439
Error      74   0.65562   0.00886
Total     110   0.98589
```

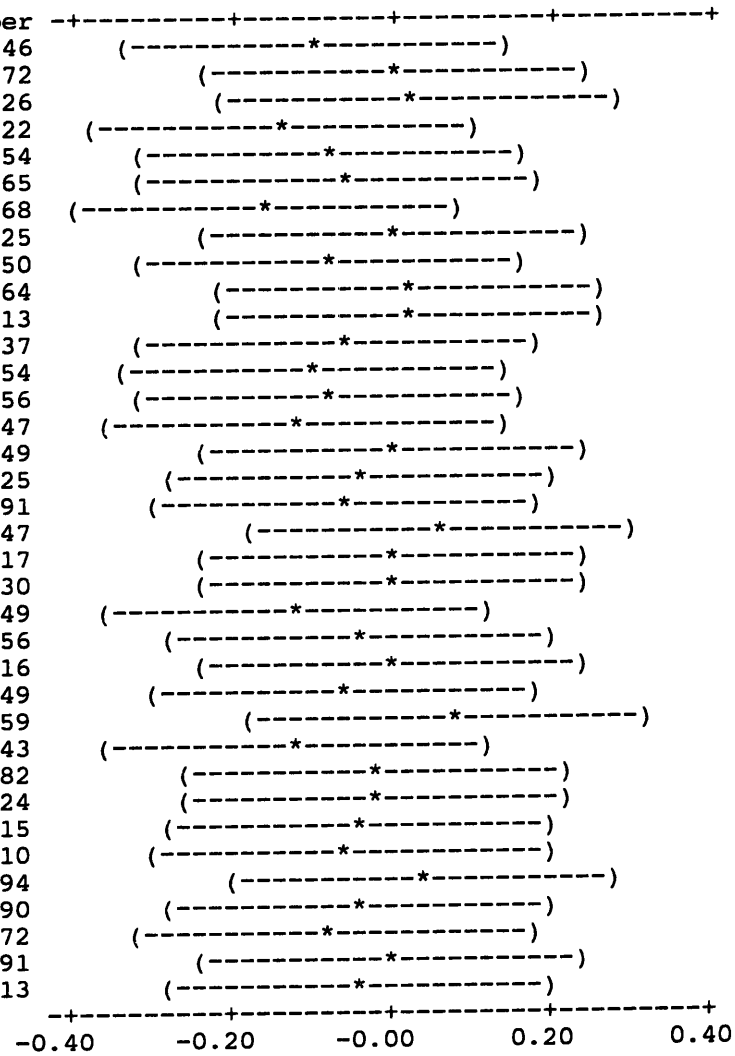
Level	N	Mean	StDev
1	3	-1.1077	0.0452
2	3	-1.0084	0.0834
3	3	-0.9858	0.0615
4	3	-1.1499	0.0390
5	3	-1.0926	0.1355
6	3	-1.0845	0.0479
7	3	-1.1784	0.1213
8	3	-1.0209	0.0114
9	3	-1.0926	0.0382
10	3	-0.9965	0.0537
11	3	-0.9890	0.0642
12	3	-1.0847	0.0842
13	3	-1.1066	0.0261
14	3	-1.0895	0.0454
15	3	-1.1256	0.0302
16	3	-1.0196	0.0660
17	3	-1.0539	0.0656
18	3	-1.0712	0.0734
19	3	-1.0148	0.0093
20	3	-0.9606	0.0514
21	3	-1.0159	0.1746
22	3	-1.0168	0.1554
23	3	-1.1356	0.1963
24	3	-1.0505	0.1002
25	3	-1.0210	0.0653
26	3	-1.0746	0.0720
27	3	-0.9435	0.0831
28	3	-1.1377	0.0935
29	3	-1.0303	0.1185
30	3	-1.0299	0.0617
31	3	-1.0500	0.1392
32	3	-1.0650	0.0775
33	3	-0.9732	0.1350
34	3	-1.0612	0.0564
35	3	-1.0854	0.1242
36	3	-1.0062	0.1647
37	3	-1.0620	0.0808

```
Pooled StDev =   0.0941
```



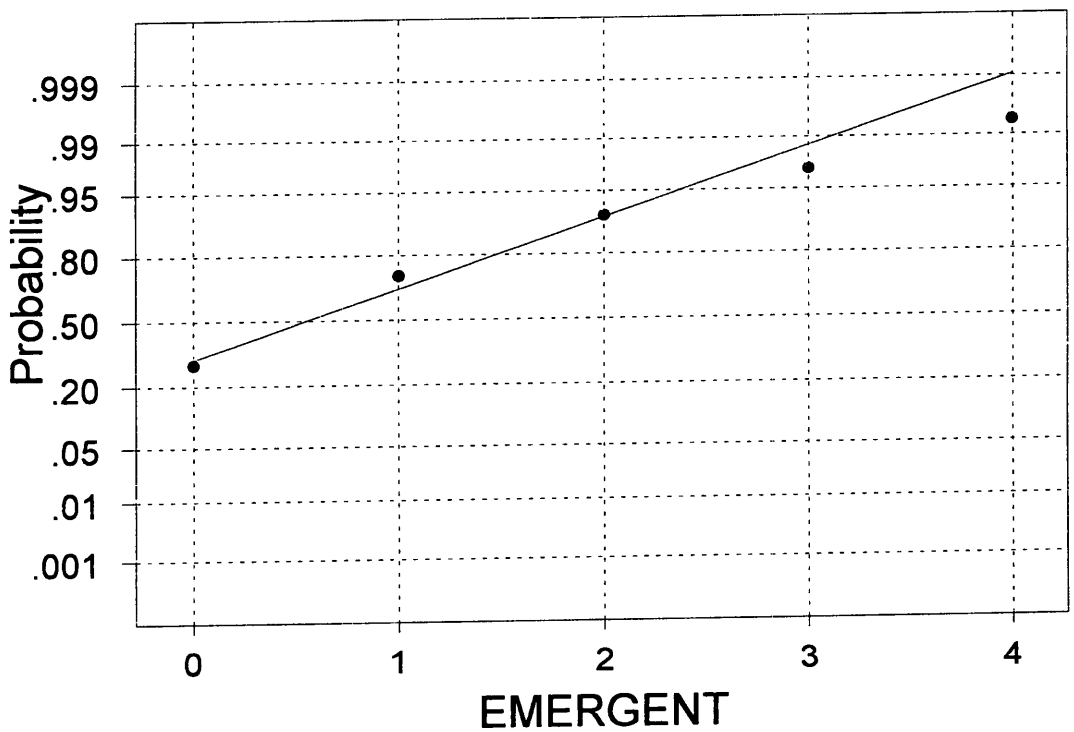

```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

Control = level 19 of TEST ID
```

Level	Lower	Center	Upper
1	-0.33418	-0.09286	0.14846
2	-0.23492	0.00640	0.24772
3	-0.21238	0.02894	0.27026
4	-0.37642	-0.13510	0.10622
5	-0.31910	-0.07778	0.16354
6	-0.31099	-0.06967	0.17165
7	-0.40496	-0.16364	0.07768
8	-0.24739	-0.00607	0.23525
9	-0.31914	-0.07782	0.16350
10	-0.22300	0.01832	0.25964
11	-0.21551	0.02581	0.26713
12	-0.31127	-0.06995	0.17137
13	-0.33310	-0.09178	0.14954
14	-0.31608	-0.07476	0.16656
15	-0.35217	-0.11085	0.13047
16	-0.24615	-0.00483	0.23649
17	-0.28039	-0.03907	0.20225
18	-0.29773	-0.05641	0.18491
20	-0.18717	0.05415	0.29547
21	-0.24247	-0.00115	0.24017
22	-0.24334	-0.00202	0.23930
23	-0.36215	-0.12083	0.12049
24	-0.27708	-0.03576	0.20556
25	-0.24748	-0.00616	0.23516
26	-0.30115	-0.05983	0.18149
27	-0.17005	0.07127	0.31259
28	-0.36421	-0.12289	0.11843
29	-0.25682	-0.01550	0.22582
30	-0.25640	-0.01508	0.22624
31	-0.27649	-0.03517	0.20615
32	-0.29154	-0.05022	0.19110
33	-0.19970	0.04162	0.28294
34	-0.28774	-0.04642	0.19490
35	-0.31192	-0.07060	0.17072
36	-0.23273	0.00859	0.24991
37	-0.28851	-0.04719	0.19413



MTB >

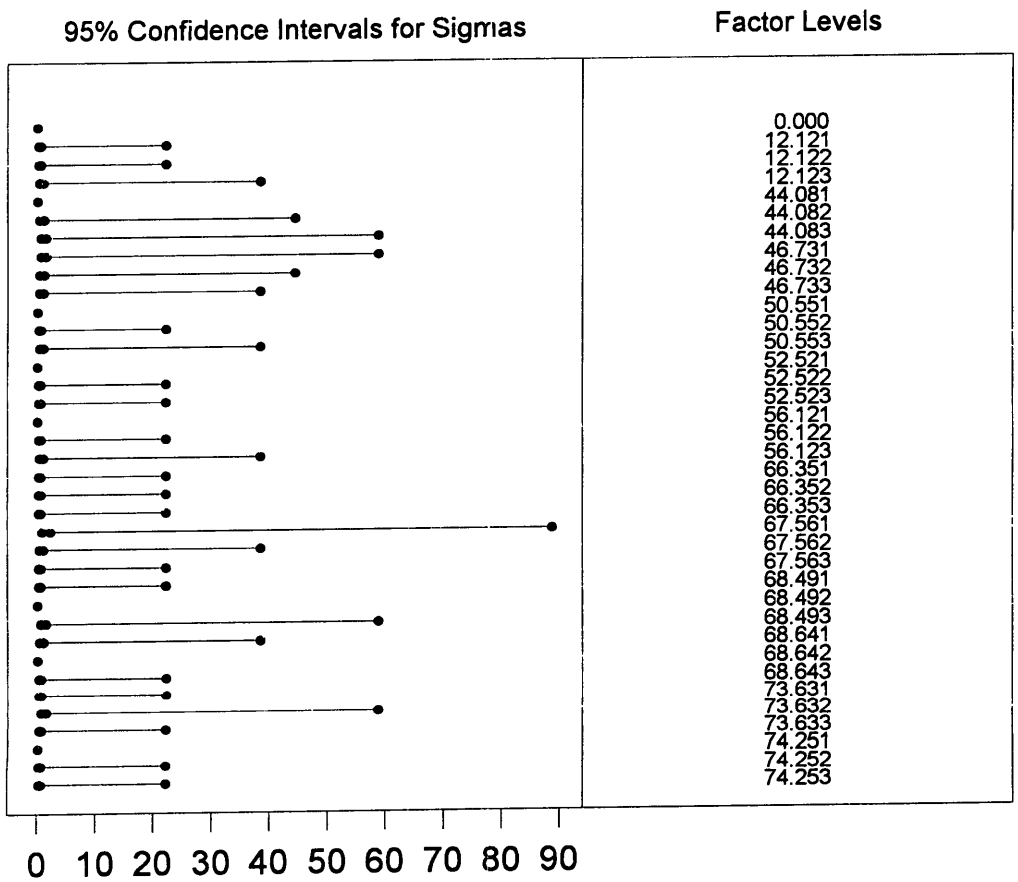
AMPHIPOD EMERGENCE (SAMPLES)



Average: 0.612613
Std Dev: 0.865198
N of data: 111

W-test for Normality
R: 0.9861
p value (approx): 0.0319

AMPHIPOD EMERGENCE (SAMPLES)



Bartlett's Test

Test Statistic: -4.660

p value : 1.000

Levene's Test

Test Statistic: 0.669

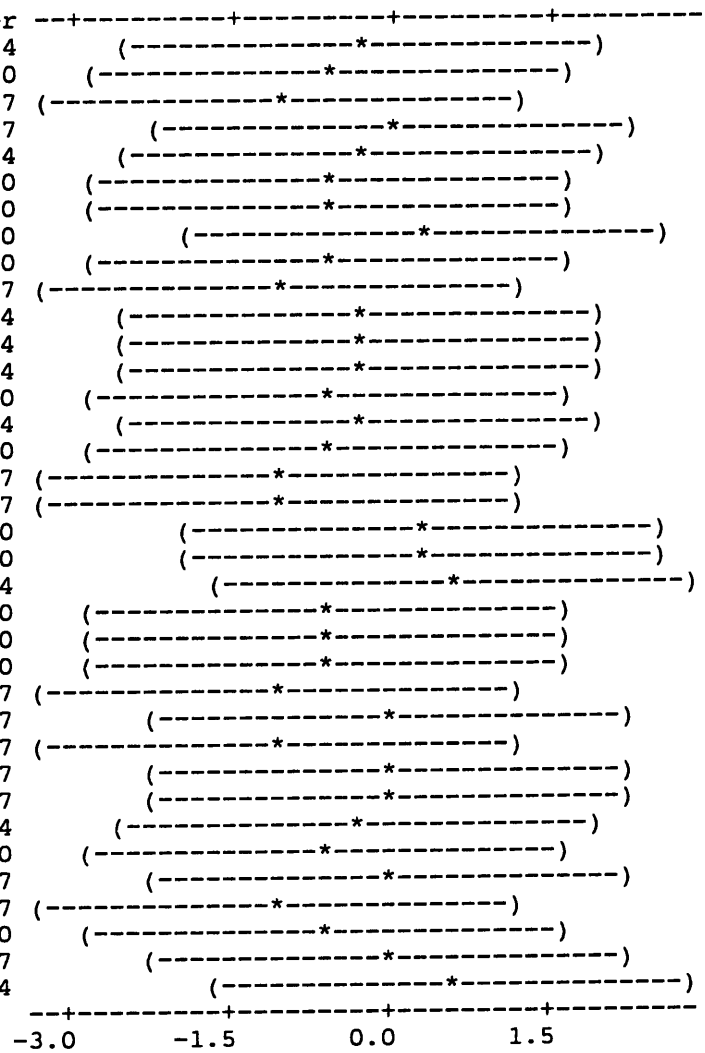
p value : 0.908

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02HA.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02HA.MTW
Worksheet was saved on 10/13/2000
MTB > Oneway 'EMERGENT' 'TEST ID';
SUBC>   Dunnett 5 19.
```

One-Way Analysis of Variance

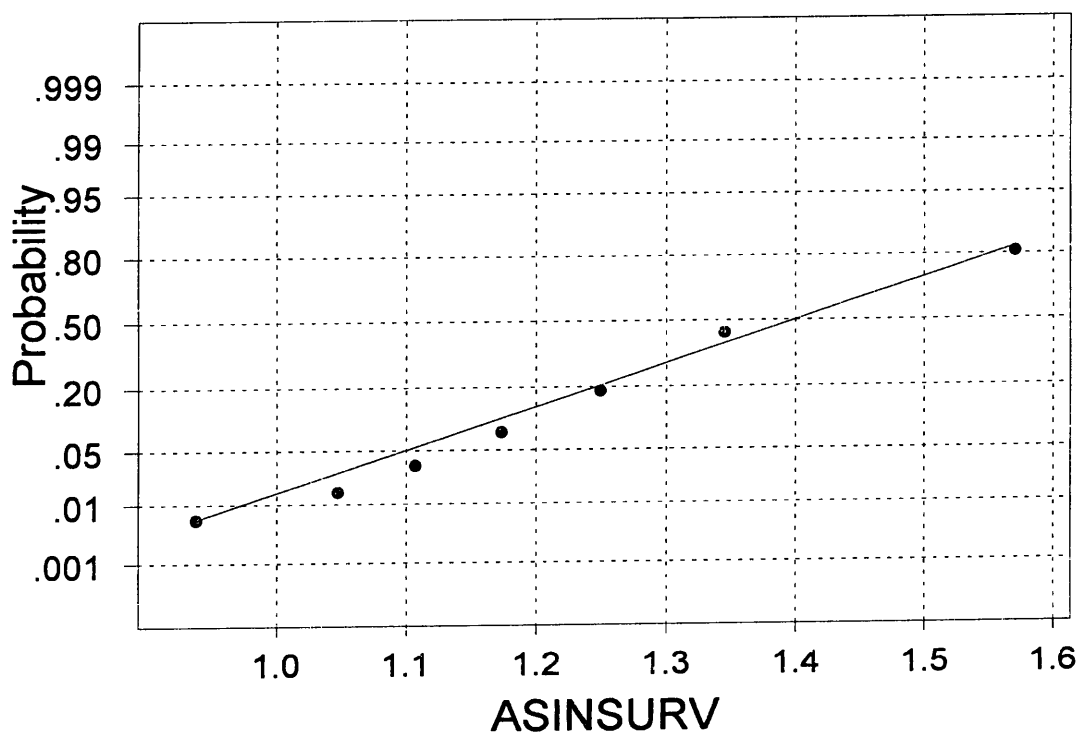
```
Analysis of Variance on EMERGENT
Source     DF        SS        MS        F        p
TEST ID    36    25.009     0.695     0.90    0.634
Error      74    57.333     0.775
Total     110    82.342
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  -+---------+---------+---------+-----
     1      3    0.6667    0.5774          (---------*---------)
     2      3    0.3333    0.5774      (---------*---------)
     3      3    0.0000    0.0000   (---------*---------)
     4      3    1.0000    1.0000             (---------*---------)
     5      3    0.6667    0.5774          (---------*---------)
     6      3    0.3333    0.5774      (---------*---------)
     7      3    0.3333    0.5774      (---------*---------)
     8      3    1.3333    1.5275                (---------*---------)
     9      3    0.3333    0.5774      (---------*---------)
    10      3    0.0000    0.0000   (---------*---------)
    11      3    0.6667    1.1547          (---------*---------)
    12      3    0.6667    0.5774          (---------*---------)
    13      3    0.6667    1.1547          (---------*---------)
    14      3    0.3333    0.5774      (---------*---------)
    15      3    0.6667    0.5774          (---------*---------)
    16      3    0.3333    0.5774      (---------*---------)
    17      3    0.0000    0.0000   (---------*---------)
    18      3    0.0000    0.0000   (---------*---------)
    19      3    1.0000    0.0000             (---------*---------)
    20      3    1.3333    2.3094                (---------*---------)
    21      3    1.3333    1.5275                (---------*---------)
    22      3    1.6667    1.5275                    (---------*---------)
    23      3    0.3333    0.5774      (---------*---------)
    24      3    0.3333    0.5774      (---------*---------)
    25      3    0.3333    0.5774      (---------*---------)
    26      3    0.0000    0.0000   (---------*---------)
    27      3    1.0000    1.0000             (---------*---------)
    28      3    0.0000    0.0000   (---------*---------)
    29      3    1.0000    1.0000             (---------*---------)
    30      3    1.0000    1.0000             (---------*---------)
    31      3    0.6667    0.5774          (---------*---------)
    32      3    0.3333    0.5774      (---------*---------)
    33      3    1.0000    1.0000             (---------*---------)
    34      3    0.0000    0.0000   (---------*---------)
    35      3    0.3333    0.5774      (---------*---------)
    36      3    1.0000    1.0000             (---------*---------)
    37      3    1.6667    1.5275                    (---------*---------)
                                   -+---------+---------+---------+-----
Pooled StDev =   0.8802          -1.0       0.0       1.0       2.0

Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

Control = level 19 of TEST ID
```

Level	Lower	Center	Upper
1	-2.5900	-0.3333	1.9234
2	-2.9234	-0.6667	1.5900
3	-3.2567	-1.0000	1.2567
4	-2.2567	0.0000	2.2567
5	-2.5900	-0.3333	1.9234
6	-2.9234	-0.6667	1.5900
7	-2.9234	-0.6667	1.5900
8	-1.9234	0.3333	2.5900
9	-2.9234	-0.6667	1.5900
10	-3.2567	-1.0000	1.2567
11	-2.5900	-0.3333	1.9234
12	-2.5900	-0.3333	1.9234
13	-2.5900	-0.3333	1.9234
14	-2.9234	-0.6667	1.5900
15	-2.5900	-0.3333	1.9234
16	-2.9234	-0.6667	1.5900
17	-3.2567	-1.0000	1.2567
18	-3.2567	-1.0000	1.2567
20	-1.9234	0.3333	2.5900
21	-1.9234	0.3333	2.5900
22	-1.5900	0.6667	2.9234
23	-2.9234	-0.6667	1.5900
24	-2.9234	-0.6667	1.5900
25	-2.9234	-0.6667	1.5900
26	-3.2567	-1.0000	1.2567
27	-2.2567	0.0000	2.2567
28	-3.2567	-1.0000	1.2567
29	-2.2567	0.0000	2.2567
30	-2.2567	0.0000	2.2567
31	-2.5900	-0.3333	1.9234
32	-2.9234	-0.6667	1.5900
33	-2.2567	0.0000	2.2567
34	-3.2567	-1.0000	1.2567
35	-2.9234	-0.6667	1.5900
36	-2.2567	0.0000	2.2567
37	-1.5900	0.6667	2.9234



MTB >

AMPHIPOD SURVIVAL (STATIONS)

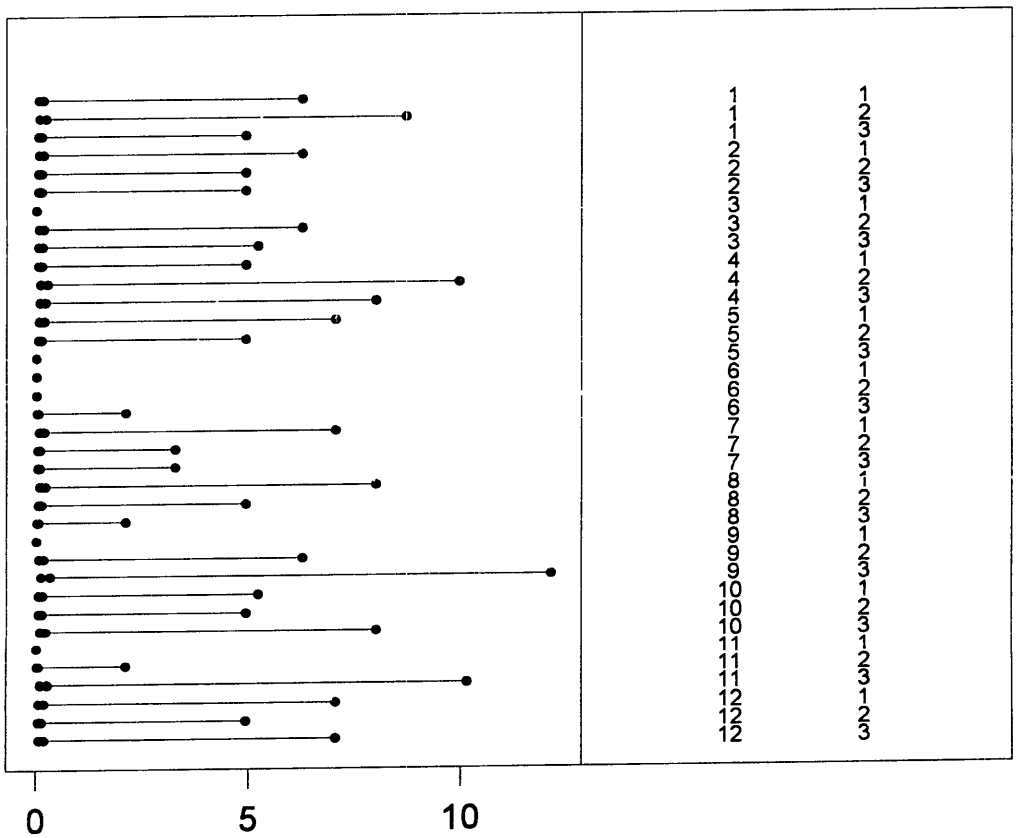


Average: 1.39233
Std Dev: 0.156685
N of data: 108

W-test for Normality
R: 0.9906
p value (approx): > 0.1000

AMPHIPOD SURVIVAL (STATIONS)

95% Confidence Intervals for Sigmas



Factor Levels

1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3
4	1
4	2
4	3
5	1
5	2
5	3
6	1
6	2
6	3
7	1
7	2
7	3
8	1
8	2
8	3
9	1
9	2
9	3
10	1
10	2
10	3
11	1
11	2
11	3
12	1
12	2
12	3

Bartlett's Test

Test Statistic: -55.771

p value : 1.000

Levene's Test

Test Statistic: 0.451

p value : 0.994

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02HANC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02HANC.MTW
Worksheet was saved on 10/13/2000
MTB > ANOVA 'ASINSURV' = C6 C7(C6).
```

Analysis of Variance (Balanced Designs)

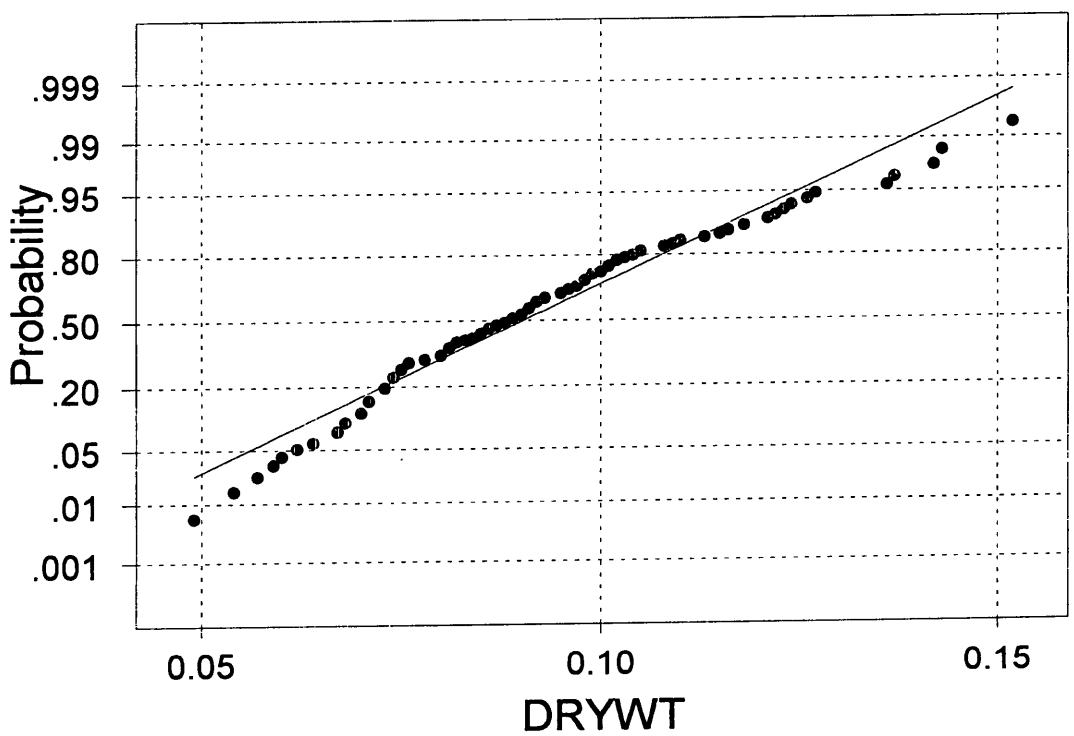
Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for ASINSURV

Source	DF	SS	MS	F	P
STATION	11	0.31557	0.02869	1.18	0.315
FLDREP(STATION)	24	0.56295	0.02346	0.97	0.519
Error	72	1.74834	0.02428		
Total	107	2.62686			

```
MTB >
```

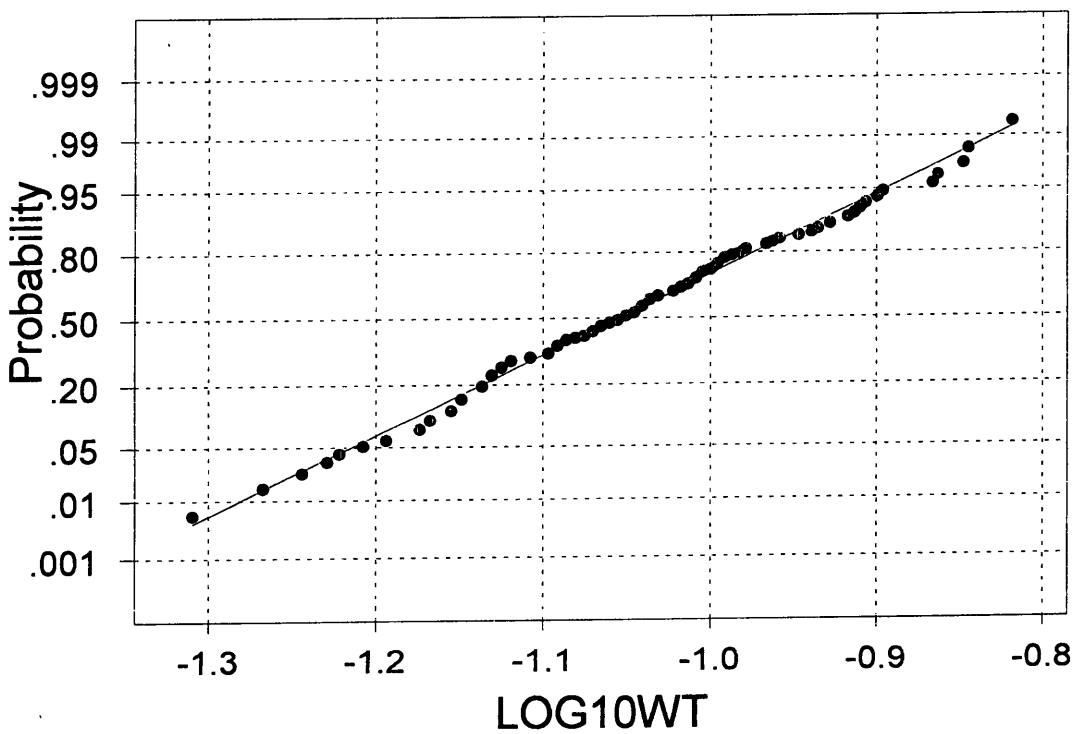
AMPHIPOD WEIGHT (STATIONS)



Average: 0.090287
Std Dev: 0.0203447
N of data: 108

W-test for Normality
R: 0.9819
p value (approx): < 0.0100

AMPHIPOD WEIGHT (LOG10) (STATIONS)

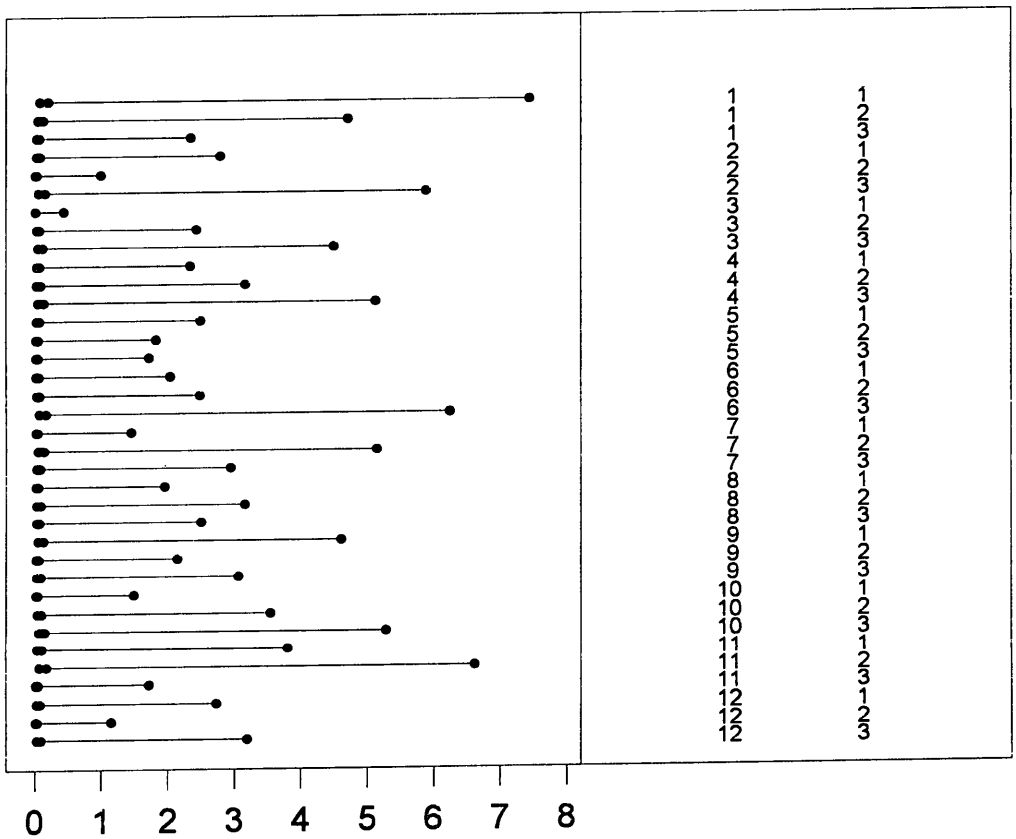


Average: -1.05491
Std Dev: 0.0957516
N of data: 108

W-test for Normality
R: 0.9969
p value (approx): > 0.1000

AMPHIPOD WEIGHT (LOG10) (STATIONS)

95% Confidence Intervals for Sigmas



Factor Levels

1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3
4	1
4	2
4	3
5	1
5	2
5	3
6	1
6	2
6	3
7	1
7	2
7	3
8	1
8	2
8	3
9	1
9	2
9	3
10	1
10	2
10	3
11	1
11	2
11	3
12	1
12	2
12	3

Bartlett's Test

Test Statistic: 33.477

p value : 0.542

Levene's Test

Test Statistic: 0.504

p value : 0.986

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02HANC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02HANC.MTW
Worksheet was saved on 10/13/2000
MTB > ANOVA 'LOG10WT' = C6 C7(C6).
```

Analysis of Variance (Balanced Designs)

Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for LOG10WT

Source	DF	SS	MS	F	P
STATION	11	0.215184	0.019562	2.15	0.027
FLDREP(STATION)	24	0.110387	0.004599	0.51	0.969
Error	72	0.655445	0.009103		
Total	107	0.981016			

```
MTB >
```

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02HANC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02HANC.MTW
Worksheet was saved on 10/13/2000
MTB > Oneway 'LOG10WT' 'STATION';
SUBC>   Tukey 5.
```

One-Way Analysis of Variance

```
Analysis of Variance on LOG10WT
Source     DF        SS        MS        F        p
STATION    11   0.21518   0.01956     2.45    0.010
Error      96   0.76583   0.00798
Total     107   0.98102
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  --------+---------+---------+--------
     1      9   -1.0836    0.1286       (-------*--------)
     2      9   -1.0649    0.0953         (--------*-------)
     3      9   -1.0134    0.0702                 (-------*--------)
     4      9   -0.9891    0.0865                    (--------*-------)
     5      9   -1.0760    0.0494        (-------*--------)
     6      9   -1.0079    0.0932                  (-------*-------)
     7      9   -1.0834    0.0815       (-------*--------)
     8      9   -0.9746    0.0683                      (--------*-------)
     9      9   -1.1005    0.0976    (--------*-------)
    10      9   -1.1125    0.0982   (-------*--------)
    11      9   -1.0580    0.1107          (--------*-------)
    12      9   -1.0950    0.0620    (--------*-------)
                                   --------+---------+---------+--------
Pooled StDev =   0.0893                 -1.120    -1.050    -0.980

Tukey's pairwise comparisons

    Family error rate = 0.0500
Individual error rate = 0.00115

Critical value = 4.74

Intervals for (column level mean) - (row level mean)
```

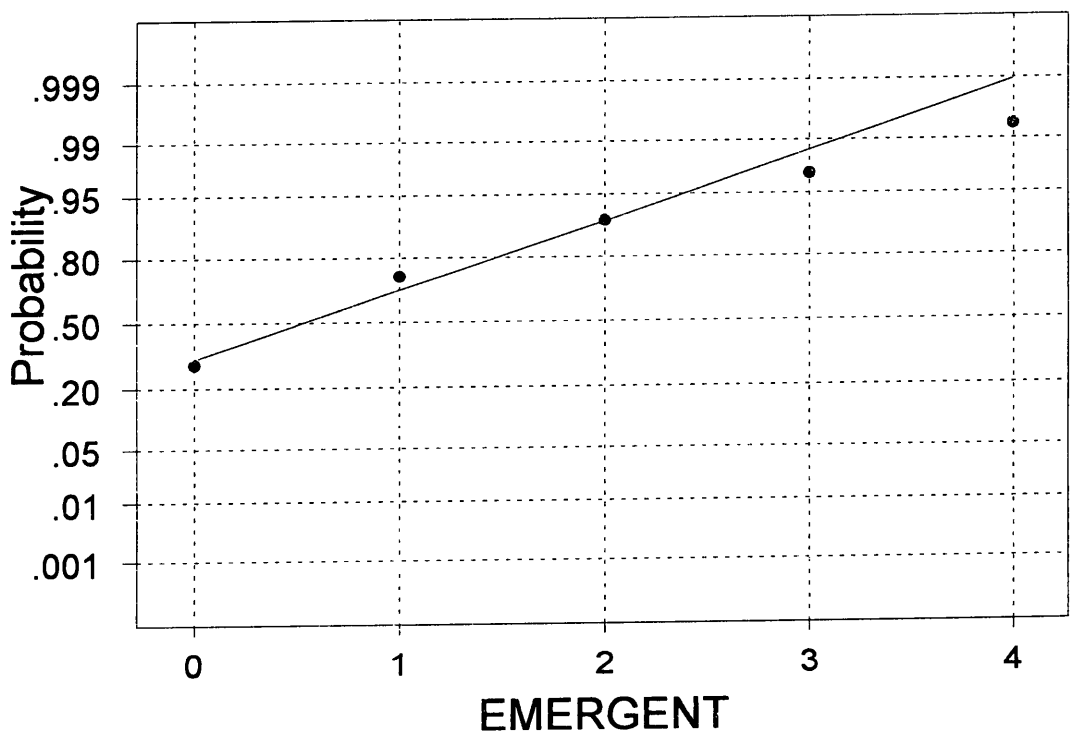
	1	2	3	4	5	6	7
2	-0.15989 0.12235						
3	-0.21137 0.07087	-0.19260 0.08964					
4	-0.23561 0.04663	-0.21684 0.06540	-0.16536 0.11688				
5	-0.14879 0.13345	-0.13003 0.15221	-0.07854 0.20370	-0.05430 0.22794			
6	-0.21687 0.06537	-0.19810 0.08414	-0.14662 0.13562	-0.12238 0.15986	-0.20920 0.07304		
7	-0.14135 0.14089	-0.12258 0.15966	-0.07110 0.21114	-0.04686 0.23538	-0.13368 0.14856	-0.06560 0.21664	
8	-0.25015 0.03209	-0.23139 0.05085	-0.17990 0.10234	-0.15566 0.12658	-0.24248 0.03976	-0.17440 0.10784	-0.24992 0.03232
9	-0.12421 0.15803	-0.10544 0.17680	-0.05396 0.22828	-0.02972 0.25252	-0.11653 0.16571	-0.04845 0.23379	-0.12398 0.15826

10	-0.11223	-0.09347	-0.04198	-0.01775	-0.10456	-0.03648	-0.11200
	0.17001	0.18877	0.24025	0.26449	0.17768	0.24576	0.17024
11	-0.16670	-0.14793	-0.09645	-0.07221	-0.15903	-0.09095	-0.16647
	0.11554	0.13431	0.18579	0.21003	0.12321	0.19129	0.11577
12	-0.12974	-0.11098	-0.05950	-0.03526	-0.12207	-0.05399	-0.12952
	0.15249	0.17126	0.22274	0.24698	0.16017	0.22825	0.15272

	8	9	10	11
9	-0.01517			
	0.26707			
10	-0.00320	-0.12915		
	0.27904	0.15309		
11	-0.05767	-0.18361	-0.19559	
	0.22457	0.09863	0.08665	
12	-0.02071	-0.14666	-0.15863	-0.10417
	0.26153	0.13558	0.12361	0.17807

MTB >

AMPHIPOD EMERGENCE (STATIONS)

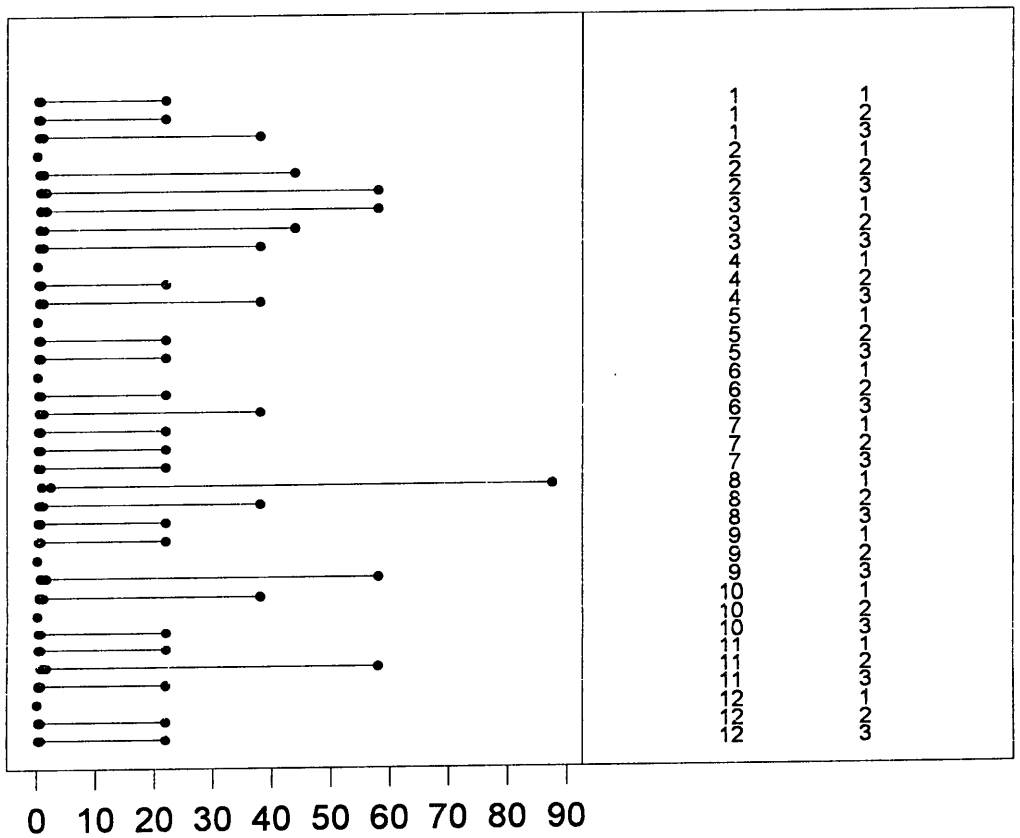


Average: 0.601852
Std Dev: 0.874774
N of data: 108

W-test for Normality
R: 0.9859
p value (approx): 0.0330

AMPHIPOD EMERGENCE (STATIONS)

95% Confidence Intervals for Sigmas



Factor Levels

1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3
4	1
4	2
4	3
5	1
5	2
5	3
6	1
6	2
6	3
7	1
7	2
7	3
8	1
8	2
8	3
9	1
9	2
9	3
10	1
10	2
10	3
11	1
11	2
11	3
12	1
12	2
12	3

Bartlett's Test

Test Statistic: -1.233

p value : 1.000

Levene's Test

Test Statistic: 0.638

p value : 0.927

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02HANC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02HANC.MTW
Worksheet was saved on 10/13/2000
MTB > ANOVA 'EMERGENT' = C6 C7(C6).
```

Analysis of Variance (Balanced Designs)

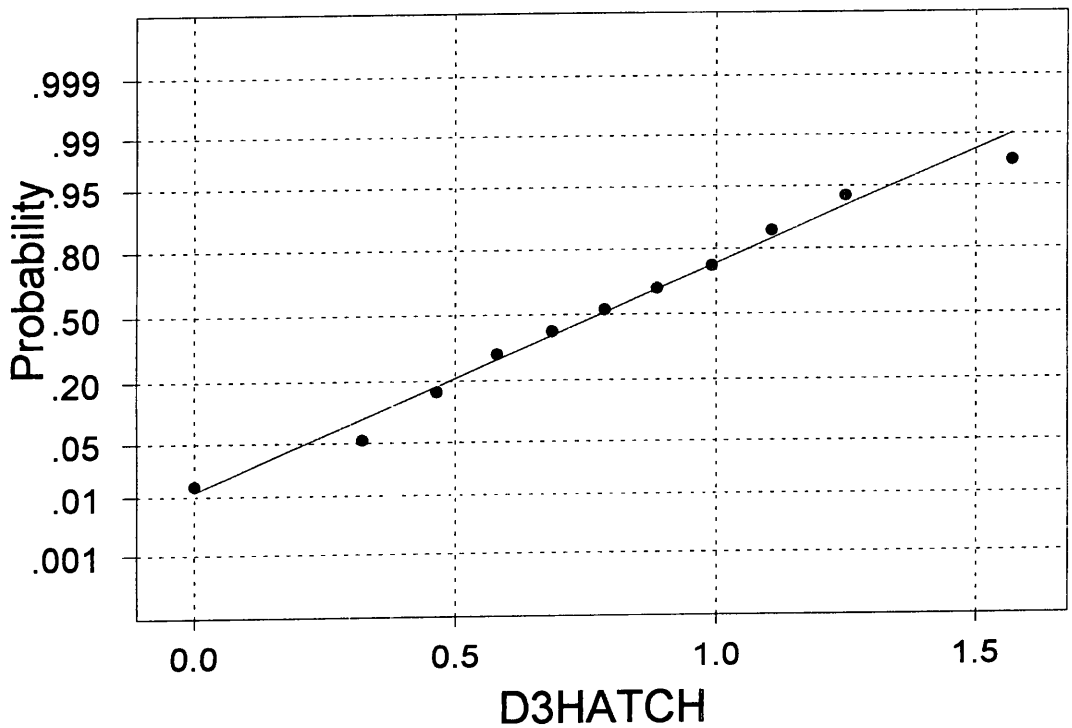
Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for EMERGENT

Source	DF	SS	MS	F	P
STATION	11	4.9907	0.4537	0.57	0.847
FLDREP(STATION)	24	19.5556	0.8148	1.02	0.450
Error	72	57.3333	0.7963		
Total	107	81.8796			

```
MTB >
```

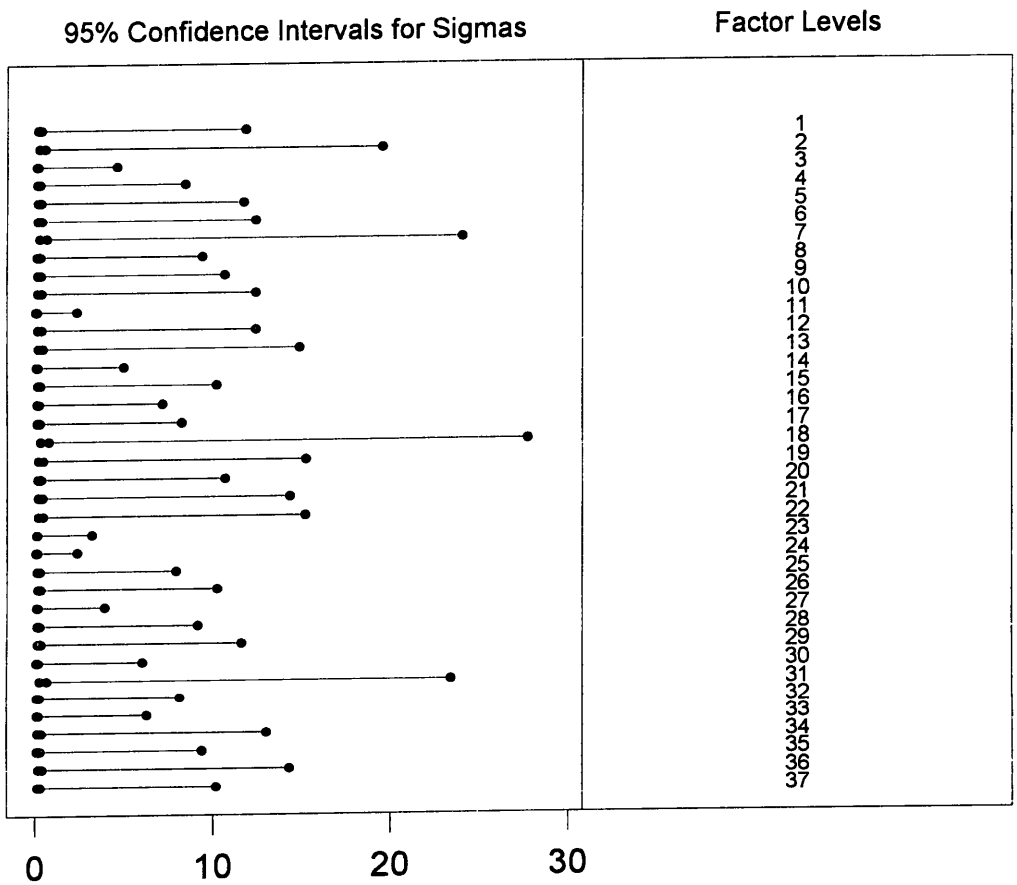
DAY 3 HATCH (SAMPLES)



Average: 0.774849
Std Dev: 0.326017
N of data: 111

W-test for Normality
R: 0.9926
p value (approx): > 0.1000

DAY 3 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: 33.625

p value : 0.582

Levene's Test

Test Statistic: 0.379

p value : 0.999

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02PP.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02PP.MTW
Worksheet was saved on 10/12/2000
MTB > Oneway 'D3HATCH' 'TESTID';
SUBC>   Dunnett 5 19.
```

One-Way Analysis of Variance

```
Analysis of Variance on D3HATCH
Source      DF        SS        MS        F        p
TESTID      36     4.014     0.111     1.07    0.389
Error       74     7.678     0.104
Total      110    11.692
```

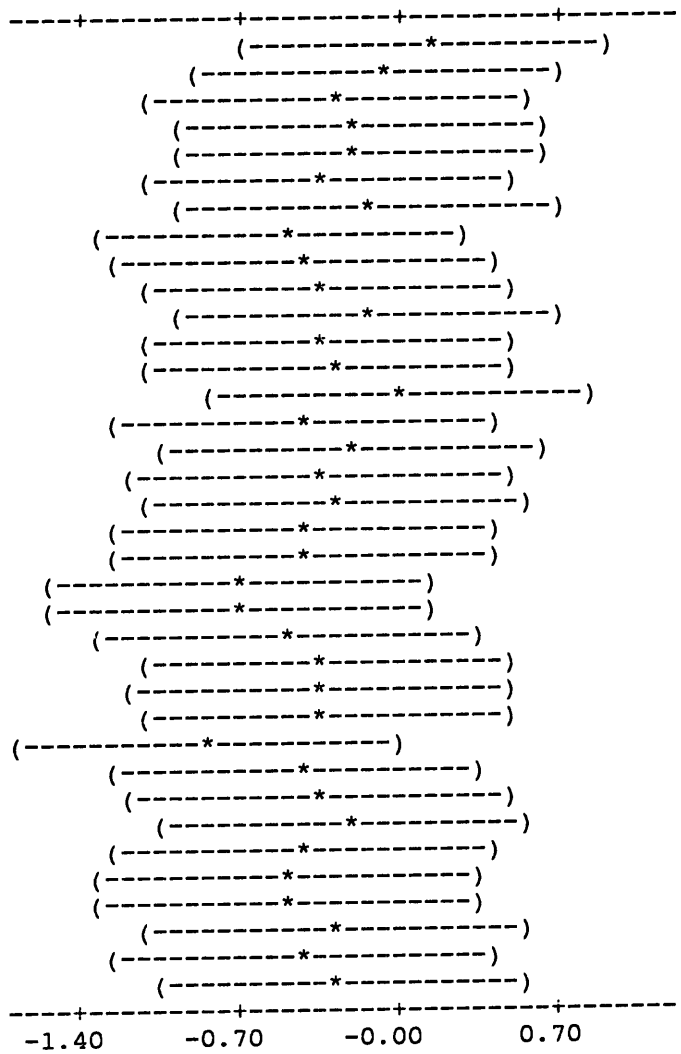
Level	N	Mean	StDev
1	3	1.2230	0.3067
2	3	1.0122	0.5075
3	3	0.8540	0.1188
4	3	0.9277	0.2183
5	3	0.9313	0.3046
6	3	0.7854	0.3218
7	3	0.9612	0.6251
8	3	0.5973	0.2439
9	3	0.6781	0.2772
10	3	0.7854	0.3218
11	3	0.9561	0.0607
12	3	0.7854	0.3218
13	3	0.8028	0.3865
14	3	1.1158	0.1292
15	3	0.7132	0.2649
16	3	0.8926	0.1858
17	3	0.7518	0.2138
18	3	0.8327	0.7211
19	3	1.1143	0.3953
20	3	0.6781	0.2772
21	3	0.6781	0.3715
22	3	0.4163	0.3948
23	3	0.4163	0.0819
24	3	0.6147	0.0607
25	3	0.7854	0.2058
26	3	0.7467	0.2659
27	3	0.7854	0.1007
28	3	0.2618	0.2376
29	3	0.6644	0.3010
30	3	0.7504	0.1562
31	3	0.8714	0.6085
32	3	0.6781	0.2113
33	3	0.6096	0.1629
34	3	0.6308	0.3376
35	3	0.8255	0.2439
36	3	0.6781	0.3715
37	3	0.8576	0.2649

```
Individual 95% CIs For Mean
Based on Pooled StDev
---+---------+---------+---------+---
                    (------*-------)
                 (------*-------)
              (------*------)
               (-------*------)
               (-------*------)
           (-------*------)
               (------*-------)
        (------*------)
         (-------*------)
           (-------*------)
               (------*-------)
           (-------*------)
            (------*------)
                  (------*-------)
          (------*-------)
             (-------*------)
           (------*------)
            (-------*------)
                  (------*-------)
         (-------*------)
         (-------*------)
     (------*-------)
     (------*-------)
        (------*-------)
           (-------*------)
           (------*------)
           (-------*------)
  (------*-------)
         (------*-------)
           (------*------)
             (------*-------)
         (-------*------)
        (------*-------)
        (-------*------)
            (-------*------)
         (-------*------)
            (------*-------)
---+---------+---------+---------+---
 0.00      0.50      1.00      1.50
```

Pooled StDev = 0.3221

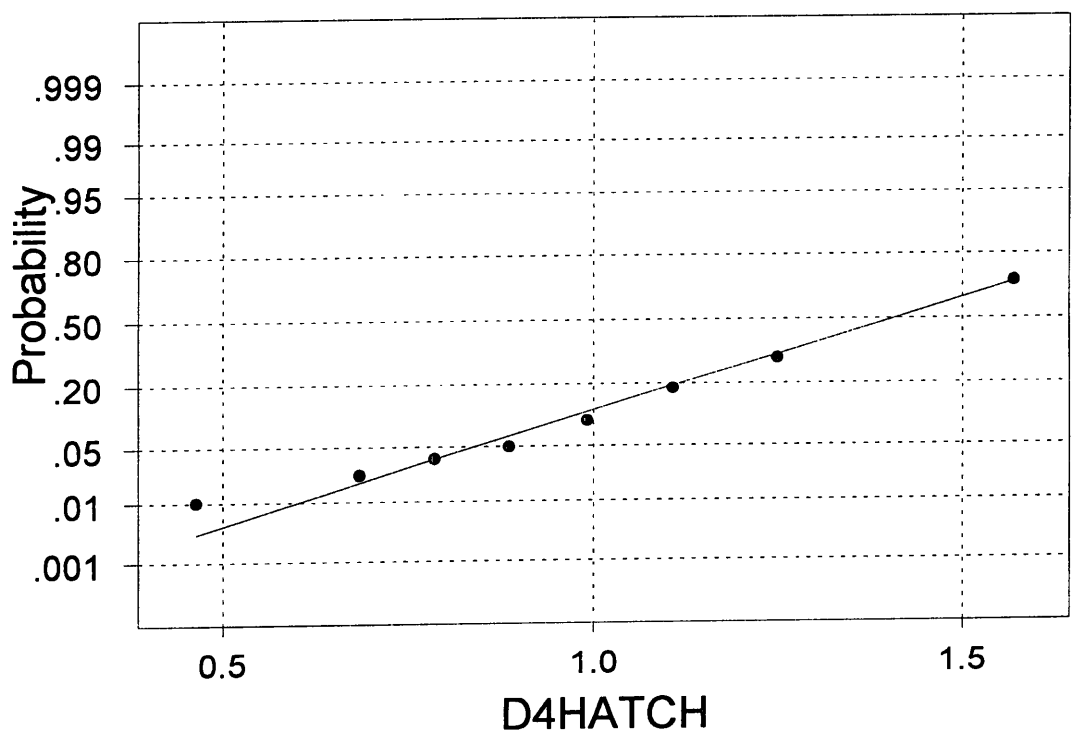
```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

Control = level 19 of TESTID
```

Level	Lower	Center	Upper
1	-0.7171	0.1087	0.9346
2	-0.9280	-0.1021	0.7237
3	-1.0862	-0.2603	0.5655
4	-1.0125	-0.1866	0.6392
5	-1.0088	-0.1830	0.6428
6	-1.1548	-0.3289	0.4969
7	-0.9789	-0.1531	0.6728
8	-1.3429	-0.5170	0.3088
9	-1.2620	-0.4362	0.3897
10	-1.1548	-0.3289	0.4969
11	-0.9840	-0.1582	0.6676
12	-1.1548	-0.3289	0.4969
13	-1.1374	-0.3115	0.5143
14	-0.8244	0.0015	0.8273
15	-1.2270	-0.4011	0.4247
16	-1.0475	-0.2217	0.6042
17	-1.1883	-0.3625	0.4634
18	-1.1075	-0.2816	0.5442
20	-1.2620	-0.4362	0.3897
21	-1.2620	-0.4362	0.3897
22	-1.5238	-0.6980	0.1279
23	-1.5238	-0.6980	0.1279
24	-1.3255	-0.4997	0.3262
25	-1.1548	-0.3289	0.4969
26	-1.1934	-0.3676	0.4583
27	-1.1548	-0.3289	0.4969
28	-1.6784	-0.8525	-0.0267
29	-1.2757	-0.4499	0.3759
30	-1.1898	-0.3639	0.4619
31	-1.0688	-0.2430	0.5829
32	-1.2620	-0.4362	0.3897
33	-1.3306	-0.5048	0.3211
34	-1.3093	-0.4835	0.3424
35	-1.1146	-0.2888	0.5370
36	-1.2620	-0.4362	0.3897
37	-1.0825	-0.2567	0.5691



MTB >

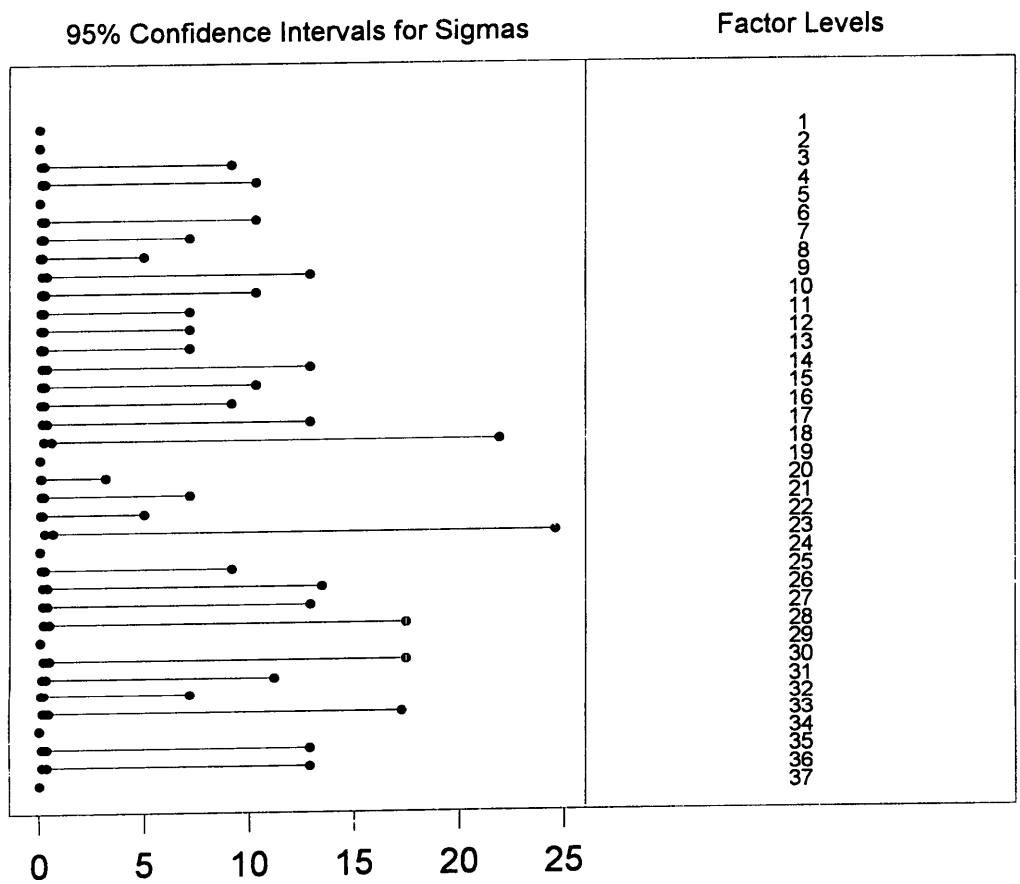
DAY 4 HATCH (SAMPLES)



Average: 1.38322
Std Dev: 0.271002
N of data: 111

W-test for Normality
R: 0.9962
p value (approx): > 0.1000

DAY 4 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: -53.167

p value : 1.000

Levene's Test

Test Statistic: 0.469

p value : 0.993

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02PP.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02PP.MTW
Worksheet was saved on 10/12/2000
MTB > Oneway 'D4HATCH' 'TESTID';
SUBC>   Dunnett 5 19.
```

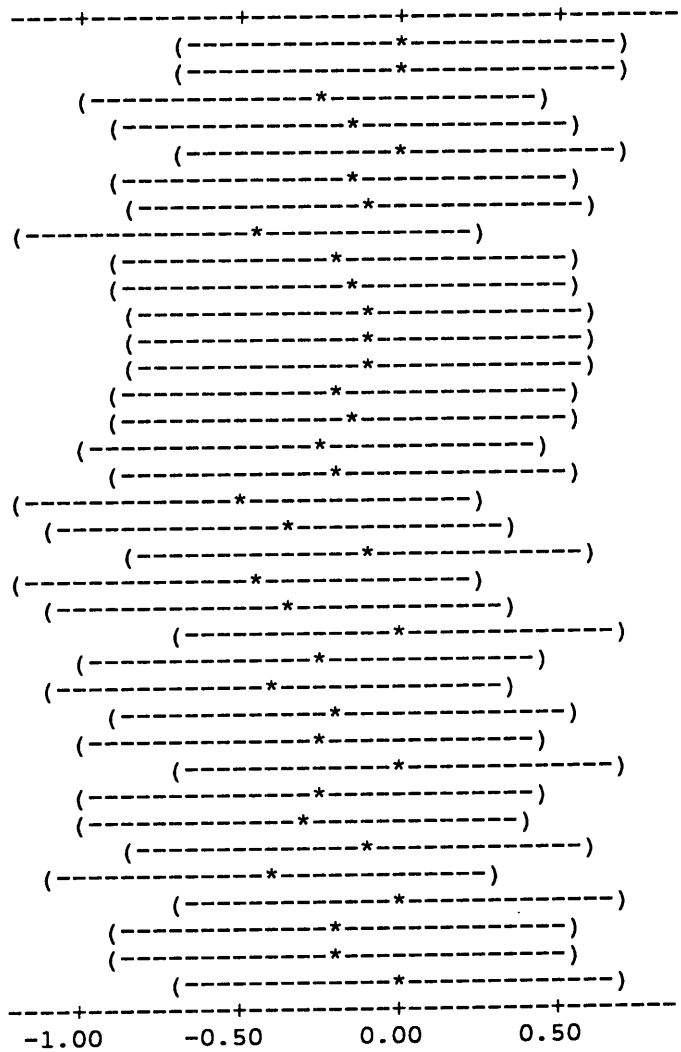
One-Way Analysis of Variance

```
Analysis of Variance on D4HATCH
Source      DF        SS        MS        F        P
TESTID      36    2.2250    0.0618     0.78    0.791
Error       74    5.8537    0.0791
Total      110    8.0787
```

```
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  --------+---------+---------+--------
     1      3    1.5708    0.0000                (--------*--------)
     2      3    1.5708    0.0000                (--------*--------)
     3      3    1.3090    0.2376        (--------*---------)
     4      3    1.4162    0.2677           (--------*---------)
     5      3    1.5708    0.0000                (--------*--------)
     6      3    1.4162    0.2677           (--------*---------)
     7      3    1.4635    0.1858             (--------*--------)
     8      3    1.1158    0.1292   (--------*--------)
     9      3    1.3776    0.3347          (--------*---------)
    10      3    1.4162    0.2677           (--------*---------)
    11      3    1.4635    0.1858             (--------*--------)
    12      3    1.4635    0.1858             (--------*--------)
    13      3    1.4635    0.1858             (--------*--------)
    14      3    1.3776    0.3347          (--------*---------)
    15      3    1.4162    0.2677           (--------*---------)
    16      3    1.3090    0.2376        (--------*---------)
    17      3    1.3776    0.3347          (--------*---------)
    18      3    1.0945    0.5695  (--------*---------)
    19      3    1.5708    0.0000                (--------*--------)
    20      3    1.2017    0.0819     (--------*---------)
    21      3    1.4635    0.1858             (--------*--------)
    22      3    1.1158    0.1292   (--------*--------)
    23      3    1.2017    0.6392     (--------*---------)
    24      3    1.5708    0.0000                (--------*--------)
    25      3    1.3090    0.2376        (--------*---------)
    26      3    1.1880    0.3494     (--------*--------)
    27      3    1.3776    0.3347          (--------*---------)
    28      3    1.3090    0.4534        (--------*---------)
    29      3    1.5708    0.0000                (--------*--------)
    30      3    1.3090    0.4534        (--------*---------)
    31      3    1.2703    0.2904       (--------*---------)
    32      3    1.4635    0.1858             (--------*--------)
    33      3    1.1682    0.4485    (--------*---------)
    34      3    1.5708    0.0000                (--------*--------)
    35      3    1.3776    0.3347          (--------*---------)
    36      3    1.3776    0.3347          (--------*---------)
    37      3    1.5708    0.0000                (--------*--------)
                                   --------+---------+---------+--------
Pooled StDev =    0.2813                     1.05      1.40      1.75
```

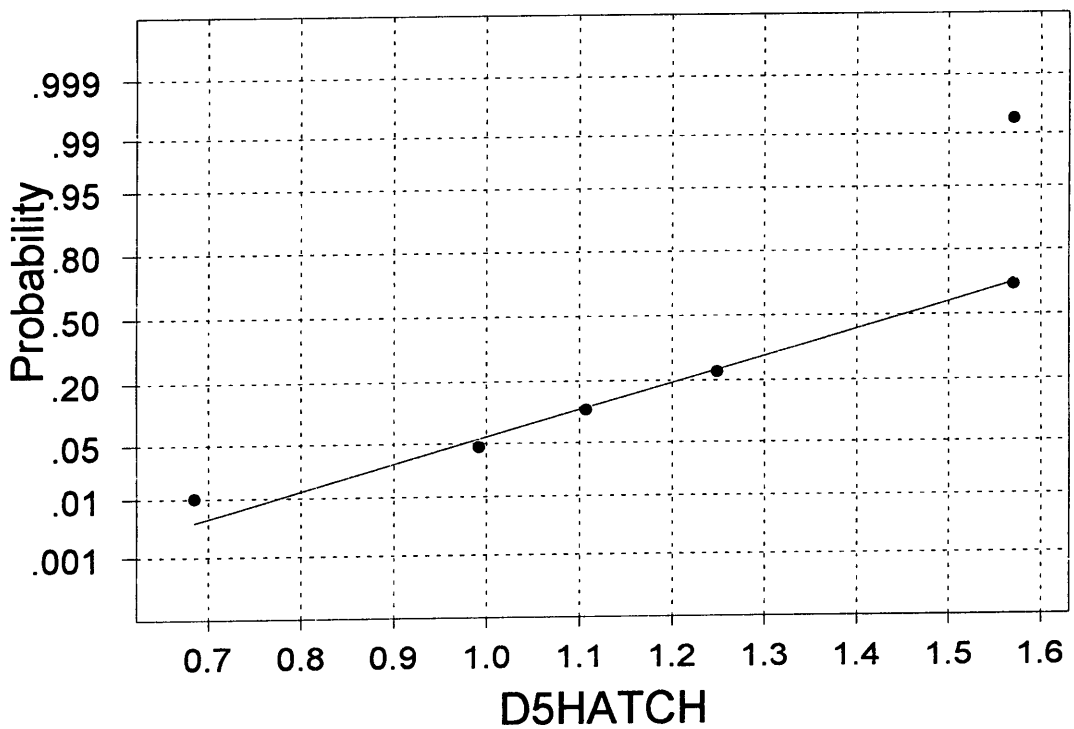
```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

Control = level 19 of TESTID
```

Level	Lower	Center	Upper
1	-0.7211	0.0000	0.7211
2	-0.7211	0.0000	0.7211
3	-0.9829	-0.2618	0.4593
4	-0.8756	-0.1545	0.5665
5	-0.7211	0.0000	0.7211
6	-0.8756	-0.1545	0.5665
7	-0.8283	-0.1073	0.6138
8	-1.1761	-0.4550	0.2661
9	-0.9143	-0.1932	0.5279
10	-0.8756	-0.1545	0.5665
11	-0.8283	-0.1073	0.6138
12	-0.8283	-0.1073	0.6138
13	-0.8283	-0.1073	0.6138
14	-0.9143	-0.1932	0.5279
15	-0.8756	-0.1545	0.5665
16	-0.9829	-0.2618	0.4593
17	-0.9143	-0.1932	0.5279
18	-1.1974	-0.4763	0.2448
20	-1.0901	-0.3690	0.3520
21	-0.8283	-0.1073	0.6138
22	-1.1761	-0.4550	0.2661
23	-1.0901	-0.3690	0.3520
24	-0.7211	0.0000	0.7211
25	-0.9829	-0.2618	0.4593
26	-1.1039	-0.3828	0.3383
27	-0.9143	-0.1932	0.5279
28	-0.9829	-0.2618	0.4593
29	-0.7211	0.0000	0.7211
30	-0.9829	-0.2618	0.4593
31	-1.0215	-0.3005	0.4206
32	-0.8283	-0.1073	0.6138
33	-1.1237	-0.4026	0.3185
34	-0.7211	0.0000	0.7211
35	-0.9143	-0.1932	0.5279
36	-0.9143	-0.1932	0.5279
37	-0.7211	0.0000	0.7211



MTB >

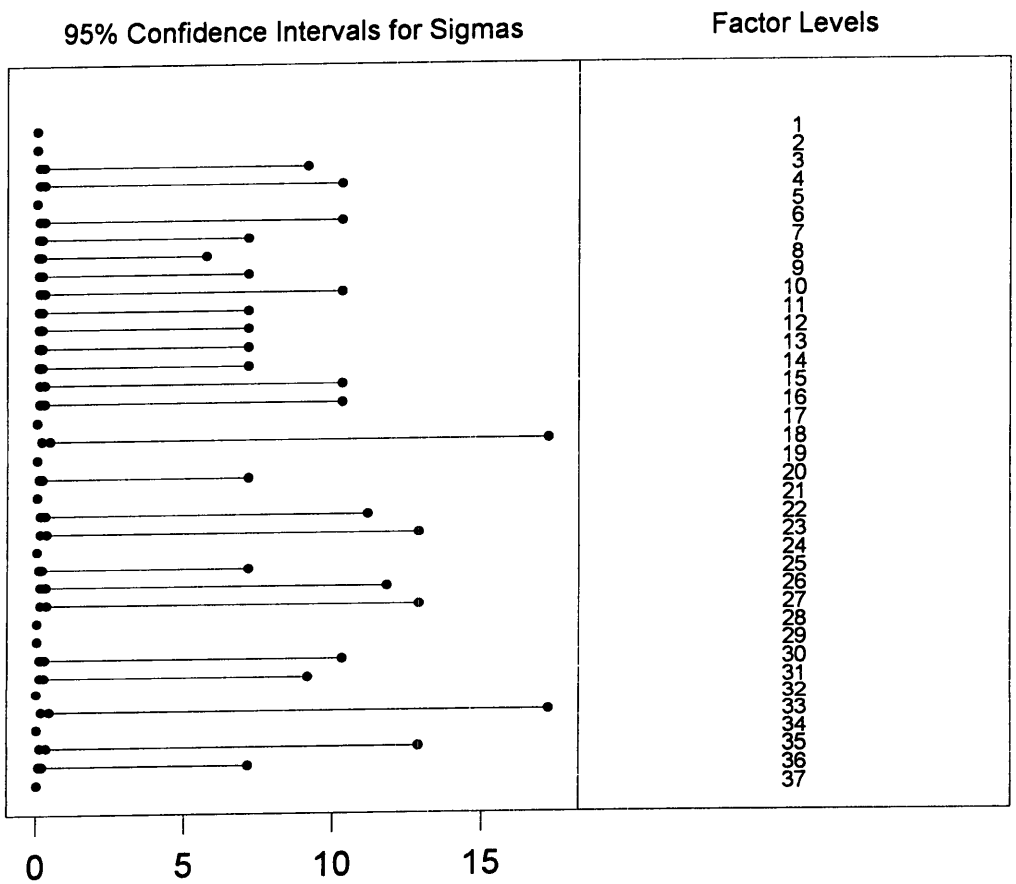
DAY 5 HATCH (SAMPLES)



Average: 1.43373
Std Dev: 0.219482
N of data: 111

W-test for Normality
R: 0.9640
p value (approx): < 0.0100

DAY 5 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: -113.096

p value : 1.000

Levene's Test

Test Statistic: 0.581

p value : 0.962

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02PP.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02PP.MTW
Worksheet was saved on 10/12/2000
MTB > Kruskal-Wallis 'D5HATCH' 'TESTID'.
```

Kruskal-Wallis Test

LEVEL	NOBS	MEDIAN	AVE. RANK	Z VALUE
1	3	1.571	73.0	0.93
2	3	1.571	73.0	0.93
3	3	1.249	37.5	-1.01
4	3	1.571	53.0	-0.16
5	3	1.571	73.0	0.93
6	3	1.571	53.0	-0.16
7	3	1.571	57.5	0.08
8	3	1.249	19.5	-1.99
9	3	1.571	57.5	0.08
10	3	1.571	53.0	-0.16
11	3	1.571	57.5	0.08
12	3	1.571	57.5	0.08
13	3	1.571	57.5	0.08
14	3	1.571	57.5	0.08
15	3	1.571	53.0	-0.16
16	3	1.571	53.0	-0.16
17	3	1.571	73.0	0.93
18	3	1.249	33.7	-1.22
19	3	1.571	73.0	0.93
20	3	1.249	54.7	-0.07
21	3	1.571	73.0	0.93
22	3	1.249	35.0	-1.15
23	3	1.571	50.5	-0.30
24	3	1.571	73.0	0.93
25	3	1.249	42.0	-0.76
26	3	1.107	30.5	-1.39
27	3	1.571	50.5	-0.30
28	3	1.571	73.0	0.93
29	3	1.571	73.0	0.93
30	3	1.571	53.0	-0.16
31	3	1.249	37.5	-1.01
32	3	1.571	73.0	0.93
33	3	1.249	33.7	-1.22
34	3	1.571	73.0	0.93
35	3	1.571	50.5	-0.30
36	3	1.571	57.5	0.08
37	3	1.571	73.0	0.93
OVERALL	111		56.0	

```
H = 22.97  d.f. = 36  p = 0.953
H = 33.45  d.f. = 36  p = 0.590 (adjusted for ties)

* NOTE * One or more small samples
MTB >
```

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02PP.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02PP.MTW
Worksheet was saved on 10/12/2000
MTB > Oneway 'D5HATCH' 'TESTID';
SUBC>   Dunnett 5 19.
```

One-Way Analysis of Variance

```
Analysis of Variance on D5HATCH
Source      DF        SS        MS         F        p
TESTID      36    1.7143    0.0476      0.98    0.510
Error       74    3.5846    0.0484
Total      110    5.2989
```

```
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level       N      Mean     StDev  ----+---------+---------+---------+--
     1       3    1.5708    0.0000                  (---------*---------)
     2       3    1.5708    0.0000                  (---------*---------)
     3       3    1.3090    0.2376        (---------*---------)
     4       3    1.4162    0.2677             (---------*---------)
     5       3    1.5708    0.0000                  (---------*---------)
     6       3    1.4162    0.2677             (---------*---------)
     7       3    1.4635    0.1858              (----------*---------)
     8       3    1.1631    0.1489  (----------*---------)
     9       3    1.4635    0.1858              (----------*---------)
    10       3    1.4162    0.2677             (---------*---------)
    11       3    1.4635    0.1858              (----------*---------)
    12       3    1.4635    0.1858              (----------*---------)
    13       3    1.4635    0.1858              (----------*---------)
    14       3    1.4635    0.1858              (----------*---------)
    15       3    1.4162    0.2677             (---------*---------)
    16       3    1.4162    0.2677             (---------*---------)
    17       3    1.5708    0.0000                  (---------*---------)
    18       3    1.1682    0.4485   (---------*---------)
    19       3    1.5708    0.0000                  (---------*---------)
    20       3    1.3563    0.1858          (---------*---------)
    21       3    1.5708    0.0000                  (---------*---------)
    22       3    1.2703    0.2904       (---------*---------)
    23       3    1.3776    0.3347           (---------*---------)
    24       3    1.5708    0.0000                  (---------*---------)
    25       3    1.3563    0.1858          (---------*---------)
    26       3    1.2230    0.3067     (---------*---------)
    27       3    1.3776    0.3347           (---------*---------)
    28       3    1.5708    0.0000                  (---------*---------)
    29       3    1.5708    0.0000                  (---------*---------)
    30       3    1.4162    0.2677             (---------*---------)
    31       3    1.3090    0.2376        (---------*---------)
    32       3    1.5708    0.0000                  (---------*---------)
    33       3    1.1682    0.4485   (---------*---------)
    34       3    1.5708    0.0000                  (---------*---------)
    35       3    1.3776    0.3347           (---------*---------)
    36       3    1.4635    0.1858              (----------*---------)
    37       3    1.5708    0.0000                  (---------*---------)
                                     ----+---------+---------+---------+--
Pooled StDev =    0.2201               1.00      1.25      1.50      1.75
```

```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

Control = level 19 of TESTID
```

Level	Lower	Center	Upper
1	-0.5643	0.0000	0.5643
2	-0.5643	0.0000	0.5643
3	-0.8261	-0.2618	0.3025
4	-0.7188	-0.1545	0.4097
5	-0.5643	0.0000	0.5643
6	-0.7188	-0.1545	0.4097
7	-0.6715	-0.1073	0.4570
8	-0.9720	-0.4077	0.1566
9	-0.6715	-0.1073	0.4570
10	-0.7188	-0.1545	0.4097
11	-0.6715	-0.1073	0.4570
12	-0.6715	-0.1073	0.4570
13	-0.6715	-0.1073	0.4570
14	-0.6715	-0.1073	0.4570
15	-0.7188	-0.1545	0.4097
16	-0.7188	-0.1545	0.4097
17	-0.5643	0.0000	0.5643
18	-0.9669	-0.4026	0.1617
20	-0.7788	-0.2145	0.3498
21	-0.5643	0.0000	0.5643
22	-0.8647	-0.3005	0.2638
23	-0.7575	-0.1932	0.3711
24	-0.5643	0.0000	0.5643
25	-0.7788	-0.2145	0.3498
26	-0.9120	-0.3478	0.2165
27	-0.7575	-0.1932	0.3711
28	-0.5643	0.0000	0.5643
29	-0.5643	0.0000	0.5643
30	-0.7188	-0.1545	0.4097
31	-0.8261	-0.2618	0.3025
32	-0.5643	0.0000	0.5643
33	-0.9669	-0.4026	0.1617
34	-0.5643	0.0000	0.5643
35	-0.7575	-0.1932	0.3711
36	-0.6715	-0.1073	0.4570
37	-0.5643	0.0000	0.5643

```
-----+---------+---------+---------+------
           (-------------*-------------)
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        (-------------*-------------)
     (-------------*-------------)
           (-------------*-------------)
  (-------------*-------------)
           (-------------*-------------)
      (-------------*-------------)
         (-------------*-------------)
           (-------------*-------------)
-----+---------+---------+---------+------
  -0.80     -0.40     -0.00      0.40
```
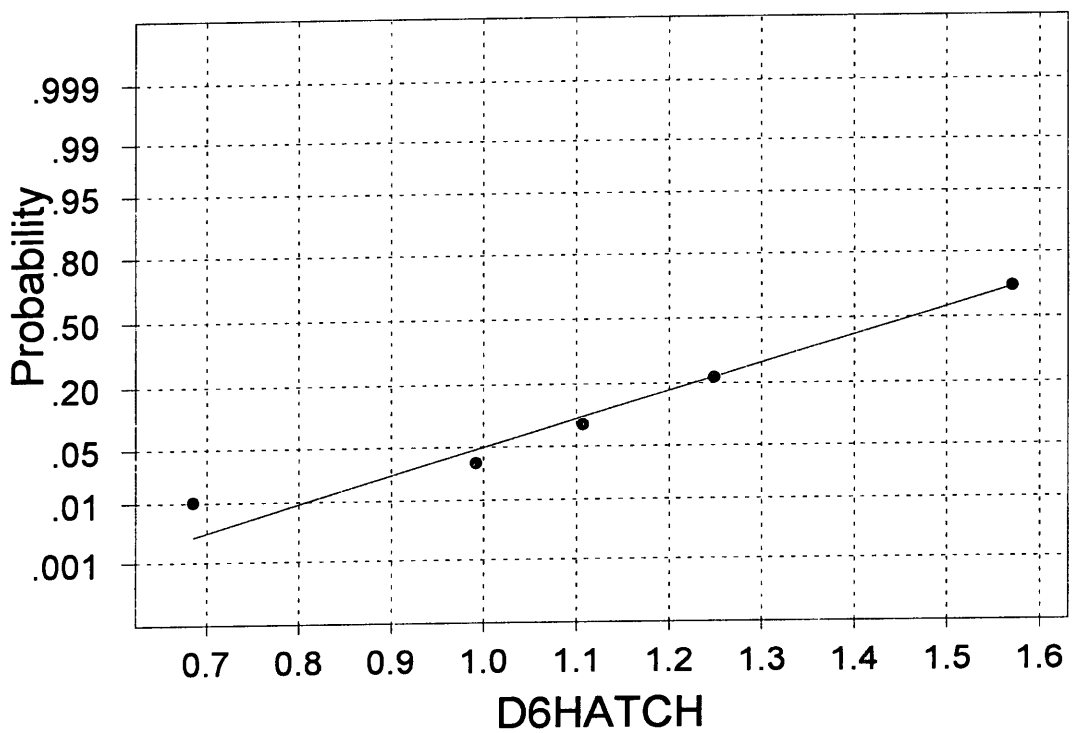

MTB >

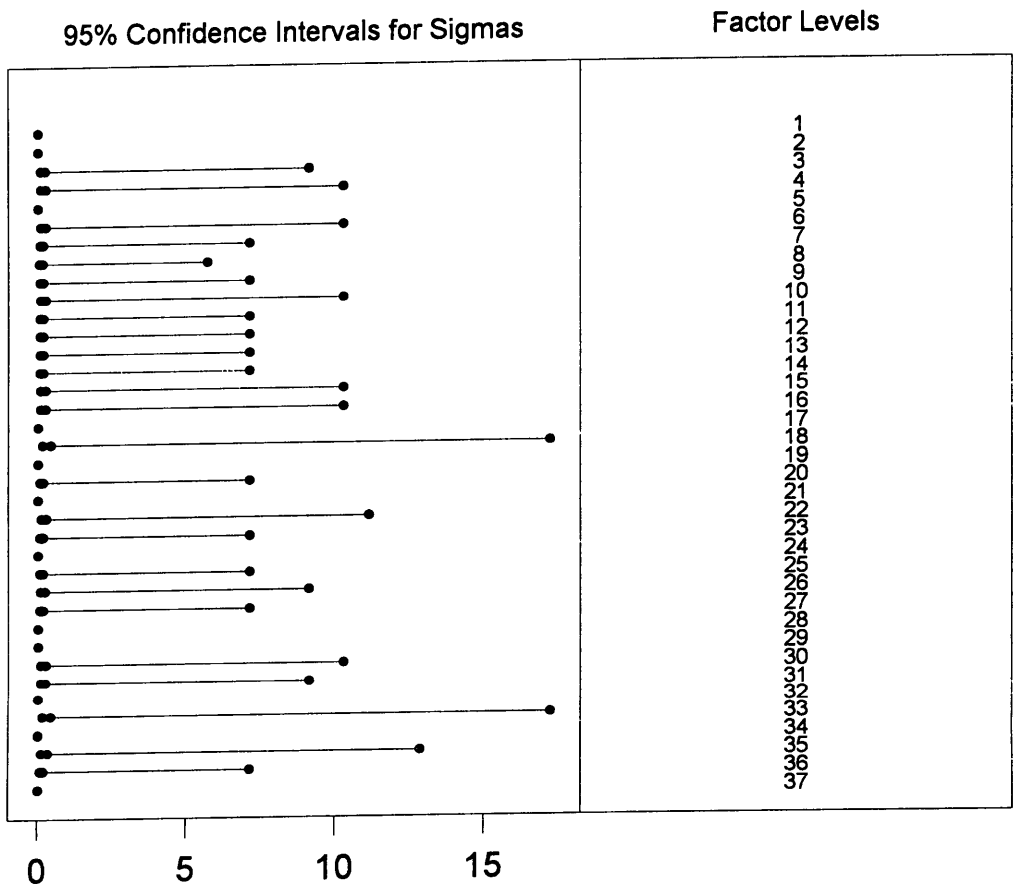
DAY 6 HATCH (SAMPLES)



Average: 1.4407
Std Dev: 0.209073
N of data: 111

W-test for Normality
R: 0.9952
p value (approx): > 0.1000

DAY 6 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: -116.544

p value : 1.000

Levene's Test

Test Statistic: 0.614

p value : 0.946

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02PP.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02PP.MTW
Worksheet was saved on 10/12/2000
MTB > Oneway 'D6HATCH' 'TESTID';
SUBC>   Dunnett 5 19.
```

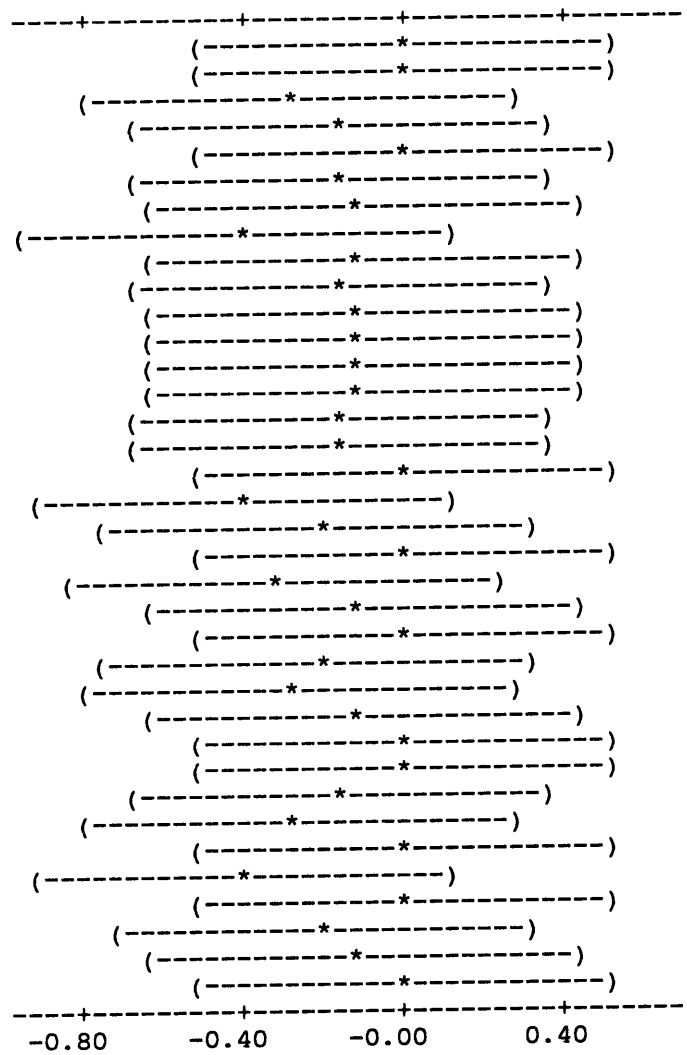
One-Way Analysis of Variance

```
Analysis of Variance on D6HATCH
Source      DF        SS        MS        F        p
TESTID      36    1.6088    0.0447     1.03    0.441
Error       74    3.1994    0.0432
Total      110    4.8083
```

```
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  ----+---------+---------+---------+--
     1      3    1.5708    0.0000                  (---------*--------)
     2      3    1.5708    0.0000                  (---------*--------)
     3      3    1.3090    0.2376         (--------*---------)
     4      3    1.4162    0.2677             (---------*--------)
     5      3    1.5708    0.0000                  (---------*--------)
     6      3    1.4162    0.2677             (---------*--------)
     7      3    1.4635    0.1858               (---------*--------)
     8      3    1.1631    0.1489   (---------*--------)
     9      3    1.4635    0.1858               (---------*--------)
    10      3    1.4162    0.2677             (---------*--------)
    11      3    1.4635    0.1858               (---------*--------)
    12      3    1.4635    0.1858               (---------*--------)
    13      3    1.4635    0.1858               (---------*--------)
    14      3    1.4635    0.1858               (---------*--------)
    15      3    1.4162    0.2677             (---------*--------)
    16      3    1.4162    0.2677             (---------*--------)
    17      3    1.5708    0.0000                  (---------*--------)
    18      3    1.1682    0.4485   (---------*--------)
    19      3    1.5708    0.0000                  (---------*--------)
    20      3    1.3563    0.1858           (--------*---------)
    21      3    1.5708    0.0000                  (---------*--------)
    22      3    1.2703    0.2904       (---------*--------)
    23      3    1.4635    0.1858               (---------*--------)
    24      3    1.5708    0.0000                  (---------*--------)
    25      3    1.3563    0.1858           (--------*---------)
    26      3    1.3090    0.2376         (--------*---------)
    27      3    1.4635    0.1858               (---------*--------)
    28      3    1.5708    0.0000                  (---------*--------)
    29      3    1.5708    0.0000                  (---------*--------)
    30      3    1.4162    0.2677             (---------*--------)
    31      3    1.3090    0.2376         (--------*---------)
    32      3    1.5708    0.0000                  (---------*--------)
    33      3    1.1682    0.4485   (---------*--------)
    34      3    1.5708    0.0000                  (---------*--------)
    35      3    1.3776    0.3347            (--------*---------)
    36      3    1.4635    0.1858               (---------*--------)
    37      3    1.5708    0.0000                  (---------*--------)
                                   ----+---------+---------+---------+--
Pooled StDev =    0.2079             1.00      1.25      1.50      1.75
```

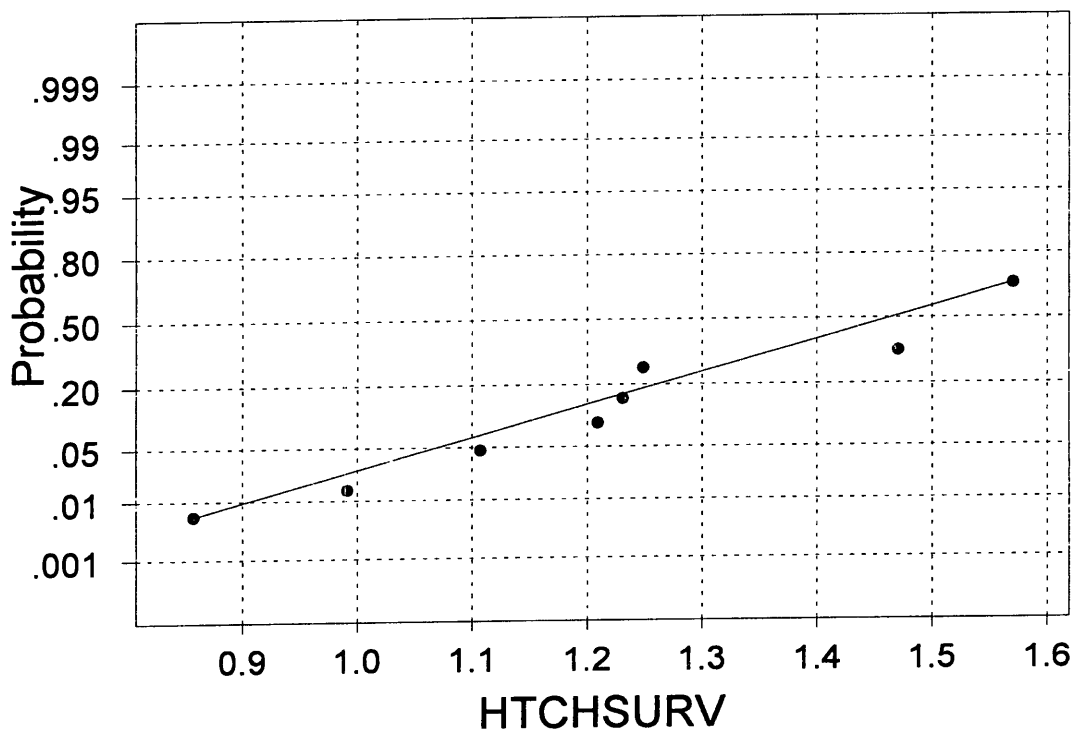
```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

Control = level 19 of TESTID
```

Level	Lower	Center	Upper
1	-0.5331	0.0000	0.5331
2	-0.5331	0.0000	0.5331
3	-0.7949	-0.2618	0.2713
4	-0.6876	-0.1545	0.3785
5	-0.5331	0.0000	0.5331
6	-0.6876	-0.1545	0.3785
7	-0.6403	-0.1073	0.4258
8	-0.9408	-0.4077	0.1254
9	-0.6403	-0.1073	0.4258
10	-0.6876	-0.1545	0.3785
11	-0.6403	-0.1073	0.4258
12	-0.6403	-0.1073	0.4258
13	-0.6403	-0.1073	0.4258
14	-0.6403	-0.1073	0.4258
15	-0.6876	-0.1545	0.3785
16	-0.6876	-0.1545	0.3785
17	-0.5331	0.0000	0.5331
18	-0.9357	-0.4026	0.1305
20	-0.7476	-0.2145	0.3186
21	-0.5331	0.0000	0.5331
22	-0.8336	-0.3005	0.2326
23	-0.6403	-0.1073	0.4258
24	-0.5331	0.0000	0.5331
25	-0.7476	-0.2145	0.3186
26	-0.7949	-0.2618	0.2713
27	-0.6403	-0.1073	0.4258
28	-0.5331	0.0000	0.5331
29	-0.5331	0.0000	0.5331
30	-0.6876	-0.1545	0.3785
31	-0.7949	-0.2618	0.2713
32	-0.5331	0.0000	0.5331
33	-0.9357	-0.4026	0.1305
34	-0.5331	0.0000	0.5331
35	-0.7263	-0.1932	0.3399
36	-0.6403	-0.1073	0.4258
37	-0.5331	0.0000	0.5331



MTB >

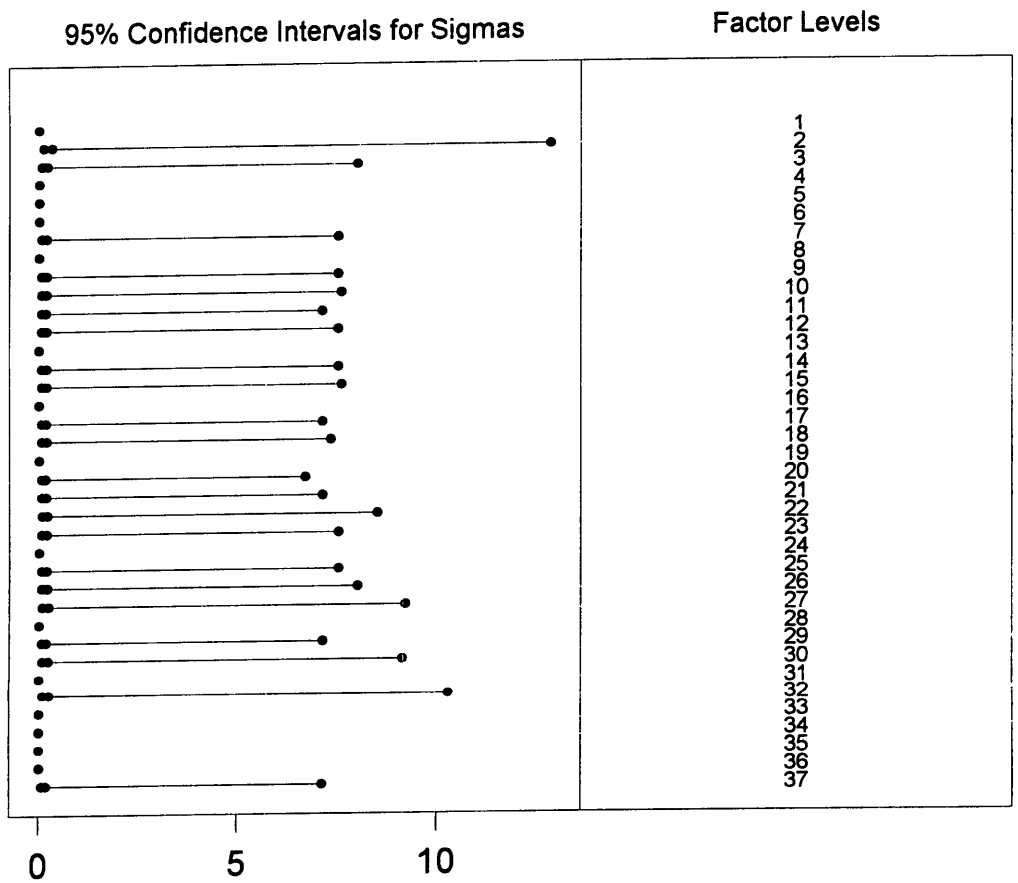
HATCHED FISH SURVIVAL (SAMPLES)



Average: 1.44607
Std Dev: 0.182110
N of data: 111

W-test for Normality
R: 0.9851
p value (approx): 0.0239

HATCHED FISH SURVIVAL (SAMPLES)



Bartlett's Test

Test Statistic: -170.607

p value : 1.000

Levene's Test

Test Statistic: 0.508

p value : 0.986

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02PP.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02PP.MTW
Worksheet was saved on 10/12/2000
MTB > Oneway 'HTCHSURV' 'TESTID';
SUBC>   Dunnett 5 19.
```

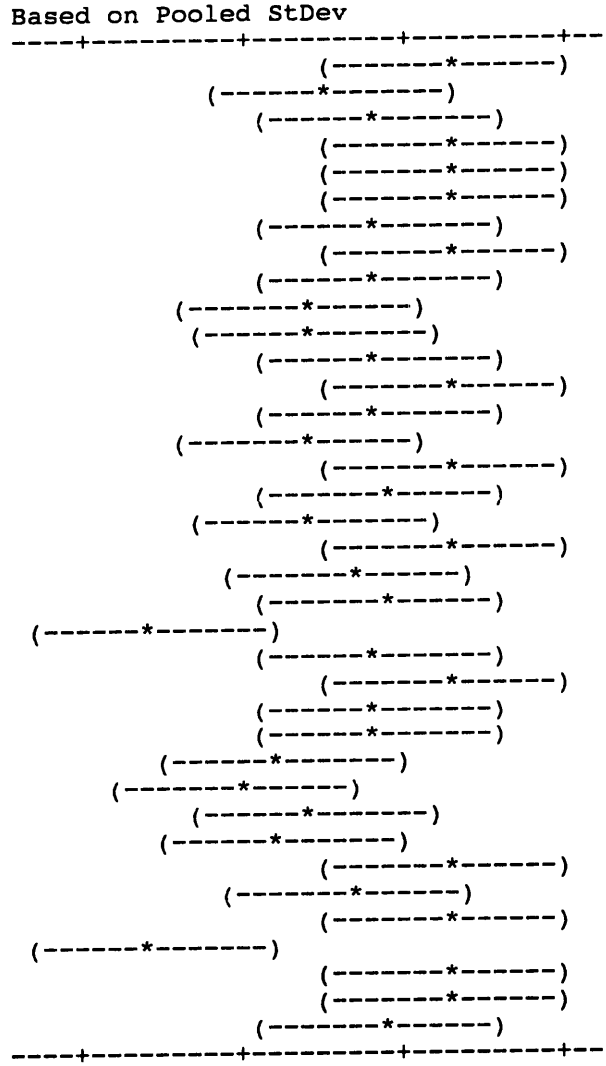
One-Way Analysis of Variance

Analysis of Variance on HTCHSURV

Source	DF	SS	MS	F	p
TESTID	36	1.6827	0.0467	1.76	0.020
Error	74	1.9654	0.0266		
Total	110	3.6481			

Level	N	Mean	StDev
1	3	1.5708	0.0000
2	3	1.3776	0.3347
3	3	1.4503	0.2086
4	3	1.5708	0.0000
5	3	1.5708	0.0000
6	3	1.5708	0.0000
7	3	1.4576	0.1961
8	3	1.5708	0.0000
9	3	1.4576	0.1961
10	3	1.3431	0.1982
11	3	1.3563	0.1858
12	3	1.4576	0.1961
13	3	1.5708	0.0000
14	3	1.4576	0.1961
15	3	1.3431	0.1982
16	3	1.5708	0.0000
17	3	1.4635	0.1858
18	3	1.3503	0.1911
19	3	1.5708	0.0000
20	3	1.4242	0.1745
21	3	1.4635	0.1858
22	3	1.1123	0.2216
23	3	1.4576	0.1961
24	3	1.5708	0.0000
25	3	1.4576	0.1961
26	3	1.4503	0.2086
27	3	1.3030	0.2400
28	3	1.2490	0.0000
29	3	1.3563	0.1858
30	3	1.3090	0.2376
31	3	1.5708	0.0000
32	3	1.4162	0.2677
33	3	1.5708	0.0000
34	3	1.1071	0.0000
35	3	1.5708	0.0000
36	3	1.5708	0.0000
37	3	1.4635	0.1858

Pooled StDev = 0.1630



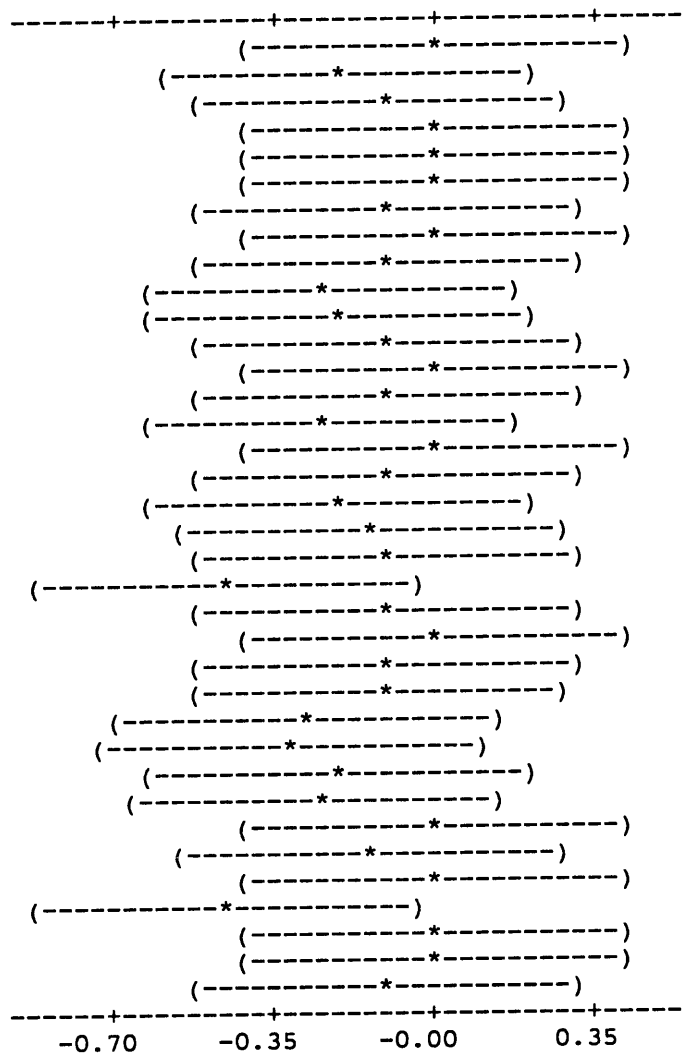
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

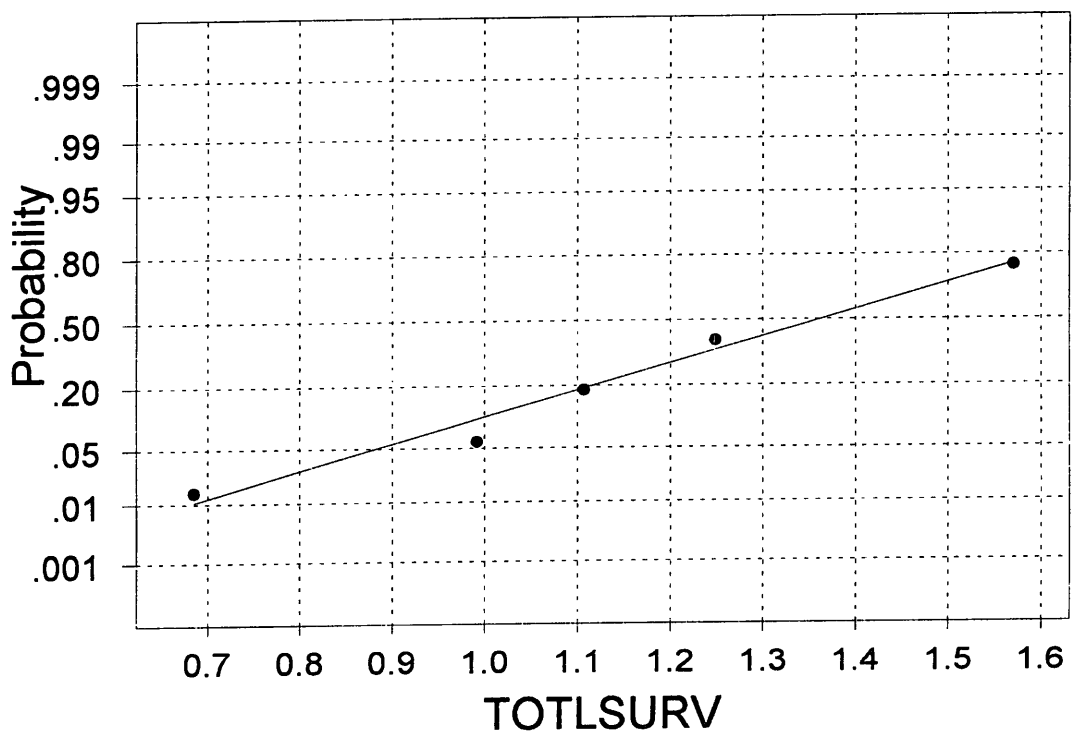
Control = level 19 of TESTID

Level	Lower	Center	Upper
1	-0.4178	0.0000	0.4178
2	-0.6110	-0.1932	0.2246
3	-0.5383	-0.1205	0.2974
4	-0.4178	0.0000	0.4178
5	-0.4178	0.0000	0.4178
6	-0.4178	0.0000	0.4178
7	-0.5310	-0.1132	0.3046
8	-0.4178	0.0000	0.4178
9	-0.5310	-0.1132	0.3046
10	-0.6455	-0.2277	0.1901
11	-0.6323	-0.2145	0.2033
12	-0.5310	-0.1132	0.3046
13	-0.4178	0.0000	0.4178
14	-0.5310	-0.1132	0.3046
15	-0.6455	-0.2277	0.1901
16	-0.4178	0.0000	0.4178
17	-0.5251	-0.1073	0.3106
18	-0.6383	-0.2205	0.1974
20	-0.5644	-0.1466	0.2712
21	-0.5251	-0.1073	0.3106
22	-0.8763	-0.4585	-0.0407
23	-0.5310	-0.1132	0.3046
24	-0.4178	0.0000	0.4178
25	-0.5310	-0.1132	0.3046
26	-0.5383	-0.1205	0.2974
27	-0.6856	-0.2678	0.1501
28	-0.7396	-0.3218	0.0961
29	-0.6323	-0.2145	0.2033
30	-0.6796	-0.2618	0.1560
31	-0.4178	0.0000	0.4178
32	-0.5724	-0.1545	0.2633
33	-0.4178	0.0000	0.4178
34	-0.8815	-0.4636	-0.0458
35	-0.4178	0.0000	0.4178
36	-0.4178	0.0000	0.4178
37	-0.5251	-0.1073	0.3106



MTB >

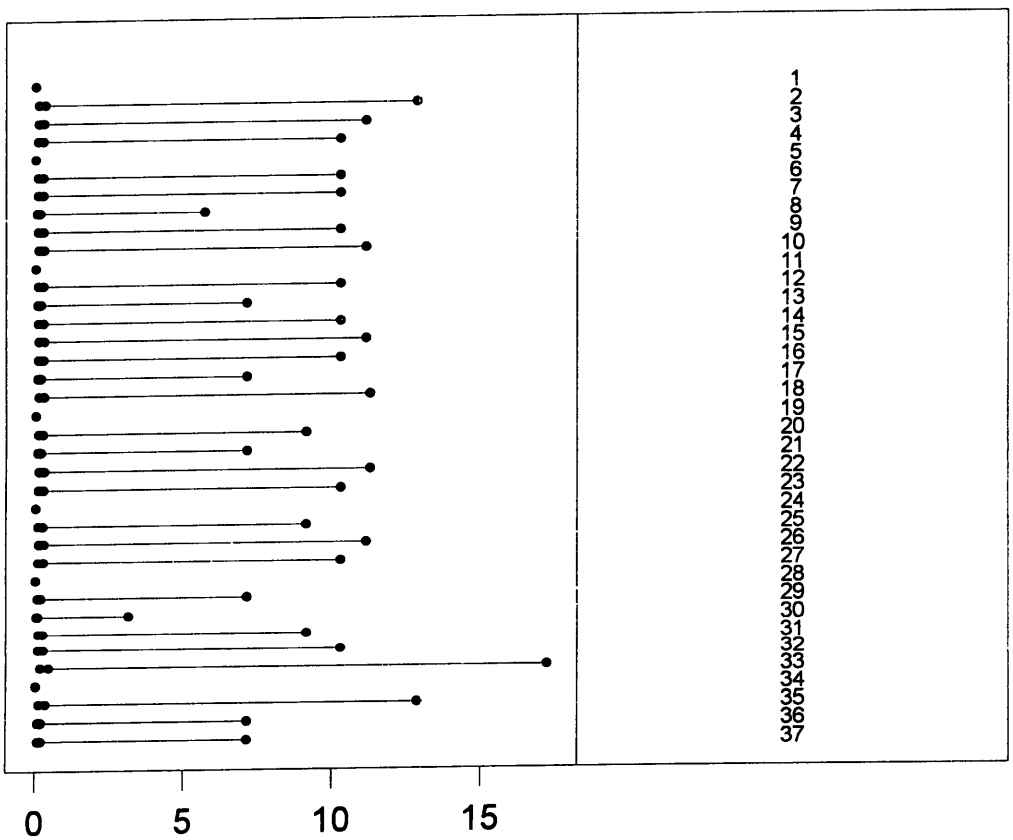
TOTAL FISH SURVIVAL (SAMPLES)



Average: 1.34721
Std Dev: 0.240537
N of data: 111

W-test for Normality
R: 0.9927
p value (approx): > 0.1000

TOTAL FISH SURVIVAL (SAMPLES)



Bartlett's Test

Test Statistic: -61.295

p value : 1.000

Levene's Test

Test Statistic: 0.390

p value : 0.999

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VM02PP.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VM02PP.MTW
Worksheet was saved on 10/12/2000
MTB > Oneway 'TOTLSURV' 'TESTID';
SUBC>   Dunnett 5 19.
```

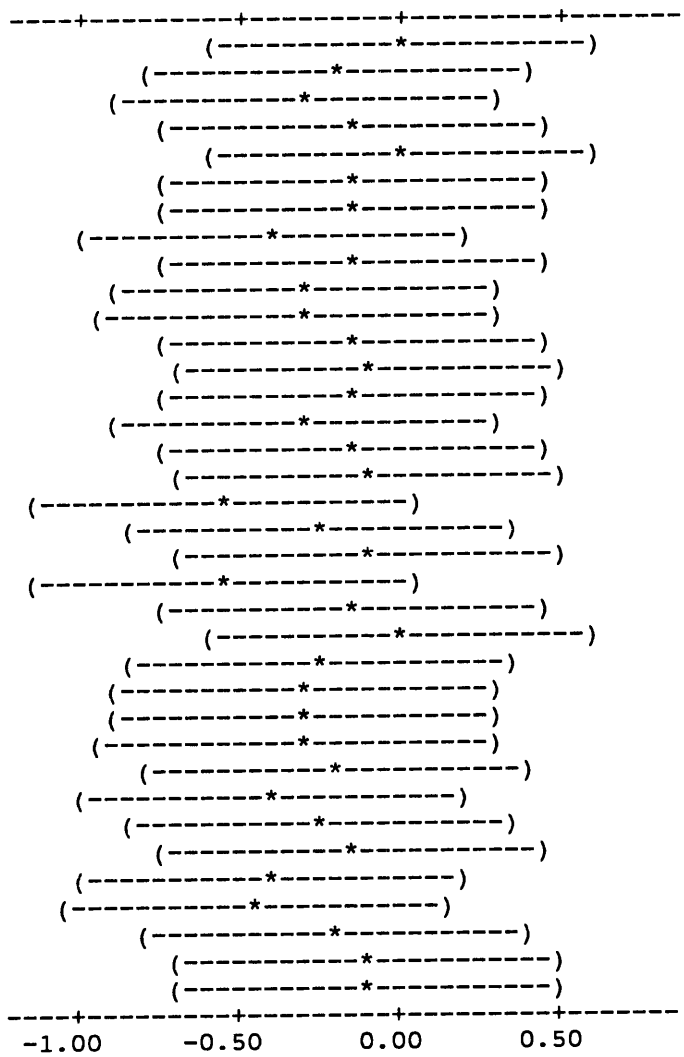
One-Way Analysis of Variance

```
Analysis of Variance on TOTLSURV
Source      DF        SS        MS        F        p
TESTID      36    2.2510    0.0625     1.12    0.329
Error       74    4.1133    0.0556
Total      110    6.3644
```

```
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  ------+---------+---------+---------+
     1      3    1.5708    0.0000                     (--------*--------)
     2      3    1.3776    0.3347                 (--------*--------)
     3      3    1.2703    0.2904             (--------*--------)
     4      3    1.4162    0.2677                 (--------*--------)
     5      3    1.5708    0.0000                     (--------*--------)
     6      3    1.4162    0.2677                 (--------*--------)
     7      3    1.4162    0.2677                 (--------*--------)
     8      3    1.1631    0.1489          (--------*--------)
     9      3    1.4162    0.2677                 (--------*--------)
    10      3    1.2703    0.2904             (--------*--------)
    11      3    1.2490    0.0000             (--------*--------)
    12      3    1.4162    0.2677                 (--------*--------)
    13      3    1.4635    0.1858                   (--------*--------)
    14      3    1.4162    0.2677                 (--------*--------)
    15      3    1.2703    0.2904             (--------*--------)
    16      3    1.4162    0.2677                 (--------*--------)
    17      3    1.4635    0.1858                   (--------*--------)
    18      3    1.0136    0.2936    (--------*--------)
    19      3    1.5708    0.0000                     (--------*--------)
    20      3    1.3090    0.2376               (--------*--------)
    21      3    1.4635    0.1858                   (--------*--------)
    22      3    1.0136    0.2936    (--------*--------)
    23      3    1.4162    0.2677                 (--------*--------)
    24      3    1.5708    0.0000                     (--------*--------)
    25      3    1.3090    0.2376               (--------*--------)
    26      3    1.2703    0.2904             (--------*--------)
    27      3    1.2617    0.2677             (--------*--------)
    28      3    1.2490    0.0000             (--------*--------)
    29      3    1.3563    0.1858                (--------*--------)
    30      3    1.1544    0.0819        (--------*---------)
    31      3    1.3090    0.2376               (--------*--------)
    32      3    1.4162    0.2677                 (--------*--------)
    33      3    1.1682    0.4485          (--------*--------)
    34      3    1.1071    0.0000        (--------*--------)
    35      3    1.3776    0.3347                 (--------*--------)
    36      3    1.4635    0.1858                   (--------*--------)
    37      3    1.4635    0.1858                   (--------*--------)
                                       ------+---------+---------+---------+
Pooled StDev =    0.2358                   0.90      1.20      1.50      1.80
```

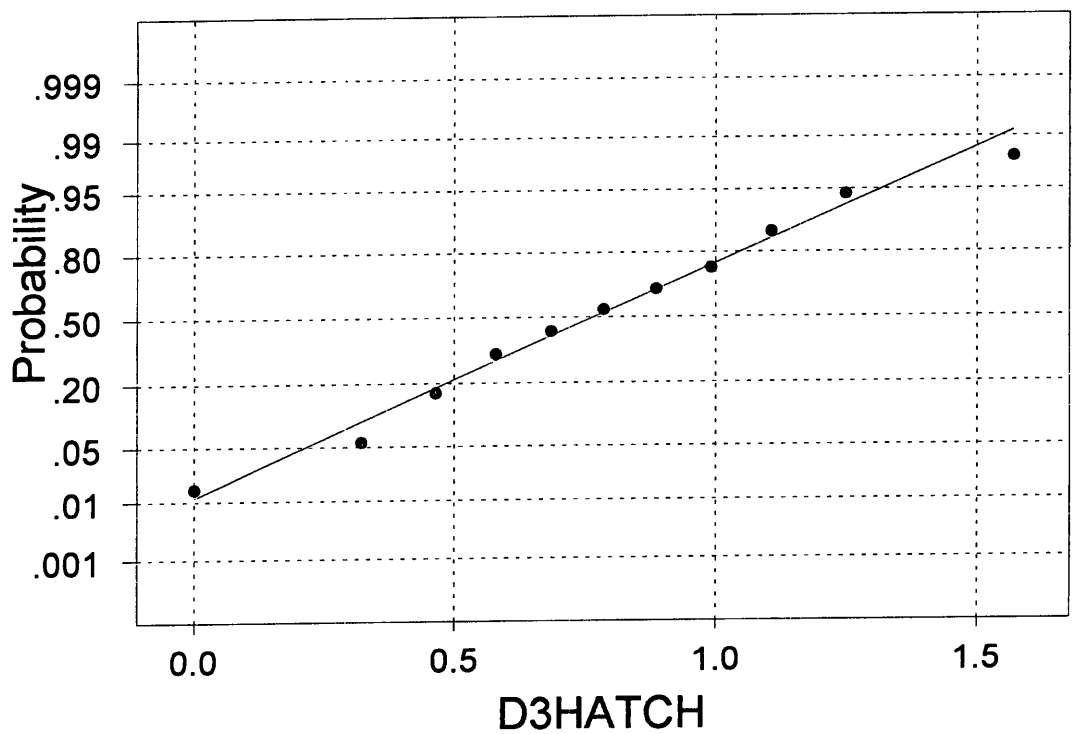
```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00239

Critical value = 3.14

Control = level 19 of TESTID
```

Level	Lower	Center	Upper
1	-0.6045	0.0000	0.6045
2	-0.7977	-0.1932	0.4112
3	-0.9049	-0.3005	0.3040
4	-0.7590	-0.1545	0.4499
5	-0.6045	0.0000	0.6045
6	-0.7590	-0.1545	0.4499
7	-0.7590	-0.1545	0.4499
8	-1.0122	-0.4077	0.1967
9	-0.7590	-0.1545	0.4499
10	-0.9049	-0.3005	0.3040
11	-0.9262	-0.3218	0.2827
12	-0.7590	-0.1545	0.4499
13	-0.7117	-0.1073	0.4972
14	-0.7590	-0.1545	0.4499
15	-0.9049	-0.3005	0.3040
16	-0.7590	-0.1545	0.4499
17	-0.7117	-0.1073	0.4972
18	-1.1616	-0.5572	0.0473
20	-0.8663	-0.2618	0.3427
21	-0.7117	-0.1073	0.4972
22	-1.1616	-0.5572	0.0473
23	-0.7590	-0.1545	0.4499
24	-0.6045	0.0000	0.6045
25	-0.8663	-0.2618	0.3427
26	-0.9049	-0.3005	0.3040
27	-0.9136	-0.3091	0.2954
28	-0.9262	-0.3218	0.2827
29	-0.8190	-0.2145	0.3900
30	-1.0208	-0.4163	0.1881
31	-0.8663	-0.2618	0.3427
32	-0.7590	-0.1545	0.4499
33	-1.0071	-0.4026	0.2018
34	-1.0681	-0.4636	0.1408
35	-0.7977	-0.1932	0.4112
36	-0.7117	-0.1073	0.4972
37	-0.7117	-0.1073	0.4972



MTB >

DAY 3 HATCH (STATIONS)

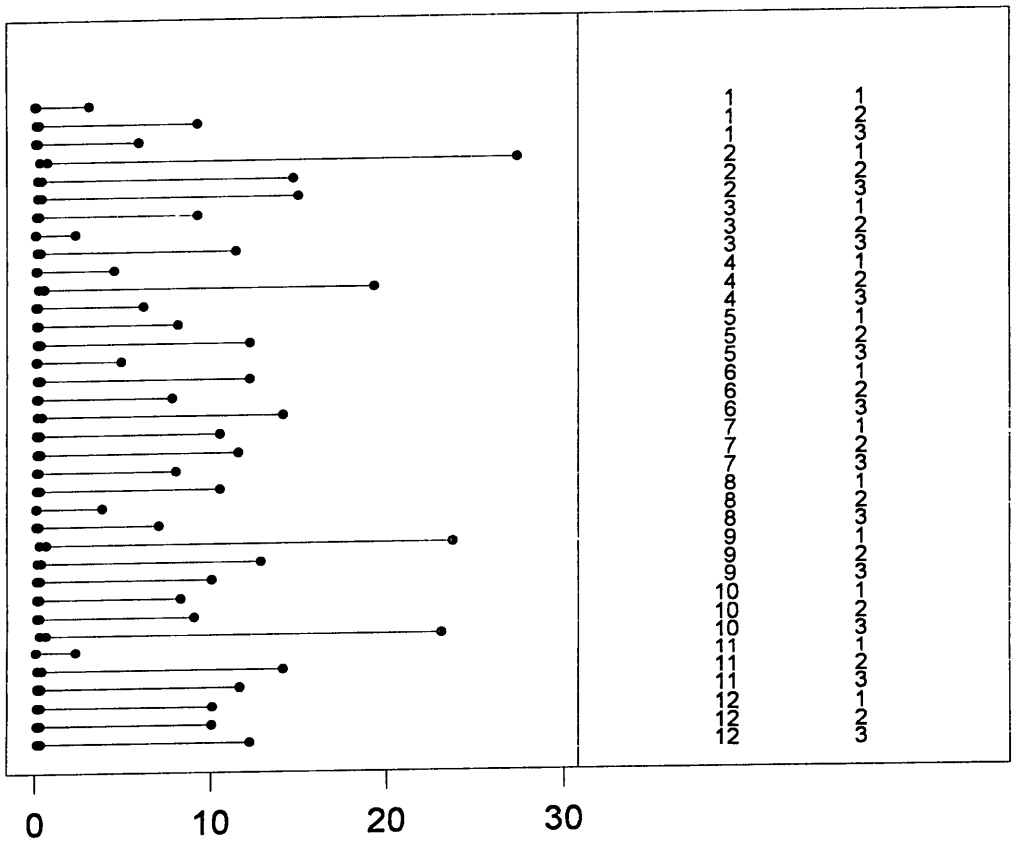


Average: 0.765419
Std Dev: 0.320975
N of data: 108

W-test for Normality
R: 0.9932
p value (approx): > 0.1000

DAY 3 HATCH (STATIONS)

95% Confidence Intervals for Sigmas



Factor Levels

1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3
4	1
4	2
4	3
5	1
5	2
5	3
6	1
6	2
6	3
7	1
7	2
7	3
8	1
8	2
8	3
9	1
9	2
9	3
10	1
10	2
10	3
11	1
11	2
11	3
12	1
12	2
12	3

Bartlett's Test

Test Statistic: 33.450

p value : 0.543

Levene's Test

Test Statistic: 0.401

p value : 0.998

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VMO2PP.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2PP.MTW
Worksheet was saved on 10/12/2000
MTB > Save  'C:\MTBWIN\DATA\VMO2PPNC.MTW';
SUBC>    Replace.
Saving worksheet in file: C:\MTBWIN\DATA\VMO2PPNC.MTW
MTB > ANOVA 'D3HATCH' = C11 C12(C11).
```

Analysis of Variance (Balanced Designs)

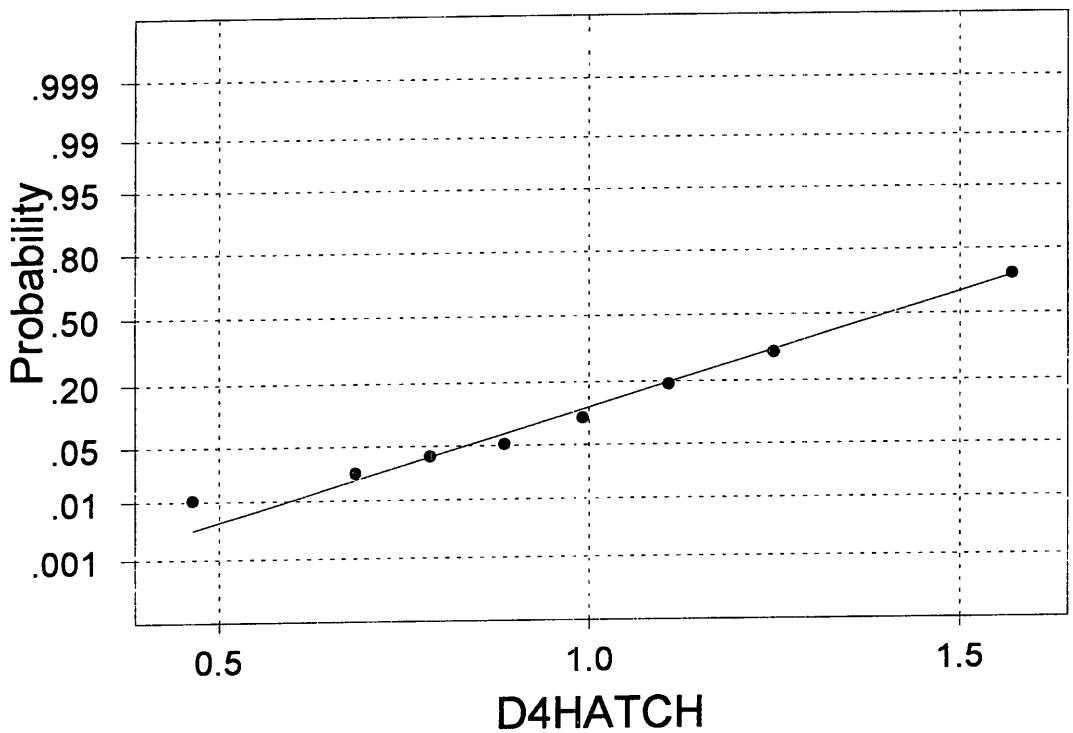
Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for D3HATCH

Source	DF	SS	MS	F	P
STATION	11	0.4535	0.0412	0.40	0.950
FLDREP(STATION)	24	3.2047	0.1335	1.31	0.193
Error	72	7.3655	0.1023		
Total	107	11.0237			

```
MTB >
```

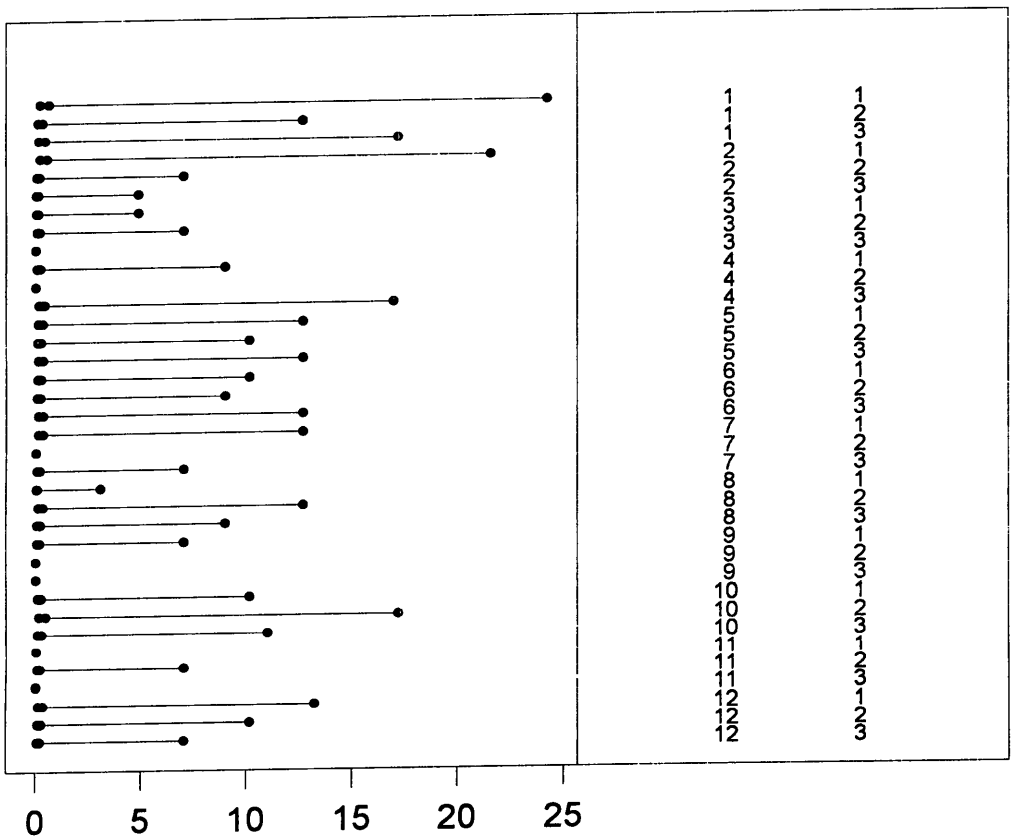
DAY 4 HATCH (STATIONS)



Average: 1.37801
Std Dev: 0.272924
N of data: 108

W-test for Normality
R: 0.9963
p value (approx): > 0.1000

DAY 4 HATCH (STATIONS)



Bartlett's Test

Test Statistic: -43.902

p value : 1.000

Levene's Test

Test Statistic: 0.445

p value : 0.995

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VMO2PPNC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2PPNC.MTW
Worksheet was saved on 10/13/2000
MTB > ANOVA 'D4HATCH' = C11 C12(C11).
```

Analysis of Variance (Balanced Designs)

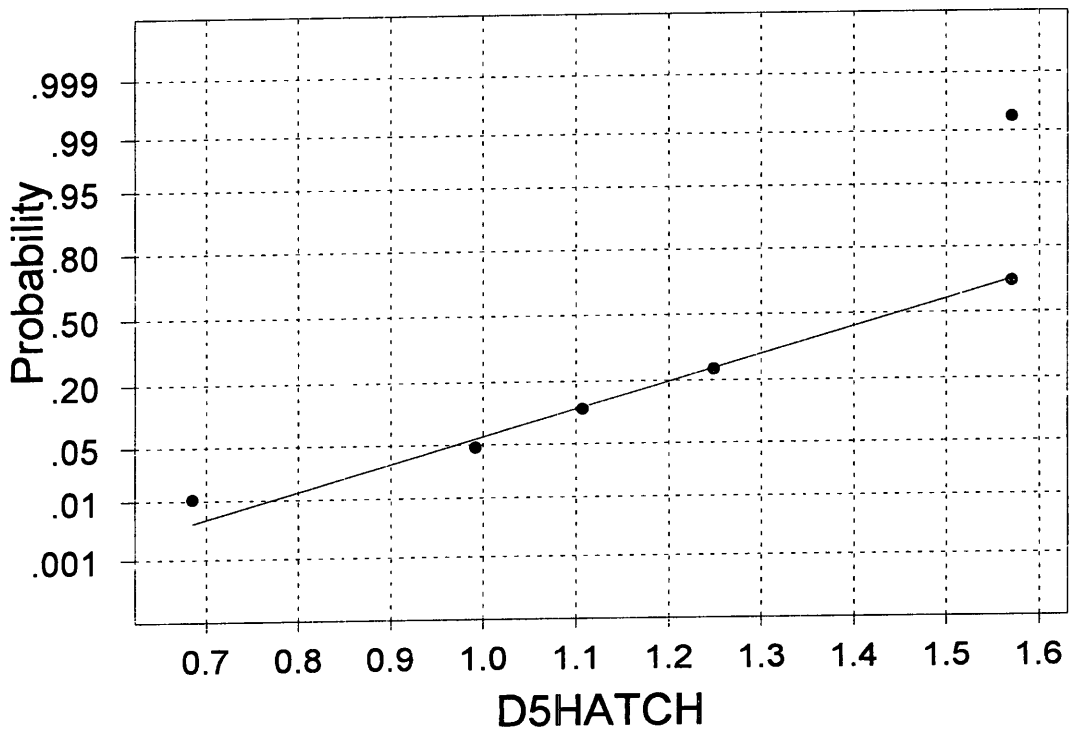
Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for D4HATCH

Source	DF	SS	MS	F	P
STATION	11	0.88723	0.08066	0.99	0.462
FLDREP(STATION)	24	1.22924	0.05122	0.63	0.897
Error	72	5.85370	0.08130		
Total	107	7.97017			

```
MTB >
```

DAY 5 HATCH (STATIONS)

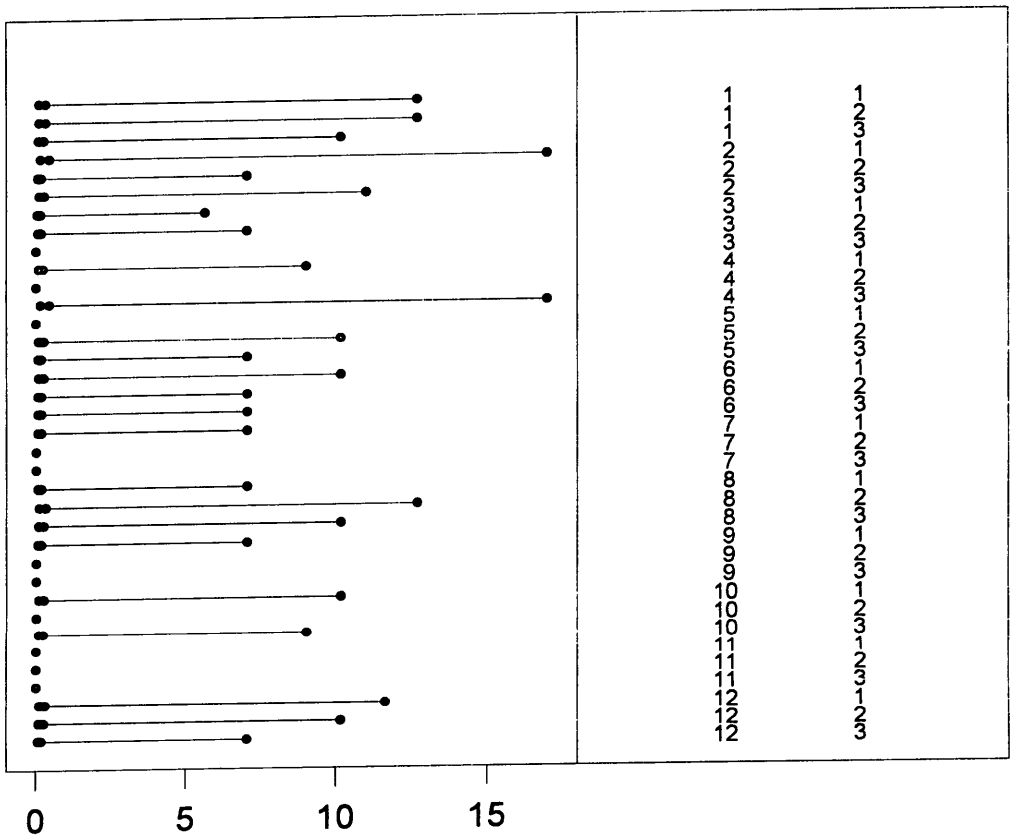


Average: 1.42992
Std Dev: 0.221317
N of data: 108

W-test for Normality
R: 0.9642
p value (approx): < 0.0100

DAY 5 HATCH (STATIONS)

95% Confidence Intervals for Sigmas



Factor Levels

1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3
4	1
4	2
4	3
5	1
5	2
5	3
6	1
6	2
6	3
7	1
7	2
7	3
8	1
8	2
8	3
9	1
9	2
9	3
10	1
10	2
10	3
11	1
11	2
11	3
12	1
12	2
12	3

Bartlett's Test

Test Statistic: -102.462

p value : 1.000

Levene's Test

Test Statistic: 0.557

p value : 0.970

```
Worksheet size: 100000 cells

MTB > Retrieve  'C:\MTBWIN\DATA\VMO2PPNC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2PPNC.MTW
Worksheet was saved on 10/13/2000
MTB > Kruskal-Wallis 'D5HATCH' 'STATION'.
```

Kruskal-Wallis Test

LEVEL	NOBS	MEDIAN	AVE. RANK	Z VALUE
1	9	1.571	50.3	-0.42
2	9	1.249	41.4	-1.31
3	9	1.571	49.2	-0.53
4	9	1.571	47.2	-0.73
5	9	1.571	60.0	0.55
6	9	1.571	50.0	-0.45
7	9	1.571	66.5	1.20
8	9	1.571	51.7	-0.28
9	9	1.571	66.5	1.20
10	9	1.571	53.5	-0.10
11	9	1.571	71.5	1.70
12	9	1.571	46.2	-0.83
OVERALL	108		54.5	

```
H =  8.96  d.f. = 11  p = 0.626
H = 12.83  d.f. = 11  p = 0.307 (adjusted for ties)

MTB >
```

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VMO2PPNC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2PPNC.MTW
Worksheet was saved on 10/13/2000
MTB > ANOVA 'D5HATCH' = C11 C12(C11).
```

Analysis of Variance (Balanced Designs)

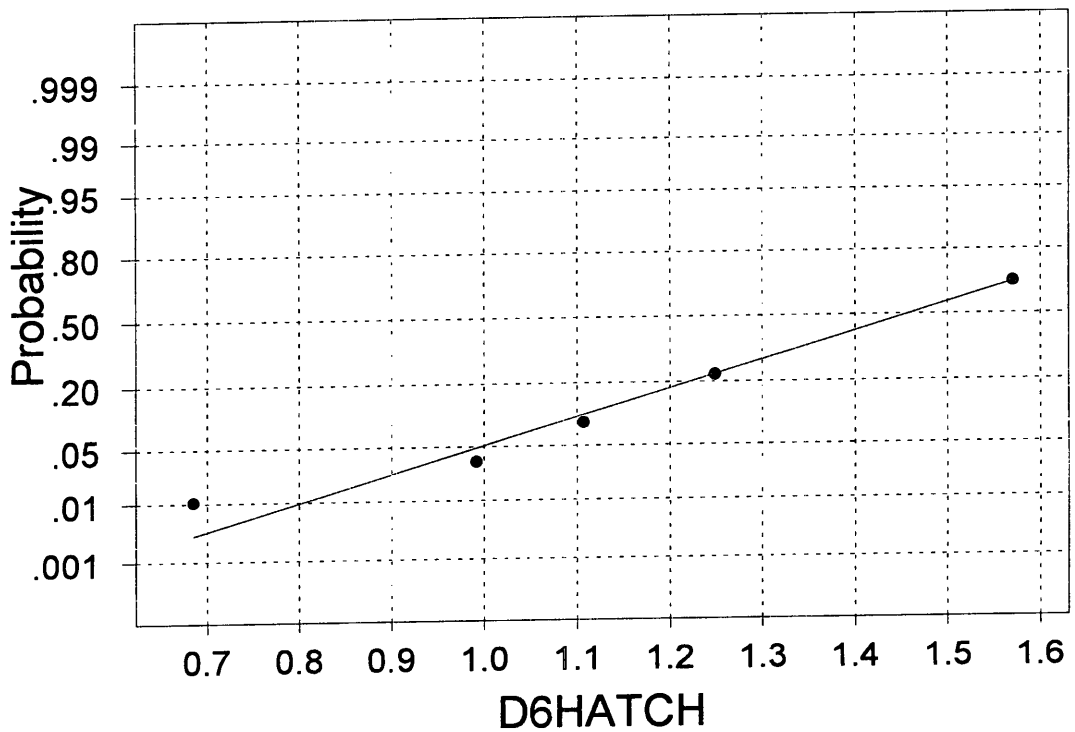
Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for D5HATCH

Source	DF	SS	MS	F	P
STATION	11	0.69207	0.06292	1.26	0.263
FLDREP(STATION)	24	0.96432	0.04018	0.81	0.716
Error	72	3.58463	0.04979		
Total	107	5.24101			

```
MTB >
```

DAY 6 HATCH (STATIONS)

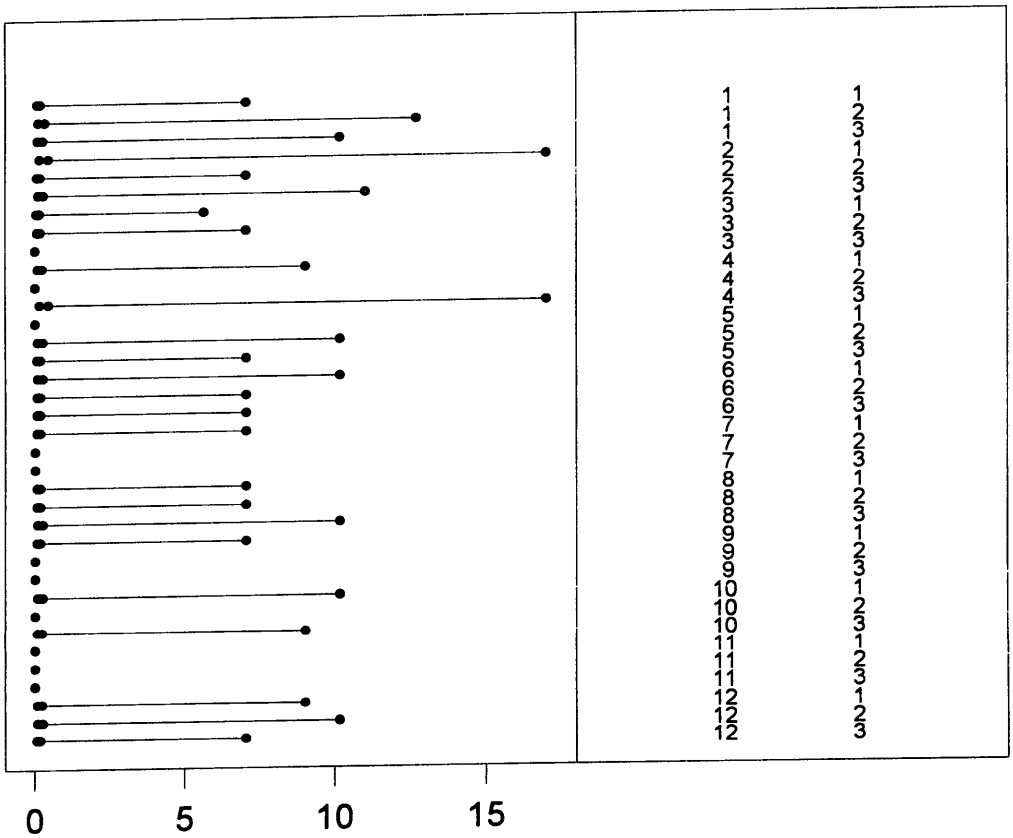


Average: 1.43709
Std Dev: 0.21083
N of data: 108

W-test for Normality
R: 0.9952
p value (approx): > 0.1000

DAY 6 HATCH (STATIONS)

95% Confidence Intervals for Sigmas



Factor Levels

1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3
4	1
4	2
4	3
5	1
5	2
5	3
6	1
6	2
6	3
7	1
7	2
7	3
8	1
8	2
8	3
9	1
9	2
9	3
10	1
10	2
10	3
11	1
11	2
11	3
12	1
12	2
12	3

Bartlett's Test

Test Statistic: -105.619

p value : 1.000

Levene's Test

Test Statistic: 0.589

p value : 0.956

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VMO2PPNC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2PPNC.MTW
Worksheet was saved on 10/13/2000
MTB > ANOVA 'D6HATCH' = C11 C12(C11).
```

Analysis of Variance (Balanced Designs)

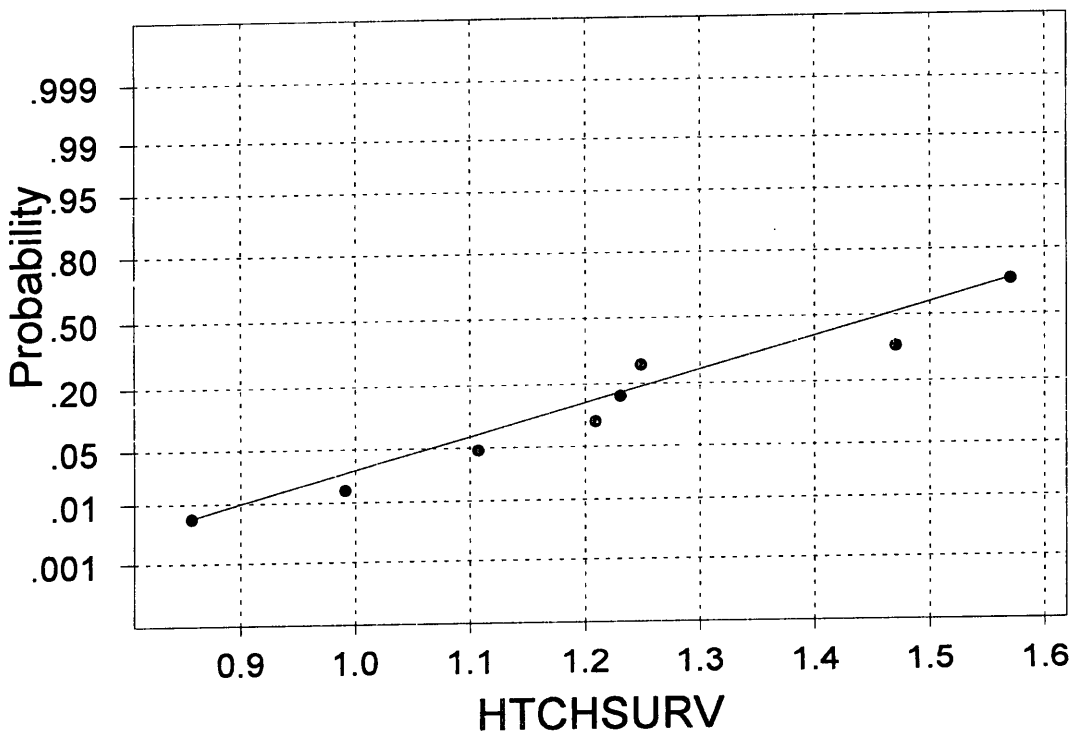
Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for D6HATCH

Source	DF	SS	MS	F	P
STATION	11	0.63220	0.05747	1.29	0.246
FLDREP(STATION)	24	0.92445	0.03852	0.87	0.643
Error	72	3.19942	0.04444		
Total	107	4.75607			

```
MTB >
```

HATCHED FISH SURVIVAL (STATIONS)

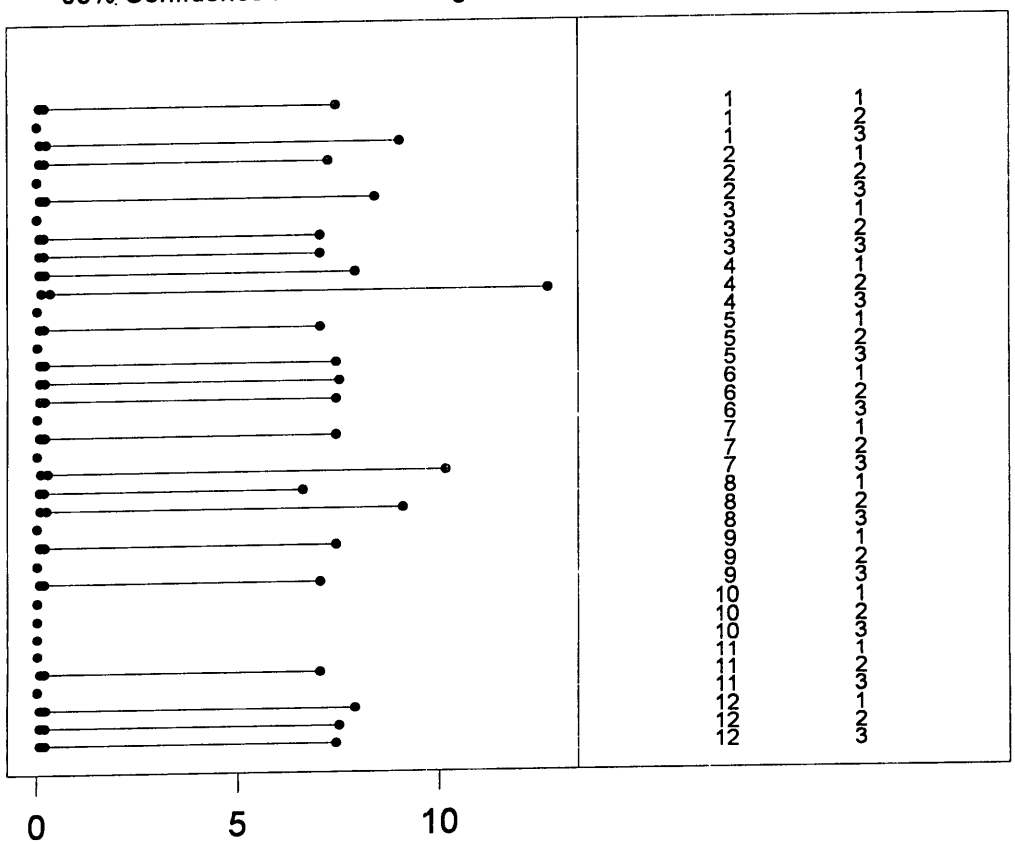


Average: 1.44261
Std Dev: 0.183428
N of data: 108

W-test for Normality
R: 0.9844
p value (approx): 0.0215

HATCHED FISH SURVIVAL (STATIONS)

95% Confidence Intervals for Sigmas



Factor Levels

1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3
4	1
4	2
4	3
5	1
5	2
5	3
6	1
6	2
6	3
7	1
7	2
7	3
8	1
8	2
8	3
9	1
9	2
9	3
10	1
10	2
10	3
11	1
11	2
11	3
12	1
12	2
12	3

Bartlett's Test

Test Statistic: -158.357

p value : 1.000

Levene's Test

Test Statistic: 0.489

p value : 0.989

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VMO2PPNC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2PPNC.MTW
Worksheet was saved on 10/13/2000
MTB > ANOVA 'HTCHSURV' = C11 C12(C11).
```

Analysis of Variance (Balanced Designs)

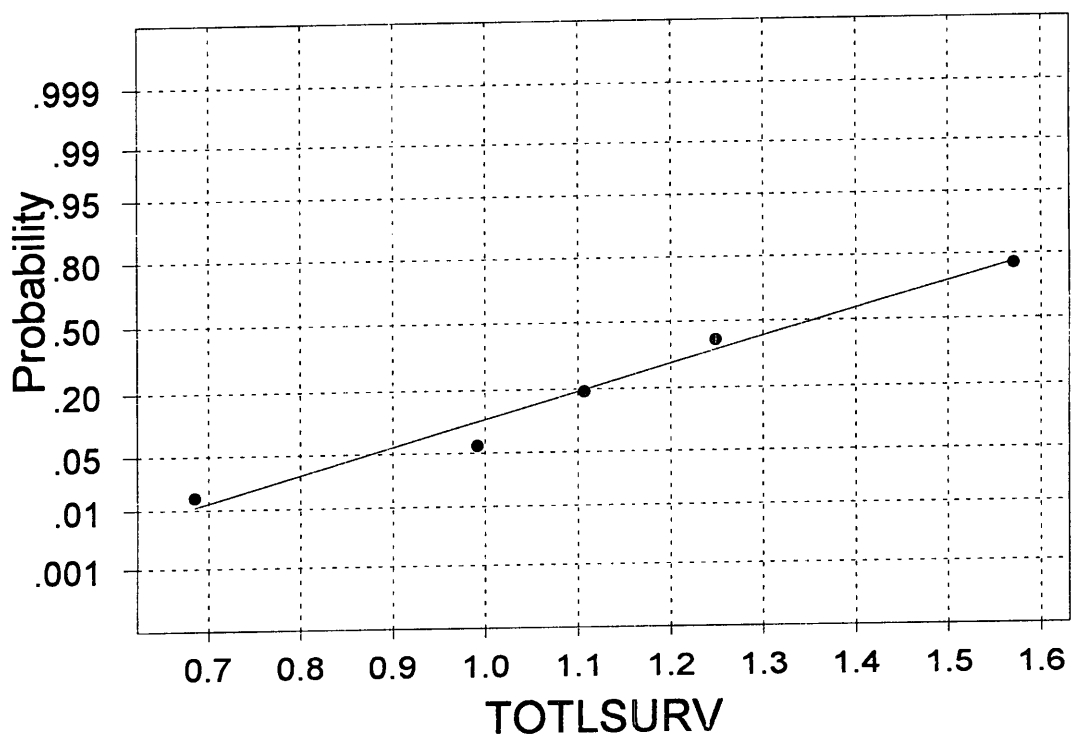
Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for HTCHSURV

Source	DF	SS	MS	F	P
STATION	11	0.31362	0.02851	1.04	0.418
FLDREP(STATION)	24	1.32110	0.05505	2.02	0.012
Error	72	1.96538	0.02730		
Total	107	3.60010			

```
MTB >
```

TOTAL FISH SURVIVAL (STATIONS)

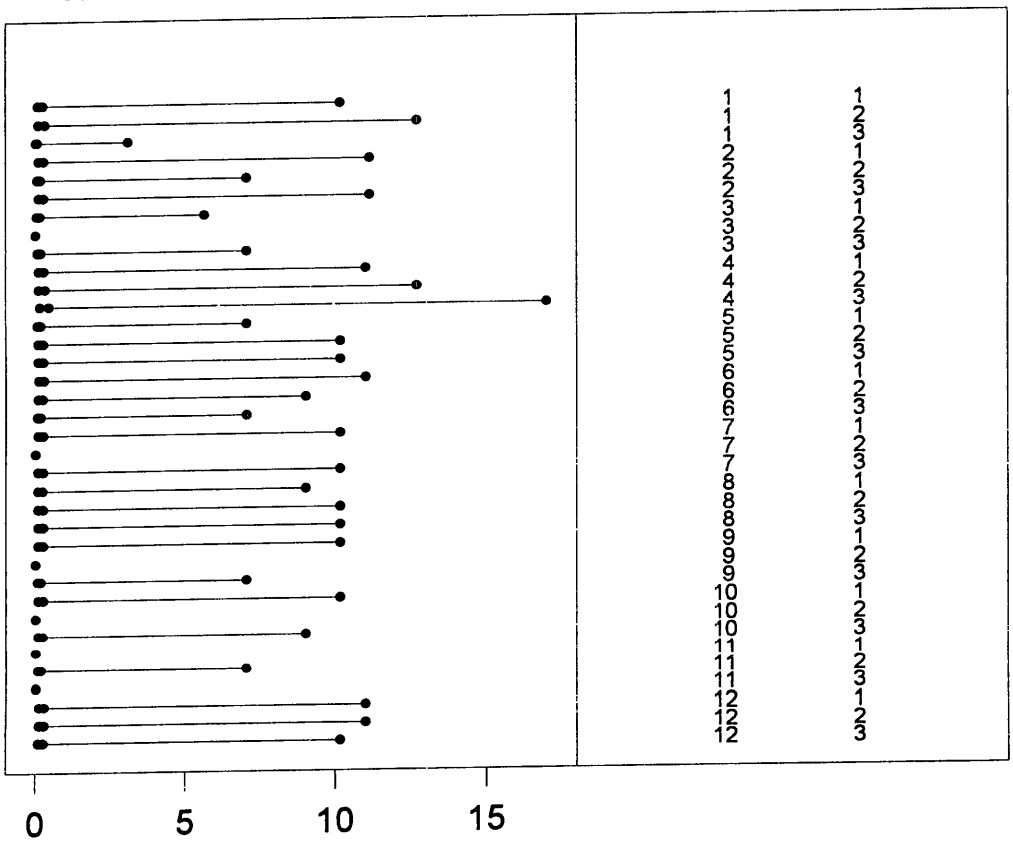


Average: 1.34100
Std Dev: 0.240914
N of data: 108

W-test for Normality
R: 0.9921
p value (approx): > 0.1000

TOTAL FISH SURVIVAL (STATIONS)

95% Confidence Intervals for Sigmas



Factor Levels

1	1
1	2
1	3
2	1
2	2
2	3
3	1
3	2
3	3
4	1
4	2
4	3
5	1
5	2
5	3
6	1
6	2
6	3
7	1
7	2
7	3
8	1
8	2
8	3
9	1
9	2
9	3
10	1
10	2
10	3
11	1
11	2
11	3
12	1
12	2
12	3

Bartlett's Test

Test Statistic: -51.157

p value : 1.000

Levene's Test

Test Statistic: 0.358

p value : 0.999

```
Worksheet size: 100000 cells


MTB > Retrieve  'C:\MTBWIN\DATA\VMO2PPNC.MTW'.
Retrieving worksheet from file: C:\MTBWIN\DATA\VMO2PPNC.MTW
Worksheet was saved on 10/13/2000
MTB > ANOVA 'TOTLSURV' = C11 C12(C11).
```

Analysis of Variance (Balanced Designs)

Factor	Type	Levels	Values							
STATION	fixed	12	1	2	3	4	5	6	7	8
			9	10	11	12				
FLDREP(STATION)	fixed	3	1	2	3					

Analysis of Variance for TOTLSURV

Source	DF	SS	MS	F	P
STATION	11	0.96421	0.08766	1.53	0.138
FLDREP(STATION)	24	1.13269	0.04720	0.83	0.693
Error	72	4.11334	0.05713		
Total	107	6.21023			

```
MTB >
```

COASTAL BIOANALYSTS BASELINE TEST INFO - 10-DAY FW SEDIMENT TESTS

TEST ORGANISMS

Species: H. azteca Source: CC

Age/Life stage: Juvenile 7-14 d (2-3 mm) Feeding: YET @ 0.5ml/d.

Acclimation Water: Type: SFW Hardness: 91 Acclimation Temperature: 23-29° Acclimation Photoperiod 16:8

Notes: DAY 0 WTS:

	TOTAL	TARE	NET	INDIVID X	= X
BEGINNING① :	9.68	7.42	2.26	0.113	0.113
MIDDLE :	7.76	5.51	2.25	0.113	
END :	9.13	6.90	2.23	0.112	

BAL CALIB
TARE 10.00 = 9.99 8/29/00
TOTAL 10.00 = 9.98 9/1/00

① of distribution rotation when adding animals to test

TEST DESIGN

Chamber Size: 300 ml ____ 1000 ml ✓ 37000 ml ____ Other ____ Sediment Volume (ml) 200 Water Volume (ml) 800

Initial No. Organisms per Replicate: 20 No. Replicates: 3 Photoperiod: 16 L: 8 D Randomization Template No. NA

TEST SET UP

Date/Time Sediment & Water Added: 8/28/00 1200-2000 Date/Time Animals Added: 8/29/00 1640

Set-up By (Initials): PD/GB Notes: ____

INSTRUMENTATION

Stem Thermometer No. C1

✓ YSI DO Meter # 1 (SNE8014475

____ YSI DO Meter # 2 (SN91A026329)

____ SP PortapH2 Meter (852360)

____ Corning 240 pH Meter (SN5268)

✓ CP Digisense pH Meter (D9500563)

✓ Sartorius R160P Balance (40020093)

____ YSI SCT 33 Meter (H8016792)

____ Spartan ATC Refractometer (A366)

NOTES:

As Quality Assurance Officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: ____

P Blasco
Signature

10/9/00
Date

File: STF006A

CBI TEST ID: VIRS 0002 HA

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS0002 MA

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	1	23.6	23.7	23.6	23.2	23.3	23.2	23.4	23.0	23.1	23.1	22.8
	2	23.6	23.8	23.6	23.3	23.2	23.3	23.5	23.1	23.2	23.1	22.8
	3	23.7	23.7	23.5	23.5	23.3	23.2	23.3	23.1	23.3	23.2	22.9
	4	23.7	23.7	23.6	23.5	23.4	23.3	23.4	23.2	23.3	23.3	23.0
	5	23.8	23.9	23.6	23.6	23.3	23.3	23.4	23.1	23.3	23.0	22.9
	6	23.7	23.6	23.2	23.6	23.5	23.2	23.5	23.1	23.4	23.1	23.1
	7	23.8	23.8	23.6	23.6	23.4	23.1	23.3	23.1	23.2	23.2	23.0
	8	23.8	23.6	23.4	23.5	23.3	23.3	23.3	23.1	23.2	23.1	23.1
DISS OXYGEN (mg/l)	1	8.6	8.6	8.6	8.5	8.5	8.5	8.5	8.5	8.4	8.5	8.5
	2	8.6	8.5	8.5	8.5	8.4	8.5	8.5	8.4	8.3	8.4	8.5
	3	8.6	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.4	8.5	8.6
	4	8.6	8.4	8.4	8.5	8.4	8.4	8.5	8.5	8.4	8.5	8.5
	5	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.3	8.5	8.5	8.6
	6	8.6	8.4	8.4	8.4	8.5	8.5	8.4	8.5	8.4	8.4	8.3
	7	8.6	8.5	8.5	8.4	8.4	8.4	8.4	8.4	8.4	8.5	8.6
	8	8.5	8.6	8.4	8.4	8.3	8.5	8.4	8.3	8.3	8.3	8.1
REPL. NO:		3	1	2	3	1	3	2	1	3	2	2
INITIALS:		GM	GM	GB	GM	GM	PD	GM	PD	GM	GM	GM

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0002 MA

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	9	23.7	23.6	23.6	23.6	23.4	23.2	23.4	23.1	23.2	23.1	23.1
	10	23.4	23.5	23.6	23.5	23.5	23.3	23.3	23.1	23.1	23.0	22.9
	11	23.6	23.4	23.4	23.6	23.5	23.2	23.3	23.3	23.1	23.1	23.2
	12	23.6	23.4	23.5	23.4	23.3	23.2	23.3	23.0	23.1	22.8	22.8
	13	23.6	23.5	23.4	23.6	23.4	23.3	23.4	23.2	23.2	22.9	22.8
	14	23.7	23.2	23.4	23.2	23.3	23.3	23.5	23.1	23.2	22.9	22.9
	15	23.8	23.2	23.6	23.6	23.4	23.2	23.4	23.0	23.1	23.0	22.8
	16	23.8	23.8	23.6	23.4	23.4	23.2	23.4	23.0	23.3	23.1	22.9
DISSOXYGEN (mg/l)	9	8.6	8.6	8.5	8.6	8.6	8.5	8.5	8.3	8.3	8.4	8.5
	10	8.6	8.6	8.5	8.6	8.5	8.5	8.5	8.4	8.3	8.3	8.4
	11	8.4	8.5	8.5	8.5	8.5	8.4	8.4	8.5	8.4	8.6	8.6
	12	8.6	8.4	8.4	8.4	8.5	8.5	8.5	8.5	8.4	8.3	8.1
	13	8.5	8.5	8.4	8.3	8.4	8.3	8.4	8.3	8.3	8.3	8.4
	14	8.6	8.5	8.4	8.4	8.3	8.5	8.4	8.3	8.4	8.3	8.2
	15	8.6	8.5	8.4	8.5	8.5	8.5	8.4	8.5	8.5	8.3	8.2
	16	8.6	8.3	8.3	8.4	8.3	8.5	8.6	8.4	8.3	8.4	8.5
REPL. NO:		3	1	2	3	1	3	2	1	3	2	2
INITIALS:		GB	GB	GB	GB	GB	JD	GB	JD	GB	GB	GB

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS0002 MA

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	17	23.5	23.4	23.3	23.5	23.4	23.3	23.4	23.3	23.3	23.1	22.4
	18	23.4	23.3	23.5	23.6	23.5	23.4	23.3	23.4	23.2	22.9	22.9
	19	23.5	23.7	23.5	23.6	23.5	23.3	23.3	23.2	23.1	23.2	23.0
	20	23.5	23.8	23.7	23.2	23.5	23.4	23.3	23.1	23.0	23.1	23.0
	21	23.6	23.6	23.6	23.7	23.6	23.5	23.4	23.0	23.1	23.2	22.9
	22	23.7	23.6	23.6	23.6	23.4	23.3	23.5	23.3	23.2	23.1	23.1
	23	23.6	23.5	23.6	23.7	23.4	23.3	23.5	23.2	23.2	23.0	22.8
	24	23.6	23.3	23.6	23.6	23.5	23.5	23.4	23.1	23.3	23.1	22.9
DISSOLVED OXYGEN (mg/l)	17	8.6	8.6	8.6	8.5	8.5	8.5	8.5	8.4	8.3	8.3	8.3
	18	8.3	8.4	8.5	8.4	8.4	8.5	8.5	8.5	8.4	8.3	8.2
	19	8.4	8.3	8.4	8.4	8.4	8.4	8.4	8.5	8.4	8.3	8.2
	20	8.6	8.4	8.4	8.4	8.3	8.5	8.5	8.4	8.3	8.4	8.4
	21	8.6	8.4	8.4	8.5	8.4	8.3	8.4	8.5	8.4	8.3	8.2
	22	8.5	8.4	8.3	8.4	8.5	8.5	8.4	8.4	8.3	8.3	8.3
	23	8.6	8.5	8.4	8.3	8.4	8.5	8.4	8.4	8.3	8.4	8.5
	24	8.6	8.5	8.5	8.4	8.4	8.3	8.4	8.3	8.3	8.4	8.5
REPL. NO:		3	1	2	3	1	3	2	1	3	2	2
INITIALS:		GB	GM	GB	GM	GB	PD	GB	PD	GM	GA	GB

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0002 KA

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	25	23.6	23.6	23.6	23.7	23.5	23.3	23.4	23.1	23.2	23.0	23.2
	26	23.7	23.7	23.5	23.6	23.5	23.5	23.5	23.0	23.3	22.9	22.8
	27	23.7	23.8	23.4	23.7	23.3	23.3	23.4	23.1	23.3	23.0	22.8
	28	23.6	23.7	23.4	23.7	23.2	23.2	23.4	23.1	23.4	22.9	22.8
	29	23.7	23.2	23.5	23.5	23.3	23.5	23.5	23.1	23.2	23.0	23.0
	30	23.5	23.7	23.5	23.6	23.4	23.5	23.3	23.3	23.1	23.1	22.9
	31	23.5	23.7	23.3	23.5	23.5	23.5	23.3	23.3	23.2	22.8	22.9
	32	23.5	23.5	23.4	23.5	23.4	23.5	23.4	23.0	23.0	22.9	23.1
DISSOLVED OXYGEN (mg/l)	25	8.6	8.6	8.5	8.5	8.5	8.6	8.6	8.5	8.4	8.5	8.5
	26	8.6	8.5	8.5	8.6	8.6	8.5	8.6	8.4	8.3	8.3	8.5
	27	8.6	8.5	8.6	8.5	8.5	8.5	8.6	8.4	8.4	8.3	8.3
	28	8.5	8.3	8.4	8.5	8.4	8.5	8.5	8.5	8.4	8.4	8.5
	29	8.4	8.2	8.3	8.4	8.4	8.5	8.4	8.4	8.3	8.4	8.4
	30	8.4	8.3	8.3	8.5	8.4	8.4	8.4	8.3	8.4	8.5	8.5
	31	8.5	8.3	8.3	8.4	8.3	8.5	8.5	8.3	8.4	8.3	8.3
	32	8.6	8.4	8.5	8.4	8.5	8.5	8.4	8.4	8.4	8.3	8.4
REPL. NO:		3	1	2	3	1	3	2	1	3	2	2
INITIALS:		GB	GB	KM	GB	GB	PD	GM	PD	GM	GA	GB

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS0002 HA

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	33	23.5	23.6	23.6	23.7	23.5	23.5	23.4	23.1	23.2	22.9	22.8
	34	23.6	23.5	23.7	23.7	23.6	23.4	23.5	23.2	23.3	22.9	22.8
	35	23.7	23.5	23.6	23.6	23.3	23.2	23.5	23.3	23.3	23.2	22.9
	36	23.6	23.5	23.6	23.5	23.4	23.3	23.5	23.1	23.1	23.0	22.9
	37	23.6	23.5	23.6	23.5	23.4	23.2	23.3	23.4	23.2	23.1	23.1
DISSOLVED OXYGEN (mg/l)	33	8.6	8.6	8.6	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.3
	34	8.6	8.5	8.5	8.5	8.4	8.5	8.5	8.4	8.4	8.4	8.5
	35	8.4	8.4	8.5	8.5	8.5	8.4	8.4	8.6	8.5	8.4	8.3
	36	8.4	8.4	8.4	8.5	8.5	8.4	8.4	8.4	8.4	8.5	8.6
	37	8.5	8.4	8.5	8.4	8.5	8.4	8.4	8.3	8.4	8.4	8.5
REPL. NO:		3	1	2	3	1	3	2	1	3	2	2
INITIALS:		GA	GM	GM	GM	GM	PD	GM	PD	GM	GA	GM

NOTES

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0002 KA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
1	1	0	0	0	0	0	0	0	0	0	20
2		0	0	0	0 (E1)	0	0	0	0	0	20
3		0	0	0	0	0	0	0	0	0	20
4		0	0	0	0	0	0	(E1) 0	0	0	19
5		0	0	0	0	0	0	0	0	(E1) 0	18
6		0	0 (E1)	0	0	0	0	0	0	0	20
7		0	0	0	0	0	0	0	0	0 (E1)	19
8		0	0	0	0	0 (E1)	0	0	0	0	19
9		0	0	0	0	0	0	0	0	0	20
10		0	0	0	0	0	0	0	0	0	20
11		0	0	0	0 (E2)	0	0	0	0	0	20
12		0	0	0	0	0	0	0	0	0	20
13		0	0	0	0	0	0	0	0	0	19
14		0	0	0 (E1)	0	0	0	0	0	0	19
15		0	0	0	0	0	0	0	0	0 (E1)	19
16		0	0	0	0	0	0	0	0	0	18
TIME:		1030	1045	1200	1400	1600	0900	1000	0956	1630	PD/MH/KD
INITIALS:		GB	CB	CB	GB	PD	GB	PD	GB	GB	0930-1510

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIM6 0002 HA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
17	1	0	0	0	0	0	0	0	0	0	20
18		0	0	0	0	0	0	0	0	0	18
19		0	0	0	0	0	0	0	0 (E1)	0	20
20		0	0	0	0	0	0	0	0	0	20
21		0	0	0	0	0 (E1)	0	0	0	0	19
22		0	0	0 (E2)	0	0	0	0	0	0	19
23		0	0	0	0	0	0	0	0	0	19
24		0	0	0	0	0	0	0	0	0	20
25		0	0	0	0	0	0	0	0	0	20
26		0	0	0	0	0	0	0	0	0	20
27		0	0	0	0	0	0	0	0	0 (E1)	20
28		0	0	0	0	0	0	0	0	0	19
29		0	0	0	0	0	0	0 (E1)	0	0	19
30		0	0	0	0	0	0	0	0	0	20
31		0	0	0	0	0 (E1)	0	0	0	0	18
32		0	0	0	0	0	0	0	0	0	19
TIME:		1030	1030	1200	1400	1600	0900	1000	0950	1630	PB/MH/GB
INITIALS:		GM	GB	GB	GM	PB	GB	PB	LB	GB	0930-1510

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS0002 HA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
33	1	0	0	0	0	0	0	0	0	0	20
34		0	0	0	0	0	0	0	0	0	18
35		0	0	0	0	0	0	0	0	0	20
36		0	0	0	0	0	0	0	0	0(2E)	19
37		0	0	0	0	0(E1)	0	0(E1)	0	0	20
1	2	0	0	0	0	0	0	0	0	0(E1)	16
2		0	0	0	0	0	0	0	0	0	15
3		0	0	0	0	0	0	0	0	0	19
4		0	0	0	0	0	0	0	0	0(E2)	16
5		0	0	0	0	0	0	0	0	0	17
6		0	0	0	0	0	0	0	0	0	19
7		0	0	0	0	0	0	0	0	0	19
8		0	0	0(E2)	0	0(E1)	0	0	0	0	19
9		0	0	0	0	0	0	0	0	0	20
10		0	0	0	0	0	0	0	0	0	20
11		0	0	0	0	0	0	0	0	0	18
TIME:		1030	1030	1200	1400	1600	0900	1000	0950	1630	PD/MM/GB
INITIALS:		GB	GB	GB	GB	PD	GB	PD	GB	GB	0930-1030

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0002 HA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
12	2	0	0	0	0	0 (E1)	0	0	0	0	18
13		0	0	0	0	0	0	0	0	0	19
14		0	0	0	0	0	0	0	0	0	19
15		0	0	0	0	0	0	0	0	0	19
16		0	0	0 (E1)	0	0	0	0	0	0	19
17		0	0	0	0	0	0	0	0	0	18
18		0	0	0	0	0	0	0	0	0	20
19		0	0	0	0	0	0	0	0	0 (E1)	18
20		0	0	0	0	0	0	0	0	0	17
21		0	0	0	0	0	0	0	0	0	18
22		0	0	0 (E1)	0	0	0	0 (E2)	0	0	20
23		0	0	0	0	0	0	0	0	0	18
24		0	0	0	0	0	0	0	0	0	20
25		0	0	0	0	0 (E1)	0	0	0	0	20
26		0	0	0	0	0	0	0	0	0	18
27		0	0	0	0	0	0	0	0 (E2)	0	19
TIME:		1030	1030	1200	1400	1600	0900	1000	0950	1630	[illegible]
INITIALS:		GB	GB	GB	GB	PD	GB	PD	GB	GB	0930-1510

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 002 MA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
28	2	0	0	0	0	0	0	0	0	0	19
29		0	0	0	0	0	0	0	0	0	16
30		0	0	0	0 (E2)	0	0	0	0	0	19
31		0	0	0	0	0	0	0	0	0	17
32		0	0	0	0	0	0	0	0	0 (E1)	17
33		0	0	0	0	0	0	0	0	0 (E1)	17
34		0	0	0	0	0	0	0	0	0	19
35		0	0	0	0	0	0	0	0	0	17
36		0	0	0	0	0	0	0	0	0 (E1)	19
37		0	0	0	0	0 (E1)	0	0	0	0 (E2)	13
1	3	0	0	0	0	0 (E1)	0	0	0	0	20
2		0	0	0	0	0	0	0	0	0	19
3		0	0	0	0	0	0	0	0	0	19
4		0	0	0	0	0	0	0	0	0	19
5		0	0	0	0 (E1)	0	0	0	0	0	19
6		0	0	0	0	0	0	0	0	0	20
TIME:		1630	1030	1200	1400	1600	0900	1000	0950	1630	pd and 1615
INITIALS:		CM	LM	LM	CM	PO	LM	PO	CM	GB	0930-1510

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIM0002 MA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
7	3	0	0	0	0	0	0	0	0	0	19
8		0	0	0	0	0	0	0	0	0	19
9		0	0	0	0	0	0	0	0 (E1)	0	18
10		0	0	0	0	0	0	0	0	0	20
11		0	0	0	0	0	0	0	0	0	19
12		0	0	0 (E1)	0	0	0	0	0	0	20
13		0	0	0	0	0	0	0 (E2)	0	0	20
14		0	0	0	0	0	0	0	0	0	19
15		0	0	0	0	0	0	0	0	0 (E1)	20
16		0	0	0	0	0	0	0	0	0	19
17		0	0	0	0	0	0	0	0	0	20
18		0	0	0	0	0	0	0	0	0	19
19		0	0	0	0	0	0	0 (E1)	0	0	20
20		0	0	0	0 (E2)	0	0	0	0	0 (E2)	18
21		0	0	0	0	0	0 (E2)	0	0	0 (E1)	19
22		0	0	0	0	0	0	0	0	0	20
TIME:		1030	1030	1200	1400	1600	0900	1000	0950	1630	PD/MH/GB
INITIALS:		GB	GM	GM	GM	PD	GM	PD	GB	GB	0950-1010

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS0002 HA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
23	3	0	0	0	0	0 (E1)	0	0	0	0	20
24		0	0	0	0	0	0 (E1)	0	0	0	20
25		0	0	0	0	0	0	0	0	0	20
26		0	0	0	0	0	0	0	0	0	20
27		0	0	0	0	0	0	0	0	0	20
28		0	0	0	0	0	0	0	0	0	20
29		0	0	0	0	0 (E2)	0	0	0	0	19
30		0	0	0 (E1)	0	0	0	0	0	0	19
31		0	0	0	0	0	0 (E1)	0	0	0	20
32		0	0	0	0	0	0	0	0	0	18
33		0	0	0	0	0	0	0	0 (E2)	0	18
34		0	0	0	0	0	0	0	0	0	20
35		0	0	0	0	0	0	0	0	0 (E1)	20
36		0	0	0	0	0	0	0	0	0	18
37		0	0	0	0	0	0	0	0	0	17
TIME:		1030	1030	1200	1400	1600	0900	1000	0950	1630	0930-1510
INITIALS:		CM	GB	GB	CM	PD	CM	PD	GB	GB	PD/MM/DS

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

ORGANISM DRY WEIGHT (mg) SEDIMENT TEST File:STF008B CBI TEST ID: VIMS0002 HA

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
1	1	1	7.87	6.12	SEE SPREAD SHEET		17	1	17	7.78	5.76	SEE SPREAD SHEET	
2		2	7.92	6.22			18		18	8.09	6.36		
3		3	8.60	6.51			19		19	8.44	6.54		
4		4	8.68	7.29			20		20	8.13	6.17		
5		5	9.15	7.54			21		21	7.51	5.93		
6		6	7.88	6.02			22		22	9.34	7.49		
7		7	8.54	6.92			23		23	7.88	6.75		
8		8	8.46	6.70			24		24	8.44	6.84		
9		9	8.28	6.59			25		25	9.51	7.90		
10		10	9.65	7.36			26		26	10.20	8.75		
11		11	9.24	6.83			27		27	10.56	8.54		
12		12	9.99	7.95			28		28	9.14	7.96		
13		13	10.43	8.89			29		29	8.76	7.36		
14		14	8.45	7.05			30		30	10.31	8.60		
15		15	8.42	7.03			31		31	9.12	7.89		
16		16	8.22	6.56			32		32	9.97	8.27		

TARE WT.: DATE 9/6/00 INITIALS: MJ CALIB. (CLASS S 10 MG): 10.00

TOTAL WT.: DATE 9/13/00 INITIALS: GB CALIB. (CLASS S 10 MG): 9.99

NOTES

ORGANISM DRY WEIGHT (mg) SEDIMENT TEST File:STF008B CBI TEST ID: VIMS DAUG HA

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
33	1	33	9.27	7.77			12	2	49	9.58	8.17		
34		34	10.05	8.70			13		50	8.12	6.74		
35		35	8.91	7.71			14		51	8.85	7.13		
36		36	8.64	7.36			15		52	9.16	7.81		
37		37	8.72	7.33			16		53	9.45	7.85		
1	2	38	8.95	7.76			17		54	8.59	7.24		
2		39	9.28	7.95			18		55	8.67	7.28		
3		40	8.77	7.07			19		56	8.64	6.86		
4		41	8.50	7.48			20		57	8.61	6.77		
5		42	8.41	7.44			21		58	9.27	8.00		
6		43	8.24	6.72			22		59	8.72	7.38		
7		44	6.82	5.89			23		60	8.56	7.58		
8		45	8.85	7.04			24		61	8.17	6.66		
9		46	8.45	7.00			25		62	8.66	6.71		
10		47	8.14	6.17			26		63	8.28	6.82		
11		48	8.52	6.89			27		64	8.71	6.76		

TARE WT.: DATE 9/4/00 INITIALS: AD CALIB. (CLASS S 10 MG): 10.00

TOTAL WT.: DATE 9/13/00 INITIALS: GB CALIB. (CLASS S 10 MG): 9.99

NOTES

ORGANISM DRY WEIGHT (mg) SEDIMENT TEST File:STF008B CBI TEST ID: UIMS0002 MA

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
28	2	65	8.10	6.83			7	3	81	9.14	7.81		
29		66	8.18	6.79			8		82	10.47 ~~10.47~~	8.61		
30		67	8.75	7.11			9		83	9.02	7.49		
31		68	8.72	7.32			10		84	9.90	8.10		
32		69	8.03	6.82			11		85	9.75 ~~9.9~~	7.89		
33		70	7.72	5.71			12		86	9.76	8.36		
34		71	6.70	4.97			13		87	9.74	8.13		
35		72	8.27	6.49			14		88	10.12	8.60		
36		73	9.21	7.31			15		89	10.31	8.70		
37		74	7.59	6.32			16		90	10.70	8.55		
1	3	75	9.27	7.82			17		91	9.21	7.40		
2		76	8.87	7.15			18		92	8.75	7.03		
3		77	9.39	7.14			19		93	7.99	6.08		
4		78	7.75	6.30			20		94	8.52	6.29		
5		79	9.76	7.79			21		95	8.96	6.08		
6		80	~~8.~~ 9.03	7.53			22		96	9.96	7.23		

TARE WT.: DATE 9/6/00 INITIALS: CD CALIB. (CLASS S 10 MG): 10.00

TOTAL WT.: DATE 9/14/00 INITIALS: MA CALIB. (CLASS S 10 MG): 9.99

NOTES

ORGANISM DRY WEIGHT (mg) SEDIMENT TEST File:STF008B CBI TEST ID: VLMS 0002 Nd

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
23	3	97	10.31	7.85									
24		98	9.81	7.50									
25		99	9.01	6.84									
26		100	9.76	7.74									
27		101	11.18	8.35									
28		102	10.39	8.53									
29		103	10.51	8.11									
30		104	10.97	8.88									
31		105	11.38	8.84									
32		106	10.22	8.40									
33		107	9.85	7.40									
34		108	8.59	6.67									
35		109	9.46	7.71									
36		110	9.76	7.19									
37		111	8.83	7.21									

TARE WT.: DATE 9/6/00 INITIALS: PD CALIB. (CLASS S 10 MG): 10.00

TOTAL WT.: DATE 9/14/00 INITIALS: MH CALIB. (CLASS S 10 MG): 9.99

NOTES

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 * (mg/l)	Hardness* (mg/l)	Alkalinity * (mg/l)	
1 (1) (POOLED REP*)	7.82	303	1.28	98	53	
2	7.82	431	1.52	92	61	
3	7.82	439	1.56	142	66	
4	7.45	276	0.80	90	44	
5	7.75	278	1.04	98	49	
6	7.67	335	3.20	100	53	
7	7.73	275	1.00	86	70	
8	7.88	561	1.28	156	80	
9	7.72	285	1.16	88	48	
10	7.71	302	0.28	108	66	
11	8.03	560	1.56	158	71	
12	7.86	277	0.40	92	57	
13	7.77	845	0.80	132	51	
14	7.74	331	0.56	96	47	
15	7.80	285	5.20	102	53	
16	8.03	382	7.20	126	110	
17	7.75	340	4.00	106	53	
18	7.70	673	2.72	104	49	
19	7.51	302	4.40	118	52	
20	7.93	341	2.72	146	74	
~~21~~ 21	7.82	294	1.28	108	46	
22	7.82	646	1.04	136	42	
23	7.52	324	1.04	96	47	
24	7.89	304	1.04	118	46	
25	7.66	312	2.32	112	49	

Test Day 0 Date 8/29/06 Initials GA

TEST ID VIMS 0002 HA

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l) *	Hardness (mg/l) *	Alkalinity (mg/l) *
26 (1) (Pool up) *	7.75	291	9.60 ~~1.28~~	126	41
27 ↓	7.82	323	4.00 ~~1.52~~	110	71
28	7.73	274	0.480 ~~1.56~~	84	48
29	7.86	442	2.08	148	56
30	7.69	296	2.12	102	53
31	7.56	272	2.00	124	41
32	7.75	278	2.48	124	45
33	7.67	362	2.88	90	52
34	7.77	285	2.08	112	44
35	7.70	294	1.88	108	47
36	7.85	296	1.16	106	50
37	7.83	268	4.00	114	44

Test Day 0 Date 8/29/00 Initials GB

TEST ID UIMS 0002 HA

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
1 ② pooled	8.05	305	3.68	90	47	
2	7.93	547	2.89	126	56	
3	8.03	581	3.52	118	71	
4	7.51	277	1.28	98	44	
5	7.74	282	2.36	94	35	
6	8.13	420	0.56	102	44	
7	7.73	271	16.8	106	33	
8	8.13	729	3.92	122	83	
9	7.68	268	1.16	92	25	
10	7.93	345	2.00	122	57	
11	8.13	764	4.80	164	85	
12	7.87	291	4.80	96	43	
13	7.80	1325	2.32	170	29	
14	8.20	416	3.92	112	51	
15	7.82	284	2.60	100	44	
16	8.21	412	1.28	178	118	
17	8.27	448	1.92	128	53	
18	7.85	1077	4.80	126	31	
19	7.84	500	15.20	136	46	
20	8.04	346	0.32	120	84	
21	7.87	352	0.28	114	53	
22	7.77	1032	0.36	132	24	
23	7.63	357	0.44	82	19	
24	8.01	304	2.96	114	62	
25	8.22	399	0.32	132	62	

Test Day 10 Date 9/8/00 Initials CB

TEST ID VIMS0002 4A

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
26 (2) pooled	7.93	277	0.44	136	51	
27	8.11	359	0.32	142	98	
28	7.42	249	0.28	64	19	
29	8.16	877	0.28	142	105	
30	7.48	314	0.26	86	15	
31	7.41	268	0.32	88	21	
32	7.75	276	0.32	90	28	
33	7.99	547	0.32	132	62	
34	7.83	312	0.28	112	30	
35	7.53	318	0.32	108	26	
36	8.03	382	0.36	104	54	
37	7.68	278	0.28	142	43	

Test Day 10 Date 9/8/00 Initials GB

TEST ID VIMS0002 HA

COASTAL BIOANALYSTS BASELINE TEST INFO - 10-DAY FW SEDIMENT TESTS

TEST ORGANISMS

Species: P. promelas Source: CC

Age/Life stage: < 48h embryo (> noon 8/27) Feeding: Artemia nauplii @ hatch

Acclimation Water: Type: SFW Hardness: 97 Acclimation Temperature: 25°C Acclimation Photoperiod: 16:8 LID

Notes:

TEST DESIGN

Chamber Size: 300 ml ____ 1000 ml ✓ 37000 ml ____ Other ____ Sediment Volume (ml) 200 Water Volume (ml) 800

Initial No. Organisms per Replicate: 10 No. Replicates: 3 Photoperiod: 16 L: 8 D Randomization Template No. NA

TEST SET UP

Date/Time Sediment & Water Added: 8/28/00 1200 - 2000 Date/Time Animals Added: 8/29/00 1100 - 1200

Set-up By (Initials): PD/GB Notes:

INSTRUMENTATION

Stem Thermometer No. C1

✓ YSI DO Meter # 1 (SNE8014475

✓ YSI DO Meter # 2 (SN91A026329)

____ SP PortapH2 Meter (852360)

____ Corning 240 pH Meter (SN5268)

✓ CP Digisense pH Meter (D9500563)

✓ Sartorius R160P Balance (40020093)

____ YSI SCT 33 Meter (H8016792)

____ Spartan ATC Refractometer (A366)

NOTES:

Feeding started day 1 since some hatching - AD

As Quality Assurance Officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments:

P Blasco 10/7/00

Signature Date

File: STF006A

CBI TEST ID: VIMS 0002 CPP

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	1	NA	24.4	24.5	24.5	24.6	24.8	24.3	24.5	24.4	24.6	24.6
	2		24.4	24.6	24.6	24.6	24.9	24.4	24.5	24.5	24.5	24.7
	3		24.6	24.6	24.6	24.4	25.0	24.4	24.4	24.6	24.5	24.7
	4		24.5	24.5	24.5	24.3	25.1	24.5	24.5	24.5	24.6	24.8
	5		24.5	24.4	24.4	24.3	24.8	24.4	24.3	24.4	24.7	24.8
	6		24.6	24.4	24.4	24.2	24.9	24.5	24.5	24.4	24.3	24.8
	7		24.3	24.3	24.3	24.3	24.7	24.6	24.4	24.4	24.4	24.7
	8		24.2	24.1	24.4	24.1	25.0	24.4	24.5	24.4	24.5	24.6
DISS OXYGEN (mg/l)	1		8.1	8.0	8.1	8.1	8.0	8.0	8.0	8.0	8.0	7.9
	2		8.2	8.1	8.1	8.1	8.1	8.0	8.0	8.0	8.0	7.6
	3		8.1	8.1	8.0	8.1	8.1	8.0	8.0	8.0	8.0	7.8
	4		8.0	8.1	8.0	8.1	8.0	7.9	8.1	8.1	7.9	8.2
	5		8.1	8.1	7.9	8.0	8.0	8.0	8.0	8.0	7.9	8.1
	6		8.0	8.2	8.1	8.1	8.1	8.0	8.0	7.9	8.1	8.1
	7		8.0	8.2	8.1	8.1	8.0	7.9	7.9	7.9	8.0	7.6
	8		8.0	8.2	7.9	8.0	8.0	7.9	8.0	8.0	7.9	8.1
REPL. NO:			2	3	1	2	2	1	1	2	3	1
INITIALS:			GB	GB	GB	GB	PD	GB	PD	GB	GB	GB

BEFORE RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0002 CPP

BEFORE RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	9	NA	24.2	24.6	24.6	24.3	24.6	24.6	24.3	24.3	24.4	24.4
	10		24.4	24.3	24.5	24.2	24.8	24.6	24.1	24.4	24.4	24.5
	11		24.3	24.4	24.4	24.2	24.7	24.5	24.2	24.4	24.4	24.5
	12		24.2	24.3	24.4	24.1	24.8	24.3	24.4	24.5	24.5	24.6
	13		24.2	24.3	24.5	24.3	24.9	24.4	24.4	24.4	24.4	24.5
	14		24.3	24.2	24.3	24.3	25.0	24.4	24.5	24.5	24.6	24.5
	15		24.1	24.3	24.3	24.4	25.0	24.4	24.1	24.5	24.6	24.6
	16		24.1	24.2	24.2	24.3	24.5	24.3	24.2	24.5	24.7	24.4
DISS OXYGEN (mg/l)	9		8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.1
	10		8.2	8.1	8.0	8.0	8.1	7.9	8.0	8.0	7.9	7.9
	11		8.1	8.1	8.1	7.9	8.0	7.9	8.0	7.9	7.8	7.7
	12		8.0	8.1	8.1	7.9	8.0	7.9	7.9	8.0	7.8	8.2
	13		8.0	8.1	8.1	7.8	8.0	8.0	7.9	7.9	7.9	8.2
	14		7.9	8.1	8.0	8.0	7.6	7.7	8.0	7.9	7.8	7.7
	15		7.9	8.0	8.1	8.1	8.1	7.9	8.0	7.9	7.8	8.2
	16		8.0	8.2	8.1	8.0	8.0	7.9	7.9	7.9	8.0	7.9
REPL. NO:			2	3	1	2	2	1	1	2	3	1
INITIALS:			GM	GM	GM	GM	PD	GM	PD	GM	GM	GM

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	17	NA	24.1	24.3	24.3	24.2	24.9	24.6	24.4	24.5	24.4	24.5
	18		24.3	24.2	24.2	24.2	24.8	24.6	24.3	24.6	24.4	24.4
	19		24.3	24.3	24.3	24.3	25.7	24.6	24.5	24.6	24.5	24.5
	20		24.4	24.4	24.5	24.4	25.8	24.6	24.3	24.5	24.6	24.3
	21		24.4	24.3	24.5	24.5	24.9	24.6	24.3	24.3	24.6	24.4
	22		24.2	24.3	24.6	24.5	24.8	24.5	24.3	24.3	24.6	24.6
	23		24.1	24.2	24.4	24.5	25.0	24.4	24.5	24.4	24.6	24.6
	24		24.2	24.4	24.5	24.6	24.9	24.3	24.1	24.2	24.4	24.5
DISSOLVED OXYGEN (mg/l)	17		8.0	8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0	8.1
	18		8.0	8.1	8.0	8.0	8.0	8.0	8.0	7.9	7.9	8.1
	19		8.0	8.1	8.0	8.0	8.1	7.9	8.0	7.9	7.8	8.1
	20		8.0	8.2	8.0	7.9	8.1	8.1	7.9	7.9	7.8	7.8
	21		8.1	8.1	7.9	7.9	8.0	8.0	8.0	8.0	7.9	8.1
	22		8.1	8.0	8.0	7.9	8.0	8.1	8.0	7.9	7.7	7.4
	23		8.2	8.1	8.0	8.1	8.0	8.1	8.0	8.0	7.9	7.6
	24		8.1	8.1	7.9	8.0	8.0	8.0	8.0	8.0	8.1	8.2
REPL. NO:			2	3	1	2	2	1	1	2	3	1
INITIALS:			GM	GM	GM	GM	PD	GD	PD	GA	GM	GM

BEFORE RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	25	NA	24.1	24.3	24.5	24.4	24.7	24.6	24.3	24.4	24.3	24.5
	26		24.0	24.4	24.5	24.7	24.7	24.5	24.4	24.5	24.4	24.6
	27		24.1	24.5	24.6	24.6	24.7	24.6	24.3	24.5	24.4	24.7
	28		24.3	24.5	24.7	24.6	24.6	24.6	24.4	24.4	24.5	24.6
	29		24.1	24.3	24.6	24.6	24.7	24.5	24.4	24.5	24.5	24.5
	30		24.1	24.1	24.6	24.5	25.0	24.6	24.5	24.3	24.6	24.5
	31		24.3	24.2	24.4	24.5	24.7	24.4	24.3	24.3	24.5	24.4
	32		24.2	24.1	24.2	24.4	24.8	24.4	24.3	24.3	24.6	24.3
DISS OXYGEN (mg/l)	25		8.1	8.1	8.0	8.1	8.0	8.0	8.0	8.0	7.9	8.1
	26		8.1	8.1	8.0	8.0	8.0	8.0	7.9	7.8	7.9	8.1
	27		8.2	8.1	8.0	7.9	7.4	7.7	7.9	7.9	8.0	8.1
	28		8.2	8.1	8.0	8.0	8.0	7.7	8.0	7.8	8.0	8.1
	29		8.1	8.1	8.0	8.0	8.1	7.6	7.9	7.8	7.8	7.6
	30		7.9	8.0	8.1	7.9	8.0	7.7	7.9	7.8	7.7	7.8
	31		8.1	8.2	7.9	8.0	7.0	7.4	7.6	7.7	7.7	8.0
	32		8.0	8.1	8.0	7.9	8.0	8.0	8.0	7.9	7.8	8.0
REPL. NO:			2	3	1	2	2	1	1	2	3	1
INITIALS:			GM	GB	GM	GB	PO	GB	PO	GM	GB	GB

BEFORE RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	33	NA	24.3	24.3	24.5	24.5	24.9	24.6	24.2	24.3	24.4	24.7
	34		24.3	24.3	24.5	24.6	24.9	24.5	24.4	24.4	24.4	24.6
	35		24.1	24.4	24.6	24.6	25.8	24.5	24.4	24.4	24.5	24.7
	36		24.2	24.3	24.5	24.5	25.0	24.4	24.1	24.5	24.4	24.6
	37		24.4	24.4	24.4	24.5	24.6	24.6	24.5	24.6	24.6	24.5
DISS OXYGEN (mg/l)	33		8.1	8.1	8.0	8.0	8.0	7.4	7.9	7.9	7.7	8.1
	34		8.0	8.1	8.0	7.4	8.0	7.8	7.9	7.8	7.8	7.4
	35		8.0	8.1	8.0	7.9	8.1	7.8	7.9	7.8	7.8	8.1
	36		8.0	8.0	7.4	7.9	8.0	7.9	8.0	7.9	7.9	8.1
	37		8.1	8.2	8.1	8.0	7.9	8.0	8.0	8.0	8.1	7.9
REPL. NO:			2	3	1	2	2	1	1	2	3	1
INITIALS:			GB	GB	GB	GB	PH	GB	PD	GB	GB	GB

BEFORE RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	1	NA	7.47	8.01	8.00	7.98	7.99	8.01	7.99	8.02	8.01	7.90
	2		7.92	8.00	7.95	7.96	7.93	7.95	8.01	8.01	8.01	7.78
	3		8.07	8.03	8.05	8.01	7.99	7.98	8.03	7.99	7.97	7.74
	4		7.84	7.92	7.92	7.95	7.95	7.96	8.03	8.05	8.01	7.79
	5		7.95	7.98	7.97	7.96	7.86	7.85	8.02	7.91	7.90	7.76
	6		7.89	7.86	7.88	7.87	7.89	7.81	8.05	7.89	7.91	7.88
	7		7.86	7.88	7.85	7.81	7.83	7.80	7.82	7.81	7.80	7.81
	8		8.08	8.11	8.10	8.03	7.99	7.92	7.99	7.95	7.92	7.79
CONDUCTIVTY (uS/cm)	1		296	295	279	281	280	283	290	285	287	297
	2		424	404	353	402	344	351	338	328	328	297
	3		492	413	363	381	342	349	345	351	352	310
	4		262	271	267	269	279	282	283	281	282	286
	5		274	280	280	283	280	281	299	285	287	302
	6		283	323	306	316	302	310	327	312	315	310
	7		280	282	234	280	281	281	295	291	299	290
	8		623	504	424	468	365	415	415	410	415	364
REPL. NO:			2	3	2	2	2	1	1	2	3	1
INITIALS:			CB	LM	CB	LM	PD	LM	PD	LMB	LM	LMB

BEFORE RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	9	NA	7.91	7.94	7.92	7.93	7.96	7.91	7.99	7.99	7.96	7.65
	10		7.88	8.04	7.92	7.99	7.99	7.95	7.96	7.99	7.97	7.90
	11		8.18	8.00	8.03	8.01	8.03	7.99	8.01	7.99	8.03	7.95
	12		7.99	7.98	7.99	7.99	7.97	7.81	7.93	7.87	7.95	7.84
	13		7.85	7.91	7.87	7.89	7.99	7.89	7.95	7.91	7.93	7.80
	14		7.86	7.92	7.87	7.89	7.89	7.86	7.88	7.87	7.86	7.96
	15		7.92	7.98	7.95	7.98	7.96	7.90	7.95	7.93	7.91	7.86
	16		8.16	8.16	8.17	8.15	8.13	8.01	8.06	8.08	8.10	7.90
CONDUCTIVITY (uS/cm)	9		286	284	275	281	281	282	286	277	275	283
	10		305	293	299	295	292	301	311	304	310	306
	11		670	536	429	461	396	410	415	411	420	385
	12		287	279	281	277	280	291	296	295	297	295
	13		976	704	568	601	474	495	515	510	511	475
	14		347	329	303	309	315	306	308	310	315	305
	15		282	273	261	265	280	282	284	291	295	297
	16		389	356	317	342	318	321	327	322	321	319
REPL. NO:			2	3	2	2	2	1	1	2	3	1
INITIALS:			GA	GA	GA	GA	PD	GA	PD	GM	GA	GA

BEFORE PENETRATION

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	17	NA	7.92	7.97	7.95	7.99	7.96	7.92	7.96	7.97	7.99	7.90
	18		7.84	7.81	7.82	7.85	7.89	7.87	7.95	8.01	8.03	7.74
	19		7.86	8.06	7.96	7.99	8.00	7.99	8.02	8.02	8.03	7.78
	20		8.14	8.10	8.01	8.05	8.03	7.70	7.79	7.86	7.85	7.69
	21		8.01	8.06	8.05	8.06	8.07	7.72	7.78	7.76	7.77	7.88
	22		7.89	7.84	7.91	7.87	7.86	7.67	7.86	7.81	7.81	7.57
	23		7.82	7.83	7.82	7.82	7.85	7.66	7.71	7.72	7.71	7.68
	24		8.01	8.05	8.03	8.04	8.00	7.81	7.80	7.78	7.69	7.89
CONDUCTIVTY (uS/cm)	17		362	324	299	301	308	310	295	299	297	326
	18		831	614	541	551	470	501	513	510	515	417
	19		248	302	317	310	329	324	313	310	315	284
	20		343	310	318	317	312	303	308	305	310	304
	21		287	282	288	289	282	293	302	292	298	298
	22		824	587	565	571	470	481	468	464	475	391
	23		329	309	306	310	307	387	313	318	315	291
	24		295	286	282	281	295	294	298	295	297	291
REPL. NO:			2	3	2	2	2	1	1	2	3	1
INITIALS:			GB	GB	GB	GB	PD	GB	PD	GB	GB	GB

BEFORE RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: Vims 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	25	NA	7.85	7.83	7.85	7.85	7.88	7.84	7.90	7.92	7.93	7.96
	26		8.00	7.91	7.92	7.92	7.91	7.81	7.81	7.81	7.80	7.82
	27		8.12	8.09	8.08	8.01	8.03	7.85	7.89	7.88	7.91	7.88
	28		7.88	7.90	7.89	7.91	7.96	7.78	7.91	7.79	7.76	7.72
	29		8.18	8.09	8.01	8.07	8.03	7.67	8.00	7.77	7.71	7.60
	30		7.72	7.83	7.77	7.77	7.79	7.72	7.76	7.74	7.78	7.44
	31		7.81	7.91	7.83	7.81	7.86	7.74	7.80	7.78	7.81	7.77
	32		7.85	7.92	7.85	7.87	7.81	7.82	7.81	7.80	7.81	7.78
CONDUCTIVITY (uS/cm)	25		302	298	299	294	291	312	320	318	319	325
	26		286	272	276	277	287	288	295	291	292	299
	27		361	336	337	334	319	328	336	329	327	318
	28		254	270	274	272	271	269	274	275	281	273
	29		574	490	473	498	419	457	464	461	459	403
	30		301	361	295	247	295	299	295	297	302	293
	31		272	267	277	270	277	272	279	273	281	284
	32		281	271	284	280	282	279	285	286	291	286
REPL. NO:			2	3	2	2	2	1	1	2	3	1
INITIALS:			GB	GM	GM	GB	PD	GM	PD	GM	GM	GM

BATCH RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: Vims 0002 CPP

BEFORE RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	33	NA	~~7.41~~ 7.91 CB	7.89	7.95	7.99	7.97	7.78	7.81	7.79	7.79	7.76
	34		~~7.87~~ 7.95 CB	7.95	7.95	7.99	7.96	7.78	7.90	7.91	7.92	7.48
	35		7.87	7.90	7.88	7.91	7.89	7.82	7.96	7.85	7.82	7.76
	36		7.92	7.93	7.91	7.92	7.91	7.82	7.88	7.83	7.82	7.87
	37		7.98	7.92	7.97	7.95	7.95	7.70	7.75	7.72	7.69	7.64
CONDUCTIVITY (uS/cm)	33		441	378	384	389	378	341	379	365	368	330
	34		287	270	288	275	296	296	301	298	301	305
	35		312	304	291	301	281	298	306	301	308	276
	36		301	305	301	304	296	307	305	306	308	304
	37		279	282	282	281	284	288	291	292	294	287
REPL. NO:			2	3	2	2	2	1	1	2	3	
INITIALS:			CB	CB	CB	CB	PD	CB	PD	CB	CB	

NOTES

AFTER RENEWAL

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	1	24.3	24.1	24.1	24.3	24.6	24.6	24.3	24.5	24.5	24.6	NA
	2	24.0	24.1	24.2	24.2	24.7	24.7	24.4	24.4	24.6	24.7	
	3	24.1	24.3	24.3	24.1	24.7	24.6	24.5	24.4	24.6	24.7	
	4	24.1	24.0	24.2	24.2	24.6	24.5	24.4	24.3	24.7	24.7	
	5	24.0	24.2	24.3	24.3	24.4	24.7	24.4	24.3	24.6	24.8	
	6	24.4	24.1	24.3	24.4	24.5	24.6	24.6	24.5	24.5	24.7	
	7	24.3	24.2	24.1	24.4	24.5	24.7	24.4	24.2	24.5	24.6	
	8	24.2	24.4	24.0	24.3	24.6	24.6	24.5	24.1	24.5	24.5	
DISSOXYGEN (mg/l)	1	8.2	8.2	8.1	8.0	8.2	8.1	8.1	8.2	8.2	8.2	
	2	8.2	8.2	8.1	7.9	8.1	8.1	8.1	8.2	8.2	8.2	
	3	8.0	8.2	8.0	7.9	8.1	8.1	8.1	8.1	8.2	8.2	
	4	8.0	8.2	7.9	7.9	8.1	8.2	8.1	8.1	8.2	8.2	
	5	8.2	8.2	8.0	8.1	8.2	8.2	8.1	8.2	8.2	8.2	
	6	8.1	8.2	8.1	8.0	8.1	8.2	8.1	8.2	8.2	8.2	
	7	8.1	8.1	8.1	8.0	8.1	8.1	8.0	8.1	8.1	8.2	
	8	8.2	8.1	8.0	8.0	8.1	8.1	8.0	8.2	8.1	8.2	
REPL. NO:		3	1	2	2	3	2	1	1	2	1	
INITIALS:		PB	LB	LB	LB	LB	PB	LB	PB	LB	LB	

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0002 Cff

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	9	24.0	24.3	24.3	24.4	24.6	24.6	24.4	24.3	24.5	24.6	NA
	10	24.0	24.4	24.3	24.5	24.7	24.5	24.4	24.4	24.6	24.6	
	11	24.0	24.5	24.4	24.6	24.7	24.6	24.3	24.5	24.6	24.7	
	12	24.1	24.1	24.3	24.6	24.6	24.7	24.4	24.3	24.5	24.7	
	13	24.2	24.2	24.5	24.5	24.5	24.5	24.5	24.3	24.4	24.8	
	14	24.3	24.4	24.4	24.4	24.4	24.6	24.4	24.5	24.6	24.7	
	15	24.1	24.3	24.4	24.3	24.4	24.7	24.6	24.2	24.6	24.7	
	16	24.2	24.3	24.2	24.4	24.6	24.6	24.5	24.3	24.5	24.7	
DISSOLVED OXYGEN (mg/l)	9	8.1	8.2	8.1	8.1	8.2	8.1	8.2	8.2	8.2	8.2	
	10	8.2	8.2	8.1	8.1	8.1	8.2	8.2	8.1	8.1	8.2	
	11	8.1	8.1	8.1	8.1	8.2	8.1	8.2	8.1	8.1	8.1	
	12	8.2	8.1	8.0	8.1	8.2	8.2	8.1	8.0	8.1	8.1	
	13	8.2	8.1	7.9	8.0	8.1	8.2	8.1	8.1	8.1	8.1	
	14	8.2	8.1	8.0	8.1	8.1	8.2	8.1	8.1	8.1	8.0	
	15	8.2	8.1	8.1	8.0	8.1	8.1	8.0	8.2	8.2	8.1	
	16	8.2	8.1	8.1	8.0	8.0	8.2	8.1	8.1	8.1	8.2	
REPL. NO:		3	1	2	2	3	2	1	1	2	1	
INITIALS:		PB	LM	LB	LM	LM	PD	LP	PD	M	LM	

AFTER RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS0002 cpp

AFTER RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	17	24.0	24.3	24.3	24.4	24.6	24.7	24.6	24.6	24.6	24.6	NA
	18	24.2	24.4	24.4	24.5	24.7	24.7	24.5	24.5	24.5	24.7	
	19	24.2	24.3	24.4	24.6	24.6	24.6	24.5	24.5	24.6	24.7	
	20	24.2	24.4	24.5	24.6	24.7	24.7	24.5	24.3	24.6	24.6	
	21	24.1	24.3	24.4	24.7	24.6	24.6	24.4	24.4	24.5	24.5	
	22	24.1	24.1	24.5	24.5	24.5	24.7	24.5	24.6	24.4	24.7	
	23	24.1	24.1	24.5	24.6	24.6	24.7	24.5	24.5	24.4	24.8	
	24	24.0	24.0	24.4	24.6	24.4	24.6	24.5	24.3	24.5	24.6	
DISS OXYGEN (mg/l)	17	8.2	8.1	8.2	8.2	8.1	8.2	8.1	8.2	8.2	8.0	
	18	8.2	8.1	8.2	8.2	8.1	8.2	8.1	8.2	8.2	8.1	
	19	8.2	8.2	8.2	8.2	8.2	8.1	8.2	8.1	8.2	8.1	
	20	8.2	8.2	8.2	8.2	8.1	8.1	8.2	8.1	8.2	8.0	
	21	8.2	8.2	8.2	8.2	8.2	8.1	8.2	8.2	8.2	8.2	
	22	8.0	8.2	8.2	8.2	8.2	8.1	8.2	8.2	8.2	8.1	
	23	8.2	8.2	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.0	
	24	8.2	8.1	8.2	8.2	8.2	8.2	8.1	8.2	8.1	8.1	
REPL. NO:		3	1	2	2	3	2	1	1	2	1	
INITIALS:		RB	GM	GM	GM	GM	RD	GM	RD	GM	GM	

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: Vims 0002 CPP

AFTER RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	25	24.1	24.2	24.3	24.7	24.7	24.6	24.5	24.3	24.6	24.4	NA
	26	24.2	24.1	24.4	24.6	24.8	24.7	24.5	24.3	24.7	24.5	
	27	24.3	24.3	24.4	24.6	24.7	24.7	24.6	24.4	24.7	24.6	
	28	24.1	24.4	24.5	24.5	24.6	24.6	24.6	24.6	24.6	24.8	
	29	24.0	24.3	24.4	24.6	24.7	24.6	24.7	24.5	24.4	24.8	
	30	24.0	24.3	24.5	24.7	24.7	24.5	24.6	24.3	24.3	24.7	
	31	24.1	24.4	24.5	24.5	24.6	24.7	24.6	24.5	24.4	24.7	
	32	24.1	24.3	24.6	24.6	24.7	24.7	24.5	24.5	24.3	24.6	
DISSOLVED OXYGEN (mg/l)	25	8.2	8.2	8.2	8.2	8.2	8.2	8.1	8.2	8.2	8.0	
	26	7.8	8.1	8.2	8.2	8.2	8.2	8.1	8.2	8.2	8.1	
	27	8.2	8.2	8.2	8.2	8.2	8.1	8.0	8.1	8.2	8.0	
	28	8.2	8.2	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.1	
	29	8.2	8.2	8.2	8.1	8.1	8.1	8.1	8.2	8.1	8.1	
	30	8.2	8.1	8.2	8.1	8.1	8.1	8.1	8.2	8.1	8.2	
	31	8.2	8.2	8.2	8.1	8.2	8.2	8.2	8.2	8.1	8.2	
	32	8.2	8.2	8.2	8.1	8.2	8.2	8.2	8.1	8.1	8.2	
REPL. NO:		3	1	2	2	3	2	1	1	2	1	
INITIALS:		PB	GM	GB	GB	GB	PB	GB	PB	GB	GM	

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: Vins 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	33	24.1	24.1	24.2	24.4	24.7	24.6	24.6	24.4	24.6	24.7	NA
	34	24.0	24.3	24.2	24.5	24.7	24.7	24.7	24.3	24.5	24.8	
	35	24.2	24.5	24.3	24.6	24.7	24.7	24.6	24.4	24.4	24.7	
	36	24.0	24.4	24.3	24.7	24.6	24.6	24.6	24.4	24.4	24.6	
	37	24.1	24.1	24.4	24.6	24.6	24.6	24.7	24.3	24.4	24.5	
DISS OXYGEN (mg/l)	33	8.2	8.2	8.2	8.1	8.2	8.1	8.2	8.1	8.2	8.2	
	34	8.1	8.2	8.2	8.1	8.1	8.2	8.2	8.2	8.2	8.2	
	35	8.0	8.2	8.2	8.0	8.1	8.2	8.2	8.2	8.2	8.2	
	36	8.2	8.2	8.2	8.1	8.1	8.2	8.1	8.1	8.2	8.1	
	37	8.2	8.2	8.2	8.0	8.1	8.2	8.1	8.2	8.1	8.2	
REPL. NO:		3	1	2	2	3	2	1	1	2	1	
INITIALS:		PB	GA	GM	GB	GB	PD	GM	PD	GB	GM	

After Renewal

NOTES

AFTER RENEWAL

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS 0002 CPP

AFTER RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
pH (S.U.)	1	7.75	7.80	7.77	7.76	7.77	7.79	7.78	7.79	7.81	7.80	
	2	7.76	7.92	7.81	7.83	7.81	7.80	7.81	7.82	7.82	7.83	
	3	7.78	7.80	7.82	7.82	7.85	7.81	7.81	7.83	7.82	7.84	
	4	7.50	7.65	7.61	7.62	7.61	7.63	7.62	7.65	7.70	7.71	
	5	7.70	7.74	7.73	7.75	7.71	7.75	7.62	7.70	7.71	7.71	
	6	7.64	7.71	7.70	7.71	7.75	7.76	7.71	7.76 P.D.	7.75	7.69	
	7	7.57	7.73	7.75	7.74	7.72	7.75	7.61	7.66	7.63	7.61	
	8	7.96	7.86	7.87	7.86	7.81	7.83	7.73	7.80	7.81	7.83	
CONDUCTIVITY (uS/cm)	1	294	293	295	293	291	290	292	291	290	289	
	2	443	405	415	410	411	408	405	406	410	415	
	3	457	377	391	381	384	386	384	388	384	377	
	4	282	261	268	264	262	275	271	277	275	278	
	5	280	275	275	277	281	280	281	280	280	281	
	6	317	307	310	310	305	300	301	306	305	310	
	7	281	278	278	277	282	280	281	284	283	282	
	8	538	464	481	471	477	399	399	397	394	391	
REPL. NO:		3	1	2	2	3	2	1	1	2	1	
INITIALS:		[illegible]	GB	GB	GB	GB	PD	GB	PD	GB	GB	

NOTES

AFTER RENEWAL

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS0002 CIP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	9	7.66	7.75	7.77	7.79	7.81	7.85	7.84	7.86	7.85	7.87	
	10	7.71	7.72	7.75	7.76	7.71	7.80	7.81	7.80	7.80	7.82	
	11	7.90	7.96	7.99	7.97	7.98	7.91	7.92	7.94	7.91	7.92	
	12	7.76	7.75	7.77	7.76	7.71	7.75	7.72	7.73	7.75	7.68	
	13	7.65	7.80	7.89	7.81	7.87	7.89	7.89	7.84	7.84	7.85	
	14	7.71	7.74	7.75	7.75	7.79	7.83	7.81	7.80	7.78	7.79	
	15	7.76	7.85	7.90	7.91	7.87	7.85	7.87	7.92	7.86	7.91	
	16	8.04	7.96	8.01	7.98	8.03	8.00	8.01	8.00	7.99	8.01	
CONDUCTIVITY (uS/cm)	9	286	276	277	278	279	283	281	280	283	282	
	10	304	283	302	301	284	285	284	286	288	282	
	11	560	464	481	458	480	410	415	411	410	408	
	12	285	293	295	295	298	288	291	295	294	297	
	13	808	618	678	619	661	600	610	611	609	610	
	14	350	313	312	310	310	306	304	302	303	310	
	15	286	277	278	277	279	281	280	281	285	289	
	16	369	366	367	367	368	349	351	354	354	359	
REPL. NO:		3	1	1	2	3	2	1	1	2	1	
INITIALS:		PD	GM	GM	GM	GM	PD	GM	PD	GM	GM	

AFTER RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS 0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	17	7.67	7.72	7.75	7.75	7.76	7.80	7.69	7.75	7.72	7.71	NA
	18	7.73	7.60	7.68	7.69	7.63	7.77	7.75	7.71	7.74	7.72	
	19	7.68	7.76	7.76	7.75	7.71	7.73	7.71	7.70	7.68	7.68	
	20	7.96	7.85	7.81	7.87	7.83	7.85	7.61	7.69	7.71	7.72	
	21	7.83	7.80	7.91	7.85	7.89	7.91	7.71	7.75	7.72	7.77	
	22	7.71	7.93	7.92	7.92	7.88	7.88	7.62	7.80	7.78	7.81	
	23	7.56	7.79	7.64	7.75	7.66	7.69	7.59	7.66	7.61	7.62	
	24	7.88	7.75	7.78	7.76	7.76	7.79	7.66	7.75	7.69	7.71	
CONDUCTIVITY (uS/cm)	17	334	313	315	321	322	306	303	302	304	300	
	18	670	618	652	625	647	541	540	538	555	554	
	19	293	302	301	300	309	320	318	326	319	321	
	20	320	298	315	299	310	306	287	284	286	281	
	21	282	282	285	283	287	285	284	289	288	289	
	22	694	514	582	517	535	510	427	410	415	411	
	23	326	294	305	298	301	306	301	300	299	298	
	24	286	280	281	280	281	291	279	281	282	285	
REPL. NO:		3	1	1	2	3	2	1	1	2	1	
INITIALS:		PB	GB	GM	GM	GB	PD	GB	PD	GM	GM	

After renewal

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS0002 CPP

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	25	7.74	7.74	7.77	7.75	7.77	7.82	7.81	7.83	7.82	7.82	
	26	7.49	7.78	7.40	7.81	7.92	7.90	7.66	7.69	7.69	7.71	
	27	7.84	7.92	7.81	7.91	7.86	7.85	7.67	7.78	7.79	7.79	
	28	7.68	7.56	7.62	7.58	7.61	7.70	7.52	7.61	7.65	7.61	
	29	7.90	7.88	7.89	7.82	7.92	7.88	7.59	7.70	7.75	7.74	
	30	7.64	7.79	7.82	7.81	7.77	7.79	7.61	7.68	7.65	7.64	
	31	7.56	7.69	7.59	7.71	7.58	7.69	7.61	7.58	7.56	7.53	
	32	7.66	7.73	7.71	7.75	7.68	7.75	7.64	7.70	7.72	7.71	
CONDUCTIVITY (uS/cm)	25	301	306	305	301	304	292	312	311	310	308	
	26	274	278	277	278	269	280	285	288	287	288	
	27	319	353	320	322	351	320	316	310	315	312	
	28	256	267	268	267	271	280	269	279	281	277	
	29	412	414	412	412	418	411	421	416	419	422	
	30	295	286	291	287	291	296	291	298	299	301	
	31	276	276	271	272	268	275	273	280	275	278	
	32	278	262	261	260	257	280	275	283	275	271	
REPL. NO:			1	1	2	3	2	1	1	2	1	
INITIALS:			GB	GB	GB	GB	PD	GB	PD	GB	GB	

After renewal

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: Vims 0002 CPP

AFTER RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
pH (S.U.)	33	7.63	7.74	7.75	7.78	7.76	7.79	7.60	7.66	7.63	7.62	
	34	7.57	7.79	7.81	7.82	7.61	7.80	7.59	7.66	7.57	7.57	
	35	7.62	7.66	7.61	7.69	7.59	7.66	7.66	7.70	7.68	7.69	
	36	7.71	7.65	7.61	7.64	7.66	7.90	7.66	7.73	7.71	7.78	
	37	7.69	7.73	7.72	7.71	7.72	7.81	7.57	7.61	7.62	7.72	
CONDUCTIVITY (uS/cm)	33	366	345	358	349	351	366	321	318	315	310	
	34	276	275	271	271	274	295	281	287	281	282	
	35	274	284	281	281	282	291	291	295	292	297	
	36	280	297	299	291	282	286	283	286	287	287	
	37	277	282	278	278	279	283	287	288	287	288	
REPL. NO:		3	1	1	2	3	2	1	1	2	1	
INITIALS:		PB	GB	GB	GB	GB	PD	GB	PD	GB	GB	

NOTES

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0002 CPP

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
1	1	10e	10e	2e7f1fd	10f	10	10	PD ~~8~~ 10	10	10	10
2		10e	9e1f	10f	10f	10	10	9	8	7	7
3		10e	9e1f	5e5f	2e8f	0e8f	8	8	8	8	7
4		8e2f	8e2f	2e PD ~~8~~ 7f 1fd 1	8f 1df	8	8	8	8	8	8
5		10e	10e	2e8f	10f	10	10	10	10	10	10
6		10e	10e	2e8f	10f	10	10	10	10	10	10
7		10e	10e	10f	10f	10	10	10	10	10	10
8		10e	10e	5e4f	2e8f	0e9f	9	9	9	9	9
9		10e	10e	3e7f	10f	10	10	10	10	10	10
10		10e	7e3f	8f 1fd	1e8f	0e8f	8	8	7	7	7
11		10e	10e	4e6f	10f	10	10	10	10	10	9
12		10e	10e	5e5f	9f 1df	9	9	9	9	9	8
13		10e	10e	1e9f	10f	10	10	10	10	10	10
14		10e	10e	2e8f	10f	10	10	10	10	10	10
15		10e	10e	3e7f ~~7f 3~~ PD	2e8f	0e8f	8	8	8	8	7
16		10e	10e	2e8f	1e9f	10	10	10	10	10	10
TIME:		1420	1130	1545	1100	1200	1200	1100	0955	1300	1015
INITIALS:		GB	GB	PD	GB	PD	PD	PD	GB	GB	GB

NOTES

Note: day 3 - all dead fish appeared to have died during/shortly after hatch - still have yolk sac, curled (not unfolded)

① 2e7f1fd

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0002 CPP

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
17	1	10e	10e	3e 7f	10f	10	10	10	10	10	10
18		10e	10e	7e 3fd	2e 2f 4e 3df	4f	4	4	4	4	4
19		10e	10e	10f	10f	10	10	10	10	10	10
20		10e	8e 2f	6e 3f 1df	9f	9	9	8	8	8	8
21		10e	10e	8e 2f	10f	10	10	10	10	10	9
22		10e	10e	8e 2f	9f 1df	9	9	9	9	9	8
23		10e	10e	8e 2f	10f	10	10	10	10	10	10
24		10e	10e	7e 3f	10f	10	10	10	10	10	10
25		10e	10e	3e 7f	10f	10	10	10	10	10	10
26		10e	10e	3e 7f	1e 8f 1df	8f	8	8	8	8	7
27		10e	10e	4e 6f	10f	10	10	10	10	10	10
28		10e	10e	10e	5e 5f	10f	10	10	10	10	9
29		10e	9e 1f	3e 6f	10f	10	10	10	10	10	9
30		10e	10e	4e 6f	10f	10	10	10	10	10	8
31		10e	10e	7e 3f	9f 1df	9	9	9	9	9	9
32		10e	10e	6e 4f	1e 9f	10f	10	10	10	10	10
	TIME:	1420	1130	1545	1100	1200	1200	1100	0955	1320	1019
	INITIALS:	GB	GB	PD	GB	PP	PP	PP	GB	GB	GB

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0002 CPP

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
33	1	10e	10e	8e2f	10f	10	10	10	10	10	10
34		10e	10e	7e3f	10f	10	10	10	10	10	8
35		10e	10e	2e8f	10f	10	10	10	10	10	10
36		10e	10e	8e2f	2e7f14f	9f	9	9	9	9	9
37		10e	10e	4e6f	10f	10	10	10	10	10	10
1	2	10e	10e	2e8f	10f	10	10	10	10	10	10
2		10e	10e	7e3f	10f	10	10	10	10	10	10
3		10e	10e	5e5f	10f	10	10	10	10	10	10
4		10e	10e	6e4f	10f	10	10	10	10	10	10
5		10e	9e1f	7e3f	10f	10	10	10	10	10	10
6		10e	10e	5e5f	10f	10	10	10	10	10	10
7		10e	10e	9e1f	9f	9	9	9	9	9	8
8		10e	10e	3e5f1M	7f2Mf	7	7	7	7	7	7
9		10e	10e	7e3f	10f	10	10	10	10	10	10
10		10e	10e	8e2f	10f	10	10	10	10	10	10
11		10e	10e	3e7f	9f10Mf	9	9	9	9	9	9
TIME:		1620	1130	1545	1300	1300	1300	1200	1050	1415	1030
INITIALS:		KM	KB	PD	GB	PD	PD	PD	GB	GB	GB

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0002 LPP

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
12	2	10e	10e	8e2f	10f	10	10	10	10	10	10
13		10e	10e	7e3f	10f	10	10	10	10	10	10
14		10e	10e	1e9f	10f	10	10	10	10	10	10
15		~~9e1f~~ 10e PD	9e1f	8e2f	10f	10	10	10	10	10	10
16		10e	10e	4e5f 1fd	8f 1df	8	8	8	8	8	8
17		10e	10e	7e3f	3e7f	10f	10	10	10	10	10
18		9e/1fd	9e	9f	9f	9	9	~~10~~ 9	~~10~~ 9	~~10~~ 9	8
19		10e	10e	4e6f	10f	~~0e9~~ PD 10	10	10	10	10	10
20		10e	9e1f	7e2f	2e8f	0e9f	9	9	9	9	~~8~~ 9
21		10e	10e	8e2f	10f	10	10	10	10	10	10
22		10e	10e	10e	1e7f	5f 1df	5	5	5	5	~~5~~ 4
23		10e	10e	9e1f	10f	10	10	10	10	10	10
24		10e	9e1f	7e3f	10f	10	10	10	10	10	10
25		10e	10e	7e3f	2e8f	0e9f	9	9	9	9	8
26		10e	10e	5e5f	10f	10	10	10	10	10	10
27		10e	10e	5e5f	10f	10	10	10	10	10	8
TIME:		PD/GB	1130	1545	1300	~~1300~~ 1300 PD	1300	1200	1050	1440	1030
INITIALS:			GB/PD	PD	GB	PD	PD	PD	GB	GB	GB

NOTES

e = live embryos f = live fish e.g. 3e7f = 3 live embryo + 7 live fish

fd = dead fish

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0002 CPP

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
28	2	10e	10e	9e1f	10f	10	10	10	10	9	9
29		10e	10e	9e1f	10f	10	10	10	10	10	10
30		10e	10e	7e3f	4e5f1df	0e8f	8	8	8	8	8
31		10e	9e1f	8e2f	2e7f1df	0e8f	8	8	8	8	8
32		10e	10e	8e2f	10f	10	10	10	9	9	8
33		10e	10e	4e5f1df	10 9f	9	9	9	9	9	9
34		10e	10e	9e1f	10f	10	10	10	9	8	8
35		10e	10e	6e4f	10f	10	10	10	10	10	10
36		10e	10e	8e2f	10f	10	10	10	10	10	10
37		10e	7e3f	2e8f	10f	10	10	10	10	10	9
1	3	10e	10e	10f	10f	10	10	10	10	10	10
2		10e	10e	4e6f	10f	10	10	10	10	10	10
3		10e	10e	2e7f1df	9f	9	9	9	9	9	9
4		10e	10e	2e8f	10f	10	10	10	10	10	10
5		10e	10e	2e8f	10f	10	10	10	10	10	10
6		10e	10e	6e2f2df	8f	8	8	8	8	8	8
TIME:		1630	1130	1545	1545	1400	1030	1230	1215	1540	1100
INITIALS:		GM/PP	GB/PP	GB/PP	GB	PP	GM	PP	GB	GB	GB

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0002 CPP

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
7	3	10e	10e	3e7f	10f	10	10	10	10	10	10
8		10e	10e	3e1f 10L	9f	9	9	9	9	9	9
9		10e	10e	7e2f 10M	2e7f	9f	9	9	8	8	8
10		10e	10e	5e5f	10f	10	10	10	10	10	9
11		10e	10e	7f3e	10f	10	10	10	10	10	9
12		10e	10e	2e8f	10f	10	10	10	10	10	10
13		10e	10e	7e3f	1e9f	0e 9f	9f 10f	9	9	9	9
14		10e	10e	3e7f	3e7f	0e 9f	9	9	9	9	8
15		10e	10e	6e4f	10f	10	10	10	10	10	9
16		10e	10e	5e5f	10f	10	10	10	10	10	10
17		10e	10e	6e4f	10f	10	10	10	10	10	9
18		10e	10e	1e9f	10f	10	10	10	10	10	9
19		10e	10e	4e6f	10f	10	10	10	10	10	10
20		10e	8e2f	3e7f	1e9f	10f	10	10	10	10	10
21		10e	8e2f	2e8f	1e9f	10f	10	10	10	10	10
22		10e	10e	5e5f	2e8f	10f	9	9	9	9	9
TIME:		1630	1400	1545	1700	1400	1030	1230	1245	1540	1100
INITIALS:		LM	LD	CB	CB	PD	LM	PD	CB	LM	CB

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: V1MS0002 CAP

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
23	3	10e	9e1fd	8e2f	8e2f	2e7f	9	9	9	9	8
24		10e	10e	6e4f	10f	10	10	10	10	10	10
25		10e	10e	5e5f	9f1df	9	9	9	9	9	9
26		10e	10e	7e2f1df	3e6f	2e7f	9	9	9	9	9
27		10e	9e1f	6e4f	2e7f1df	2e7f	9	9	9	9	8
28		10e	10e	8e2f	10f	10	10	10	10	10	9
29		10e	10e	5e5f	10f	10	10	10	10	10	9
30		10e	8e2f	5e5f	10f	10	10	10	9	9	9
31		10e	10e	10f	10f	10	10	10	10	10	10
32		10e	10e	4e6f	10f	10	10	10	10	10	10
33		10e	10e	6e3f1df	2e4f2df	4f	4	4	4	4	4
34		10e	8e2f	3e7f	10f	10	10	10	10	10	8
35		10e	10e	5e4f1df	7f2df	7	7	7	7	7	7
36		10e	10e	2e8f	10f	10	10	10	10	10	10
37		10e	10e	7e3f	10f	10	10	10	10	10	10
TIME:		1630	1400	1545	1700	1400	1100	1230	1245	1600	1100
INITIALS:		GA	PD/GA	GA/PD	GA	PD	GA	PD	GA	GA	GA

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
1 (POOLED REPS)	NA	NA	3.28	NA	NA	
2			3.52			
3			3.28			
4			4.00			
5			6.00			
6			1.80			
7			2.16			
8			2.20			
9			1.68			
10			0.88			
11			2.76			
12			0.52			
13			0.80			
14			0.48			
15			0.40			
16			2.08			
17			1.64			
18			1.20			
19			2.08			
20			2.40			
21			1.20			
22			2.40			
23			0.92			
24			0.96			
25			0.48			

Test Day 0 Date 9/12/00 Initials GB

TEST ID VIMS0002 GPP

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
26	NA	NA	0.64	NA	NA	
27			2.08			
28			0.44			
29			0.92			
30			0.64			
31			0.32			
32			1.84			
33			1.44			
34			1.64			
35			1.24			
36			1.32			
37			1.24			

Test Day 0 Date_____ Initials_____

TEST ID VIMS 0002 UPP

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
1 (POOLED REPS)	NA	NA	2.64	NA	NA	
2			1.32			
3			13.2			
4			1.84			
5			1.00			
6			2.88			
7			0.56			
8			1.12			
9			0.28			
10			0.24			
11			0.32			
12			0.32			
13			0.32			
14			0.80			
15			0.56			
16			0.56			
17			0.32			
18			0.40			
19			7.60			
20			0.42			
21			0.64			
22			0.28			
23			0.36			
24			0.40			
25			7.26			

Test Day 10 Date 9/13/00 Initials GA

TEST ID VIMS0002 CPP

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
26	NA	NA	0.24	NA	NA	
27			1.12			
28			0.88			
29			0.28			
30			0.36			
31			0.32			
32			0.28			
33			0.36			
34			0.21			
35			0.28			
36			0.36			
37			0.38			

Test Day 10 Date 9/13/00 Initials GA

TEST ID VIMS 0002 GPP

COASTAL BIOANALYSTS, INC. 96-H ACUTE STATIC REF TEST (Form STF003A 3/1/97)

mg/L TCE Treatment	I.D.	Day 1 # Live	Day 2 # Live	Day 3 # Live	Day 4 # Live	Final % Live
Control	C-1	10	10	10	10	100
	C-2	10	10	10	10	
307	1-1	10	10	10	10	95
	1-2	10	10	10	9	
384	2-1	10	10	10	10	95
	2-2	10	10	10	9	
480	3-1	10	10	10	4	60
	3-2	10	10	10	8	
600	4-1	10	10	7	3	20
	4-2	7	6	6	1	
750	5-1	3	0	0	0	0
	5-2	3	3	1	0	
Observer:		GB	PD	GB	PD	
Time:		1300	1620	0900	1045	

Species: H. azteca Source: PC

Hatch date/time: 2-4 mm Arrival date (non-CBI) ~~NA~~ 8/28/00

Acclimation water type: SFW Salinity (g/kg) NA Hardness (mg/l) 90

Acclimation temperature (range) 23.1 to 23.8

Feeding prior to test: maple leaves/rabbit pellets/YCT

Feeding during test: 0.5 ml YCT daily D&2

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: ____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: ____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ✓ Other ____ Randomization Template Number: 2-1,2

SET-UP: Date 9/1/00 Time Water Added 1350

Time Animals Added 1100 Set Up By GM

INSTRUMENTATION USED:

Stem Thermometer Number: m1

☐ YSI D.O. Meter # 1 (SNE8014475)

☒ CP Digisense pH Meter (D9500563)

☐ SP PortapH2 Meter (852360)

☒ YSI D.O. Meter # 2 (SN91A026329)

☐ Corning 240 pH Meter (SN5268)

☐ Sartorius R160P Balance (40020093

☐ Spartan ATC Refractometer (A366)

☐ YSI SCT 33 Meter (H8016792)

Other Hach cond. meter

TEST I.D.: HART

COASTAL BIOANALYSTS, INC. 96-H ACUTE STATIC REF TEST (Form STF003A 3/1/97)

		Day 0	Day 1	Day 2	Day 3	Day 4
TEMP	C	23.2	23.4	23.5	23.6	23.4
	1	23.2	23.4	23.6	23.7	23.4
	2	23.1	23.4	23.6	23.6	23.5
	3	23.1	23.5	23.5	23.7	23.5
	4	23.1	23.6	23.6	23.7	23.4
	5	23.1	23.6	23.6	23.7	23.3
pH	C	7.43	7.86	7.87	7.86	7.86
	1	7.91	7.75	7.89	7.81	7.91
	2	7.92	7.85	7.85	7.82	7.88
	3	7.94	7.87	7.86	7.87	7.90
	4	7.93	7.86	7.88	7.87	7.90
	5	7.92	7.85	7.90	7.90	7.91
D.O. (mg/l)	C	8.6	8.6	8.4	8.5	8.5
	1	8.6	8.5	8.5	8.4	8.4
	2	8.6	8.4	8.5	8.5	8.4
	3	8.6	8.5	8.5	8.4	8.5
	4	8.6	8.5	8.5	8.5	8.4
	5	8.6	8.4	8.5	8.5	8.5
Alk	C	292	NA	NA	NA	295
	1	736				741
	2	909				915
	3	1067				1077
	4	1257				1258
	5	1507				1531
Replicate # above meas.		2	1	2	2	1
Initials:		GA	GA	PD	GA	PD

NOTES

1500mg KCl / 2L SFW highest concen

D:1 H_2O = 81 HD 57 ALK 10

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments

NA-RT

Signature Date

TEST I.D.: HART 09D100

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

HAART

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
307.0000	20	1	0.0500	0.0500
384.0000	20	1	0.0500	0.0500
480.0000	20	8	0.4000	0.4000
600.0000	20	16	0.8000	0.8000
750.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 4.370
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

HAART

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	306.377	240.226	349.927
LC/EC 50.00	498.995	463.167	538.011

COASTAL BIOANALYSTS, INC. NPDES ACUTE REFERENCE/*Pimephales promelas* (Form PPART)

Conc. (mg/l)	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
515	1-1	10	10	100
	1-2	10	10	
735	2-1	10	10	95
	2-2	10	9	
1050	3-1	10	5	40
	3-2	10	3	
1500	4-1	4	~~2~~ 0	0
	4-2	2	0	
2143	5-1	0	0	0
	5-2	0	0	
Observer:		GB	GB	
Time:		1540	1500	

		Day 0	Day 1	Day 2
TEMP	C	20.0	19.6	19.7
	1	20.1	19.6	19.2
	2	20.0	19.7	19.6
	3	19.9	19.5	19.8
	4	19.9	19.6	19.7
	5	20.0	19.6	—
pH	C	8.01	8.06	7.89
	1	8.02	7.97	7.90
	2	8.01	7.95	7.92
	3	8.03	7.96	7.91
	4	8.04	7.91	7.90
	5	8.05	8.01	—
D.O. (mg/l)	C	8.9	8.9	8.7
	1	8.9	8.8	8.2
	2	8.9	8.7	8.8
	3	8.9	8.6	8.7
	4	8.9	8.7	8.6
	5	8.9	8.8	—
COND (uS)	C	272	NA	275
	1	997		1002
	2	1372		1375
	3	1856		1752
	4	2590		2580
	5	3840	3840	—
Replicate # above meas.		1	2	2
Initials:		PD	GB	GB

Species: Pimephales promelas Source: CC

Hatch date/time: 8/27/00 embryos used for test 9/1/00 0900 to 9/1/00 1230

Acclimation water: SFW ✓ Other:

Acclimation Temp. (range): 19.7 to 20.1

Feeding prior to test: *Artemia* 2X /d Other:

Feeding during test: Not fed ☒ Other:

Chamber size: 500 ml ☐ 1000 ml ☒ 8000 ml ☐ Other: ml

Test Volume: 250 ml ☐ 500 ml ☒ 4000 ml ☐ Other: ml

Initial no. animals per replicate 10 No. replicates 2

Photoperiod: 16L:8D ☒ Other: Randomization template no.: 6

SET UP: Date 9/5/00 Time Water Added 1320

Time Animals Added 1600 Set Up By PD

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Horiba Conductivity Meter (511001)

Other

NOTES:

Dilution water hardness: 97 mg/l

Dilution water alkalinity: 59 mg/l

Toxicant stock: KCL Sigma "Ultra"

Prep. of highest conc: 6430 mg/3L SFW

Balance calibration: 100 mg class S wt =

48-h LC50 992.9 mg/l

95% C.L. 907.7 - 1085.7 mg/l

Calculation method Prob.+

TEST I.D.: PPART

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

PPART

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
515.0000	20	0	0.0000	0.0000
735.0000	20	1	0.0500	0.0500
1050.0000	20	12	0.6000	0.6000
1500.0000	20	20	1.0000	1.0000
2143.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 0.288
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

PPART

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	666.085	482.374	765.292
LC/EC 50.00	992.891	907.651	1085.664

FORM RWF001A
10/09/99

YEAR: 2000

SYNTHETIC FRESHWATER (SFW) PREP LOG
TEST DILUTION WATER VATS

VAT NO. - PREP. DATE	HARDNESS (mg/l)	ALKALINITY (mg/l)	CONDUCTIVITY (uMHOS)	pH (S.U.)	INITIALS
5/13/00	83	58	263	8.05	GB
5/17/00	86	57	271	8.08	GB
5/22/00	99	65	275	8.12	GB
6/2/00	94	58	281	7.95	PD/AB
6/10/00	95	58	279	7.97	SB
6/18/00	98	59	287	7.82	SB
6/27/00	89	61	286	7.93	GB
7/16/00	95	58	273	7.99	GB
7/14/00	84	59	274	8.01	GB
7/18/00	89	58	262	7.94	GB
7/25/00	92	59	280	8.02	GB
7/29/00	91	63	280	8.03	GB
8/1/00	84	59	274	8.04	GB
8/9/00	99	57	278	7.98	GB
8/14/00	98	57	280	8.02	GB
8/15/00	98	59	274	8.04	GB
8/17/00	89	57	282	8.02	GB
8/19/00	100	57	269	8.06	GB
8/22/00	91	59	276	8.12	GB
8/26/00	95	57	281	7.96	GB
8/28/00	96	58	274	8.04	GB
8/29/00	89	60	277	7.90	GB

IMS 0002

NOTE: VERIFY HARDNESS 80-100 mg/l, ALKALINITY 57-65 mg/l AND pH 7.6-8.0 BEFORE USE

FORM RWF001A
10/09/99

YEAR: 2000

SYNTHETIC FRESHWATER (SFW) PREP LOG
TEST DILUTION WATER VATS

V1m5 0002

VAT NO. - PREP. DATE	HARDNESS (mg/l)	ALKALINITY (mg/l)	CONDUCTIVITY (uMHOS)	pH (S.U.)	INITIALS
8/31/00	91	57	268	8.10	GB
9/1/00	81	58	274	8.12	GB
9/2/00	99	58	266	8.02	GB
9/5/00	~~99~~ 97	59	277	7.81	GB
9/7/00	93	58	274	7.95	GB
9/9/00	86	57	274	8.01	GB
9/11/00	97	65	272	8.04	GB
9/15/00	83	57	274	8.01	GB
9/18/00	99	58	281	7.99	GB
9/20/00	100	58	282	8.04	GB
9/23/00	88	61	276	7.98	GB
9/24/00	99	59	272	7.96	GB
9/26/00	82	57	274	7.98	GB
10/2/00	91	59	268	8.10	GB
10/10/00	93	57	272	8.04	GB

NOTE: VERIFY HARDNESS 80-100 mg/l, ALKALINITY 57-65 mg/l AND pH 7.6-8.0 BEFORE USE

(File STF013A) CBI TEST ID VIMS 0002

SEDIMENT-TREATMENT I.D. ASSIGNMENT:

SEDIMENT I.D.	TREATMENT I.D.
73.63 #3	1
50.55 #2	2
50.55 #1	3
68.64 #1	4
66.35 #2	5
~~55~~ 52.52 #2	6
68.49 #1	7
46.73 #1	8
66.35 #1	9
56.12 #1	10
46.73 #2	11
74.25 #3	12
44.08 #2	13
52.52 #3	14
74.25 #2	15
67.56 #3	16
52.52 #1	17
44.08 #1	18
CONTROL	19

ASSIGNED BY: PD DATE: 8/28/00

(File STF013A) CBI TEST ID VLMS 0002

SEDIMENT-TREATMENT I.D. ASSIGNMENT:

SEDIMENT I.D.	TREATMENT I.D.
67.56 #1	20
73.63 #2	21
44.08 #3	22
12.12 #1	23
73.63 ~~#3~~ PP 1	24
56.12 #2	25
74.25 #1	26
67.56 #2	27
68.64 #2	28
46.73 #3	29
12.12 #3	30
68.64 #3	31
66.35 #3	32
50.55 #3	33
68.49 #2	34
12.12 #2	35
56.12 #3	36
68.49 #3	37

ASSIGNED BY: PP DATE: 8/28/00

SEDIMENT % WATER WORKSHEET (File:STF016A)

Sample I.D.	Total Wet Wt (g)	Total Dry Wt (g)	Tare Wt. (g)	Net Wet Wt (g)	Net Dry Wt (g)	% H2O
1-A	22.2	11.9	0.5	N/A	- SEE SPREADSHEET	
1-B	21.9	11.7	0.5			
2-A	30.0	10.8	0.4			
2-B	35.2	12.5	0.5			
3-A	31.0	10.9	0.5			
3-B	33.9	11.8	0.4			
4-A	32.9	17.5	0.5			
4-B	30.5	16.0	0.4			
5-A	38.8	15.7	0.5			
5-B	30.9	12.7	0.4			
6-A	36.3	17.3	0.5			
6-B	41.4	19.5	0.5			
7-A	41.5	26.5	0.5			
7-B	39.8	23.6	0.4			
8-A	51.0	16.0	0.5			
8-B	39.3	12.4	0.5			
9-A	31.9	13.3	0.5			
9-B	31.3	13.2	0.5			
10-A	35.3	19.8	0.4			
10-B	37.1	20.6	0.5			
11-A	33.6	11.0	0.5			
11-B	32.8	11.0	0.5			
12-A	37.1	20.6	0.5			
12-B	48.0	26.6	0.5			

Tare Wt: Date 8/28/00 Class S Calib Wt 10.0 Initials PB
Wet Wt: Date 9/16/00 Class S Calib Wt 10.0 Initials GM
Dry Wt: Date 8/28/00 Class S Calib Wt 10.0 Initials GM

CBI TEST ID Vims 0002

SEDIMENT % WATER WORKSHEET (File:STF016A)

Sample I.D.	Total Wet Wt (g)	Total Dry Wt (g)	Tare Wt. (g)	Net Wet Wt (g)	Net Dry Wt (g)	% H2O
13-A	57.2	21.4	0.5	N/A	SEE	SEPARATE
13-B	52.1	19.3	0.4			SHEET
14-A	48.1	23.4	0.5			
14-B	57.7	28.0	0.5			
15-A	39.0	21.3	0.5			
15-B	47.7	25.9	0.5			
16-A	40.0	14.7	0.5			
16-B	40.7	14.8	0.5			
17-A	46.3	21.8	0.4			
17-B	45.4	21.5	0.5			
18-A	56.2	23.1	0.5			
18-B	45.8	18.8	0.5			
19-A	33.2	9.7	0.5			
19-B	33.2	9.7	0.4			
20-A	33.7	13.2	0.5			
20-B	34.7	13.5	0.4			
21-A	26.2	13.1	0.5			
21-B	32.7	16.0	0.5			
22-A	30.3	13.8	0.5			
22-B	28.7	13.2	0.4			
23-A	20.8	7.0	0.5			
23-B	19.2	6.5	0.4			
24-A	28.5	13.4	0.4			
24-B	27.2	12.9	0.5			

Tare Wt: Date 8/28/00 Class S Calib Wt 10.0 Initials RB
Wet Wt: Date 8/28/00 Class S Calib Wt 10.0 Initials LB
Dry Wt: Date 9/14/00 Class S Calib Wt 10.0 Initials LB

CBI TEST ID UMS 0002

SEDIMENT % WATER WORKSHEET (File:STF016A)

Sample I.D.	Total Wet Wt (g)	Total Dry Wt (g)	Tare Wt. (g)	Net Wet Wt (g)	Net Dry Wt (g)	% H2O
25-A	31.2	12.7	0.4	N/A	-SEE SP MEMO	
25-B	32.8	13.4	0.4			
26-A	33.6	15.7	0.5			
26-B	38.5	17.8	0.5			
27-A	33.4	11.3	0.5			
27-B	35.1	11.8	0.5			
28-A	37.0	17.8	0.5			
28-B	38.7	18.6	0.5			
29-A	38.2	11.6	0.5			
29-B	30.8	9.4	0.4			
30-A	36.8	14.1	0.4			
30-B	34.8	13.2	0.5			
31-A	38.4	19.0	0.4			
31-B	34.9	17.1	0.4			
32-A	26.5	10.2	0.4			
32-B	36.6	14.0	0.5			
33-A	29.4	10.6	0.5			
33-B	35.1	12.5	0.5			
34-A	36.8	18.8	0.5			
34-B	39.8	20.2	0.5			
35-A	31.8	10.5	0.5			
35-B	39.1	13.0	0.4			
36-A	44.2	21.1	0.5			
36-B	37.8	17.6	0.5			
37-A	33.5	18.9	0.5			
37-B	40.4	22.2	0.5			

Tare Wt: Date 8/28/00 Class S Calib Wt 10.0 Initials RB
Wet Wt: Date 8/28/00 Class S Calib Wt 10.0 Initials RB
Dry Wt: Date 9/19/00 Class S Calib Wt 10.0 Initials [illegible]

CBI TEST ID VIMS 0002

FORM STF009B SEDIMENT CHARACTERISTICS
(rev. 8/1/00)

TEST I.D. UTMS0002

Sediment I.D.	Arrival Temp. (°C)	Sediment Appearance	Indigenous Organisms (note type if present) 1 mm sieve	0.5 mm sieve	0.25 mm sieve	Pore water pH (S.U.)*	Pore water NH_3-N (mg/l)*	Pore water Salinity (g/kg)*
2JMS073.63 #1	0.8	Mud, some (slight) sand	—	—	—	7.24	4.8	NA
" #2	1.0	"	(1) midge or fly larva 2	(2) midge or fly larva 1	—	7.02	4.0	
" #3	1.1	"	(3) midge or fly larva 1	(4) midge or fly larva 2	—	7.06	4.0	
2JMS074.25 #1	0.9	"	—	—	—	7.04	5.0	
" #2	0.3	"	—	—	—	6.56	4.0	
" #3	0.3	"	—	(5) midge larva, red	—	7.39	2.8	
			Note 1-4 appear to be same sp. pooled for preservation					
Date/Initials:	GB 8/23/00	PD 8/23/00	←	PD 8/23/00	→			

Note: See separate work sheet for percent water. TOC and grainsize analyses are subcontracted (collect sub-sample when inspecting for indigenous organisms)

*Pore water pH, ammonia and salinity (estuarine sediments only) are determined on test day -1 or 0. Other parameters should be checked on arrival.

(#) = cup # specimens placed in, -PD

FORM STF009B SEDIMENT CHARACTERISTICS
(rev. 8/1/00)

TEST I.D. VIMS0002

Sediment I.D.	Arrival Temp. (°C)	Sediment Appearance	Indigenous Organisms (note type if present) 1 mm sieve	0.5 mm sieve	0.25 mm sieve	Pore water pH (S.U.)*	Pore water NH_3-N (mg/l)*	Pore water Salinity (g/kg)*
2CHK012.12#1	11.2	mud	—	fly larvae	—	6.76	7.2	
#3	5.8	grass	—	"	—	6.83	8.0	
2JMS056.12 #1	8.2	mud	② Mag fly	fly larvae	—	7.17	0.8	
#2	9.9	"	Mag fly		—	7.14	2.8	
#3	7.2	"	"	"	—	7.11	2.8	
2JMS052.52 #1	9.1	mud	—	—	—	7.01	3.1	
#2	10.8	"	—	—	—	7.37	3.2	
#3	9.8	"	—	—	—	7.17	2.4	
LAB CONTROL	21.6	mud	Eel ~6"	—	—	7.31	21.0	
2CHK012.12#2	6.0	mud/grass	—	—	—	6.75	5.9	
Date/Initials:	LB & PD 8/25/00							

Note: See separate work sheet for percent water. TOC and grainsize analyses are subcontracted (collect sub-sample when inspecting for indigenous organisms)

*Pore water pH, ammonia and salinity (estuarine sediments only) are determined on test day -1 or 0. Other parameters should be checked on arrival.

FORM STF009B SEDIMENT CHARACTERISTICS
(rev. 8/1/00)

TEST I.D. VIMS0002

Sediment I.D.	Arrival Temp. (°C)	Sediment Appearance	Indigenous Organisms (note type if present) 1 mm sieve	0.5 mm sieve	0.25 mm sieve	Pore water pH (S.U.)*	Pore water NH_3-N (mg/l)*	Pore water Salinity (g/kg)*
2-JMS068.49 #1	4.8	mud w/ some sand	—	—	chironomid, 1, red	7.04	5.3	
#2	5.3	"	(1) numerous (*) capitellid like	(2) same as 1 but also chironomid larvae	—	6.90	5.7	
#3	5.4	"	(3) "	(4) red chironomid-like	—	7.07	5.1	
2-JMS066.35 #1	4.1	mud	—	(5) fly larvae	—	6.86	4.6	
#2	2.9	"	—	(6) fly/chironomid larvae	—	7.30	6.7	
#3	9.1	"	—	—	—	6.80	6.8	
2-JMS068.64 #1	7.2	mud	(7) same as (1) many plus fly larvae	(8) same as 1, few	—	6.82	3.6	
#2	8.1	"	(9) "	(10) "	—	6.68	5.5	
#3	7.1	"	(10) "	"	—	6.65	2.3	
2JMS067.56 #1	6.8	mud	—	—	—	7.21	13	
#2	6.8	"	—	—	—	7.07	24	
#3	5.3	"	—	—	—	7.17	19	
Date/Initials:	GB 8/24/00	PD 8/24/00	←	PD 8/24/00	→			

Sieve for that 500µm

Sieve for that 500µm

Note: See separate work sheet for percent water. TOC and grainsize analyses are subcontracted (collect sub-sample when inspecting for indigenous organisms)

*Pore water pH, ammonia and salinity (estuarine sediments only) are determined on test day -1 or 0. Other parameters should be checked on arrival.

(*) Cyathura polita (B. Diaz, VIMS) - P.D.

FORM STF009B SEDIMENT CHARACTERISTICS
(rev. 8/1/00)

TEST I.D. V. ms 0002

Sediment I.D.	Arrival Temp. (°C)	Sediment Appearance	Indigenous Organisms (note type if present) 1 mm sieve	0.5 mm sieve	0.25 mm sieve	Pore water pH (S.U.)*	Pore water NH_3-N (mg/l)*	Pore water Salinity (g/kg)*
2Jms046.73 #1	5.2	mud	← few fly	larvae	→	7.31	18	
#2	6.8	"	"	"	"	7.26	9.2	
#3	3.8	"	"	"	"	7.21	9.7	
2Jms044.08 #1	5.4	mud	crab	—	—	6.57	6.2	
#2	6.1	"	isopod as ①	isopod	—	6.99	4.8	
#3	5.8	"		isopods	—	6.68	3.8	
2Jms 5050.55 #1	4.7	mud	small clams	fly larvae	—	7.32	15.0	
#2	5.8	"	"	"	—	7.28	8.0	
#3	5.9	"	"	"	—	7.04	8.0	
PD.								
Date/Initials:	PD/GB 8/25/05	→						

Sieved 500 µm for test

Note: See separate work sheet for percent water. TOC and grainsize analyses are subcontracted (collect sub-sample when inspecting for indigenous organisms)

*Pore water pH, ammonia and salinity (estuarine sediments only) are determined on test day -1 or 0. Other parameters should be checked on arrival.

Tox. Tests

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240

CHAIN OF CUSTODY RECORD

ID NO. (PC/NPDES)	PROJECT/ CASE NAME	DEQ REGION	OWNER ADDRESS
	AMBTOX		Central Office

SAMPLERS: (Signatures) Bud Rodi

SITE LOCATION (Lat. & Long. optional) James River

STA. NO.	DATE	TIME	STATION LOCATION	COMP.	GRAB	NO. OF CONTAINERS	SEALED YES	PRESERVED YES	PICTURES TAKEN	TESTS TO BE RUN IN LAB: Tox. Tests					Observations, Field Tests, Remarks Made in Field
17	8/24	1350	2-JMS044.08		✓	3				✓					
18	8/24	1650	2-JMS 046.73		✓	3				✓					
20	8/24	1225	2-JMS 050.55		✓	3				✓					
21	8/24	1130	2-JMS 052.52		✓	3				✓					
56	8/24	0950	2-JMS056.12		✓	3				✓					
19	8/24	1940	2-CHK012.12		✓	7				✓					

Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
[signature]	8/24 2022	M. Roberts			
Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
Morris L. Roberts	8/25 0830	[signature]			
Relinquished by: (Signature)	Date/ Time	Received in Laboratory by: (Signature)	Date/ Time	Seals in place? _____ Preservation OK? _____	Lab Remarks:

Original to Accompany Shipment; copy to Sampler; Copy to Transporter

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240

Tox. Test

CHAIN OF CUSTODY RECORD

ID NO. (PC/ NPDES)	PROJECT/ CASE NAME	DEQ REGION	OWNER ADDRESS

SAMPLERS: (Signatures) Bud Rodi

SITE LOCATION (Lat. & Long. optional) James River

STA. NO.	DATE	TIME	STATION LOCATION	COMP.	GRAB	NO. OF CONTAINERS	SEALED YES	PRESERVED YES	PICTURES TAKEN	TESTS TO BE RUN IN LAB						Observations, Field Tests, Remarks Made in Field
30	8/23/00		2-JMS 068.64		✓	3										
23	8/23/00		2-JMS 067.56		✓	3										
29	8/23/00		2-JMS 068.49		✓	3										
58	8/23/00		2-JMS 066.35		✓	3										

Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
[signature]	8/23	M. Roberts			
Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
M. Roberts	8/24 0811	[signature]			
Relinquished by: (Signature)	Date/ Time	Received in Laboratory by: (Signature)	Date/ Time	Seals in place? _____ Preservation OK? _____	Lab Remarks:

Original to Accompany Shipment; copy to Sampler; Copy to Transporter

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

#59

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
	2-JMS273.69	8 2 2	1550	m	10

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	TOX					AJR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW

SWL	SPWL	HOURS	YIELD

TISSUE

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER 3 subsamples in order taken 1-2-3

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17	Transported to:		M. Roberts	8/23/00
19				
21				
23	Rec'd @ CBI		0820	8/23/00
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

#59 Dup

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2JMS073.63	0822		M	1.75

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	P					AJR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER 3 subsamples in order taken 1-2-3

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17	Transported		M Roberts	8/23/00
19				
21				
23	Rcvd @ CBI		0820 8/23/00	
25				
27				

gsl/CL: 7/947/95(deqform)

I 75

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2JMS074.25	000822	1032	M1	.75

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 - ~~[illegible]~~	P TOX					AJR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	D	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS Tox. Test samples 3 subsamples in order taken 1, 2, + 3 match sequential order

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
	tub 2/2	was	labelled	
3	station	2JMS012.12		
5				
7				
9				
11				
13				
15				
17	Transported: M Roberts			8/23/00
19				
21				
23	Rec'd @ CBL 0830 8/23/00			
25				
27				

gsl/CL: 7/947/95(deqform)

Site 25
Station Order

center 37 19.1932 77 13.2435

	Station Number	LAT 83		LON 83	
		D	MM.mmmm	D	MM.mmmm
1	320	37	19.2097	77	13.2773
2	262	37	19.2015	77	13.2705
3	411	37	19.2207	77	13.2401
	383	37	19.2179	77	13.2671
	118	37	19.1795	77	13.2165
	362	37	19.2152	77	13.2705
	196	37	19.1905	77	13.2232
	338	37	19.2097	77	13.2165
	200	37	19.1932	77	13.2773
	153	37	19.1850	77	13.2334
	431	37	19.2234	77	13.2401
	27	37	19.1685	77	13.2536
	162	37	19.1877	77	13.2705
	390	37	19.2179	77	13.2435
	88	37	19.1767	77	13.2503
	155	37	19.1850	77	13.2266
	440	37	19.2262	77	13.2773
	268	37	19.2015	77	13.2503
	82	37	19.1767	77	13.2705
	380	37	19.2179	77	13.2773

Site 59
Station Order

Center 37 19.3982 77 12.4907

Station Number	LAT 83 D	LAT 83 MM.mmmm	LON 83 D	LON 83 MM.mmmm
363	37	19.4202	77	12.5144
19	37	19.3707	77	12.4603
107	37	19.3844	77	12.5009
256	37	19.4037	77	12.4705
203	37	19.3982	77	12.5144
326	37	19.4147	77	12.5043
341	37	19.4174	77	12.5211
52	37	19.3762	77	12.4840
428	37	19.4284	77	12.4975
121	37	19.3872	77	12.5211
360	37	19.4202	77	12.5245
160	37	19.3927	77	12.5245
13	37	19.3707	77	12.4806
84	37	19.3817	77	12.5110
11	37	19.3707	77	12.4874
154	37	19.3899	77	12.4772
260	37	19.4064	77	12.5245
57	37	19.3762	77	12.4671
36	37	19.3735	77	12.4705
437	37	19.4284	77	12.4671

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2JMS068.49	0008 23	1605	M	3.3

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 - TOX	P tests		6	606		Agh

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
D				
74995	74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER 1/3 254
2/3 233
3/3 95

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA			
	D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS066B5	000823	1720	M	1.5T

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-TOX	PTests		6	606		AJA

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	D	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER 1/3 = 139
2/3 290
3/3 322

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2JMS068.64	000823	1020	M 7 -	C

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 - TOX	P.TESTS		6			AJR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER 1/3 #51
2/3 # 192
3/3 # 159

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT
OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS06756	000823	1225	M	4.75

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-TOX	P TESTS		6			AJH

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW — TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER 1/3 = 137
2/3 424
3/3 43

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2CHK012-12	000824	1912	M	10

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-TOX	PTest		6	606		AJH

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME (C°) (00020)	BAROMETER PRESSURE (00025)

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	D	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER 1/3 379
2/3 416
3/3 46

COUNTY

COMMENTS 3 of 3 in 5 mahogany bottles (500 ml each)

1 of 3 Bottle from Dana White

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Bottle 2 of 2 mislabeled 74.25 B 8/24/03

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2JMS044.08	000824	1350		7.5

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-TOX	PTESTS	7	6	606		AJR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	D	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER 1/3 59
2/3 404
3/3 66

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2JMS046-73	000824	1650	M3.5	

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-TOX	PTESTS		6			AJA

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
	D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER 1/3 404
2/3 9
3/3 171

COUNTY

COMMENTS 3/3 lost label
cont. time of collection
17:30; check field notes

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY 4

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2JMS056.12	000824	0950		10

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 - TBX	PTests		6			AJL

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW — TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
	D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER 1/3 49
2/3 155
3/3 3

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

esl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2JMS052.52	000824	1130		10

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 - TOX	P TESTS		6	606		AJN

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	D	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER 1/3 2/7
2/3 234
3/3 401

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AJ	2JMS050.55	000824	1225		77

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 - TOX	P TESTS		6	606		AJA

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

#

1/3 318

2/3 292

3/3 252

COUNTY

COMMENTS

DEPTH (m)	FIELD DATA			
	D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

Coastal Bioanalysts, Inc.

ENVIRONMENTAL SAMPLE INFORMATION/CHAIN OF CUSTODY

SAMPLE MATRIX/TYPE: SEDIMENT ✓ SOIL___ SURFACE WATER___ GROUND WATER___ OTHER_____

PROJECT I.D. VIMS0002

SAMPLE I.D. LAB CONTROL SED.

COLLECTION DATE/TIME: 8/25/00 0755

SAMPLING LOCATION/SITE: RT 614 ~ 1/4 MILE E. OF US RT 17, GLOUCESTER CO (WHITE MARSH) VA UT of SEVERN RIVER.

SAMPLING EQUIPMENT/METHODS: PLASTIC SHOVEL

SAMPLE CONTAINER: GLASS ✓ HDPE____ PTFE____ OTHER (SPECIFY):_____

METHOD OF SHIPMENT: HAND DELIVER

IS SAMPLE CONSIDERED HAZARDOUS IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND/OR LOCAL LAWS?* YES____ NO ✓

I certify that the above information is correct: [signature] (SAMPLER SIGNATURE)

P. DELISLE (PRINT NAME) CBI (AFFILIATION) 8/25/00 (DATE)

*UNLESS PREVIOUSLY NEGOTIATED, SAMPLES DETERMINED TO BE HAZARDOUS WILL BE RETURNED AND SHIPMENT CHARGED AT COST PLUS 25%; OR COASTAL BIOANALYSTS WILL DISPOSE OF THE SAMPLES AT COST PLUS 25%.

****

Print & Sign Names

1. Relinquished by: [signature] Date/time: 8/25/00 0815

   Received by: B. Briggs Date/time: 8/25/00 0815

2. Relinquished by:_____ Date/time:_____

   Received by:_____ Date/time:_____

3. Relinquished by:_____ Date/time:_____

   Received by:_____ Date/time:_____

4. Relinquished by:_____ Date/time:_____

   Received by:_____ Date/time:_____

FORM QSF602A

Appendix B

Data Tables from:

James River Sediment and Water Column Toxicity Survey.

Sediment Stations: JMS040.03, JMS042.46, JMS047.33, JMS065.81, JMS068.68 and JMS074.29.

Water Column Stations: JMS040.03, JMS042.46, JMS047.33, JMS065.81, JMS068.68, JMS072.08 and JMS074.29.

10/17/00 to 10/25/00 Sampling Period.

Final report from Coastal Bioanalysts, Inc., Gloucester, VA 23061

To Virginia Institute of Marine Science, Gloucester Point, VA 23062

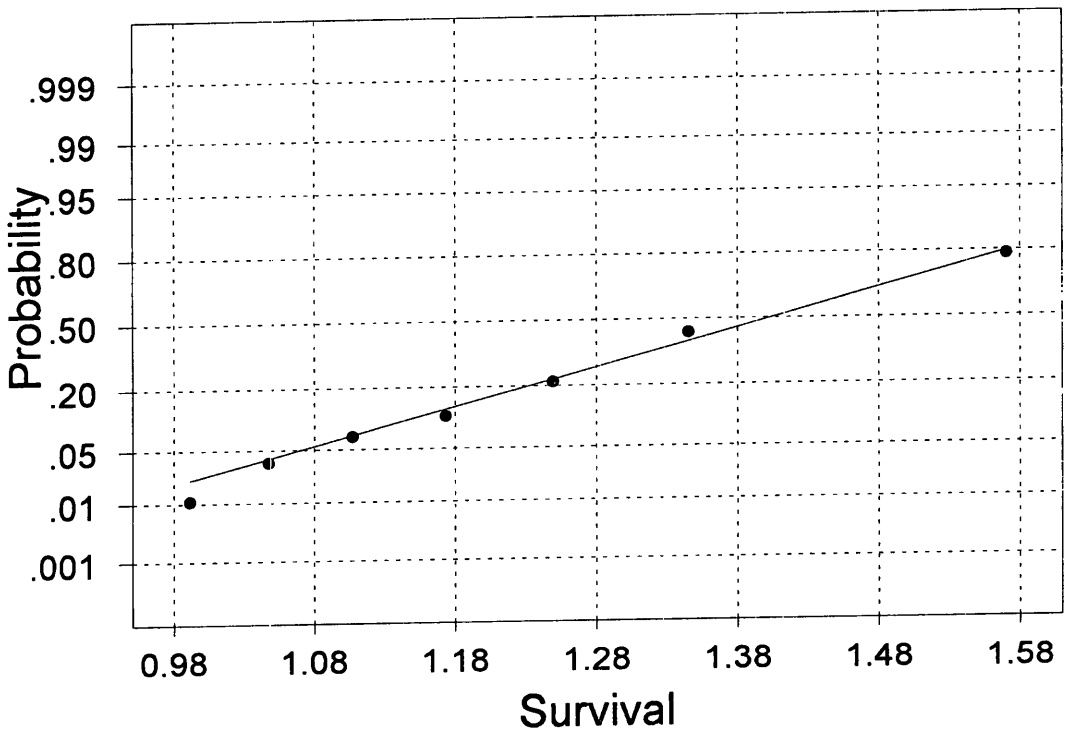
Table A1. Summary Water Quality – *Hyalella azteca* Sediment Test

Station	Temperature (°C)		Diss. Oxygen (mg/l)		pH (S.U.)		Conductivity (uS/cm)		Hardness (mg/l as $CaCO_3$)		Alkalinity (mg/l as $CaCO_3$)		NH3-N (mg/l)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Control	23.2	0.3	8.3	0.1	8.01	0.25	333	31.0	152.0	12.0	82.5	26.5	0.6	0.5
40.031	23.2	0.2	8.3	0.1	8.02	0.08	1309	431.0	177.5	16.5	71.0	8.0	0.5	0.4
40.032	23.2	0.2	8.4	0.2	7.88	0.21	1261	412.0	195.0	17.0	69.0	6.0	0.5	0.4
40.033	23.2	0.2	8.3	0.1	7.82	0.13	1222	352.0	194.0	16.0	49.0	6.0	0.4	0.3
42.461	22.9	0.3	8.3	0.1	8.01	0.01	718	111.0	153.0	9.0	64.0	11.0	0.2	0.1
42.462	23.2	0.2	8.3	0.1	8.00	0.06	956	275.5	158.0	22.0	69.0	1.0	0.2	0.1
42.463	23.1	0.2	8.3	0.1	8.04	0.08	812	137.5	160.5	19.5	64.0	7.0	0.2	0.1
47.331	23.0	0.1	8.3	0.2	8.05	0.06	720	149.0	167.0	11.0	80.0	9.0	0.7	0.6
47.332	23.1	0.2	8.3	0.1	8.01	0.08	800	192.5	168.0	36.0	55.5	0.5	0.6	0.5
47.333	23.2	0.3	8.3	0.2	7.96	0.11	841	235.5	165.0	17.0	64.5	6.5	0.5	0.4
47.811	23.1	0.2	8.3	0.2	7.95	0.05	609	142.0	122.0	16.0	53.0	4.0	0.3	0.2
47.812	23.3	0.2	8.3	0.1	7.97	0.04	570	80.5	136.0	2.0	68.0	1.0	0.7	0.6
47.813	23.2	0.2	8.4	0.1	7.96	0.07	579	81.0	153.0	7.0	69.5	3.5	0.8	0.7
65.811	23.1	0.2	8.3	0.1	7.72	0.21	276	4.5	90.0	6.0	40.5	4.5	0.3	0.2
65.812	23.2	0.2	8.3	0.1	7.91	0.01	283	0.0	105.0	21.0	48.5	7.5	0.5	0.4
65.813	23.1	0.1	8.3	0.1	7.94	0.12	332	6.0	133.5	10.5	76.5	7.5	1.4	1.3
68.681	23.2	0.2	8.3	0.1	7.36	0.13	258	11.0	82.0	14.0	35.0	11.0	0.3	0.2
68.682	23.0	0.1	8.3	0.2	7.73	0.25	265	1.5	114.0	4.0	34.0	10.0	0.4	0.3
68.683	23.1	0.2	8.3	0.1	7.71	0.07	264	24.5	123.0	7.0	38.5	7.5	0.3	0.2
74.291	23.2	0.2	8.3	0.2	8.12	0.06	390	27.5	187.5	34.5	123.0	20.0	1.6	1.5
74.292	23.2	0.2	8.3	0.1	8.13	0.12	355	36.0	142.0	20.0	99.0	17.0	0.6	0.5
74.293	23.0	0.2	8.3	0.1	8.17	0.02	409	42.5	174.0	22.0	118.0	10.0	2.3	2.2

Table A2. Summary Water Quality – *Pimephales promelas* Sediment Test

Station	Temperature (°C)		Diss. Oxygen (mg/l)		pH (S.U.)		Conductivity (uS/cm)		NH3-N (mg/l)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Control	24.5	0.3	7.8	0.2	7.62	0.16	311	20.4	1.3	0.2
40.031	24.4	0.3	7.7	0.3	7.67	0.10	565	212.2	0.9	0.3
40.032	24.4	0.3	7.8	0.3	7.74	0.14	500	191.5	0.8	0.4
40.033	24.4	0.2	7.9	0.2	7.71	0.10	580	257.3	0.7	0.4
42.461	24.4	0.3	7.8	0.2	7.71	0.10	440	125.3	0.4	0.1
42.462	24.5	0.2	7.9	0.1	7.75	0.10	450	129.1	0.3	0.1
42.463	24.4	0.3	7.8	0.2	7.71	0.09	465	153.3	1.1	0.9
47.331	24.4	0.2	7.7	0.3	7.72	0.12	442	126.6	0.8	0.6
47.332	24.4	0.2	7.6	0.4	7.58	0.13	427	111.0	0.9	0.4
47.333	24.4	0.3	7.8	0.3	7.61	0.11	428	97.1	0.8	0.3
47.811	24.4	0.2	7.7	0.2	7.62	0.10	378	67.9	0.5	0.2
47.812	24.4	0.2	7.8	0.2	7.64	0.11	382	76.0	1.0	0.7
47.813	24.5	0.2	7.7	0.3	7.65	0.11	371	74.6	0.9	0.5
65.811	24.4	0.3	7.8	0.2	7.60	0.10	274	9.0	0.5	0.2
65.812	24.4	0.3	7.7	0.3	7.53	0.13	284	9.9	0.8	0.3
65.813	24.4	0.2	7.7	0.3	7.70	0.19	320	25.6	2.5	1.6
68.681	24.3	0.2	7.8	0.3	7.55	0.08	273	8.8	0.4	0.1
68.682	24.4	0.2	7.8	0.2	7.56	0.11	280	10.4	0.6	0.2
68.683	24.4	0.3	7.8	0.2	7.57	0.06	285	8.2	0.6	0.1
74.291	24.4	0.2	7.8	0.3	7.88	0.16	332	23.9	2.5	1.7
74.292	24.3	0.2	7.7	0.3	7.70	0.12	308	16.6	0.9	0.4
74.293	24.4	0.3	7.8	0.2	7.79	0.16	335	33.0	3.5	1.9

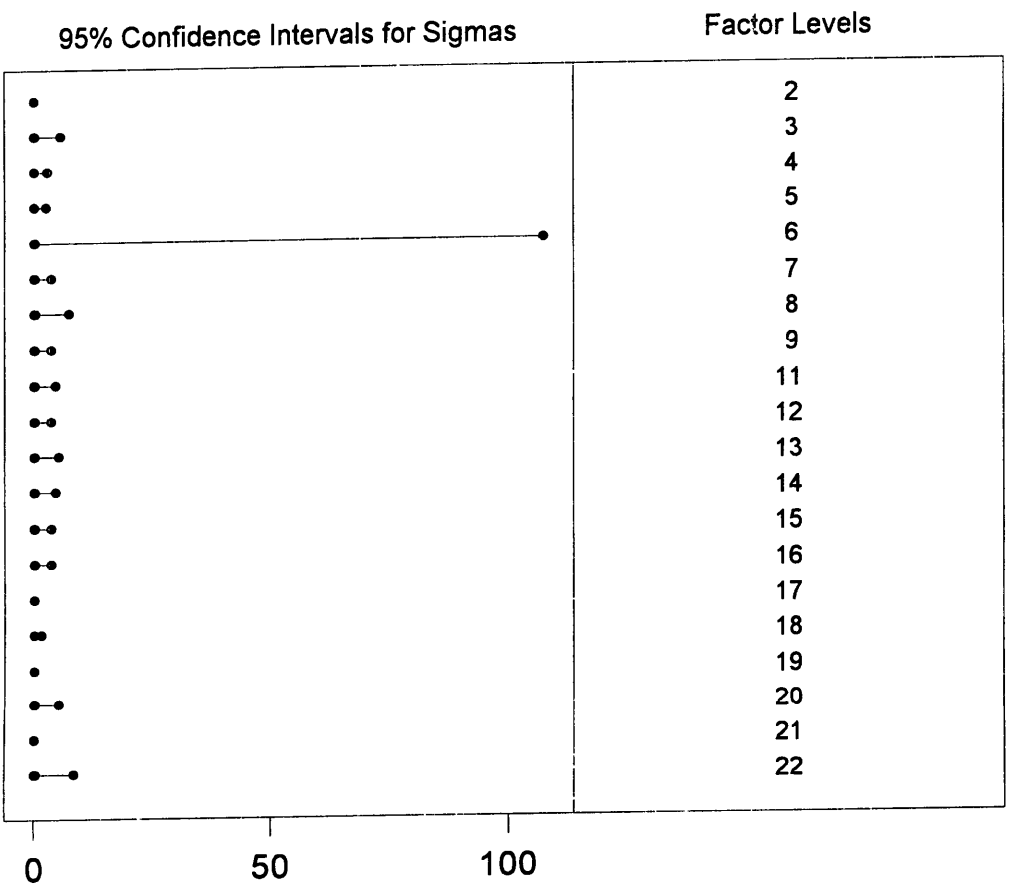
AMPHIPOD SURVIVAL (W/O C POLITA)(SAMPLES)



Average: 1.39322
Std Dev: 0.172438
N of data: 59

W-test for Normality
R: 0.9957
p value (approx): > 0.1000

AMPHIPOD SURVIVAL (W/O C POLITA)(SAMPLES)



Bartlett's Test

Test Statistic: -40.142

p value : 1.000

Levene's Test

Test Statistic: 0.505

p value : 0.944

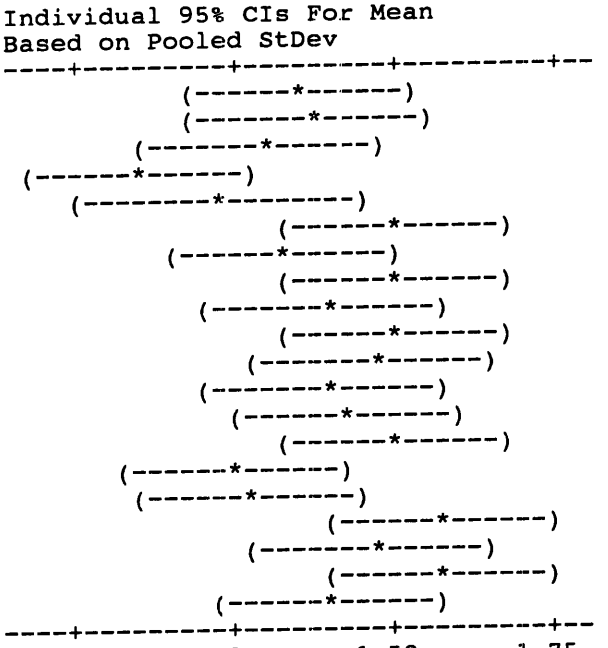
One-Way Analysis of Variance

Analysis of Variance on Survival

Source	DF	SS	MS	F	p
Test ID	19	0.8364	0.0440	1.93	0.040
Error	39	0.8882	0.0228		
Total	58	1.7246			

Level	N	Mean	StDev
2	3	1.3453	0.0000
3	3	1.3631	0.1994
4	3	1.2879	0.0994
5	3	1.0905	0.0921
6	2	1.2262	0.1684
7	3	1.4956	0.1302
8	3	1.3211	0.2626
9	3	1.4956	0.1302
11	3	1.3884	0.1651
12	3	1.4956	0.1302
13	3	1.4635	0.1858
14	3	1.3884	0.1651
15	3	1.4205	0.1302
16	3	1.4956	0.1302
17	3	1.2490	0.0000
18	3	1.2811	0.0556
19	3	1.5708	0.0000
20	3	1.4635	0.1858
21	3	1.5708	0.0000
22	3	1.3963	0.3023

Pooled StDev = 0.1509



Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00413

Critical value = 3.05

Control = level 14 of Test ID

Level	Lower	Center	Upper
2	-0.4189	-0.0431	0.3327
3	-0.4011	-0.0253	0.3505
4	-0.4763	-0.1005	0.2753
5	-0.6737	-0.2979	0.0779
6	-0.5823	-0.1622	0.2580
7	-0.2686	0.1073	0.4831
8	-0.4431	-0.0673	0.3085
9	-0.2686	0.1073	0.4831
11	-0.3758	0.0000	0.3758
12	-0.2686	0.1073	0.4831
13	-0.3006	0.0752	0.4510
15	-0.3437	0.0321	0.4079
16	-0.2686	0.1073	0.4831
17	-0.5151	-0.1393	0.2365
18	-0.4831	-0.1073	0.2686
19	-0.1934	0.1824	0.5582
20	-0.3006	0.0752	0.4510
21	-0.1934	0.1824	0.5582
22	-0.3679	0.0079	0.3837

```
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           (-----------*------------)
        (------------*-----------)
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              (-----------*------------)
                (------------*-----------)
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                   (-----------*------------)
               (------------*-----------)
                   (-----------*------------)
             (-----------*------------)
---+---------+---------+---------+--------
-0.60     -0.30      0.00      0.30
```
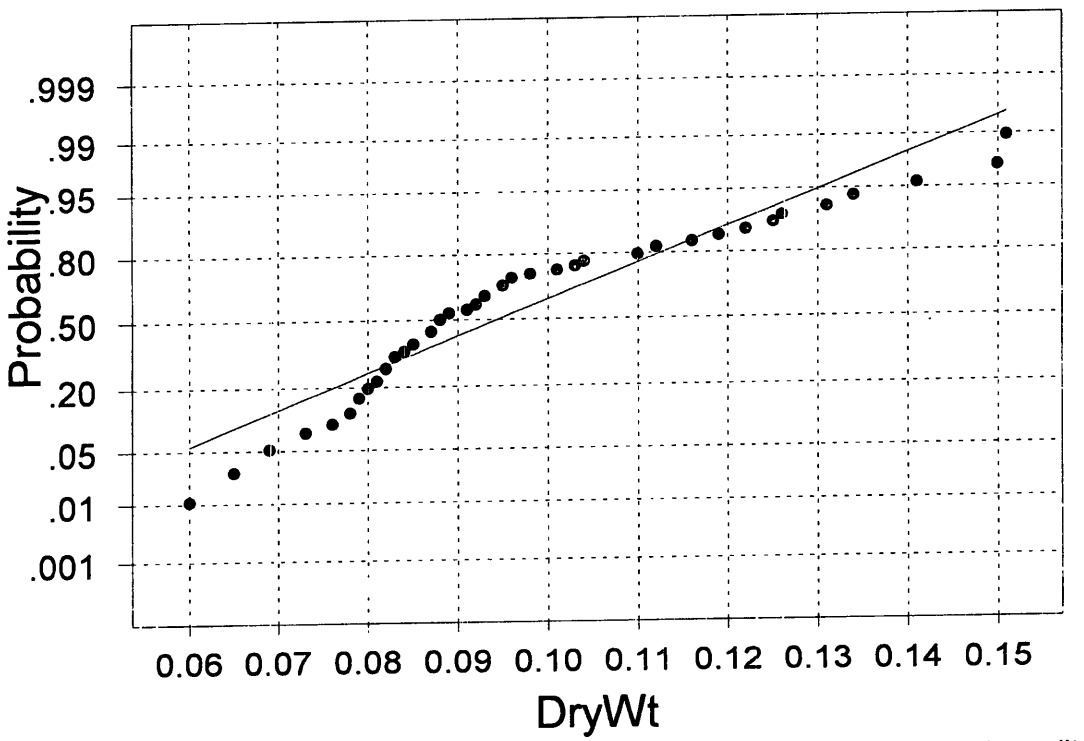

M

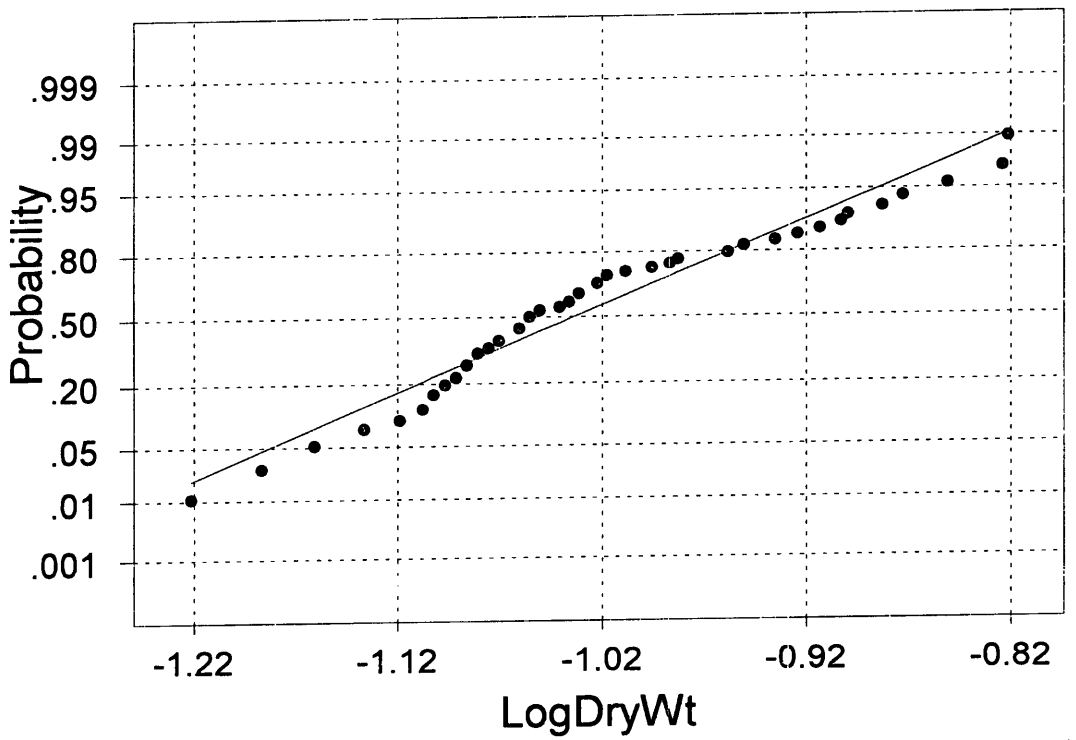
AMPHIPOD WEIGHT (W/O C POLITA)(SAMPLES)



Average: 0.0943898
Std Dev: 0.0202417
N of data: 59

W-test for Normality
R: 0.9480
p value (approx): < 0.0100

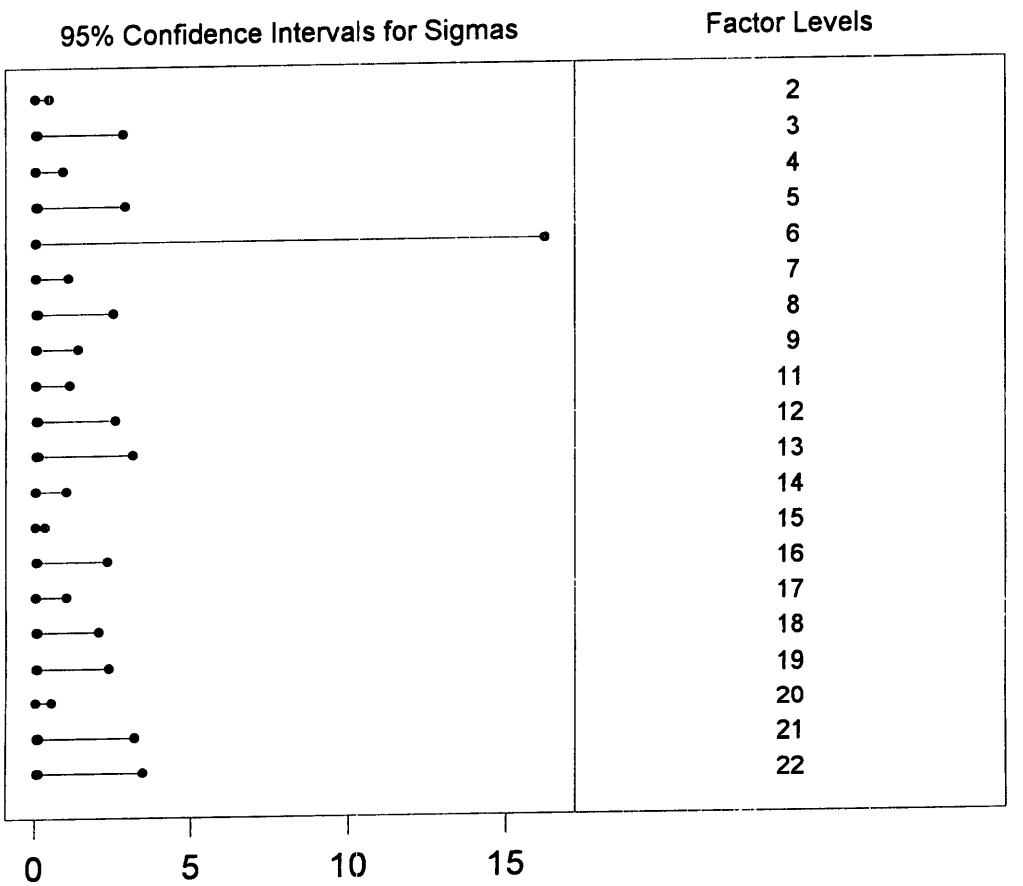
AMPHIPOD WEIGHT (W/O C POLITA)(SAMPLES)



Average: -1.03400
Std Dev: 0.0870126
N of data: 59

W-test for Normality
R: 0.9752
p value (approx): 0.0304

AMPHIPOD WEIGHT (W/O C POLITA)(SAMPLES)



Bartlett's Test

Test Statistic: 22.495

p value : 0.260

Levene's Test

Test Statistic: 0.414

p value : 0.979

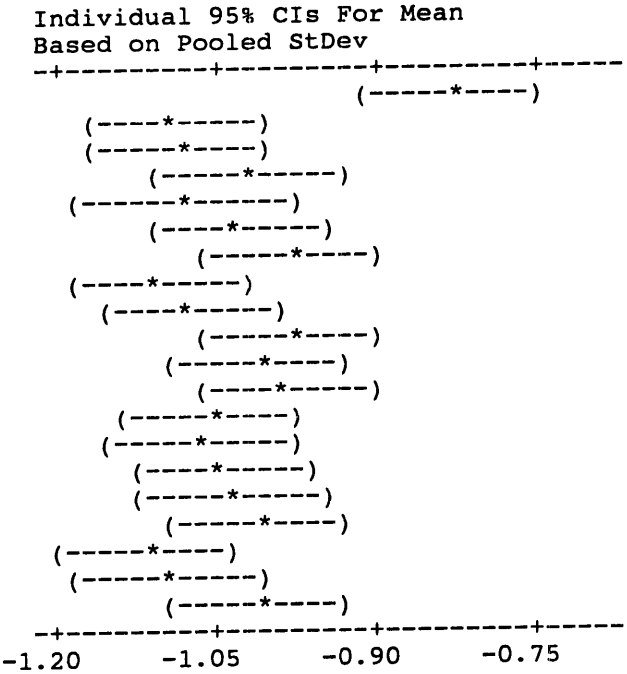
One-Way Analysis of Variance

Analysis of Variance on LogDryWt

Source	DF	SS	MS	F	p
Test ID	19	0.22907	0.01206	2.24	0.016
Error	39	0.21006	0.00539		
Total	58	0.43913			

Level	N	Mean	StDev
2	3	-0.8319	0.0164
3	3	-1.0904	0.1001
4	3	-1.0852	0.0321
5	3	-1.0170	0.1018
6	2	-1.0735	0.0255
7	3	-1.0295	0.0380
8	3	-0.9791	0.0881
9	3	-1.1060	0.0484
11	3	-1.0752	0.0394
12	3	-0.9821	0.0903
13	3	-1.0083	0.1106
14	3	-0.9853	0.0358
15	3	-1.0540	0.0113
16	3	-1.0671	0.0822
17	3	-1.0467	0.0354
18	3	-1.0324	0.0720
19	3	-1.0099	0.0834
20	3	-1.1157	0.0184
21	3	-1.0919	0.1127
22	3	-1.0119	0.1222

Pooled StDev = 0.0734



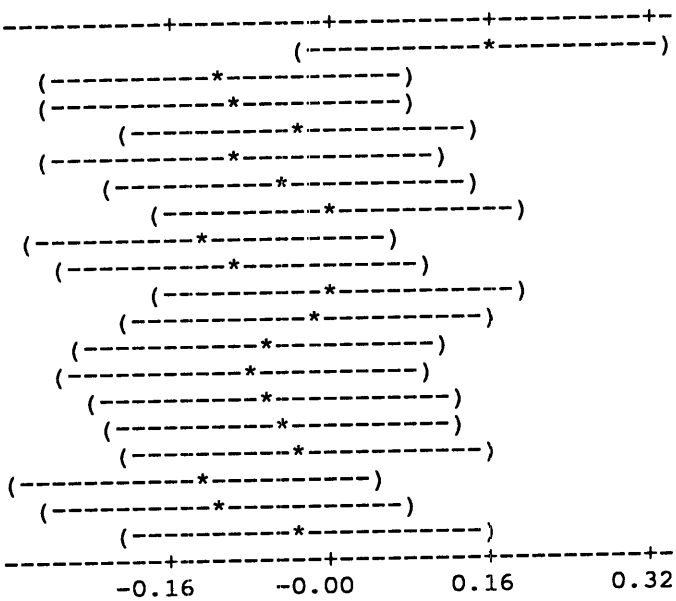
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00413

Critical value = 3.05

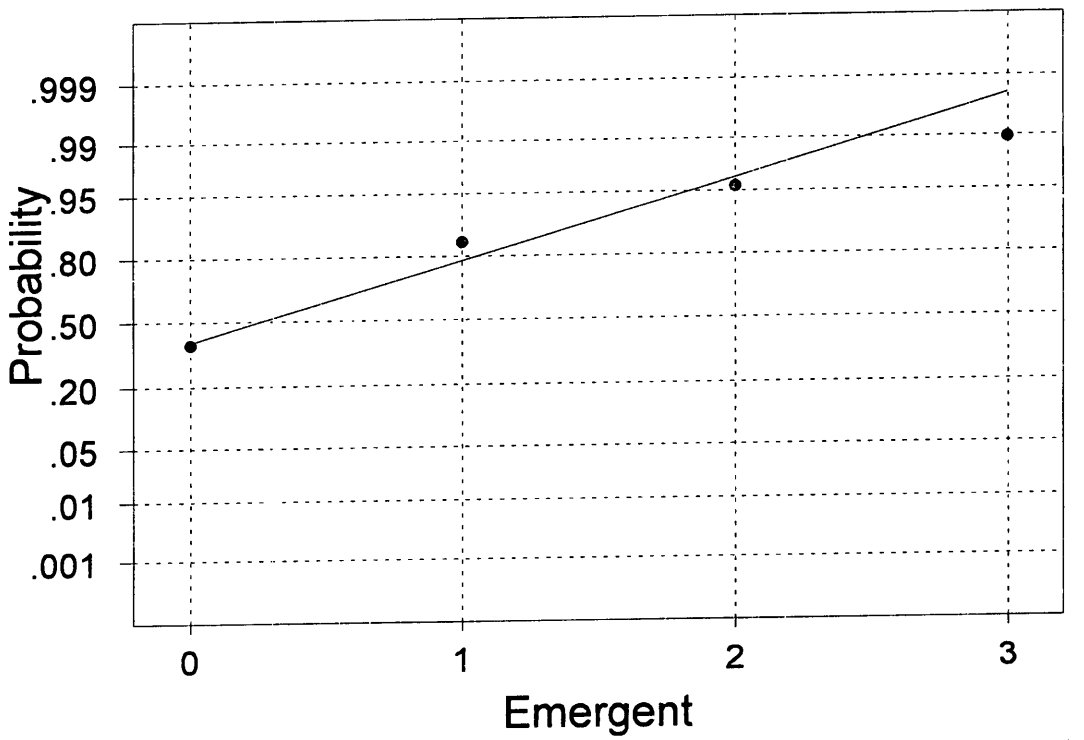
Control = level 14 of Test ID

Level	Lower	Center	Upper
2	-0.02933	0.15344	0.33620
3	-0.28781	-0.10504	0.07772
4	-0.28263	-0.09987	0.08290
5	-0.21447	-0.03170	0.15106
6	-0.29251	-0.08817	0.11616
7	-0.22694	-0.04417	0.13860
8	-0.17656	0.00620	0.18897
9	-0.30340	-0.12063	0.06214
11	-0.27263	-0.08986	0.09291
12	-0.17948	0.00328	0.18605
13	-0.20571	-0.02294	0.15982
15	-0.25140	-0.06863	0.11413
16	-0.26457	-0.08181	0.10096
17	-0.24413	-0.06137	0.12140
18	-0.22982	-0.04706	0.13571
19	-0.20730	-0.02454	0.15823
20	-0.31308	-0.13031	0.05246
21	-0.28931	-0.10654	0.07623
22	-0.20934	-0.02657	0.15619



MTB >

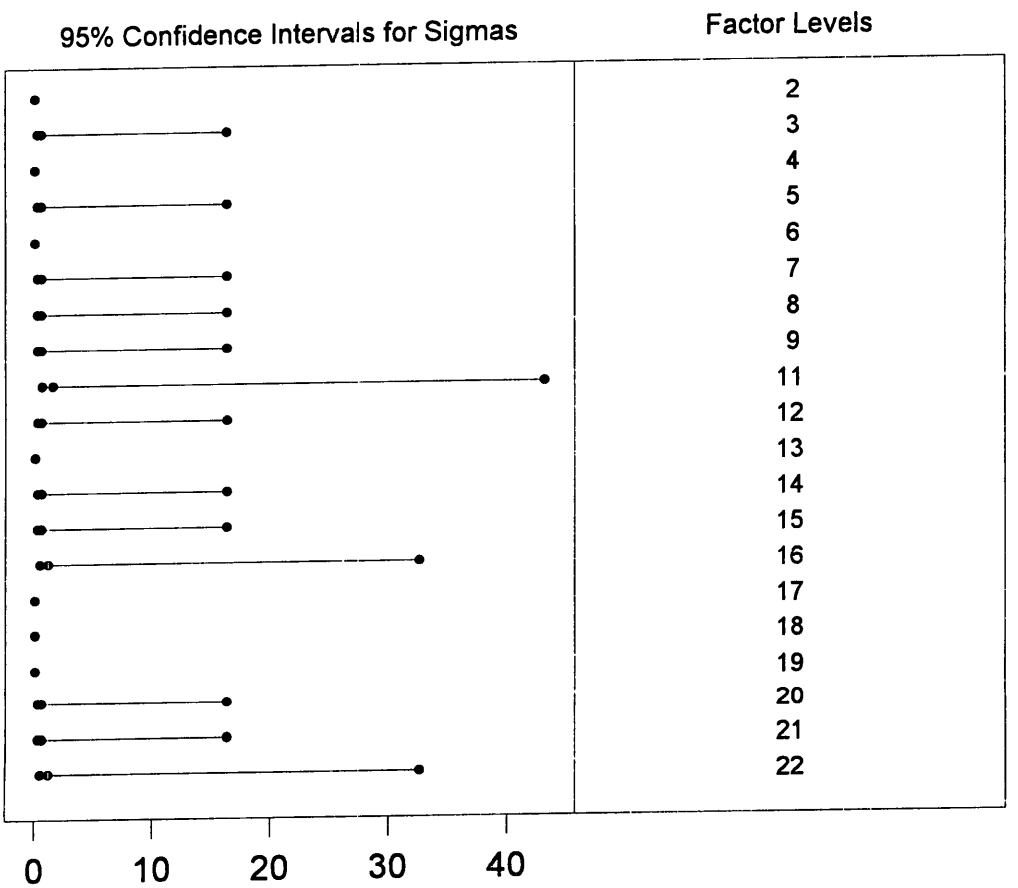
AMPHIPOD EMERGENCE (W/O C POLITA)(SAMPLES)



Average: 0.322034
Std Dev: 0.654972
N of data: 59

W-test for Normality
R: 0.9825
p value (approx): 0.0889

AMPHIPOD EMERGENCE (W/O C POLITA)(SAMPLES



Bartlett's Test

Test Statistic: -23.368

p value : 1.000

Levene's Test

Test Statistic: 0.601

p value : 0.882

One-Way Analysis of Variance

Analysis of Variance on Emergent

Source	DF	SS	MS	F	p
Test ID	19	8.215	0.432	1.01	0.470
Error	39	16.667	0.427		
Total	58	24.881			

Level	N	Mean	StDev
2	3	0.0000	0.0000
3	3	0.3333	0.5774
4	3	0.0000	0.0000
5	3	0.3333	0.5774
6	2	0.0000	0.0000
7	3	0.3333	0.5774
8	3	0.3333	0.5774
9	3	0.3333	0.5774
11	3	1.6667	1.5275
12	3	0.3333	0.5774
13	3	0.0000	0.0000
14	3	0.3333	0.5774
15	3	0.3333	0.5774
16	3	0.6667	1.1547
17	3	0.0000	0.0000
18	3	0.0000	0.0000
19	3	0.0000	0.0000
20	3	0.3333	0.5774
21	3	0.3333	0.5774
22	3	0.6667	1.1547

Pooled StDev = 0.6537

```
Individual 95% CIs For Mean
Based on Pooled StDev
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         (-------*------)
----------+---------+---------+------
        0.0       1.0       2.0
```
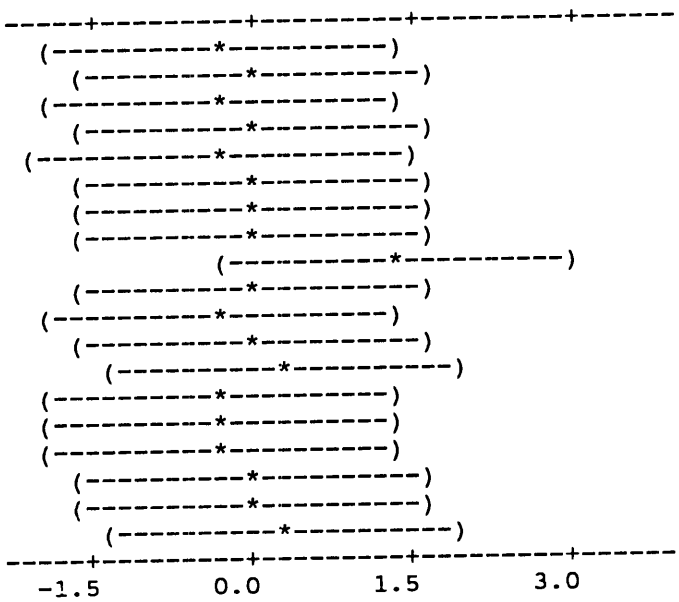

Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00413

Critical value = 3.05

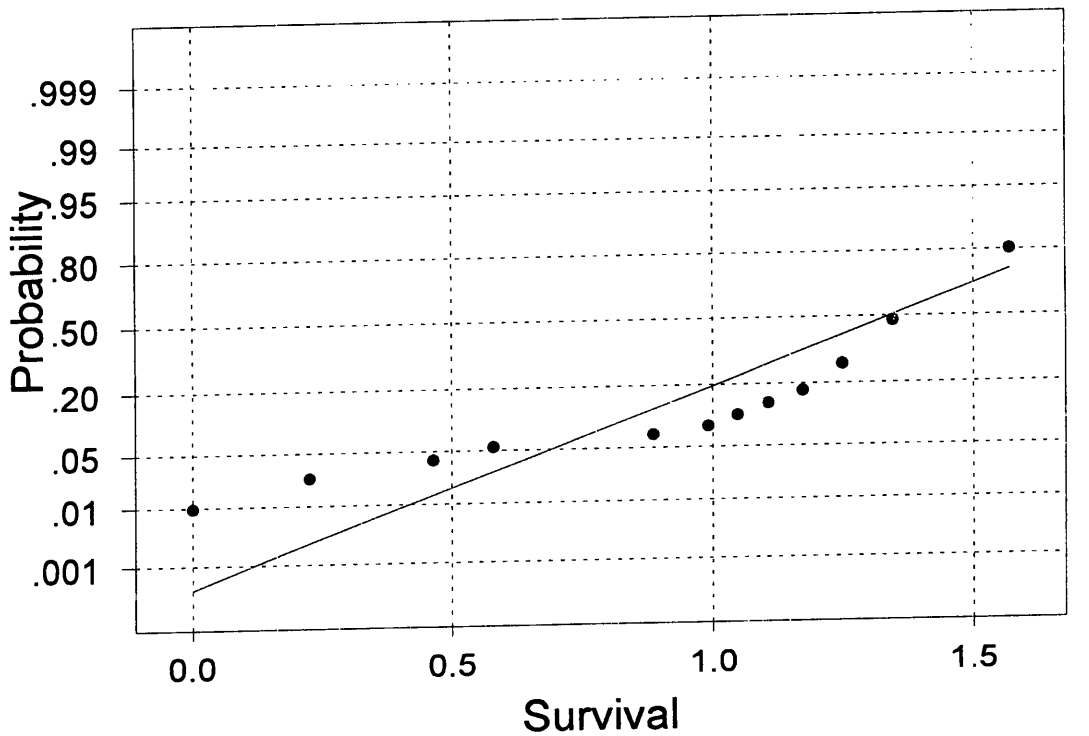
Control = level 14 of Test ID

Level	Lower	Center	Upper
2	-1.9613	-0.3333	1.2946
3	-1.6280	-0.0000	1.6280
4	-1.9613	-0.3333	1.2946
5	-1.6280	-0.0000	1.6280
6	-2.1535	-0.3333	1.4868
7	-1.6280	-0.0000	1.6280
8	-1.6280	-0.0000	1.6280
9	-1.6280	-0.0000	1.6280
11	-0.2946	1.3333	2.9613
12	-1.6280	-0.0000	1.6280
13	-1.9613	-0.3333	1.2946
15	-1.6280	-0.0000	1.6280
16	-1.2946	0.3333	1.9613
17	-1.9613	-0.3333	1.2946
18	-1.9613	-0.3333	1.2946
19	-1.9613	-0.3333	1.2946
20	-1.6280	-0.0000	1.6280
21	-1.6280	-0.0000	1.6280
22	-1.2946	0.3333	1.9613



MTB >

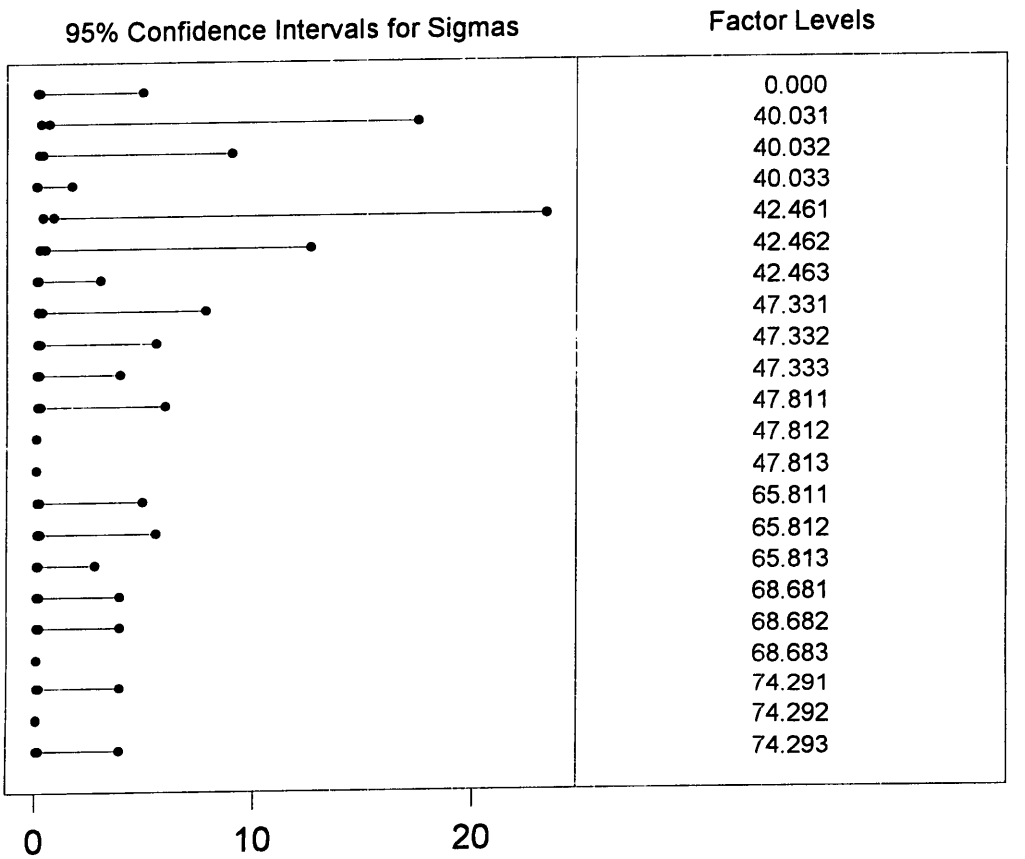
AMPHIPOD SURVIVAL (SAMPLES)



Average: 1.32083
Std Dev: 0.316688
N of data: 66

W-test for Normality
R: 0.9210
p value (approx): < 0.0100

AMPHIPOD SURVIVAL (SAMPLES)



Bartlett's Test

Test Statistic: -7.306

p value : 1.000

Levene's Test

Test Statistic: 1.206

p value : 0.293

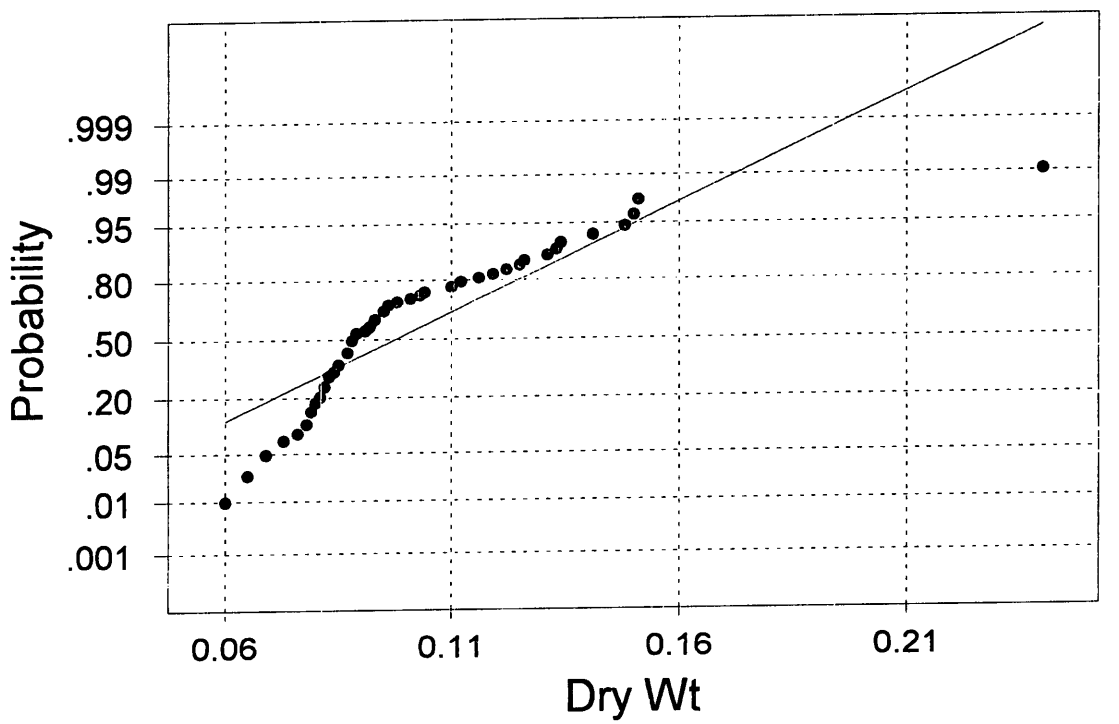
```
MTB > Kruskal-Wallis 'Survival' 'Test ID'.
```

Kruskal-Wallis Test

LEVEL	NOBS	MEDIAN	AVE. RANK	Z VALUE
1	3	0.8861	19.8	-1.26
2	3	1.3453	32.0	-0.14
3	3	1.3453	32.5	-0.09
4	3	1.3453	25.3	-0.75
5	3	1.1071	9.2	-2.25
6	3	1.1071	14.5	-1.75
7	3	1.5708	46.3	1.19
8	3	1.3453	31.0	-0.23
9	3	1.5708	46.3	1.19
10	3	0.5796	8.5	-2.31
11	3	1.3453	34.7	0.11
12	3	1.5708	46.3	1.19
13	3	1.5708	41.8	0.77
14	3	1.3453	34.7	0.11
15	3	1.3453	39.2	0.52
16	3	1.5708	46.3	1.19
17	3	1.2490	18.5	-1.39
18	3	1.2490	23.0	-0.97
19	3	1.5708	53.5	1.85
20	3	1.5708	41.8	0.77
21	3	1.5708	53.5	1.85
22	3	1.5708	38.2	0.43
OVERALL	66		33.5	

```
H = 31.19  d.f. = 21  p = 0.074
H = 33.96  d.f. = 21  p = 0.039 (adjusted for ties)

* NOTE * One or more small samples
MTB >
```

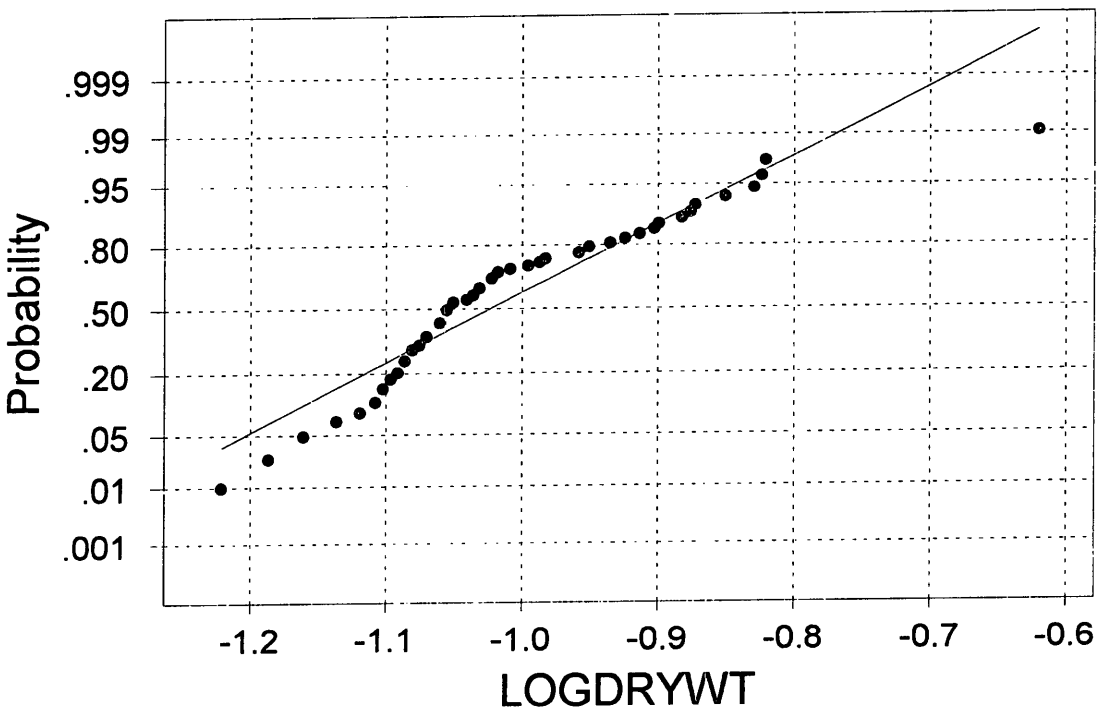
AMPHIPOD WEIGHT (SAMPLES)



Average: 0.0976923
Std Dev: 0.0276151
N of data: 65

W-test for Normality
R: 0.8718
p value (approx): < 0.0100

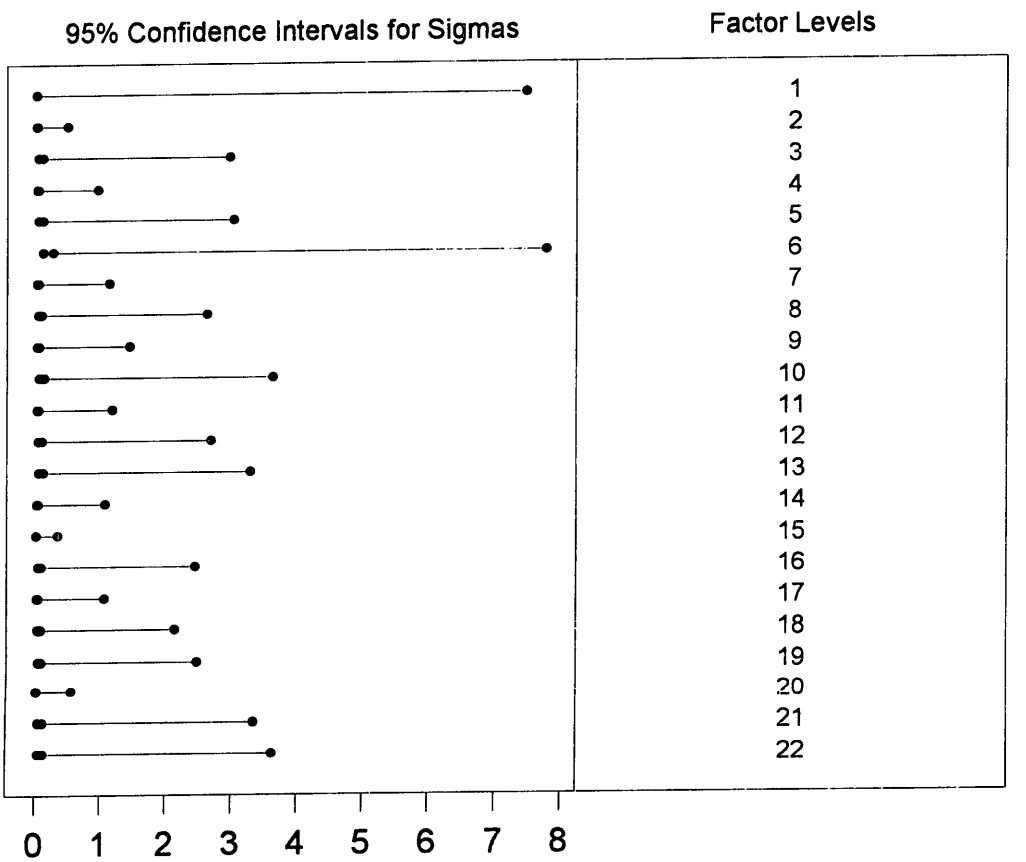
AMPHIPOD WEIGHT (LOG10)(SAMPLES)



Average: -1.02336
Std Dev: 0.102506
N of data: 65

W-test for Normality
R: 0.9477
p value (approx): < 0.0100

AMPHIPOD WEIGHTS (LOG10) (SAMPLES)



Bartlett's Test

Test Statistic: 35.707

p value : 0.024

Levene's Test

Test Statistic: 0.533

p value : 0.939

```
MTB > Kruskal-Wallis 'LogDryWt' 'Test ID'.
```

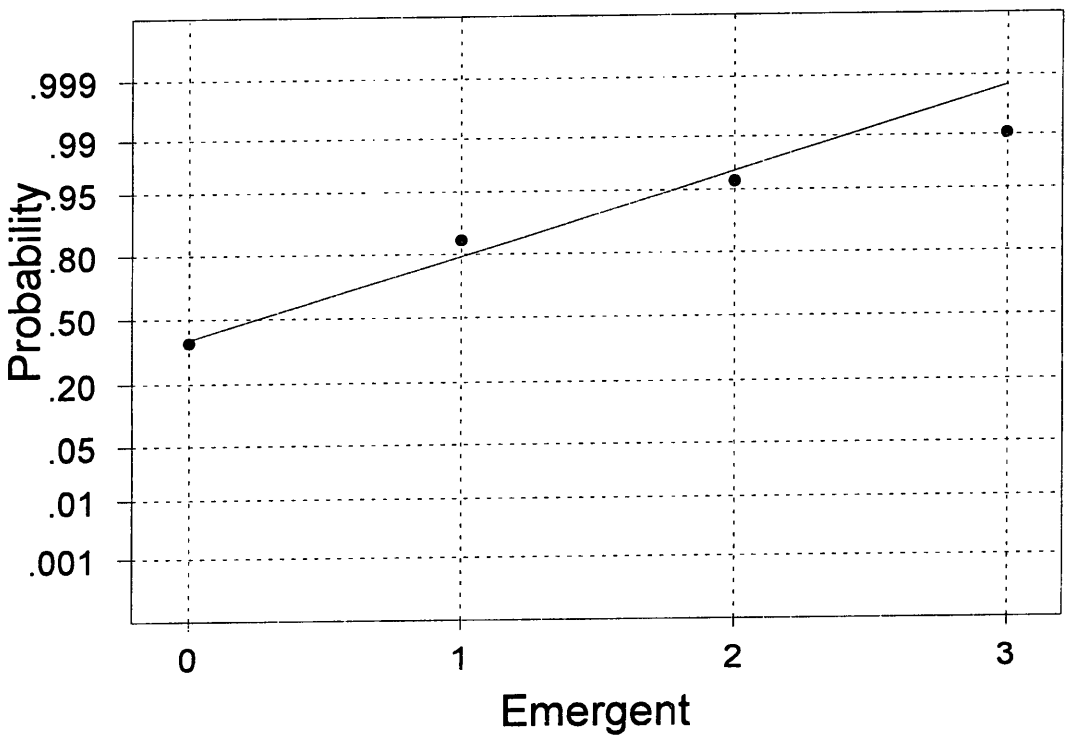
Kruskal-Wallis Test

```
   65 cases were used
    1 cases contained missing values
```

LEVEL	NOBS	MEDIAN	AVE. RANK	Z VALUE
1	2	-1.0630	28.0	-0.38
2	3	-0.8239	62.7	2.78
3	3	-1.0969	20.7	-1.16
4	3	-1.0809	19.3	-1.28
5	3	-1.0706	33.3	0.03
6	3	-1.0555	37.0	0.38
7	3	-1.0223	37.8	0.45
8	3	-0.9586	42.5	0.89
9	3	-1.0862	14.5	-1.74
10	3	-0.8761	49.7	1.56
11	3	-1.0862	21.3	-1.09
12	3	-0.9355	41.2	0.77
13	3	-1.0506	35.5	0.23
14	3	-0.9830	48.0	1.41
15	3	-1.0605	30.7	-0.22
16	3	-1.0315	29.8	-0.30
17	3	-1.0362	33.0	0.00
18	3	-1.0362	32.7	-0.03
19	3	-1.0555	38.5	0.52
20	3	-1.1079	7.5	-2.39
21	3	-1.0315	28.0	-0.47
22	3	-1.0605	32.7	-0.03
OVERALL	65		33.0	

```
H = 26.36  d.f. = 21  p = 0.197
H = 26.39  d.f. = 21  p = 0.195 (adjusted for ties)

* NOTE * One or more small samples
MTB >
```

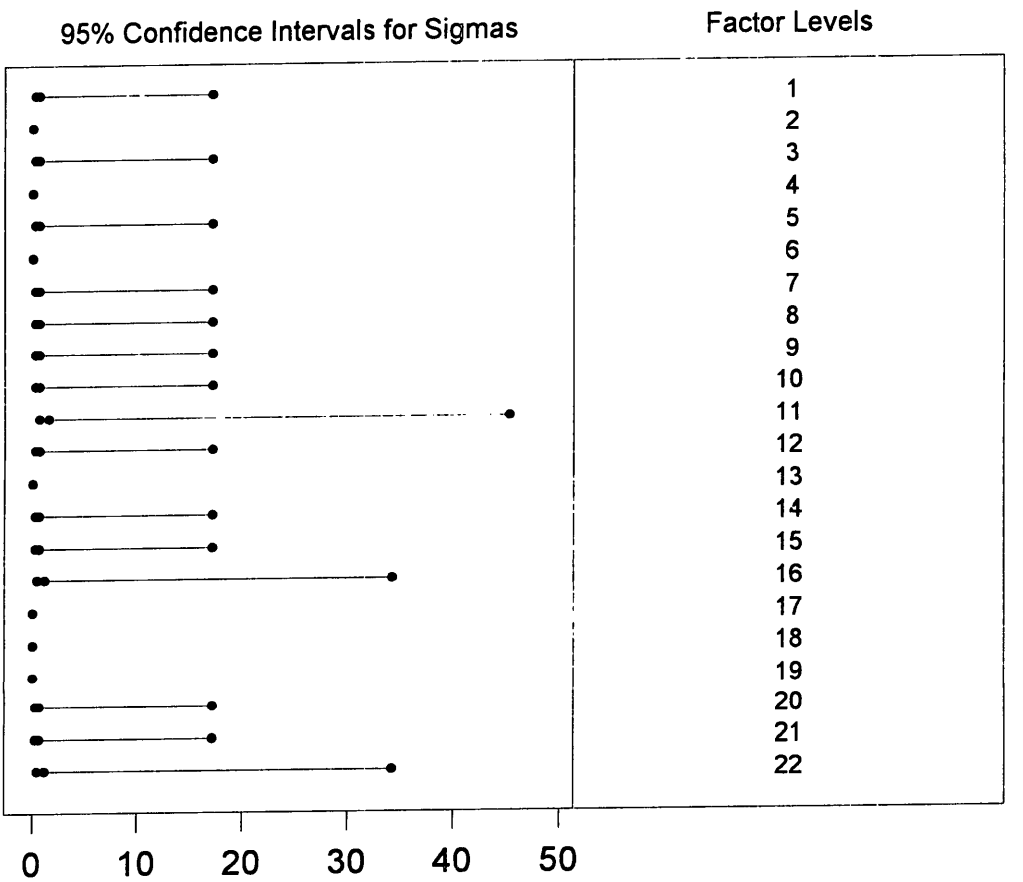
AMPHIPOD EMERGENCE (SAMPLES)



Average: 0.318182
Std Dev: 0.636314
N of data: 66

W-test for Normality
R: 0.9833
p value (approx): 0.0784

AMPHIPOD EMERGENCE (SAMPLES)



Bartlett's Test

Test Statistic: -25.119

p value : 1.000

Levene's Test

Test Statistic: 0.573

p value : 0.915

```
MTB > Oneway 'Emergent' 'Test ID';
SUBC>   Dunnett 5 14.
```

One-Way Analysis of Variance

Analysis of Variance on Emergent

Source	DF	SS	MS	F	p
Test ID	21	8.318	0.396	0.97	0.516
Error	44	18.000	0.409		
Total	65	26.318			

Level	N	Mean	StDev
1	3	0.3333	0.5774
2	3	0.0000	0.0000
3	3	0.3333	0.5774
4	3	0.0000	0.0000
5	3	0.3333	0.5774
6	3	0.0000	0.0000
7	3	0.3333	0.5774
8	3	0.3333	0.5774
9	3	0.3333	0.5774
10	3	0.3333	0.5774
11	3	1.6667	1.5275
12	3	0.3333	0.5774
13	3	0.0000	0.0000
14	3	0.3333	0.5774
15	3	0.3333	0.5774
16	3	0.6667	1.1547
17	3	0.0000	0.0000
18	3	0.0000	0.0000
19	3	0.0000	0.0000
20	3	0.3333	0.5774
21	3	0.3333	0.5774
22	3	0.6667	1.1547

Pooled StDev = 0.6396

```
Individual 95% CIs For Mean
Based on Pooled StDev
--------+---------+---------+--------
    (------*-------)
 (------*------)
    (------*-------)
 (------*------)
    (------*-------)
 (------*------)
    (------*-------)
    (------*-------)
    (------*-------)
    (------*-------)
                   (-------*------)
    (------*-------)
 (------*------)
    (------*-------)
    (------*-------)
       (-------*------)
 (------*------)
 (------*------)
 (------*------)
    (------*-------)
    (------*-------)
       (-------*------)
--------+---------+---------+--------
```

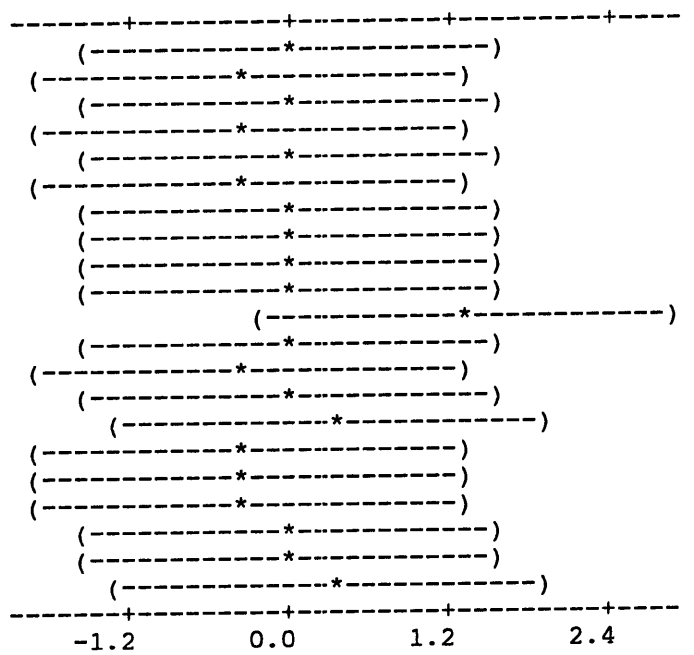
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00381

Critical value = 3.06

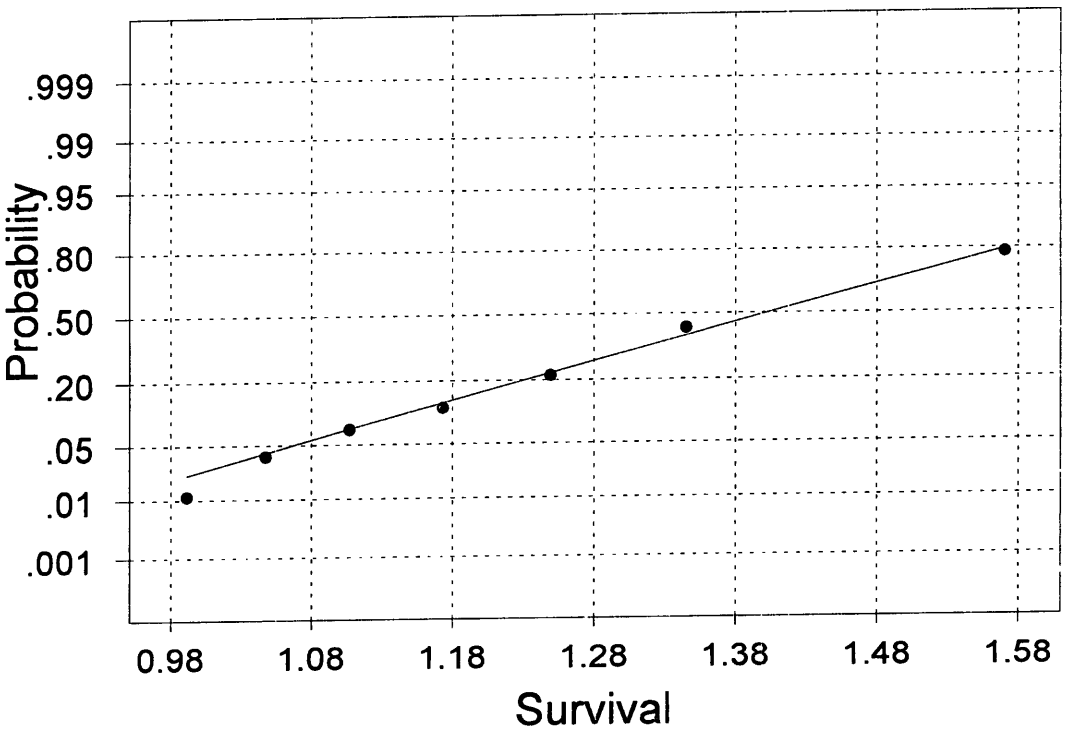
Control = level 14 of Test ID

Level	Lower	Center	Upper
1	-1.5980	-0.0000	1.5980
2	-1.9314	-0.3333	1.2647
3	-1.5980	-0.0000	1.5980
4	-1.9314	-0.3333	1.2647
5	-1.5980	-0.0000	1.5980
6	-1.9314	-0.3333	1.2647
7	-1.5980	-0.0000	1.5980
8	-1.5980	-0.0000	1.5980
9	-1.5980	-0.0000	1.5980
10	-1.5980	-0.0000	1.5980
11	-0.2647	1.3333	2.9314
12	-1.5980	-0.0000	1.5980
13	-1.9314	-0.3333	1.2647
15	-1.5980	-0.0000	1.5980
16	-1.2647	0.3333	1.9314
17	-1.9314	-0.3333	1.2647
18	-1.9314	-0.3333	1.2647
19	-1.9314	-0.3333	1.2647
20	-1.5980	-0.0000	1.5980
21	-1.5980	-0.0000	1.5980
22	-1.2647	0.3333	1.9314



MT

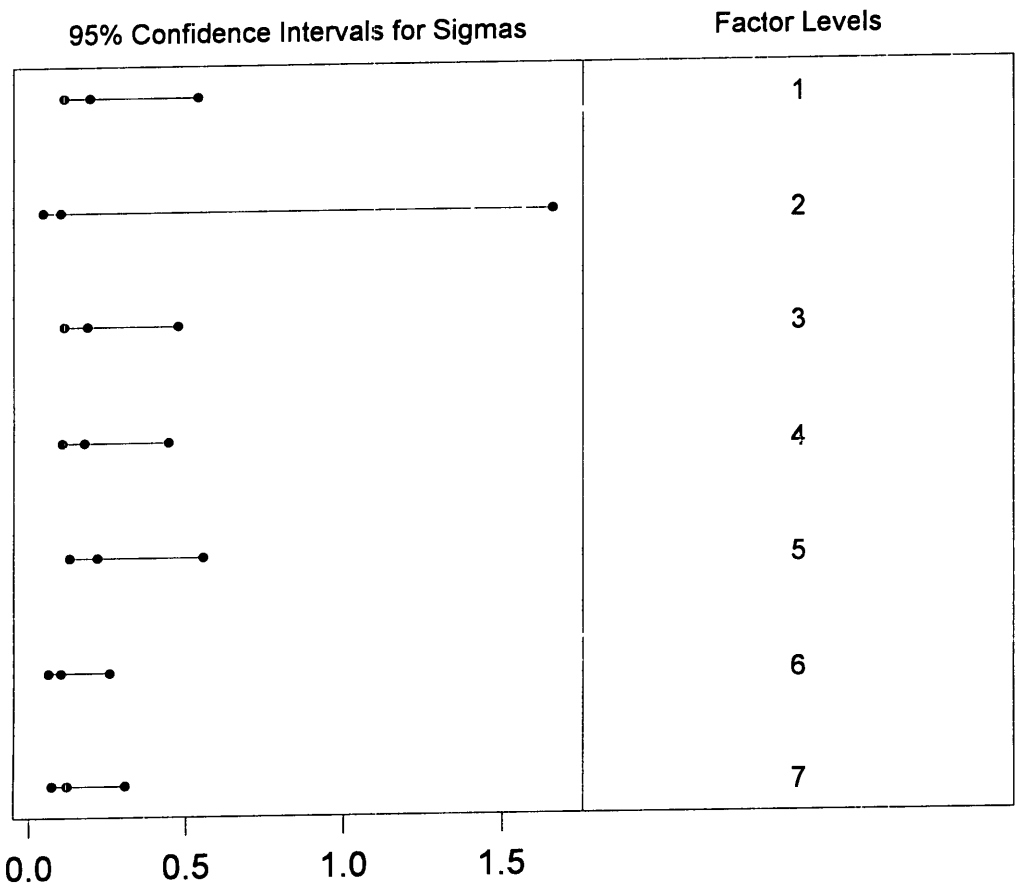
AMPHIPOD SURVIVAL (W/O C POLITA)(STATIONS)



Average: 1.39348
Std Dev: 0.174252
N of data: 56

W-test for Normality
R: 0.9963
p value (approx): > 0.1000

AMPHIPOD SURVIVAL (W/O C. POLITA)(STATION



Bartlett's Test

Test Statistic: 6.699

p value : 0.349

Levene's Test

Test Statistic: 1.356

p value : 0.251

```
Worksheet size: 100000 cells


MTB > Retrieve  'A:\V3HANC-R.MTW'.
Retrieving worksheet from file: A:\V3HANC-R.MTW
Worksheet was saved on 12/18/2000
MTB > %NormPlot 'Survival';
SUBC>   SWTest;
SUBC>   Title 'AMPHIPOD SURVIVAL (W/O C POLITA)(STATIONS)'.
Executing from file: C:\MTBWIN\MACROS\NormPlot.MAC
Macro is running ... please wait
MTB > Oneway 'Survival' 'STANCODE';
SUBC>   Tukey 5.
```

One-Way Analysis of Variance

```
Analysis of Variance on Survival
Source     DF        SS        MS        F        p
STANCODE    6    0.3157    0.0526     1.90    0.099
Error      49    1.3543    0.0276
Total      55    1.6700
```

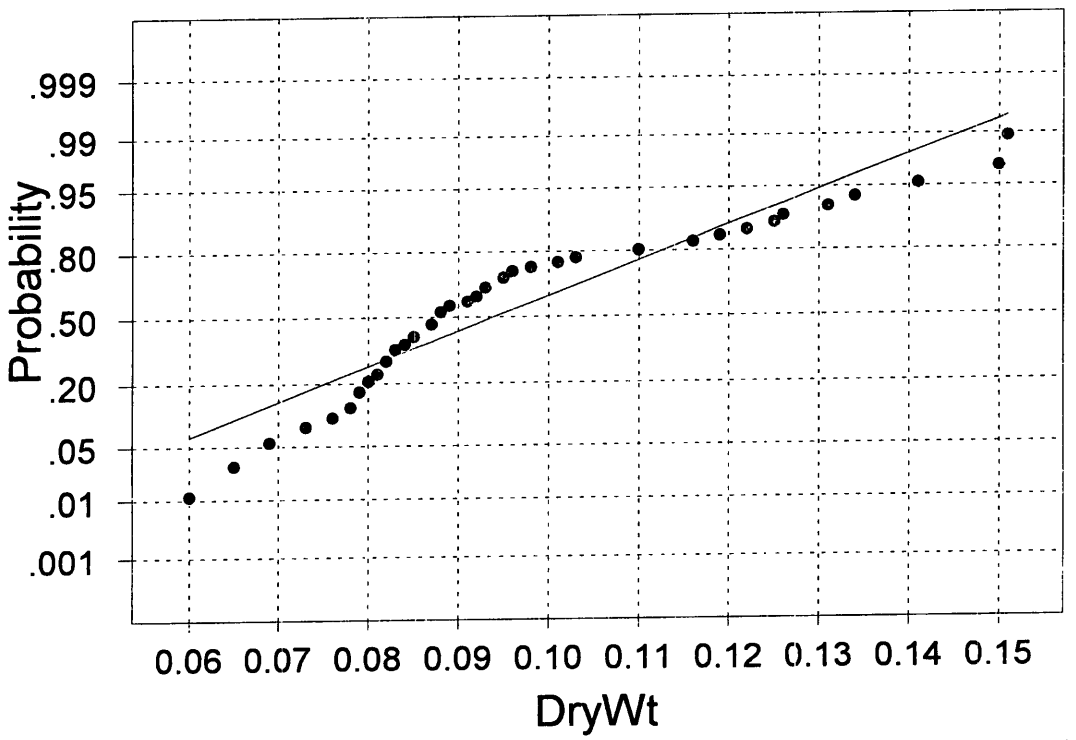
```
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  --------+---------+---------+--------
     1      8    1.3106    0.1913         (-------*-------)
     2      3    1.2879    0.0994   (------------*------------)
     3      9    1.4017    0.1847                (------*-------)
     4      9    1.3943    0.1729                (------*------)
     5      9    1.3141    0.2163          (-------*-------)
     6      9    1.5207    0.0994                        (------*-------)
     7      9    1.4455    0.1189                   (------*-------)
                                   --------+---------+---------+--------
Pooled StDev =   0.1662                  1.20      1.35      1.50
```

```
Tukey's pairwise comparisons

    Family error rate = 0.0500
Individual error rate = 0.00343

Critical value = 4.35

Intervals for (column level mean) - (row level mean)
```

	1	2	3	4	5	6
2	-0.3235 0.3689					
3	-0.3396 0.1574	-0.4547 0.2271				
4	-0.3322 0.1648	-0.4473 0.2345	-0.2337 0.2485			
5	-0.2520 0.2449	-0.3672 0.3147	-0.1535 0.3286	-0.1609 0.3212		
6	-0.4586 0.0384	-0.5737 0.1081	-0.3600 0.1221	-0.3674 0.1147	-0.4476 0.0345	
7	-0.3834 0.1135	-0.4985 0.1833	-0.2849 0.1972	-0.2923 0.1899	-0.3724 0.1097	-0.1659 0.3162

```
MTB >
```

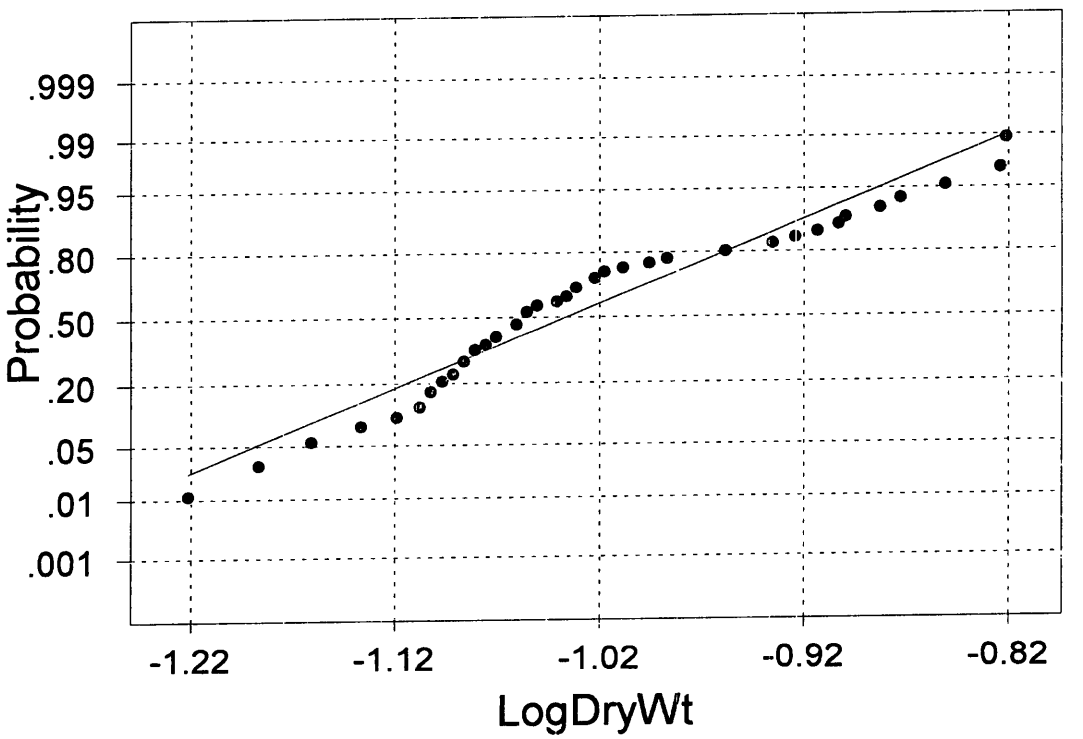
AMPHIPOD WEIGHT (W/O C POLITA)(STATIONS)



Average: 0.0938929
Std Dev: 0.0206033
N of data: 56

W-test for Normality
R: 0.9390
p value (approx): < 0.0100

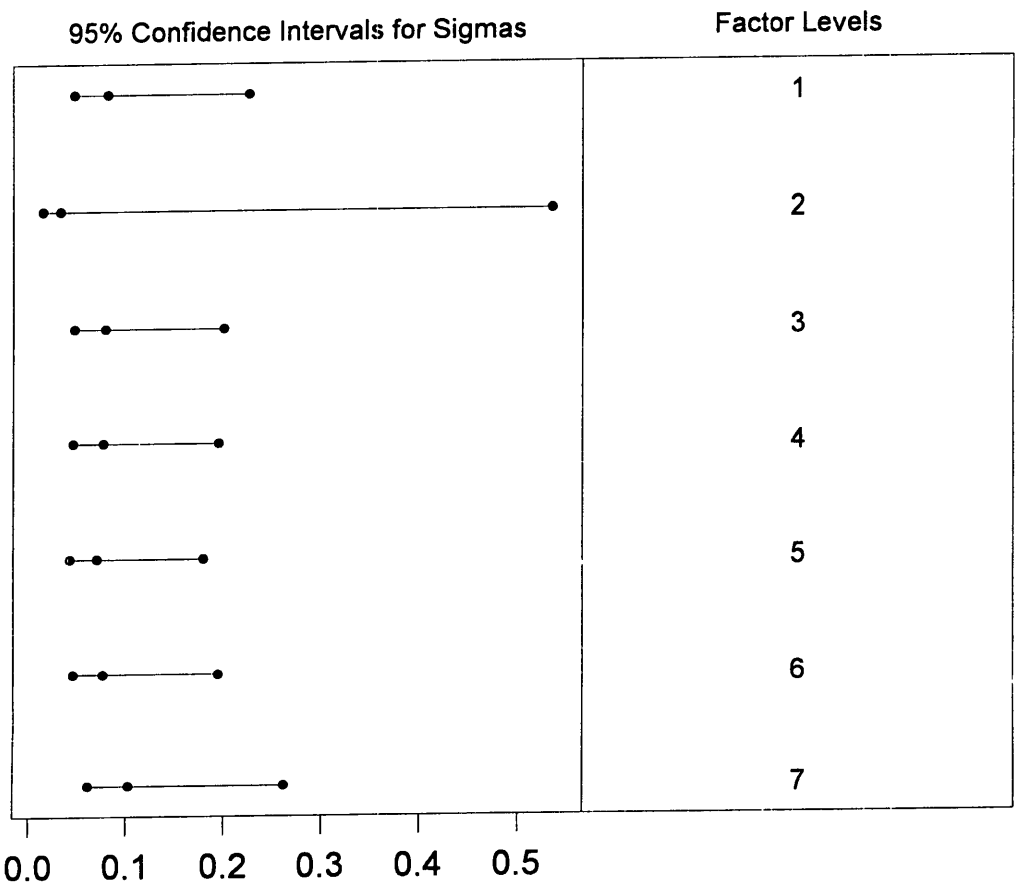
AMPHIPOD WEIGHT (W/O C POLITA)(STATIONS)



Average: -1.03660
Std Dev: 0.0883261
N of data: 56

W-test for Normality
R: 0.9683
p value (approx): < 0.0100

AMPHIPOD WEIGHT (W/O C POLITA)(STATIONS)



Bartlett's Test

Test Statistic: 3.249

p value : 0.777

Levene's Test

Test Statistic: 0.713

p value : 0.641

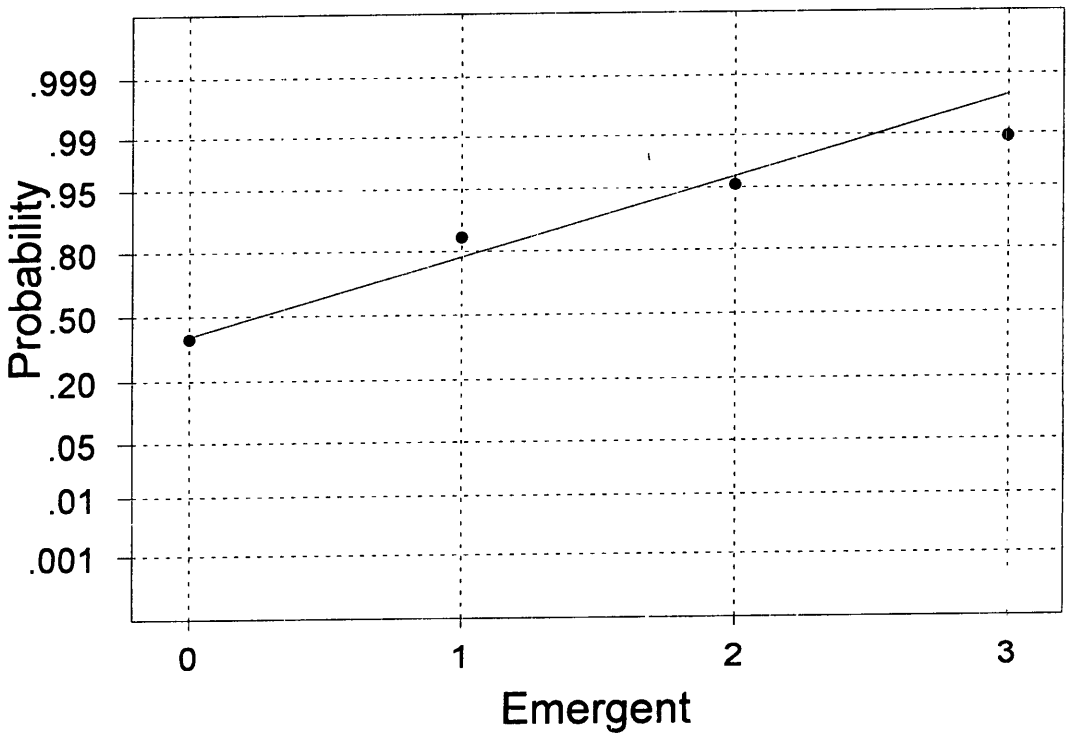
```
Worksheet size: 100000 cells


MTB > Retrieve  'A:\V3HANC-R.MTW'.
Retrieving worksheet from file: A:\V3HANC-R.MTW
Worksheet was saved on 12/18/2000
MTB > Kruskal-Wallis 'LogDryWt' 'STANCODE'.
```

Kruskal-Wallis Test

LEVEL	NOBS	MEDIAN	AVE. RANK	Z VALUE
1	8	-1.0580	27.9	-0.12
2	3	-1.0809	18.5	-1.09
3	9	-1.0506	33.3	0.97
4	9	-1.0555	28.4	-0.02
5	9	-1.0862	19.7	-1.77
6	9	-1.0706	22.6	-1.19
7	9	-0.9355	42.4	2.80
OVERALL	56		28.5	

```
H = 12.35  d.f. = 6  p = 0.056
H = 12.36  d.f. = 6  p = 0.055 (adjusted for ties)

* NOTE * One or more small samples
MTB >
```

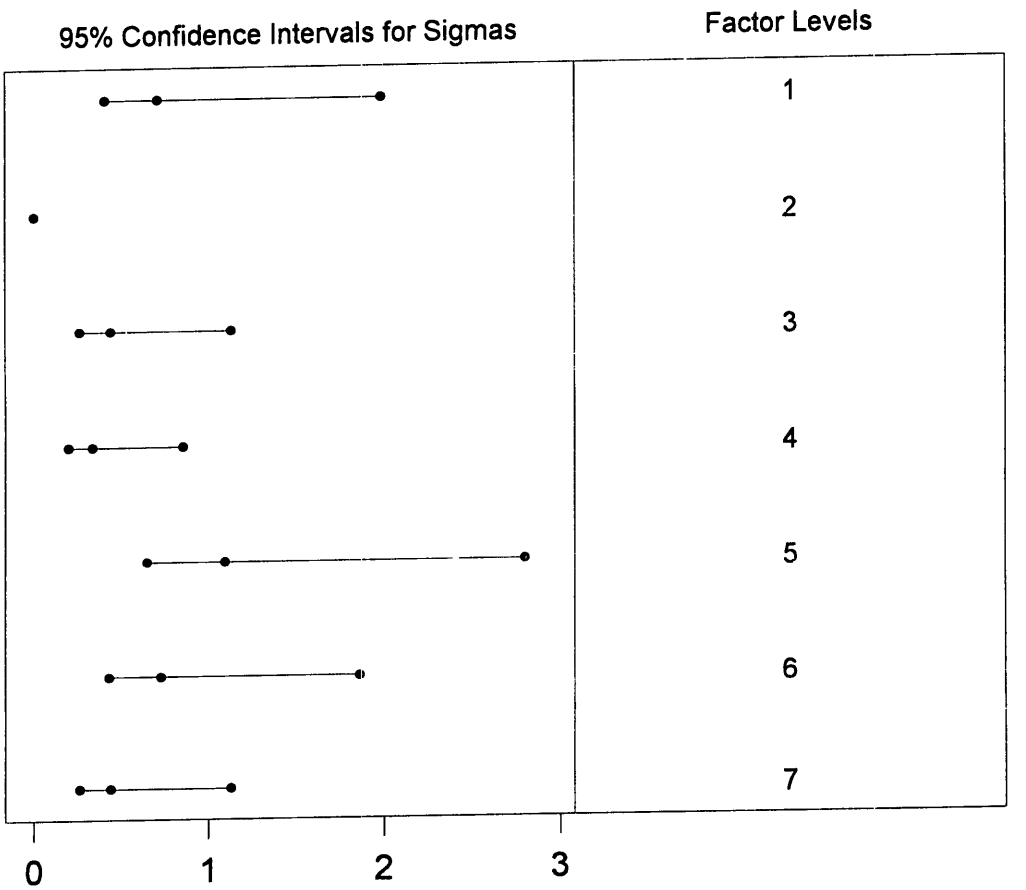
AMPHIPOD EMERGENCE (W/O C POLITA)(STATIONS)



Average: 0.321429
Std Dev: 0.663521
N of data: 56

W-test for Normality
R: 0.9819
p value (approx): 0.0923

AMPHIPOD EMERGENCE (W/O C POLITA)(STATN)



Bartlett's Test

Test Statistic: 9.149

p value : 0.103

Levene's Test

Test Statistic: 1.127

p value : 0.361

```
MTB > Oneway 'Emergent' 'STANCODE';
SUBC>   Tukey 5.
```

One-Way Analysis of Variance

Analysis of Variance on Emergent

Source	DF	SS	MS	F	p
STANCODE	6	2.937	0.489	1.13	0.361
Error	49	21.278	0.434		
Total	55	24.214			

Level	N	Mean	StDev
1	8	0.2500	0.7071
2	3	0.0000	0.0000
3	9	0.2222	0.4410
4	9	0.1111	0.3333
5	9	0.7778	1.0929
6	9	0.4444	0.7265
7	9	0.2222	0.4410

Pooled StDev = 0.6590

```
Individual 95% CIs For Mean
Based on Pooled StDev
---+---------+---------+---------+---
         (-------*-------)
(------------*------------)
         (-------*-------)
       (-------*-------)
                   (------*------)
             (------*-------)
         (-------*-------)
---+---------+---------+---------+---
-0.60      0.00      0.60      1.20
```

Tukey's pairwise comparisons

Family error rate = 0.0500
Individual error rate = 0.00343

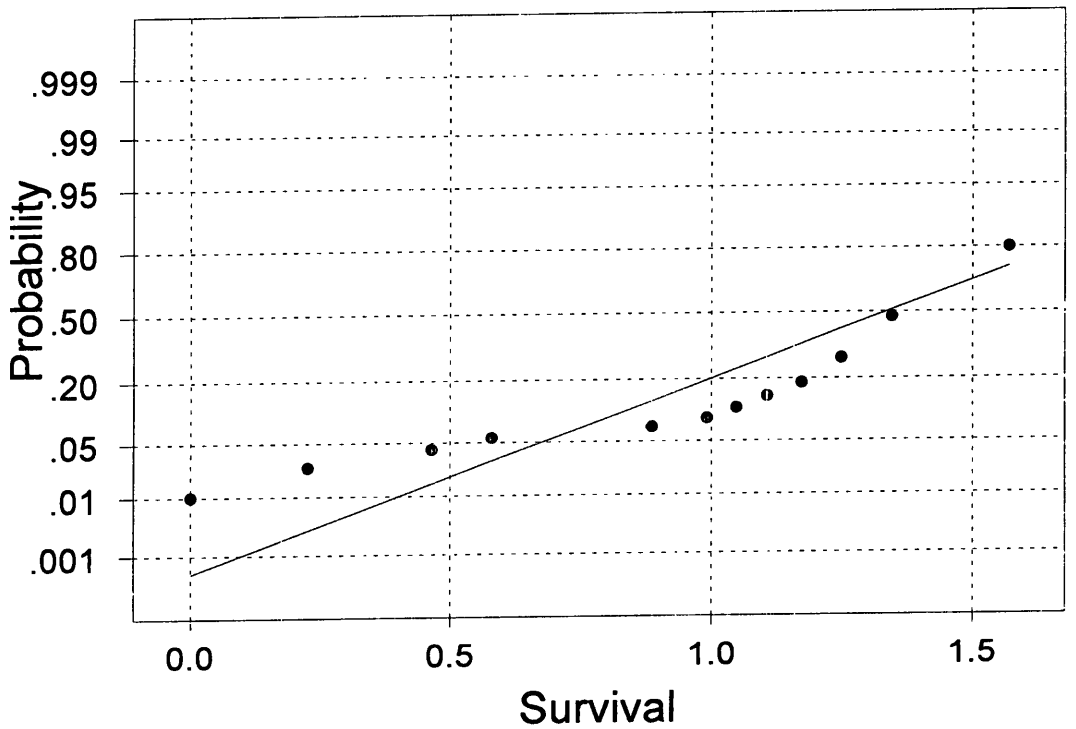
Critical value = 4.35

Intervals for (column level mean) - (row level mean)

	1	2	3	4	5	6
2	-1.1222 1.6222					
3	-0.9571 1.0127	-1.5735 1.1291				
4	-0.8460 1.1238	-1.4624 1.2402	-0.8444 1.0666			
5	-1.5127 0.4571	-2.1291 0.5735	-1.5111 0.3999	-1.6222 0.2888		
6	-1.1794 0.7905	-1.7957 0.9068	-1.1777 0.7333	-1.2888 0.6222	-0.6222 1.2888	
7	-0.9571 1.0127	-1.5735 1.1291	-0.9555 0.9555	-1.0666 0.8444	-0.3999 1.5111	-0.7333 1.1777

MTB

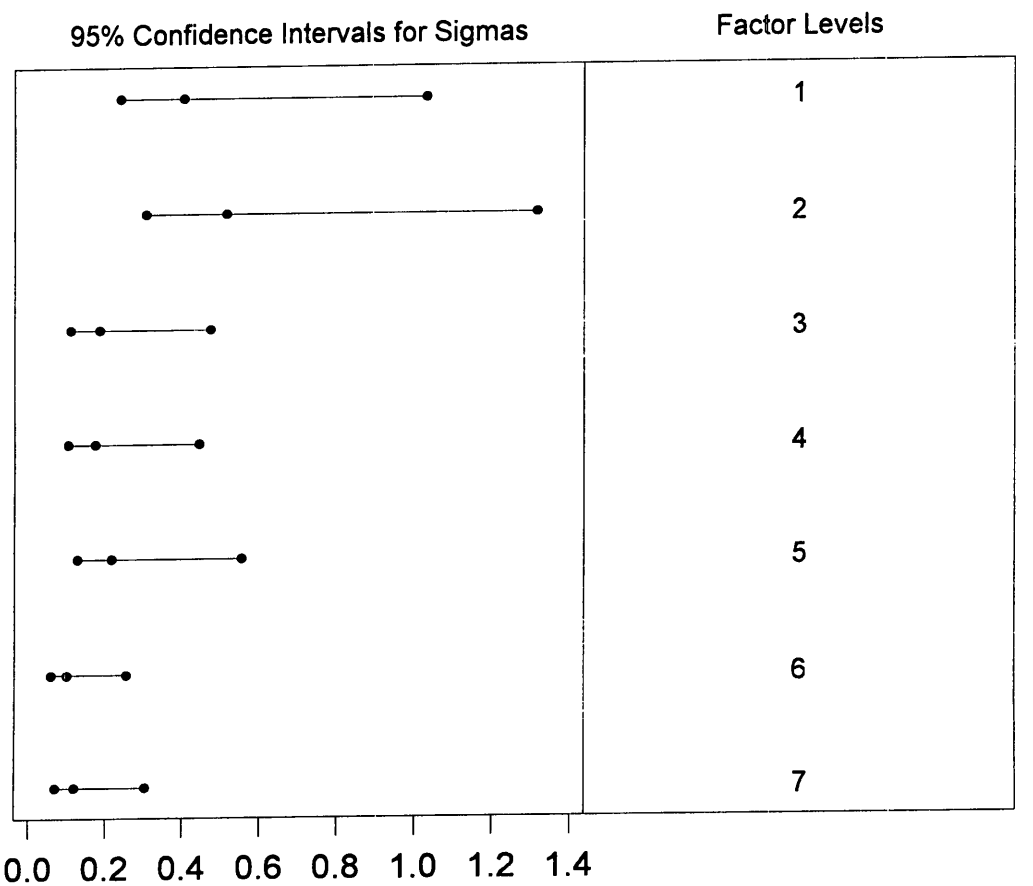
AMPHIPOD SURVIVAL (STATIONS)



Average: 1.31762
Std Dev: 0.322542
N of data: 63

W-test for Normality
R: 0.9230
p value (approx): < 0.0100

AMPHIPOD SURVIVAL (STATIONS)



Bartlett's Test

Test Statistic: 32.981

p value : 0.000

Levene's Test

Test Statistic: 2.678

p value : 0.023

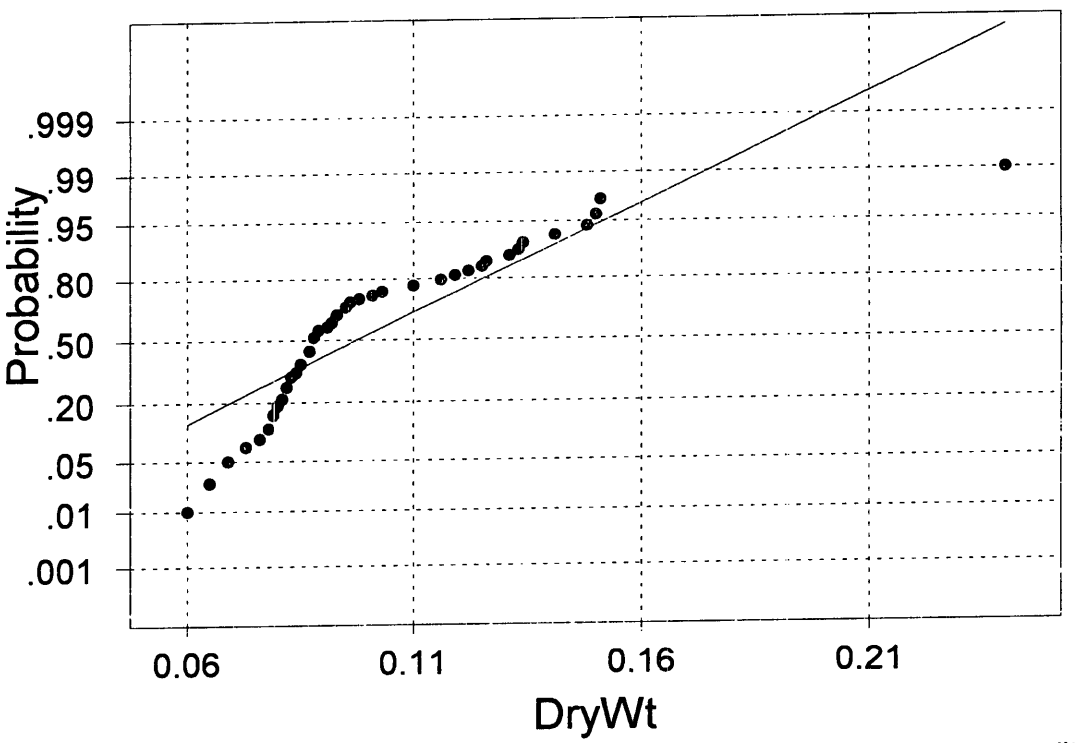
```
MTB > Kruskal-Wallis 'Survival' 'STANCODE'.
```

Kruskal-Wallis Test

LEVEL	NOBS	MEDIAN	AVE. RANK	Z VALUE
1	9	1.249	24.2	-1.37
2	9	1.173	17.2	-2.61
3	9	1.345	35.7	0.65
4	9	1.345	33.4	0.25
5	9	1.249	27.4	-0.81
6	9	1.571	46.4	2.55
7	9	1.345	39.6	1.35
OVERALL	63		32.0	

```
H = 15.58  d.f. = 6  p = 0.017
H = 16.96  d.f. = 6  p = 0.010 (adjusted for ties)

M
```

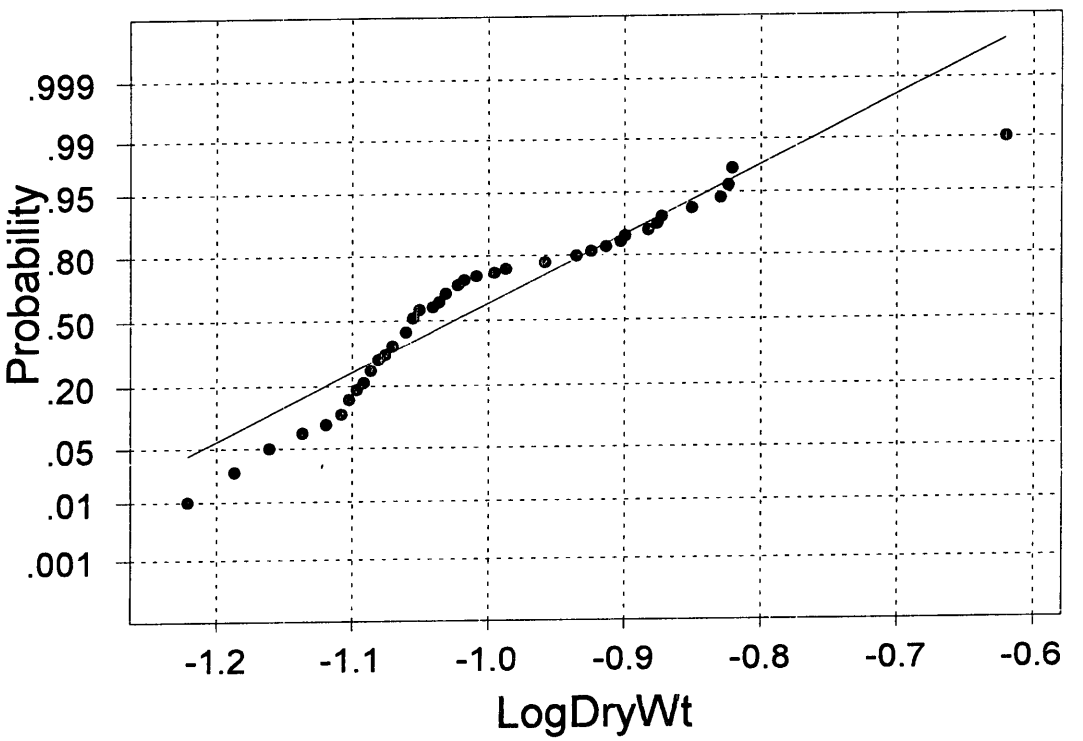
AMPHIPOD WEIGHT (STATIONS)



Average: 0.0974032
Std Dev: 0.0282114
N of data: 62

W-test for Normality
R: 0.8661
p value (approx): < 0.0100

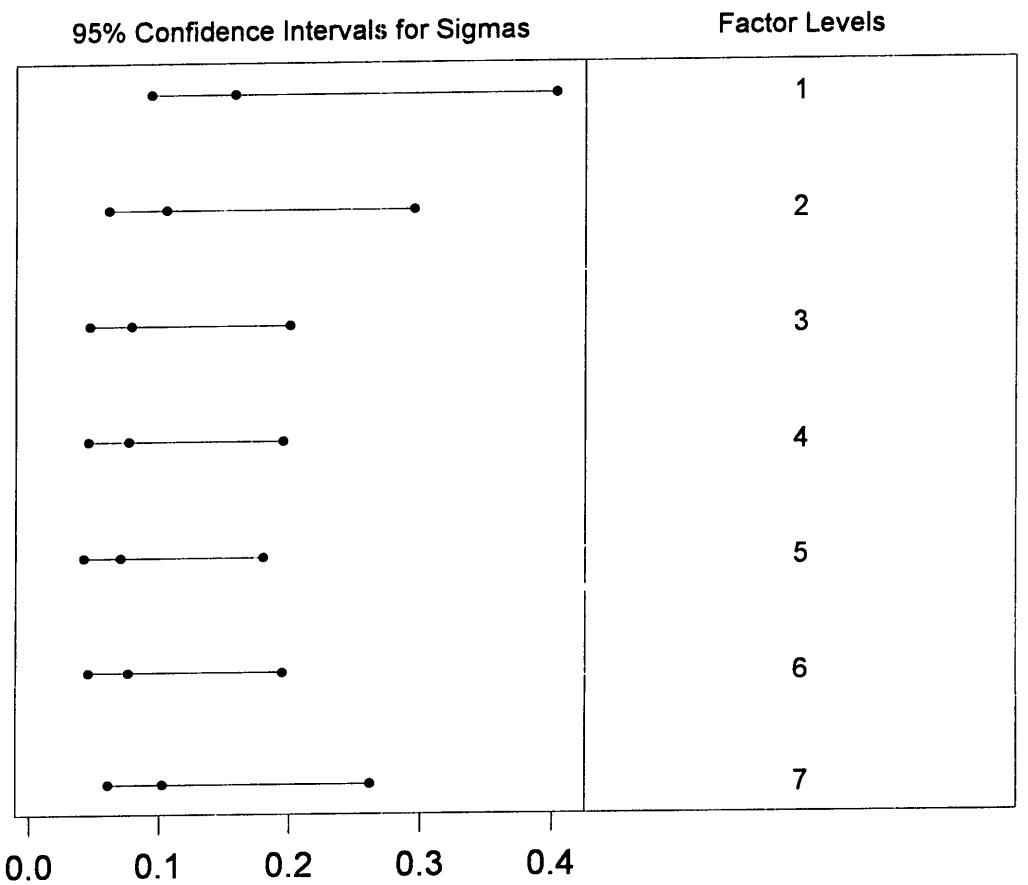
AMPHIPOD WEIGHT (STATIONS)



Average: -1.02520
Std Dev: 0.104440
N of data: 62

W-test for Normality
R: 0.9417
p value (approx): < 0.0100

AMPHIPOD WEIGHT (STATIONS)



Bartlett's Test

Test Statistic: 8.703

p value : 0.191

Levene's Test

Test Statistic: 0.542

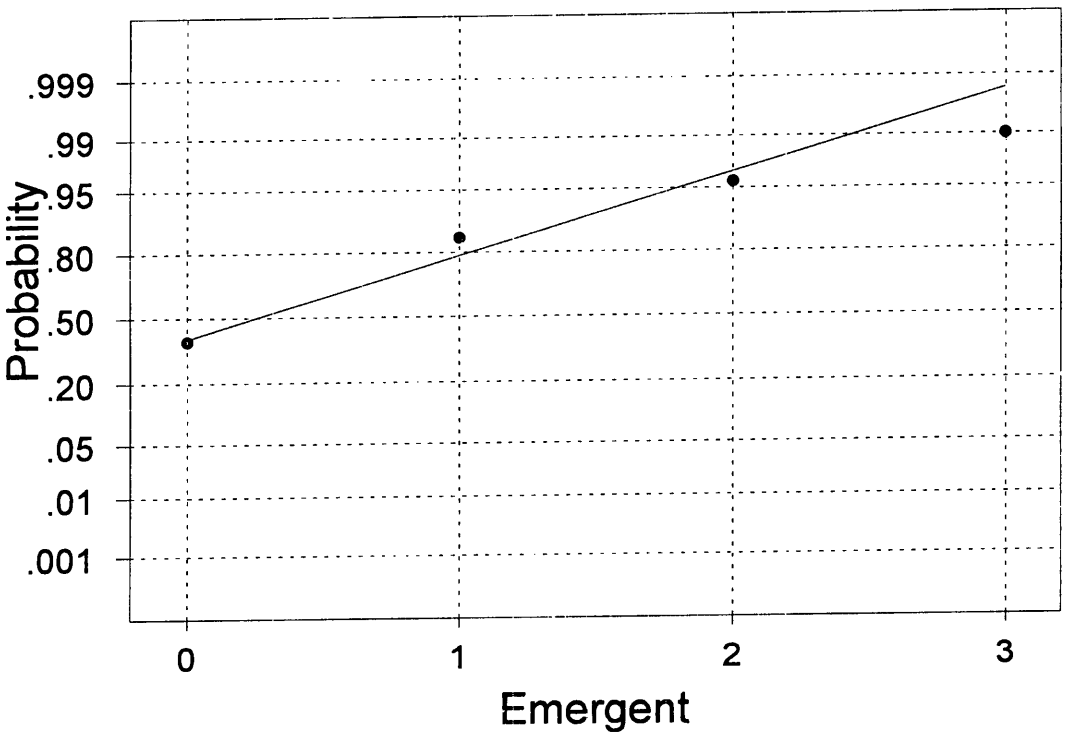
p value : 0.774

```
Worksheet size: 100000 cells


MTB > Retrieve  'A:\VM3HANC.MTW'.
Retrieving worksheet from file: A:\VM3HANC.MTW
Worksheet was saved on 12/18/2000
MTB > Kruskal-Wallis 'LogDryWt' 'STANCODE'.
```

Kruskal-Wallis Test

```
   62 cases were used
    1 cases contained missing values

LEVEL     NOBS     MEDIAN  AVE. RANK    Z VALUE
    1        9   -1.0555       33.2       0.31
    2        8   -1.0580       32.1       0.10
    3        9   -1.0506       35.3       0.69
    4        9   -1.0555       30.2      -0.24
    5        9   -1.0862       20.4      -2.00
    6        9   -1.0706       23.9      -1.36
    7        9   -0.9355       45.4       2.50
OVERALL     62                 31.5

H = 10.87  d.f. = 6  p = 0.094
H = 10.89  d.f. = 6  p = 0.093 (adjusted for ties)

MTB >
```

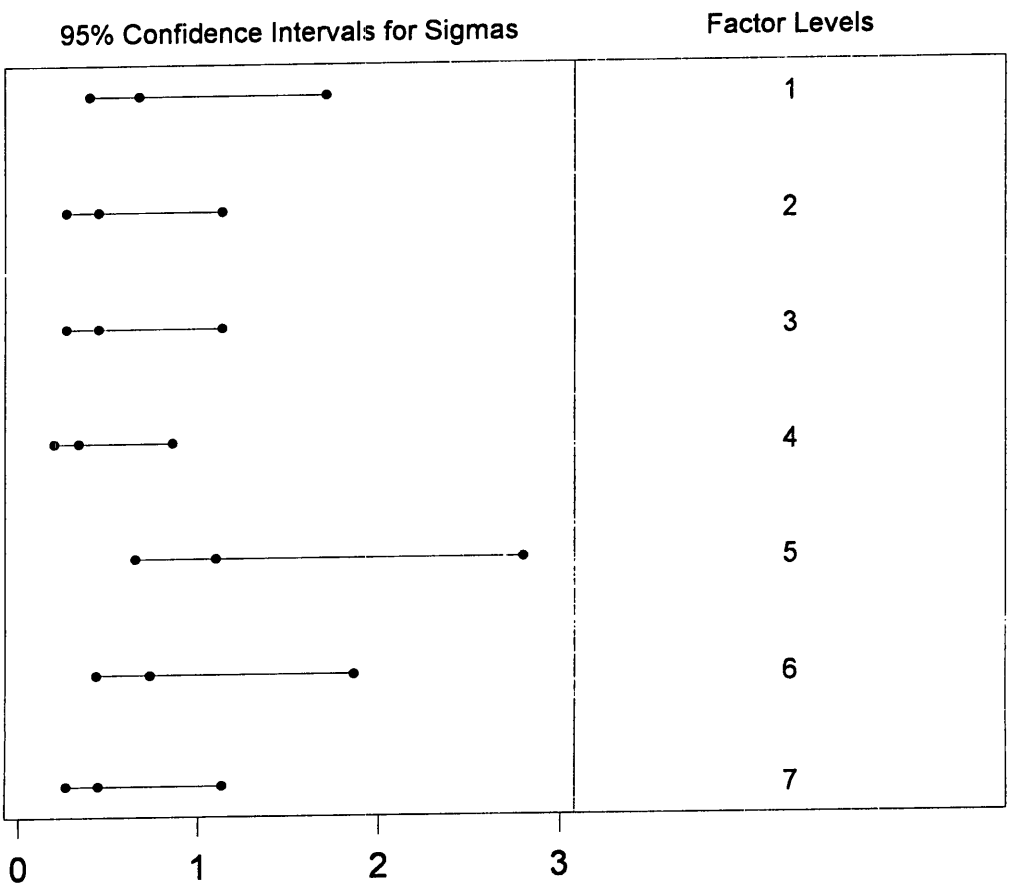
AMPHIPOD EMERGENCE (STATIONS)



Average: 0.317460
Std Dev: 0.643213
N of data: 63

W-test for Normality
R: 0.9828
p value (approx): 0.0795

AMPHIPOD EMERGENCE (STATIONS)



Bartlett's Test

Test Statistic: 16.185

p value : 0.013

Levene's Test

Test Statistic: 1.126

p value : 0.359

```
Worksheet size: 100000 cells


MTB > Retrieve  'A:\VM3HANC.MTW'.
Retrieving worksheet from file: A:\VM3HANC.MTW
Worksheet was saved on 12/18/2000
MTB > ANOVA 'Emergent' = C7 C9(C7).
```

Analysis of Variance (Balanced Designs)

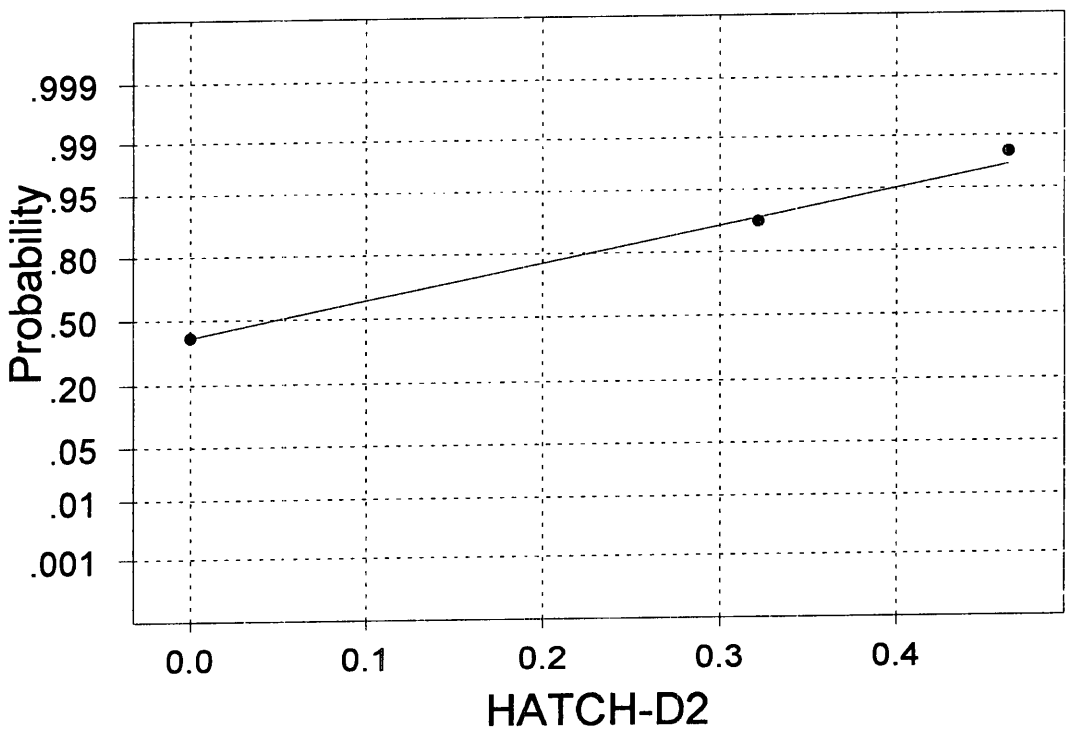
Factor	Type	Levels	Values						
STANCODE	fixed	7	1	2	3	4	5	6	7
FIELDREP(STANCODE)	fixed	3	1	2	3				

Analysis of Variance for Emergent

Source	DF	SS	MS	F	P
STANCODE	6	2.7619	0.4603	1.12	0.370
FIELDREP(STANCODE)	14	5.5556	0.3968	0.96	0.506
Error	42	17.3333	0.4127		
Total	62	25.6508			

```
MTB >
```

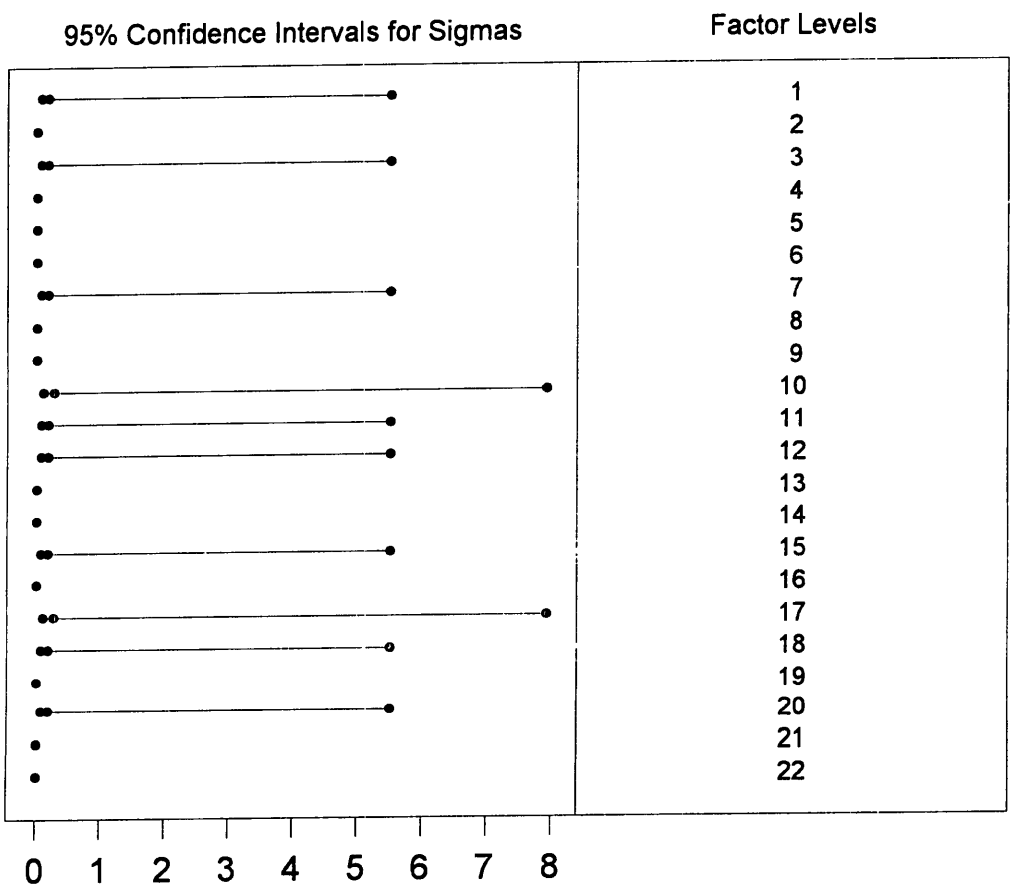
DAY 2 HATCH (SAMPLES)



Average: 0.0628
Std Dev: 0.136149
N of data: 66

W-test for Normality
R: 0.9985
p value (approx): > 0.1000

DAY 2 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: -144.242

p value : 1.000

Levene's Test

Test Statistic: 0.584

p value : 0.908

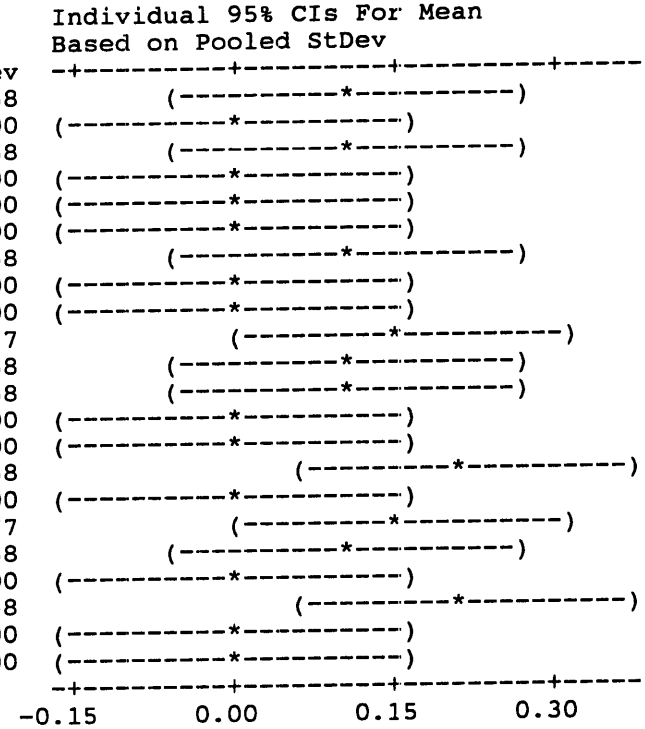
One-Way Analysis of Variance

Analysis of Variance on HATCH-D2

Source	DF	SS	MS	F	p
TestID	21	0.3661	0.0174	0.91	0.575
Error	44	0.8388	0.0191		
Total	65	1.2049			

Level	N	Mean	StDev
1	3	0.1073	0.1858
2	3	0.0000	0.0000
3	3	0.1073	0.1858
4	3	0.0000	0.0000
5	3	0.0000	0.0000
6	3	0.0000	0.0000
7	3	0.1073	0.1858
8	3	0.0000	0.0000
9	3	0.0000	0.0000
10	3	0.1545	0.2677
11	3	0.1073	0.1858
12	3	0.1073	0.1858
13	3	0.0000	0.0000
14	3	0.0000	0.0000
15	3	0.2145	0.1858
16	3	0.0000	0.0000
17	3	0.1545	0.2677
18	3	0.1073	0.1858
19	3	0.0000	0.0000
20	3	0.2145	0.1858
21	3	0.0000	0.0000
22	3	0.0000	0.0000

Pooled StDev = 0.1381



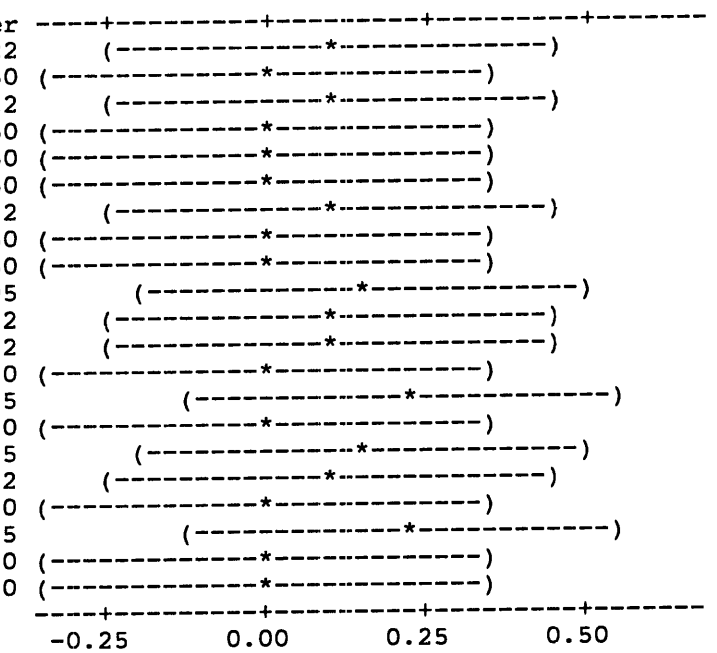
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00381

Critical value = 3.06

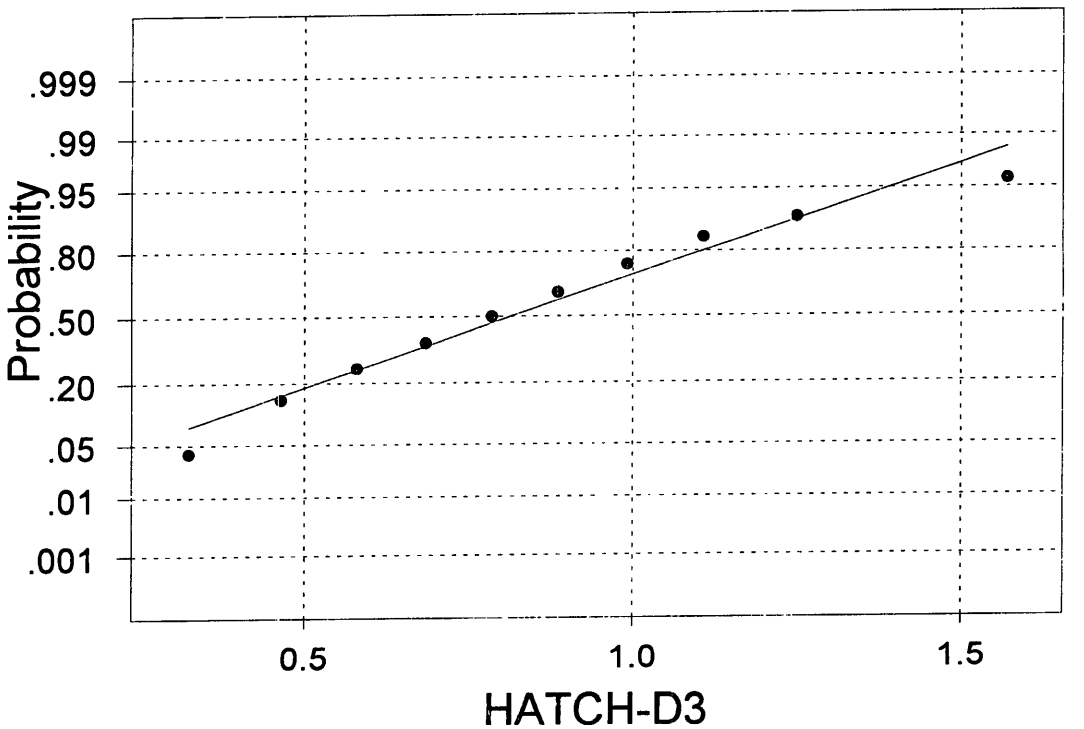
Control = level 14 of TestID

Level	Lower	Center	Upper
1	-0.2377	0.1073	0.4522
2	-0.3450	0.0000	0.3450
3	-0.2377	0.1073	0.4522
4	-0.3450	0.0000	0.3450
5	-0.3450	0.0000	0.3450
6	-0.3450	0.0000	0.3450
7	-0.2377	0.1073	0.4522
8	-0.3450	0.0000	0.3450
9	-0.3450	0.0000	0.3450
10	-0.1904	0.1545	0.4995
11	-0.2377	0.1073	0.4522
12	-0.2377	0.1073	0.4522
13	-0.3450	0.0000	0.3450
15	-0.1305	0.2145	0.5595
16	-0.3450	0.0000	0.3450
17	-0.1904	0.1545	0.4995
18	-0.2377	0.1073	0.4522
19	-0.3450	0.0000	0.3450
20	-0.1305	0.2145	0.5595
21	-0.3450	0.0000	0.3450
22	-0.3450	0.0000	0.3450



MTB >

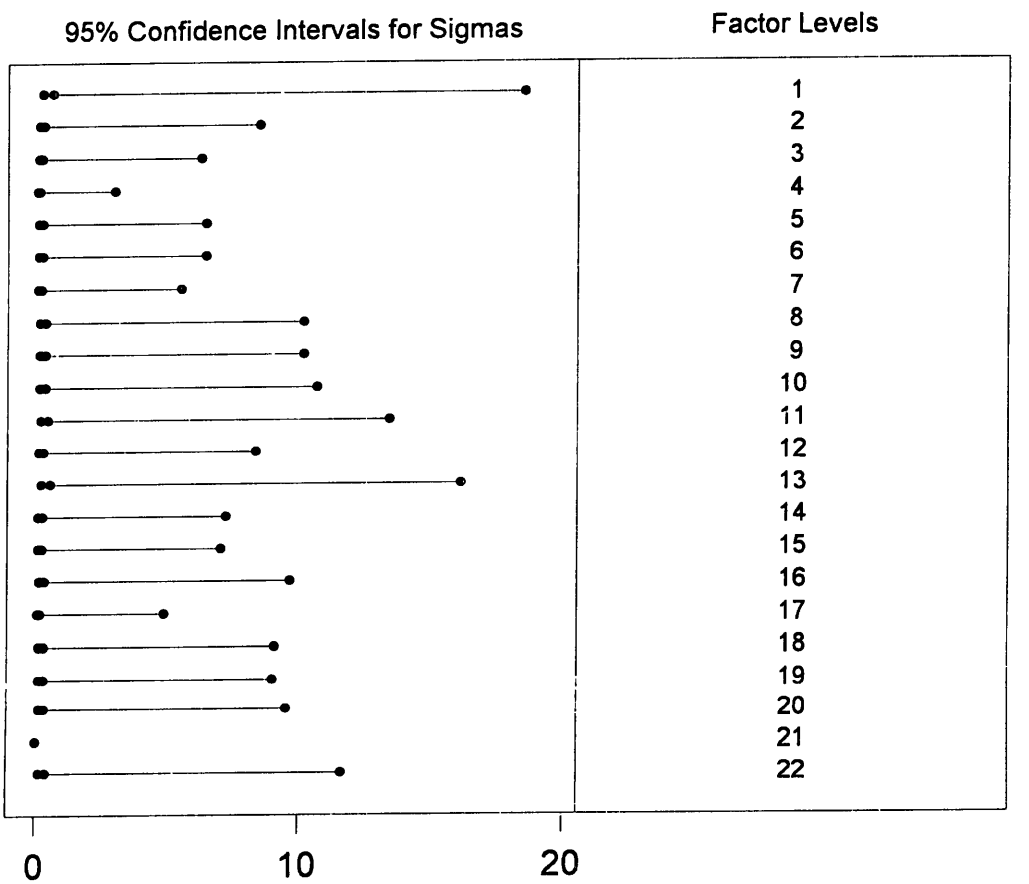
DAY 3 HATCH (SAMPLES)



Average: 0.8143
Std Dev: 0.325861
N of data: 66

W-test for Normality
R: 0.9827
p value (approx): 0.0688

DAY 3 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: 2.285

p value : 1.000

Levene's Test

Test Statistic: 0.360

p value : 0.993

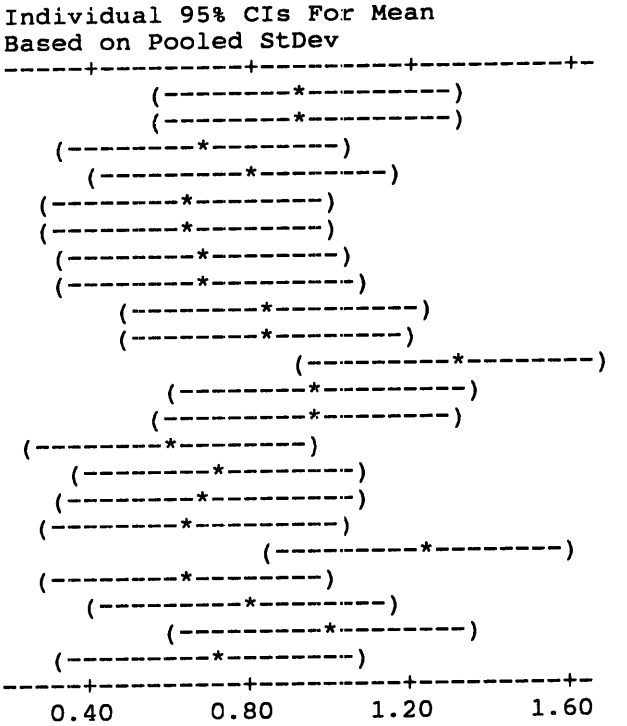
One-Way Analysis of Variance

Analysis of Variance on HATCH-D3

Source	DF	SS	MS	F	p
TestID	21	2.306	0.110	1.05	0.430
Error	44	4.597	0.104		
Total	65	6.902			

Level	N	Mean	StDev
1	3	0.9262	0.6255
2	3	0.9399	0.2860
3	3	0.6781	0.2113
4	3	0.7854	0.1007
5	3	0.6431	0.2183
6	3	0.6431	0.2183
7	3	0.6781	0.1858
8	3	0.6994	0.3429
9	3	0.8540	0.3430
10	3	0.8378	0.3600
11	3	1.3090	0.4534
12	3	0.9750	0.2825
13	3	0.9451	0.5445
14	3	0.5973	0.2439
15	3	0.7168	0.2376
16	3	0.6980	0.3258
17	3	0.6446	0.1646
18	3	1.2230	0.3067
19	3	0.6395	0.3046
20	3	0.7854	0.3218
21	3	0.9912	0.0000
22	3	0.7045	0.3931

Pooled StDev = 0.3232



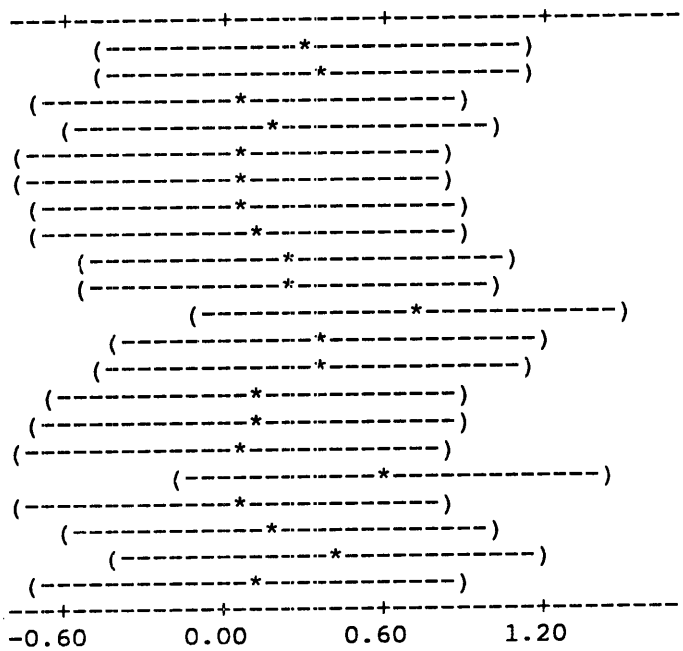
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00381

Critical value = 3.06

Control = level 14 of TestID

Level	Lower	Center	Upper
1	-0.4786	0.3289	1.1365
2	-0.4649	0.3427	1.1502
3	-0.7267	0.0809	0.8884
4	-0.6194	0.1881	0.9957
5	-0.7617	0.0458	0.8534
6	-0.7617	0.0458	0.8534
7	-0.7267	0.0809	0.8884
8	-0.7054	0.1021	0.9097
9	-0.5508	0.2567	1.0642
10	-0.5670	0.2405	1.0481
11	-0.0958	0.7117	1.5192
12	-0.4299	0.3777	1.1852
13	-0.4598	0.3478	1.1553
15	-0.6880	0.1195	0.9271
16	-0.7069	0.1007	0.9082
17	-0.7602	0.0473	0.8548
18	-0.1818	0.6257	1.4333
19	-0.7653	0.0422	0.8497
20	-0.6194	0.1881	0.9957
21	-0.4137	0.3939	1.2014
22	-0.7003	0.1073	0.9148



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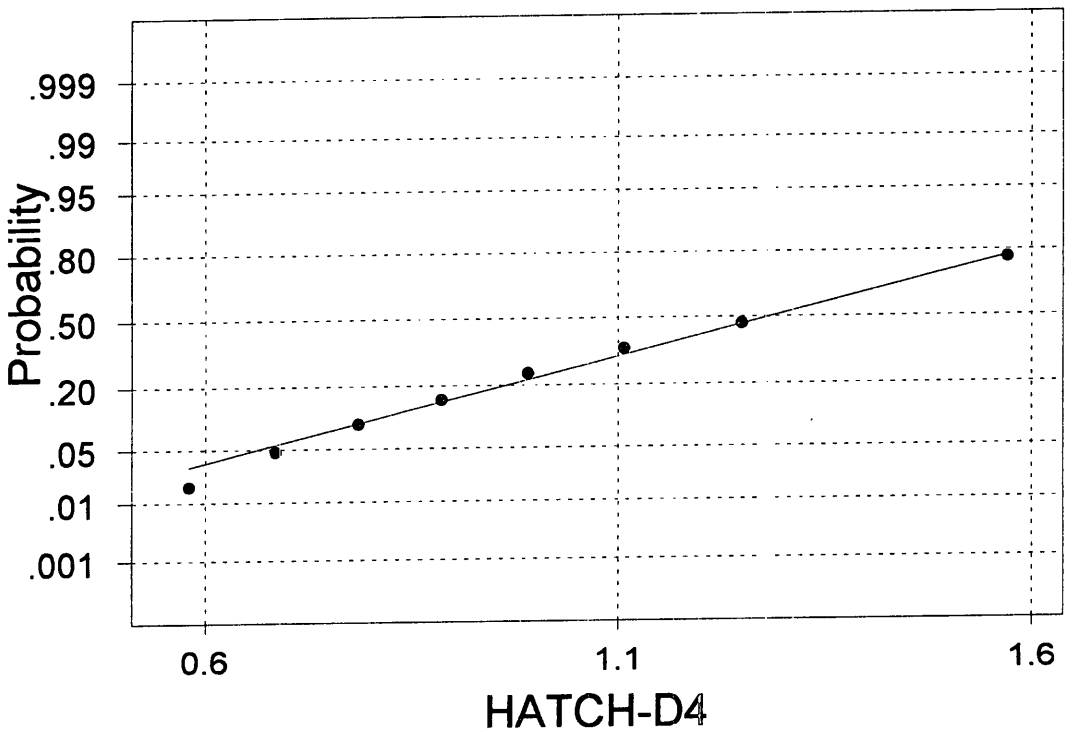
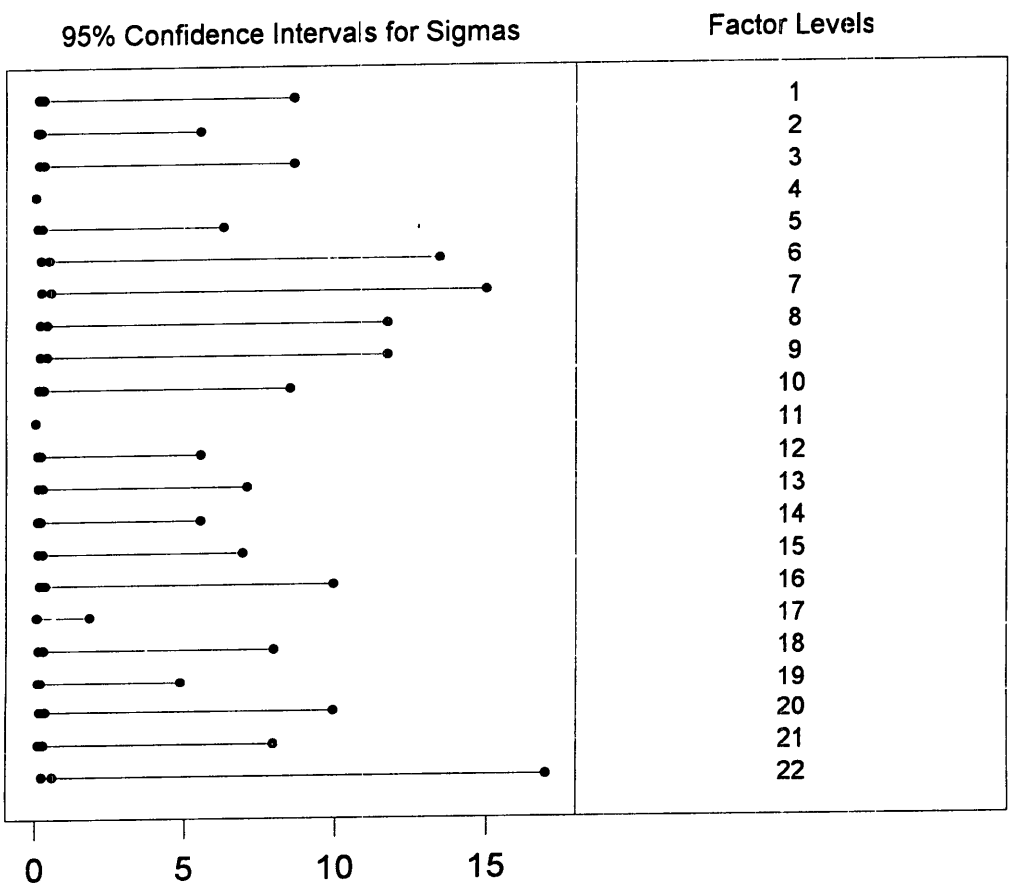
DAY 4 HATCH (SAMPLES)



Average: 1.26365
Std Dev: 0.320204
N of data: 66

W-test for Normality
R: 0.9973
p value (approx): > 0.1000

DAY 4 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: -5.064

p value : 1.000

Levene's Test

Test Statistic: 0.351

p value : 0.994

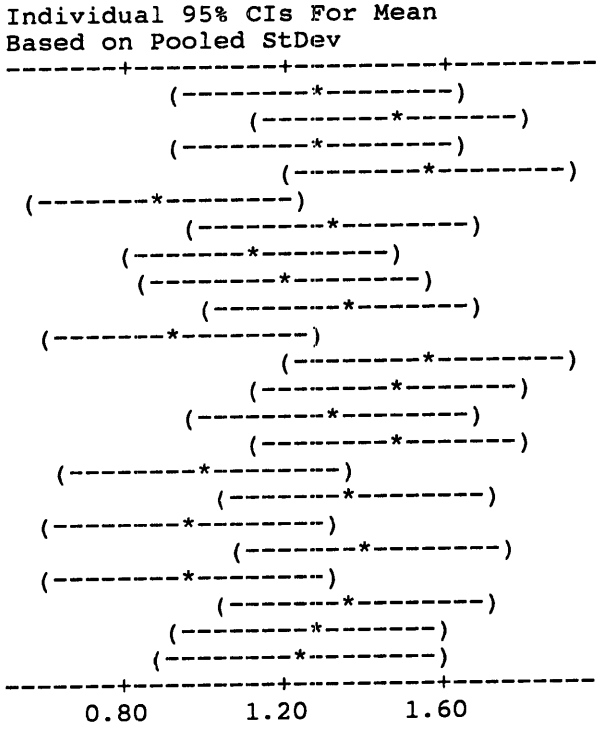
One-Way Analysis of Variance

Analysis of Variance on HATCH-D4

Source	DF	SS	MS	F	P
TestID	21	2.6495	0.1262	1.38	0.180
Error	44	4.0150	0.0912		
Total	65	6.6645			

Level	N	Mean	StDev
1	3	1.2703	0.2904
2	3	1.4635	0.1858
3	3	1.2703	0.2904
4	3	1.5708	0.0000
5	3	0.8926	0.2113
6	3	1.3090	0.4534
7	3	1.1332	0.5056
8	3	1.2017	0.3948
9	3	1.3426	0.3953
10	3	0.9399	0.2860
11	3	1.5708	0.0000
12	3	1.4635	0.1858
13	3	1.3090	0.2376
14	3	1.4635	0.1858
15	3	1.0085	0.2323
16	3	1.3776	0.3347
17	3	0.9561	0.0607
18	3	1.4162	0.2677
19	3	0.9612	0.1629
20	3	1.3776	0.3347
21	3	1.2617	0.2677
22	3	1.2404	0.5722

Pooled StDev = 0.3021



Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00381

Critical value = 3.06

Control = level 14 of TestID

Level	Lower	Center	Upper
1	-0.9479	-0.1932	0.5615
2	-0.7547	-0.0000	0.7547
3	-0.9479	-0.1932	0.5615
4	-0.6475	0.1073	0.8620
5	-1.3256	-0.5709	0.1838
6	-0.9093	-0.1545	0.6002
7	-1.0851	-0.3304	0.4243
8	-1.0165	-0.2618	0.4929
9	-0.8757	-0.1210	0.6337
10	-1.2783	-0.5236	0.2311
11	-0.6475	0.1073	0.8620
12	-0.7547	-0.0000	0.7547
13	-0.9093	-0.1545	0.6002
15	-1.2097	-0.4550	0.2997
16	-0.8407	-0.0860	0.6688
17	-1.2621	-0.5074	0.2473
18	-0.8020	-0.0473	0.7074
19	-1.2570	-0.5023	0.2524
20	-0.8407	-0.0860	0.6688
21	-0.9566	-0.2018	0.5529
22	-0.9779	-0.2231	0.5316

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        (-----------*-----------)
---+---------+---------+---------+--------
-1.20     -0.60      0.00      0.60
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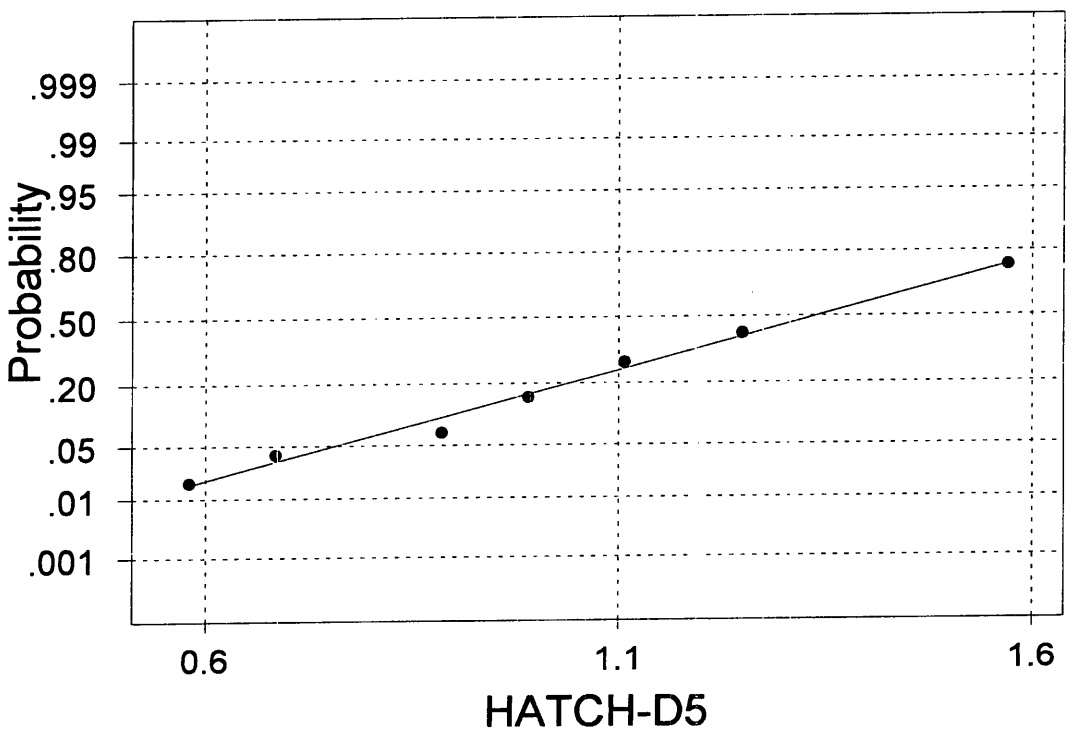
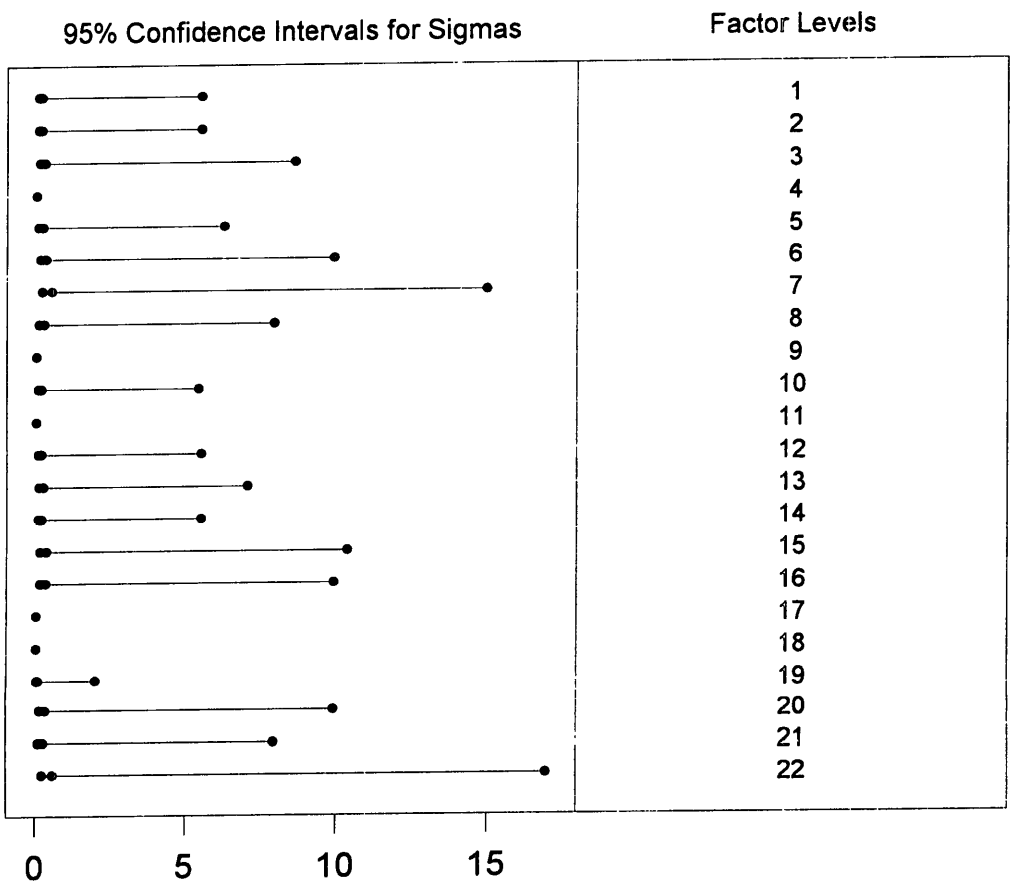
DAY 5 HATCH (SAMPLES)



Average: 1.31885
Std Dev: 0.291451
N of data: 66

W-test for Normality
R: 0.9976
p value (approx): > 0.1000

DAY 5 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: -34.920

p value : 1.000

Levene's Test

Test Statistic: 0.532

p value : 0.940

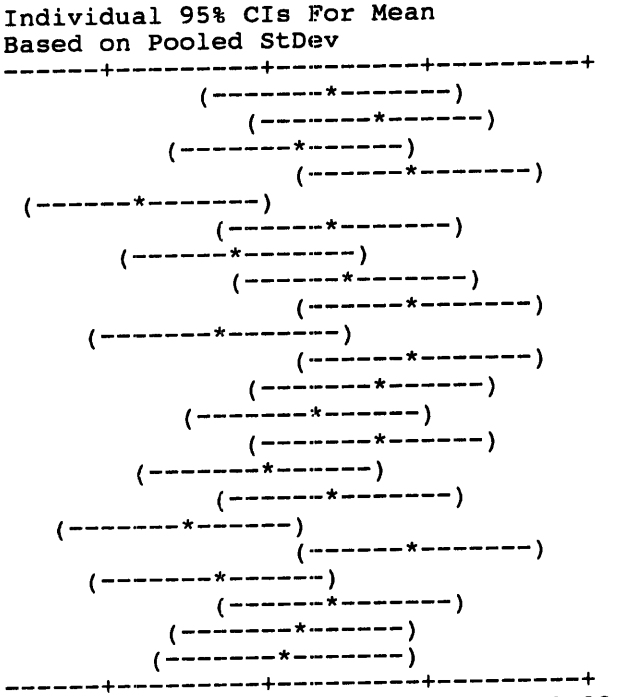
One-Way Analysis of Variance

Analysis of Variance on HATCH-D5

Source	DF	SS	MS	F	p
TestID	21	2.4295	0.1157	1.65	0.081
Error	44	3.0919	0.0703		
Total	65	5.5214			

Level	N	Mean	StDev
1	3	1.3563	0.1858
2	3	1.4635	0.1858
3	3	1.2703	0.2904
4	3	1.5708	0.0000
5	3	0.8926	0.2113
6	3	1.3776	0.3347
7	3	1.1332	0.5056
8	3	1.4162	0.2677
9	3	1.5708	0.0000
10	3	1.0808	0.1829
11	3	1.5708	0.0000
12	3	1.4635	0.1858
13	3	1.3090	0.2376
14	3	1.4635	0.1858
15	3	1.1880	0.3494
16	3	1.3776	0.3347
17	3	0.9912	0.0000
18	3	1.5708	0.0000
19	3	1.0685	0.0670
20	3	1.3776	0.3347
21	3	1.2617	0.2677
22	3	1.2404	0.5722

Pooled StDev = 0.2651



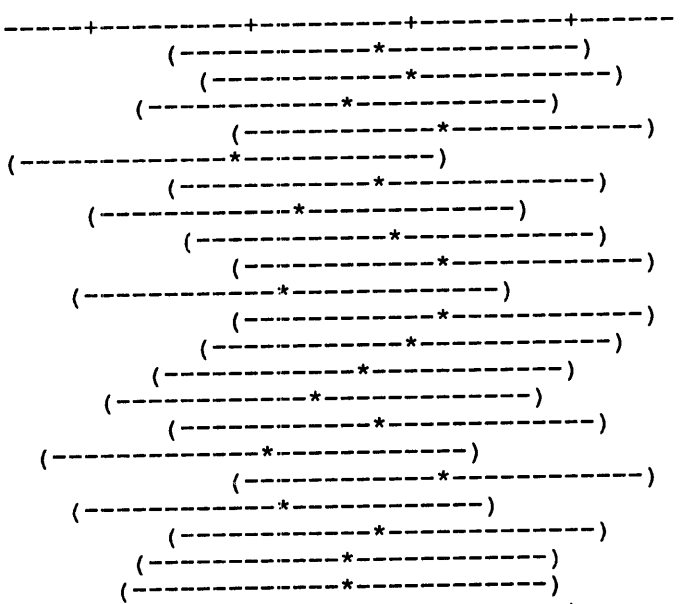
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00381

Critical value = 3.06

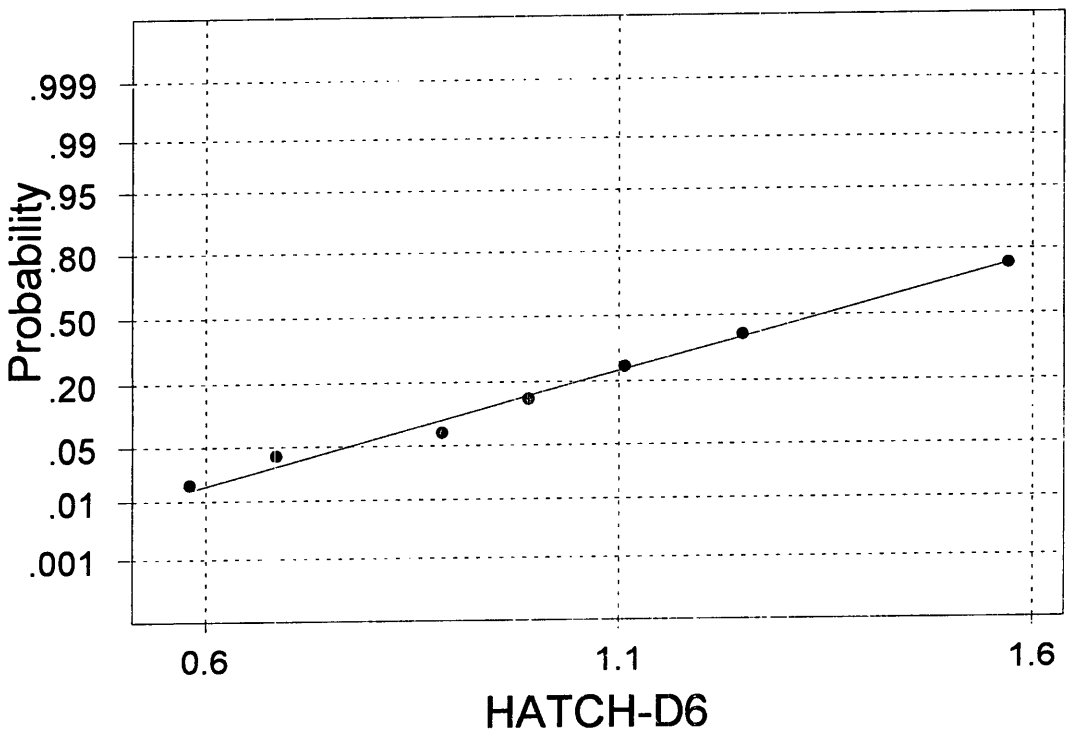
Control = level 14 of TestID

Level	Lower	Center	Upper
1	-0.7696	-0.1073	0.5551
2	-0.6623	-0.0000	0.6623
3	-0.8555	-0.1932	0.4691
4	-0.5551	0.1073	0.7696
5	-1.2332	-0.5709	0.0914
6	-0.7483	-0.0860	0.5763
7	-0.9927	-0.3304	0.3319
8	-0.7096	-0.0473	0.6150
9	-0.5551	0.1073	0.7696
10	-1.0451	-0.3828	0.2795
11	-0.5551	0.1073	0.7696
12	-0.6623	-0.0000	0.6623
13	-0.8169	-0.1545	0.5078
15	-0.9378	-0.2755	0.3868
16	-0.7483	-0.0860	0.5763
17	-1.1347	-0.4724	0.1899
18	-0.5551	0.1073	0.7696
19	-1.0574	-0.3951	0.2672
20	-0.7483	-0.0860	0.5763
21	-0.8642	-0.2018	0.4605
22	-0.8854	-0.2231	0.4392



MTB >

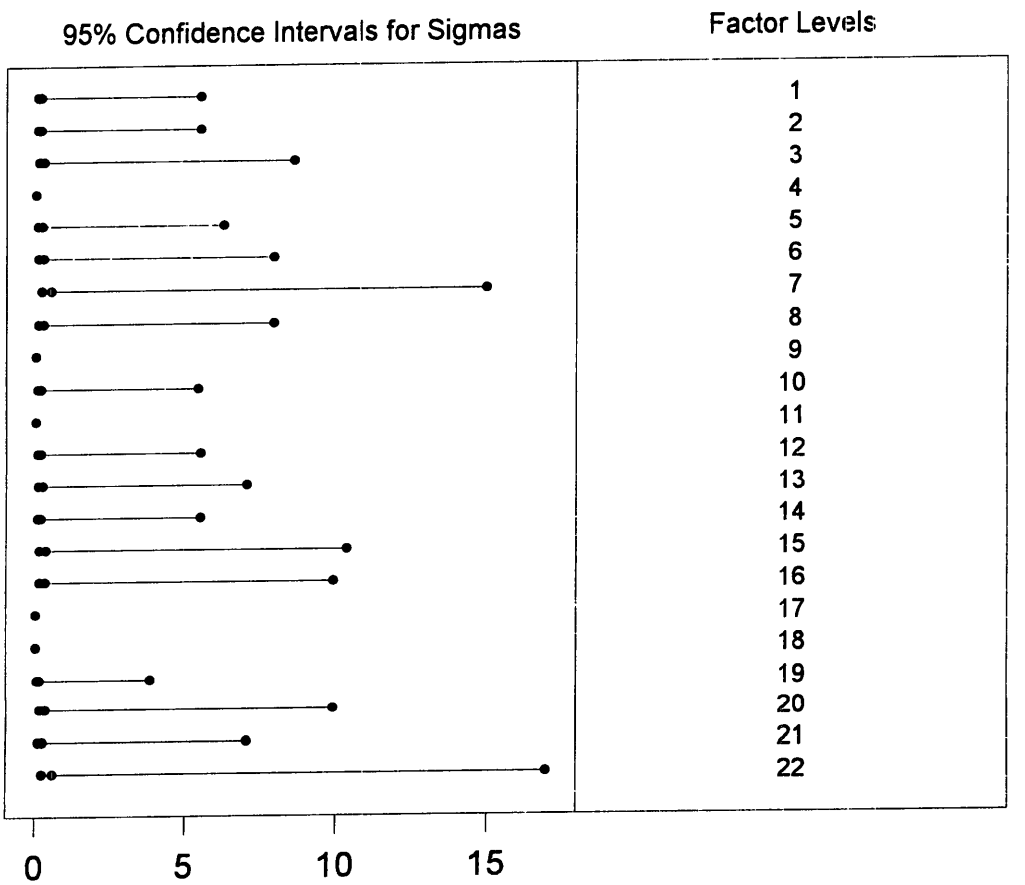
DAY 6 HATCH (SAMPLES)



Average: 1.32491
Std Dev: 0.287602
N of data: 66

W-test for Normality
R: 0.9984
p value (approx): > 0.1000

DAY 6 HATCH (SAMPLES)



Bartlett's Test

Test Statistic: -37.173

p value : 1.000

Levene's Test

Test Statistic: 0.545

p value : 0.933

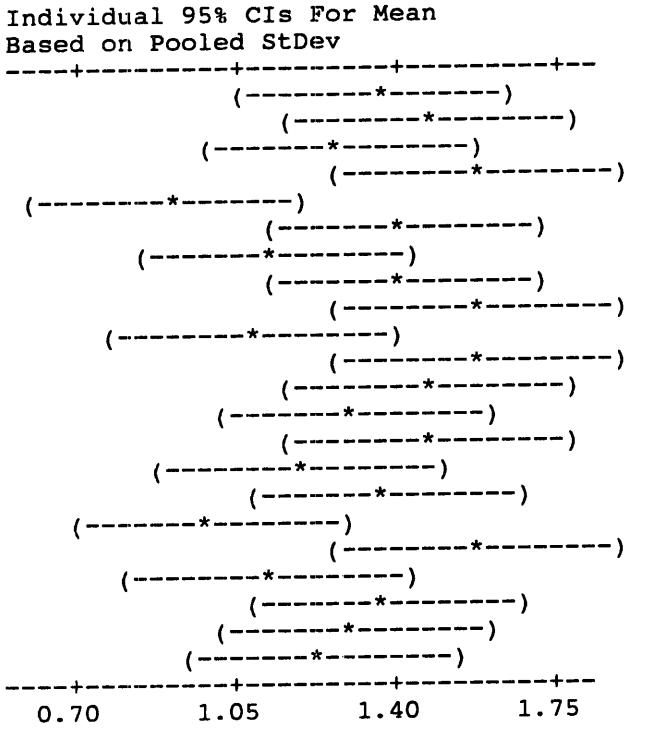
One-Way Analysis of Variance

Analysis of Variance on HATCH-D6

Source	DF	SS	MS	F	p
TestID	21	2.3713	0.1129	1.65	0.080
Error	44	3.0052	0.0683		
Total	65	5.3765			

Level	N	Mean	StDev
1	3	1.3563	0.1858
2	3	1.4635	0.1858
3	3	1.2703	0.2904
4	3	1.5708	0.0000
5	3	0.8926	0.2113
6	3	1.4162	0.2677
7	3	1.1332	0.5056
8	3	1.4162	0.2677
9	3	1.5708	0.0000
10	3	1.0808	0.1829
11	3	1.5708	0.0000
12	3	1.4635	0.1858
13	3	1.3090	0.2376
14	3	1.4635	0.1858
15	3	1.1880	0.3494
16	3	1.3776	0.3347
17	3	0.9912	0.0000
18	3	1.5708	0.0000
19	3	1.1158	0.1292
20	3	1.3776	0.3347
21	3	1.3090	0.2376
22	3	1.2404	0.5722

Pooled StDev = 0.2613



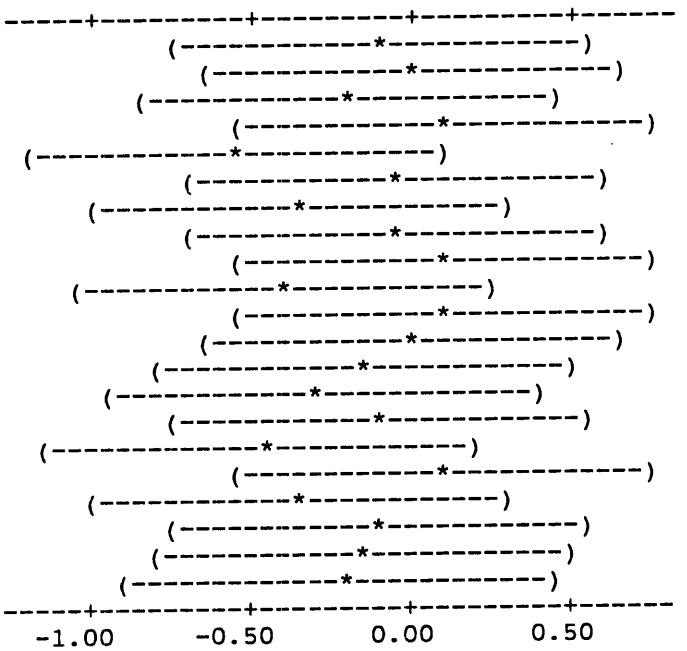
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00381

Critical value = 3.06

Control = level 14 of TestID

Level	Lower	Center	Upper
1	-0.7602	-0.1073	0.5457
2	-0.6530	-0.0000	0.6530
3	-0.8462	-0.1932	0.4597
4	-0.5457	0.1073	0.7602
5	-1.2239	-0.5709	0.0821
6	-0.7003	-0.0473	0.6057
7	-0.9833	-0.3304	0.3226
8	-0.7003	-0.0473	0.6057
9	-0.5457	0.1073	0.7602
10	-1.0357	-0.3828	0.2702
11	-0.5457	0.1073	0.7602
12	-0.6530	-0.0000	0.6530
13	-0.8075	-0.1545	0.4984
15	-0.9285	-0.2755	0.3774
16	-0.7389	-0.0860	0.5670
17	-1.1253	-0.4724	0.1806
18	-0.5457	0.1073	0.7602
19	-1.0007	-0.3478	0.3052
20	-0.7389	-0.0860	0.5670
21	-0.8075	-0.1545	0.4984
22	-0.8761	-0.2231	0.4298



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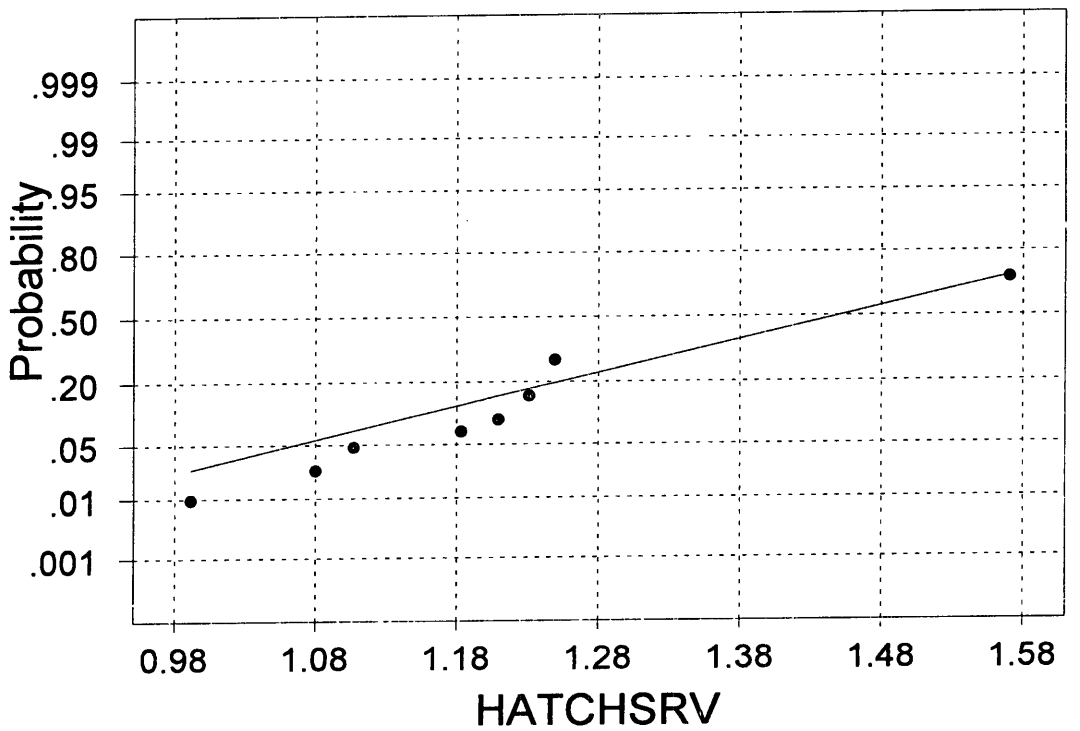
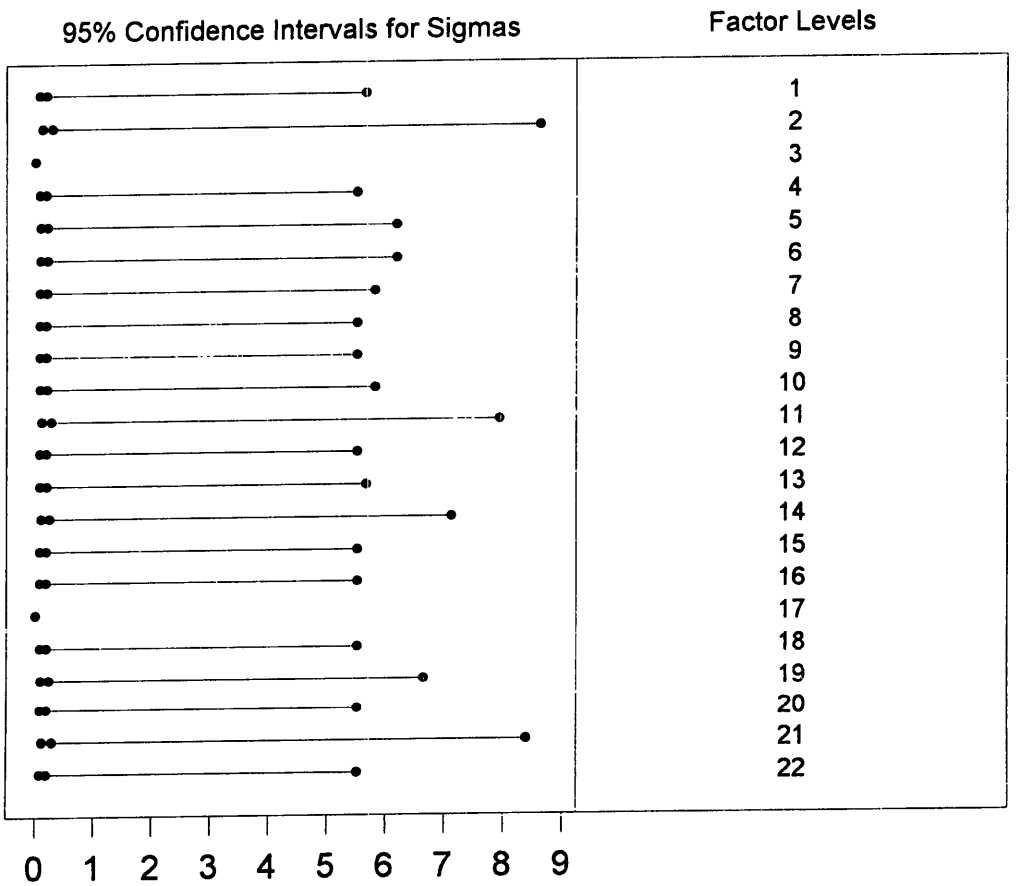
HATCHED FISH SURVIVAL (SAMPLES)



Average: 1.43433
Std Dev: 0.180746
N of data: 66

W-test for Normality
R: 0.9766
p value (approx): 0.0261

HATCHED FISH SURVIVAL (SAMPLES)



Bartlett's Test

Test Statistic: -19.688

p value : 1.000

Levene's Test

Test Statistic: 0.151

p value : 1.000

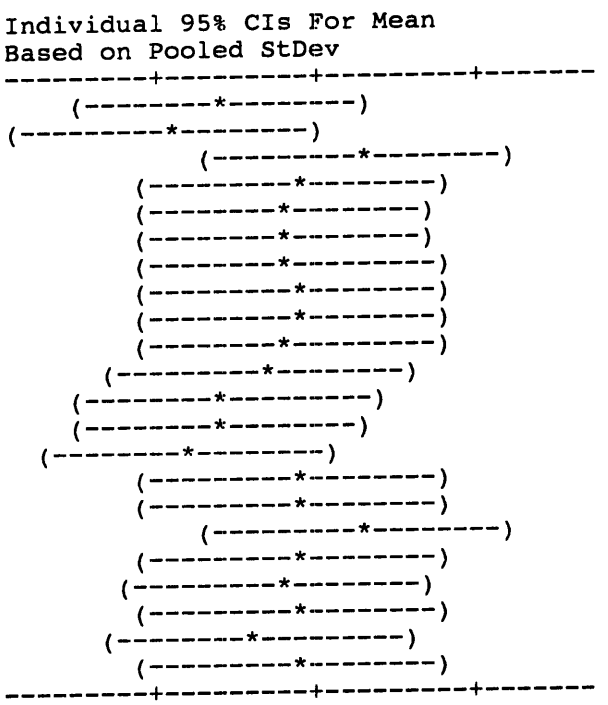
One-Way Analysis of Variance

Analysis of Variance on HATCHSRV

Source	DF	SS	MS	F	p
TestID	21	0.3393	0.0162	0.40	0.987
Error	44	1.7841	0.0405		
Total	65	2.1235			

Level	N	Mean	StDev
1	3	1.3503	0.1911
2	3	1.2644	0.2912
3	3	1.5708	0.0000
4	3	1.4635	0.1858
5	3	1.4503	0.2086
6	3	1.4503	0.2086
7	3	1.4576	0.1961
8	3	1.4635	0.1858
9	3	1.4635	0.1858
10	3	1.4576	0.1961
11	3	1.4162	0.2677
12	3	1.3563	0.1858
13	3	1.3503	0.1911
14	3	1.3030	0.2400
15	3	1.4635	0.1858
16	3	1.4635	0.1858
17	3	1.5708	0.0000
18	3	1.4635	0.1858
19	3	1.4415	0.2239
20	3	1.4635	0.1858
21	3	1.4073	0.2833
22	3	1.4635	0.1858

Pooled StDev = 0.2014



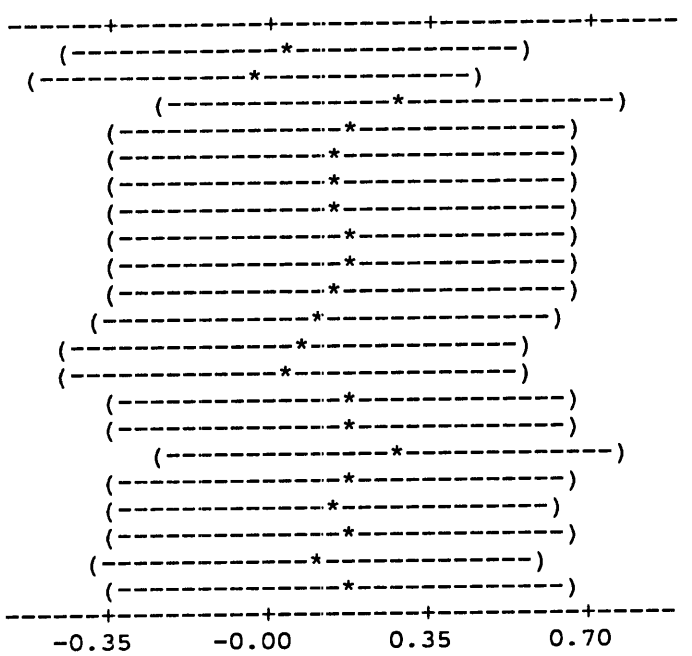
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00381

Critical value = 3.06

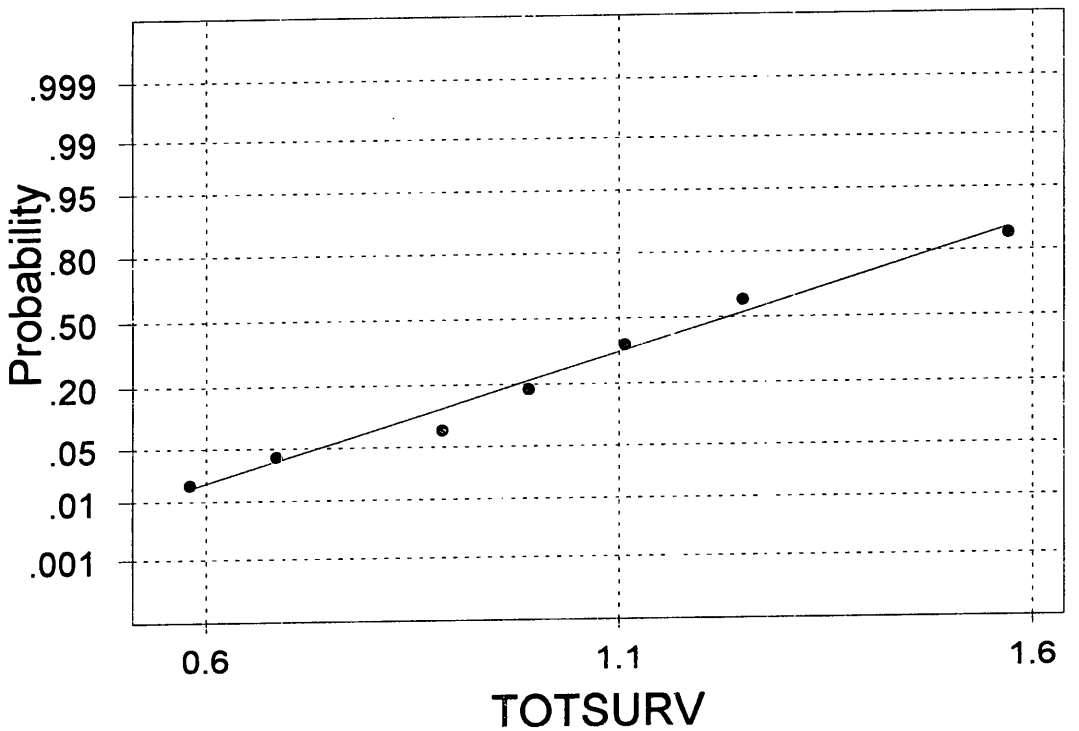
Control = level 14 of TestID

Level	Lower	Center	Upper
1	-0.4558	0.0473	0.5504
2	-0.5418	-0.0387	0.4644
3	-0.2353	0.2678	0.7709
4	-0.3426	0.1605	0.6636
5	-0.3558	0.1473	0.6504
6	-0.3558	0.1473	0.6504
7	-0.3486	0.1545	0.6577
8	-0.3426	0.1605	0.6636
9	-0.3426	0.1605	0.6636
10	-0.3486	0.1545	0.6577
11	-0.3899	0.1132	0.6163
12	-0.4498	0.0533	0.5564
13	-0.4558	0.0473	0.5504
15	-0.3426	0.1605	0.6636
16	-0.3426	0.1605	0.6636
17	-0.2353	0.2678	0.7709
18	-0.3426	0.1605	0.6636
19	-0.3646	0.1385	0.6416
20	-0.3426	0.1605	0.6636
21	-0.3989	0.1042	0.6073
22	-0.3426	0.1605	0.6636



MTB

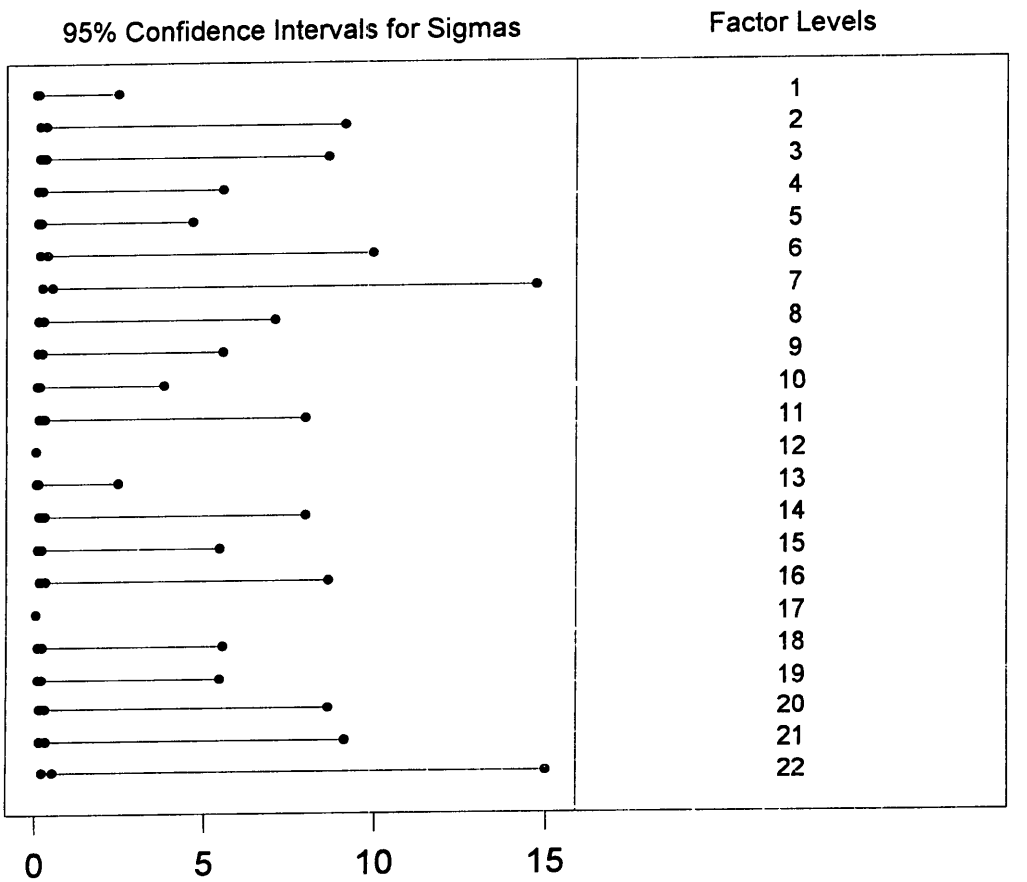
TOTAL FISH SURVIVAL (SAMPLES)



Average: 1.22166
Std Dev: 0.266200
N of data: 66

W-test for Normality
R: 0.9899
p value (approx): > 0.1000

TOTAL FISH SURVIVAL (SAMPLES)



Bartlett's Test

Test Statistic: -5.326

p value : 1.000

Levene's Test

Test Statistic: 0.579

p value : 0.911

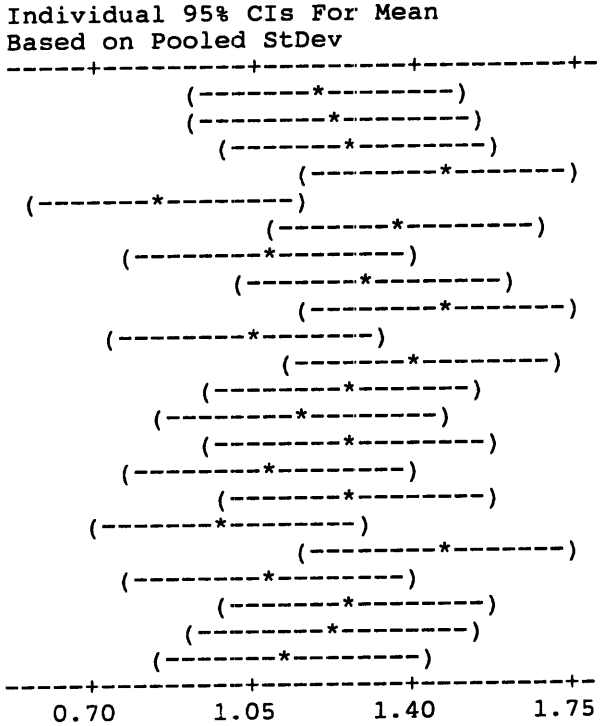
One-Way Analysis of Variance

Analysis of Variance on TOTSURV

Source	DF	SS	MS	F	p
TestID	21	1.6483	0.0785	1.17	0.324
Error	44	2.9578	0.0672		
Total	65	4.6061			

Level	N	Mean	StDev
1	3	1.2017	0.0819
2	3	1.2230	0.3067
3	3	1.2703	0.2904
4	3	1.4635	0.1858
5	3	0.8540	0.1557
6	3	1.3776	0.3347
7	3	1.0859	0.4959
8	3	1.3090	0.2376
9	3	1.4635	0.1858
10	3	1.0335	0.1276
11	3	1.4162	0.2677
12	3	1.2490	0.0000
13	3	1.1544	0.0819
14	3	1.2617	0.2677
15	3	1.0808	0.1829
16	3	1.2703	0.2904
17	3	0.9912	0.0000
18	3	1.4635	0.1858
19	3	1.0808	0.1829
20	3	1.2703	0.2904
21	3	1.2230	0.3067
22	3	1.1332	0.5056

Pooled StDev = 0.2593



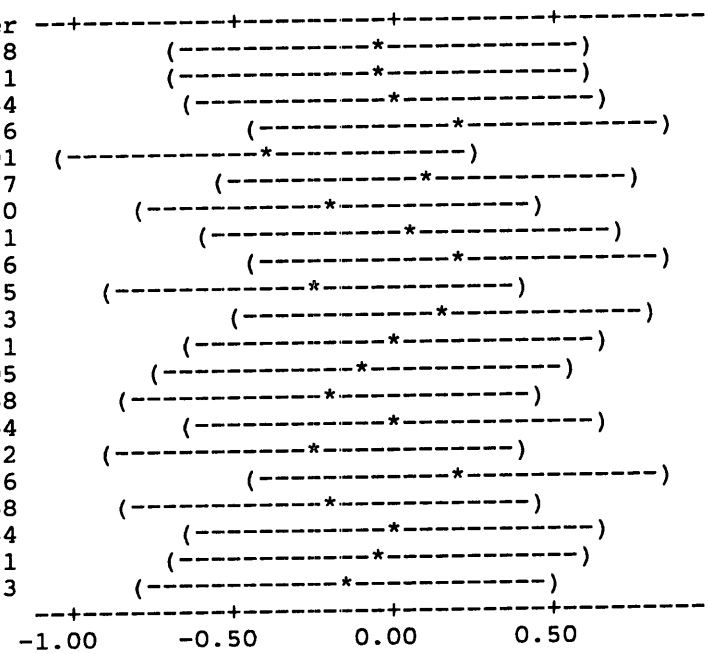
Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.00381

Critical value = 3.06

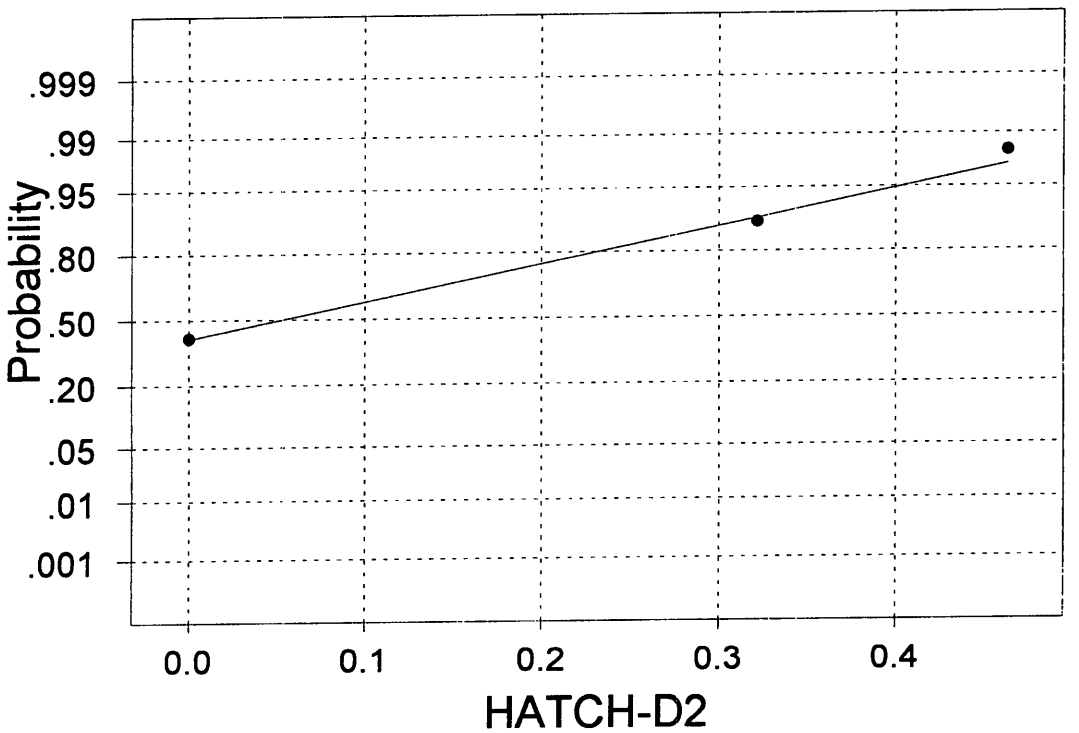
Control = level 14 of TestID

Level	Lower	Center	Upper
1	-0.7077	-0.0600	0.5878
2	-0.6865	-0.0387	0.6091
3	-0.6392	0.0086	0.6564
4	-0.4459	0.2018	0.8496
5	-1.0555	-0.4077	0.2401
6	-0.5319	0.1159	0.7637
7	-0.8236	-0.1758	0.4720
8	-0.6005	0.0473	0.6951
9	-0.4459	0.2018	0.8496
10	-0.8760	-0.2282	0.4195
11	-0.4932	0.1545	0.8023
12	-0.6604	-0.0127	0.6351
13	-0.7550	-0.1073	0.5405
15	-0.8287	-0.1809	0.4668
16	-0.6392	0.0086	0.6564
17	-0.9183	-0.2705	0.3772
18	-0.4459	0.2018	0.8496
19	-0.8287	-0.1809	0.4668
20	-0.6392	0.0086	0.6564
21	-0.6865	-0.0387	0.6091
22	-0.7763	-0.1285	0.5193



MT

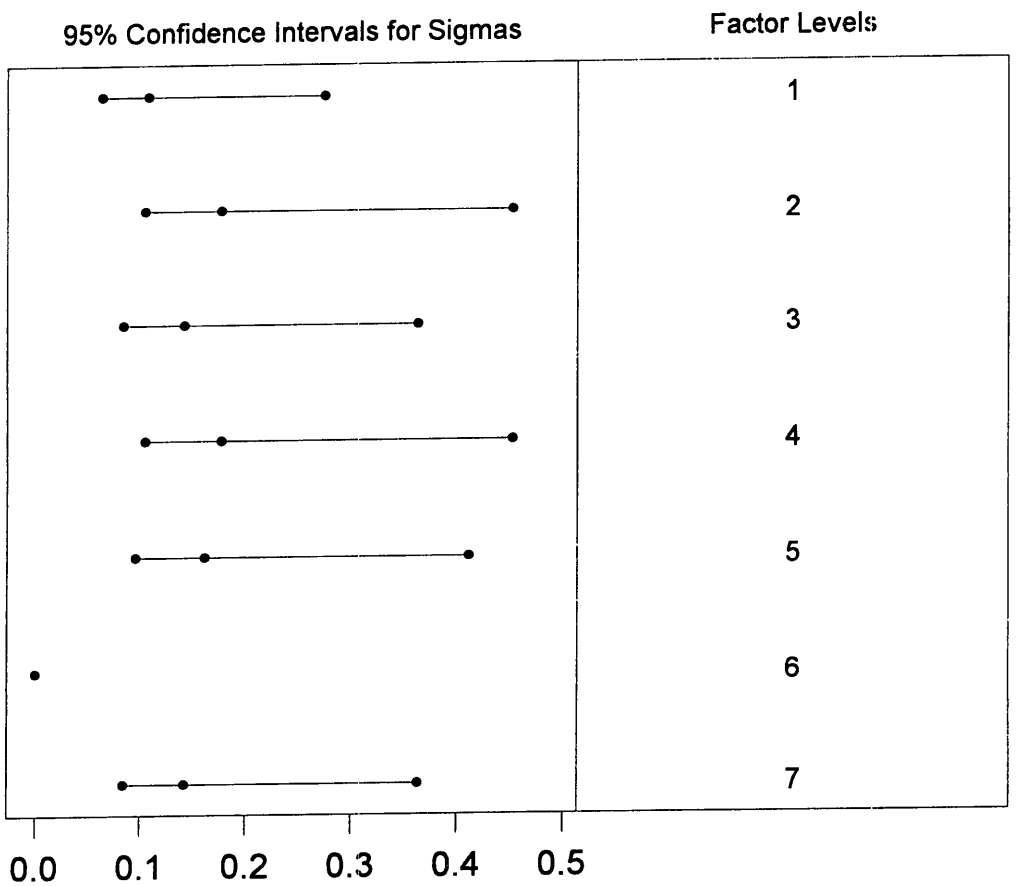
DAY 2 HATCH (STATIONS)



Average: 0.0657905
Std Dev: 0.138685
N of data: 63

W-test for Normality
R: 0.9983
p value (approx): > 0.1000

DAY 2 HATCH (STATIONS)



Bartlett's Test

Test Statistic: -39.131

p value : 1.000

Levene's Test

Test Statistic: 0.595

p value : 0.733

Analysis of Variance (Balanced Designs)

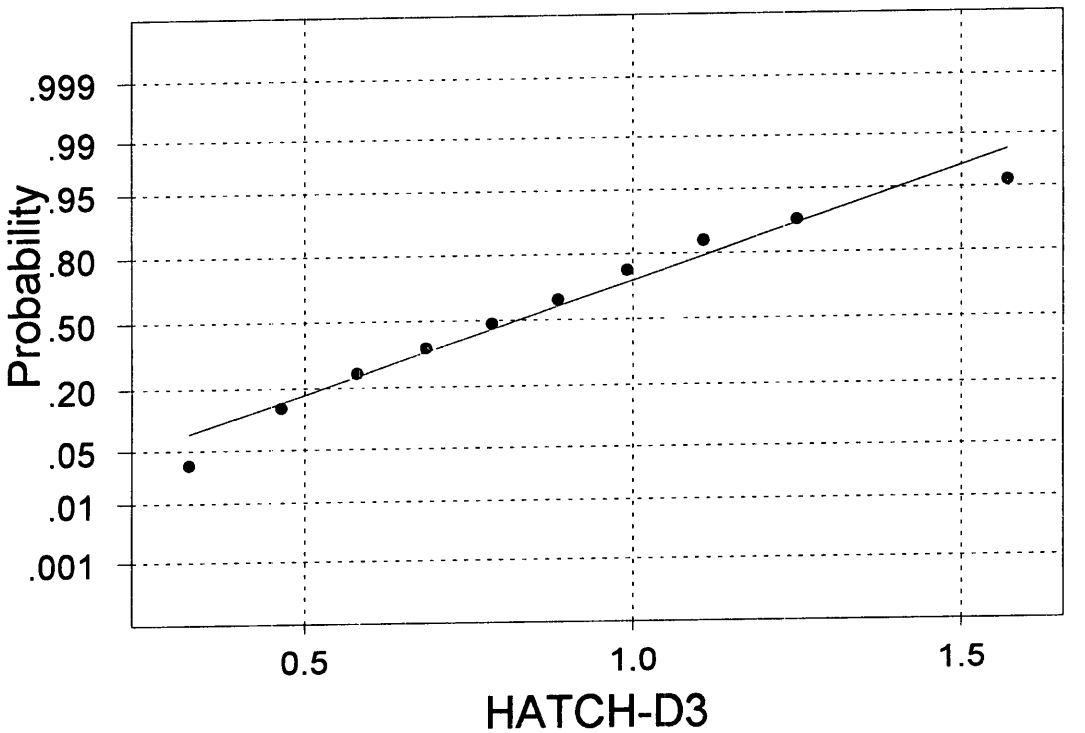
Factor	Type	Levels	Values						
STANCODE	fixed	7	1	2	3	4	5	6	7
FieldRep(STANCODE)	fixed	3	1	2	3				

Analysis of Variance for HATCH-D2

Source	DF	SS	MS	F	P
STANCODE	6	0.07144	0.01191	0.60	0.732
FieldRep(STANCODE)	14	0.28230	0.02016	1.01	0.462
Error	42	0.83875	0.01997		
Total	62	1.19248			

M

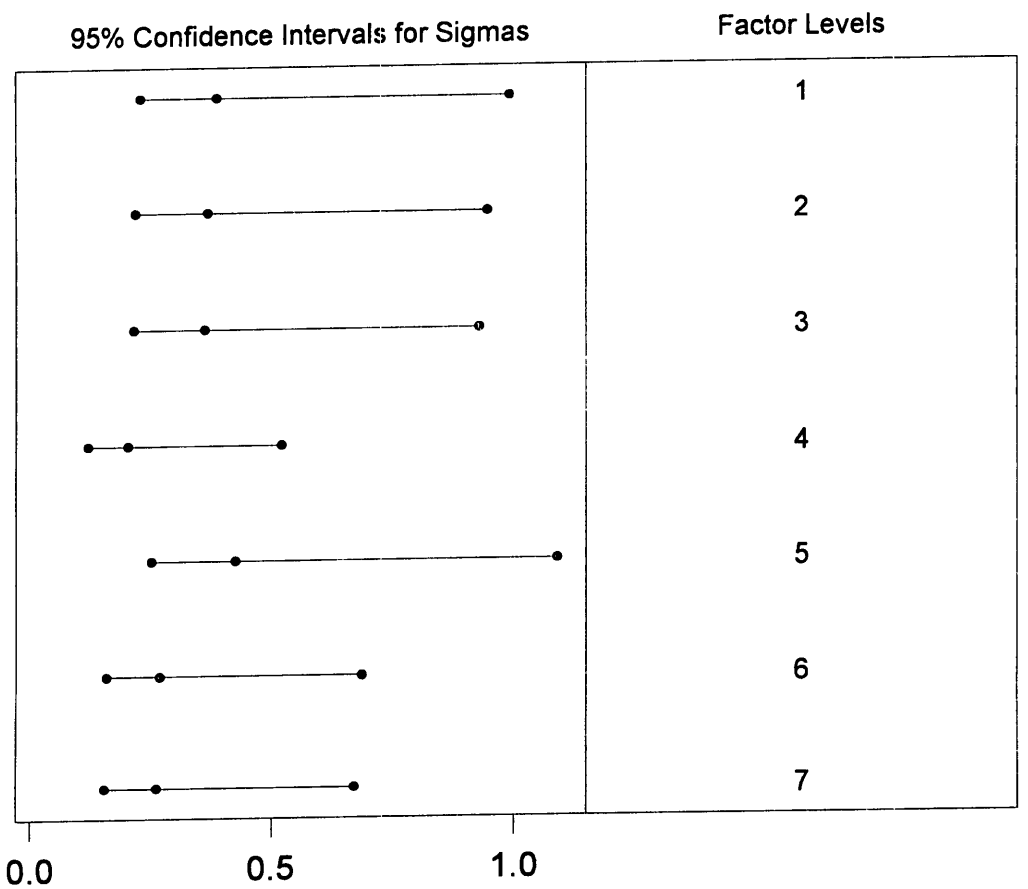
DAY 3 HATCH (STATIONS)



Average: 0.824634
Std Dev: 0.327135
N of data: 63

W-test for Normality
R: 0.9824
p value (approx): 0.0742

DAY 3 HATCH (STATIONS)



Bartlett's Test

Test Statistic: 5.880

p value : 0.437

Levene's Test

Test Statistic: 0.625

p value : 0.709

Analysis of Variance (Balanced Designs)

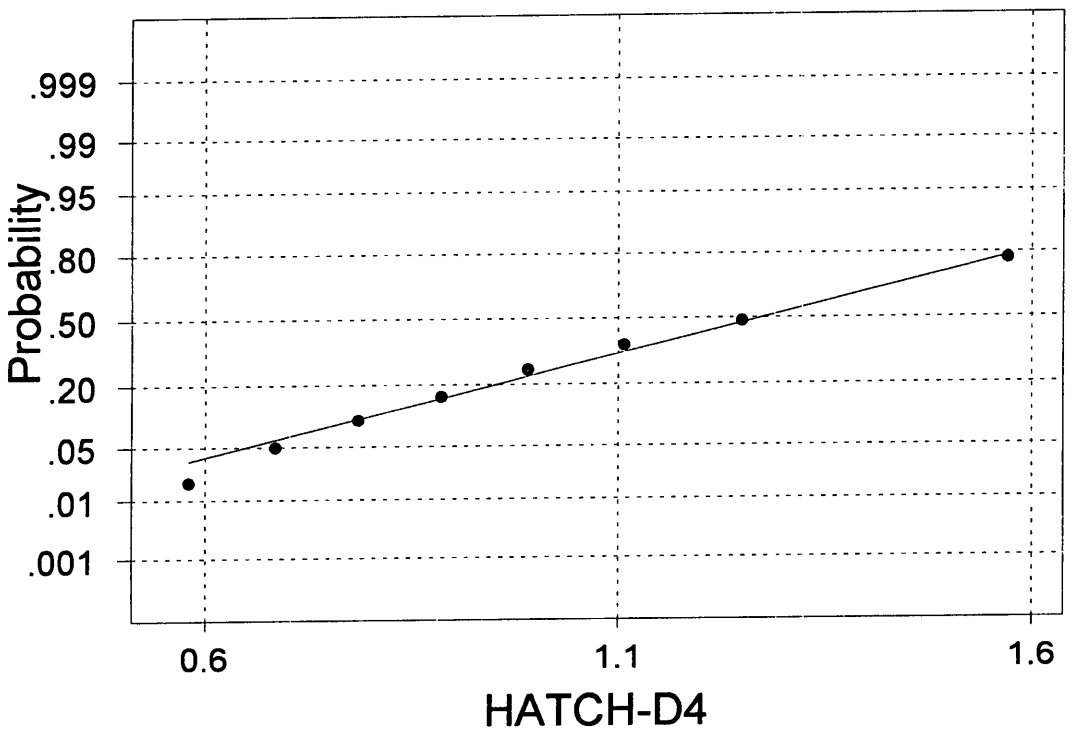
Factor	Type	Levels	Values						
STANCODE	fixed	7	1	2	3	4	5	6	7
FieldRep(STANCODE)	fixed	3	1	2	3				

Analysis of Variance for HATCH-D3

Source	DF	SS	MS	F	P
STANCODE	6	0.3781	0.0630	0.59	0.736
FieldRep(STANCODE)	14	1.7794	0.1271	1.19	0.316
Error	42	4.4776	0.1066		
Total	62	6.6351			

MTB >

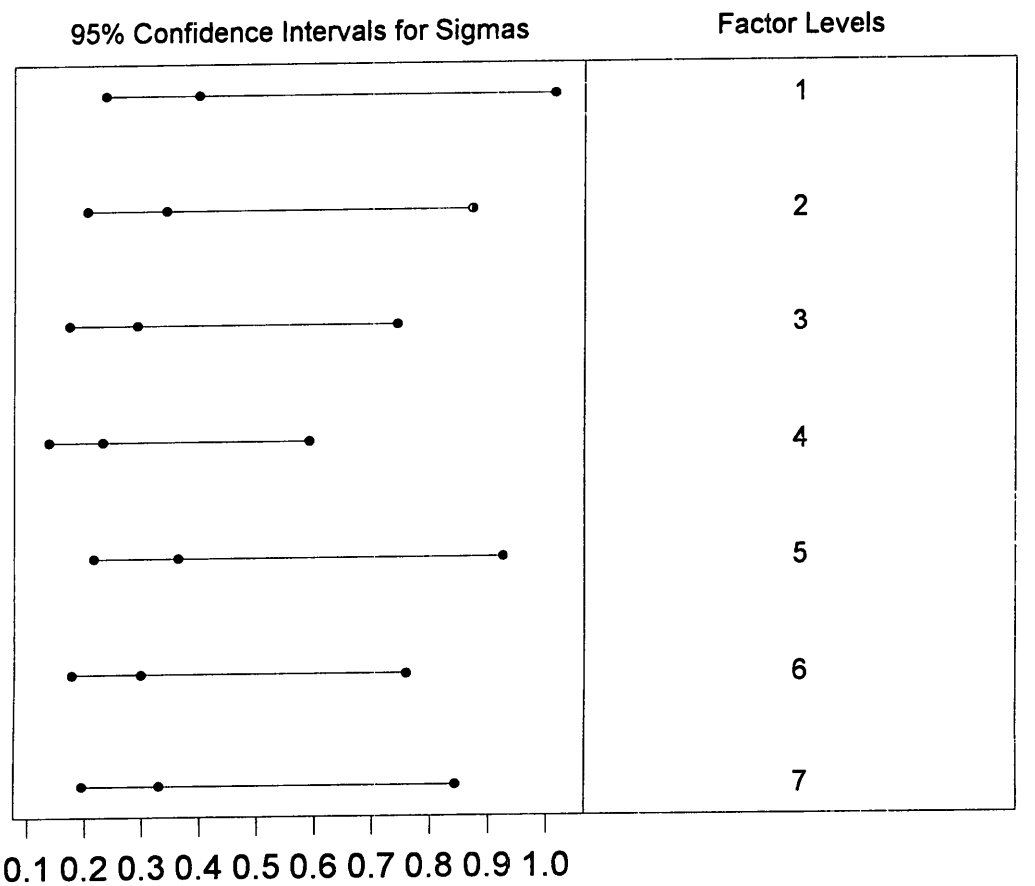
DAY 4 HATCH (STATIONS)



Average: 1.25413
Std Dev: 0.323037
N of data: 63

W-test for Normality
R: 0.9965
p value (approx): > 0.1000

DAY 4 HATCH (STATIONS)



Bartlett's Test

Test Statistic: 2.692

p value : 0.846

Levene's Test

Test Statistic: 0.257

p value : 0.954

Analysis of Variance (Balanced Designs)

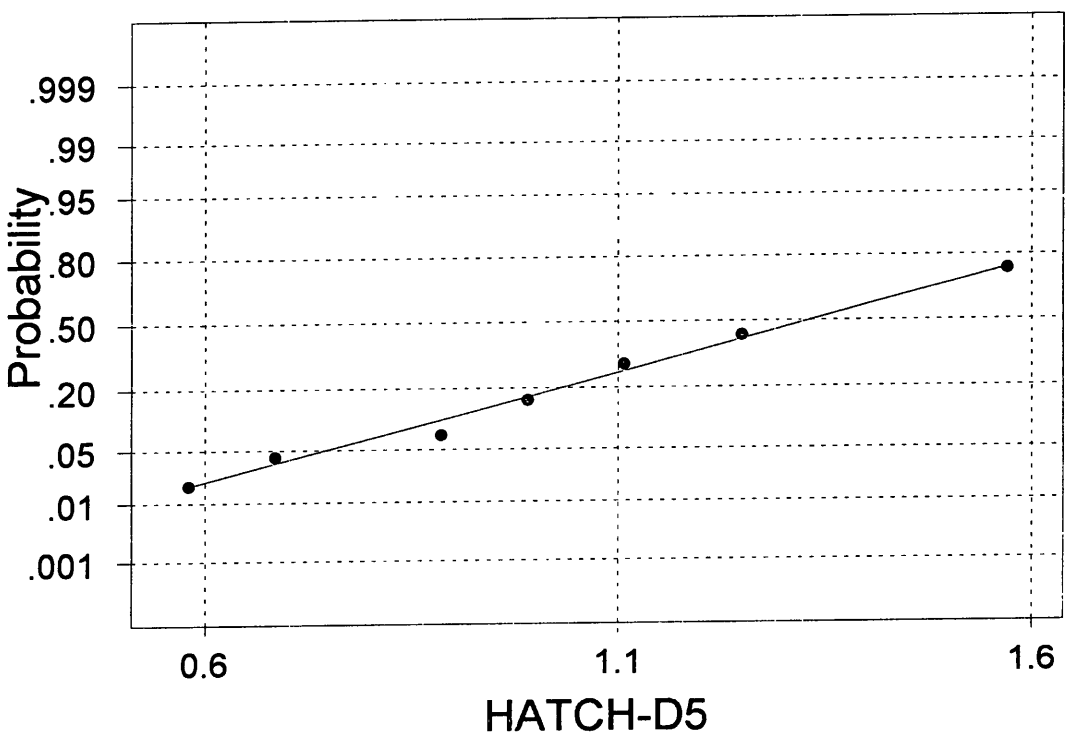
Factor	Type	Levels	Values						
STANCODE	fixed	7	1	2	3	4	5	6	7
FieldRep(STANCODE)	fixed	3	1	2	3				

Analysis of Variance for HATCH-D4

Source	DF	SS	MS	F	P
STANCODE	6	0.57410	0.09568	1.02	0.427
FieldRep(STANCODE)	14	1.94981	0.13927	1.48	0.160
Error	42	3.94597	0.09395		
Total	62	6.46989			

MT

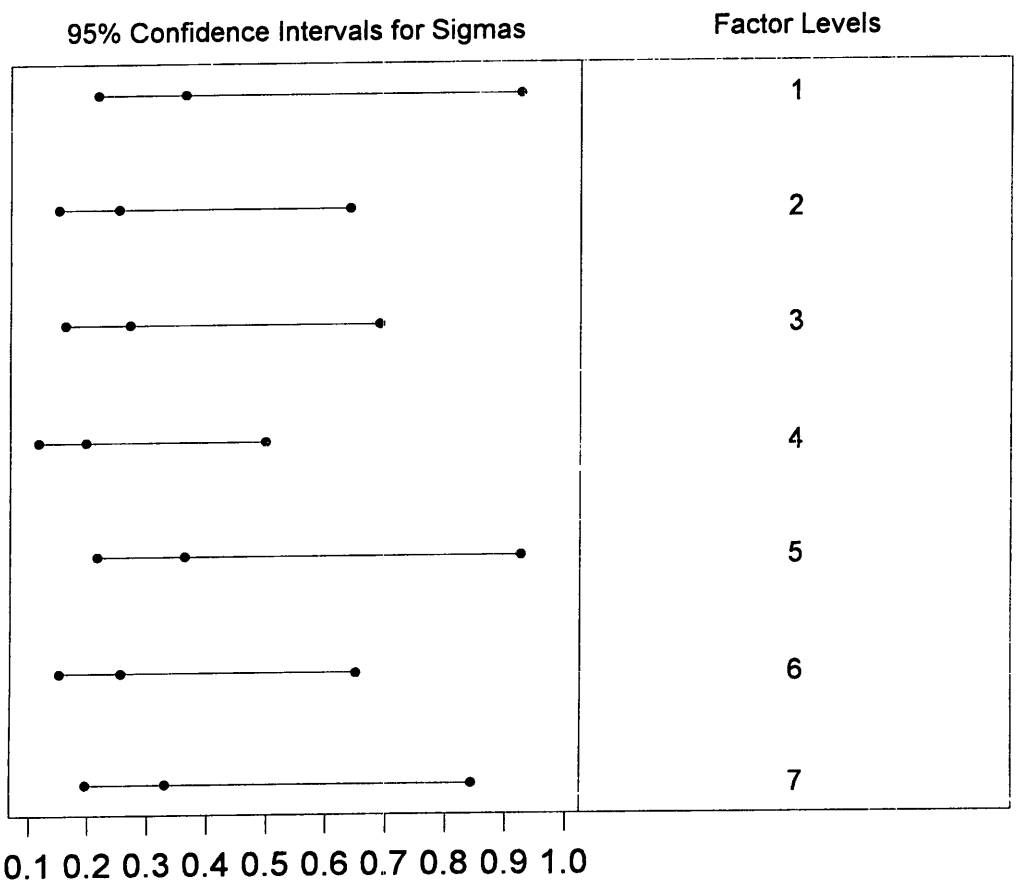
DAY 5 HATCH (STATIONS)



Average: 1.31196
Std Dev: 0.294754
N of data: 63

W-test for Normality
R: 0.9971
p value (approx): > 0.1000

DAY 5 HATCH (STATIONS)



Bartlett's Test

Test Statistic: 4.525

p value : 0.606

Levene's Test

Test Statistic: 0.362

p value : 0.900

Analysis of Variance (Balanced Designs)

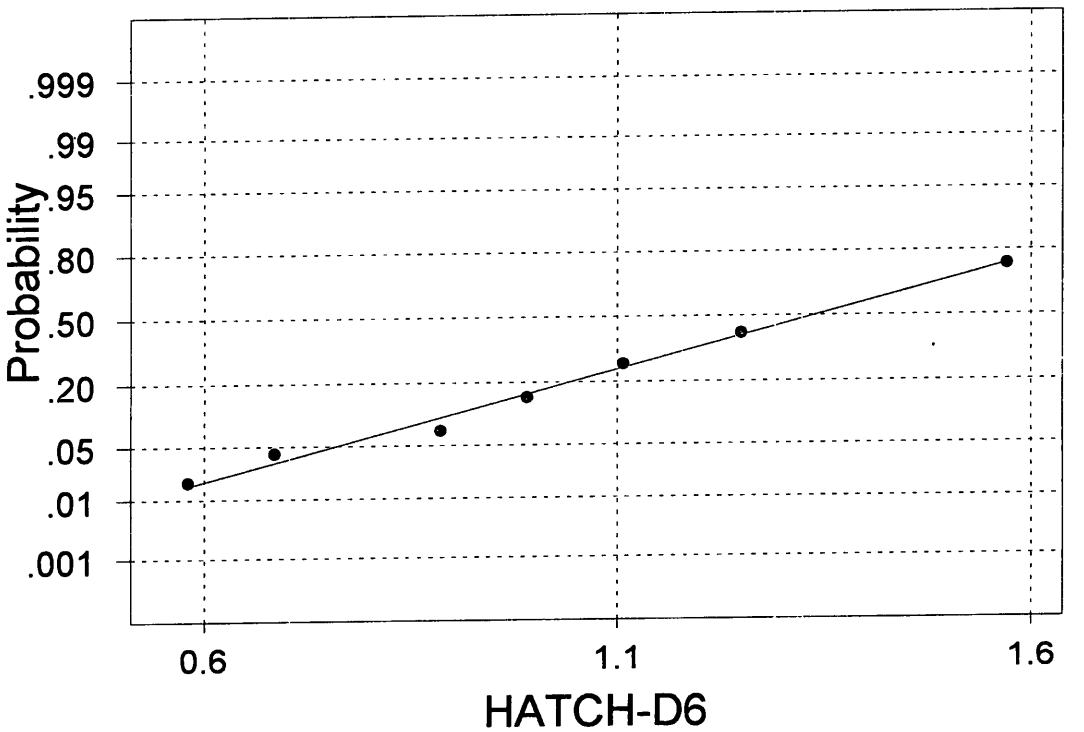
Factor	Type	Levels	Values						
STANCODE	fixed	7	1	2	3	4	5	6	7
FieldRep(STANCODE)	fixed	3	1	2	3				

Analysis of Variance for HATCH-D5

Source	DF	SS	MS	F	P
STANCODE	6	0.53643	0.08940	1.24	0.305
FieldRep(STANCODE)	14	1.82726	0.13052	1.81	0.069
Error	42	3.02285	0.07197		
Total	62	5.38654			

M

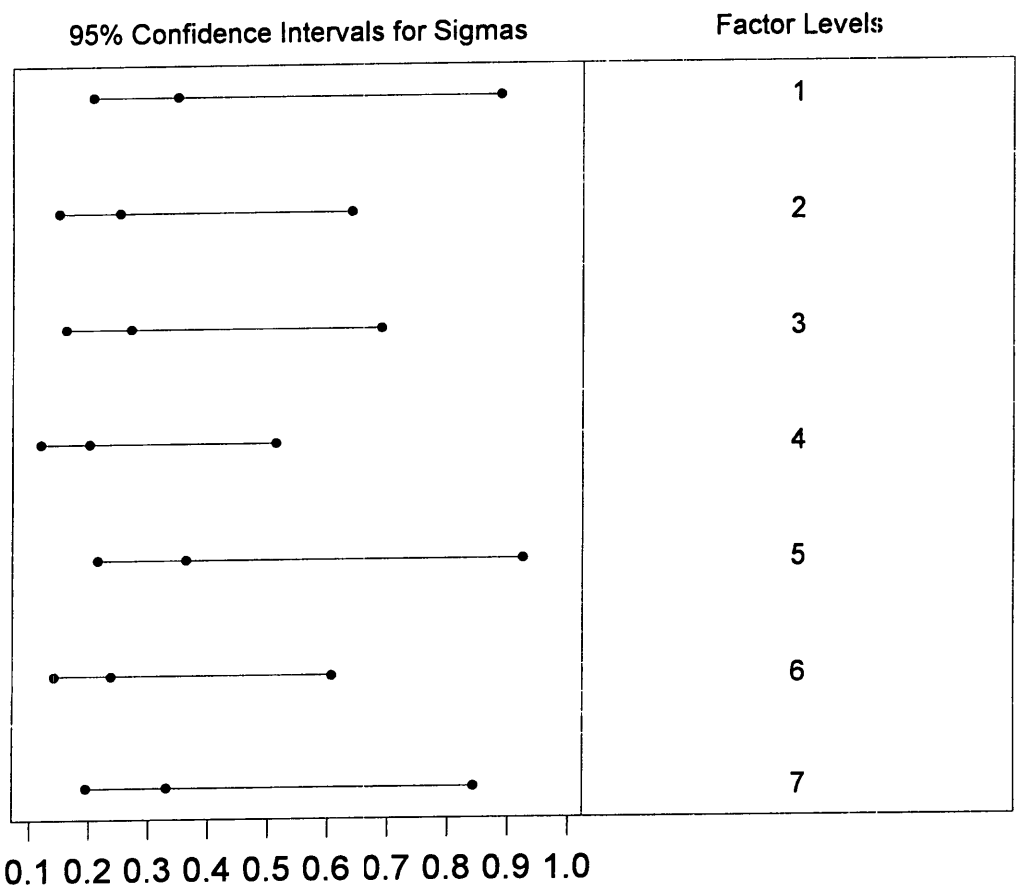
DAY 6 HATCH (STATIONS)



Average: 1.31831
Std Dev: 0.290912
N of data: 63

W-test for Normality
R: 0.9983
p value (approx): > 0.1000

DAY 6 HATCH (STATIONS)



Bartlett's Test

Test Statistic: 4.318

p value : 0.634

Levene's Test

Test Statistic: 0.369

p value : 0.896

Analysis of Variance (Balanced Designs)

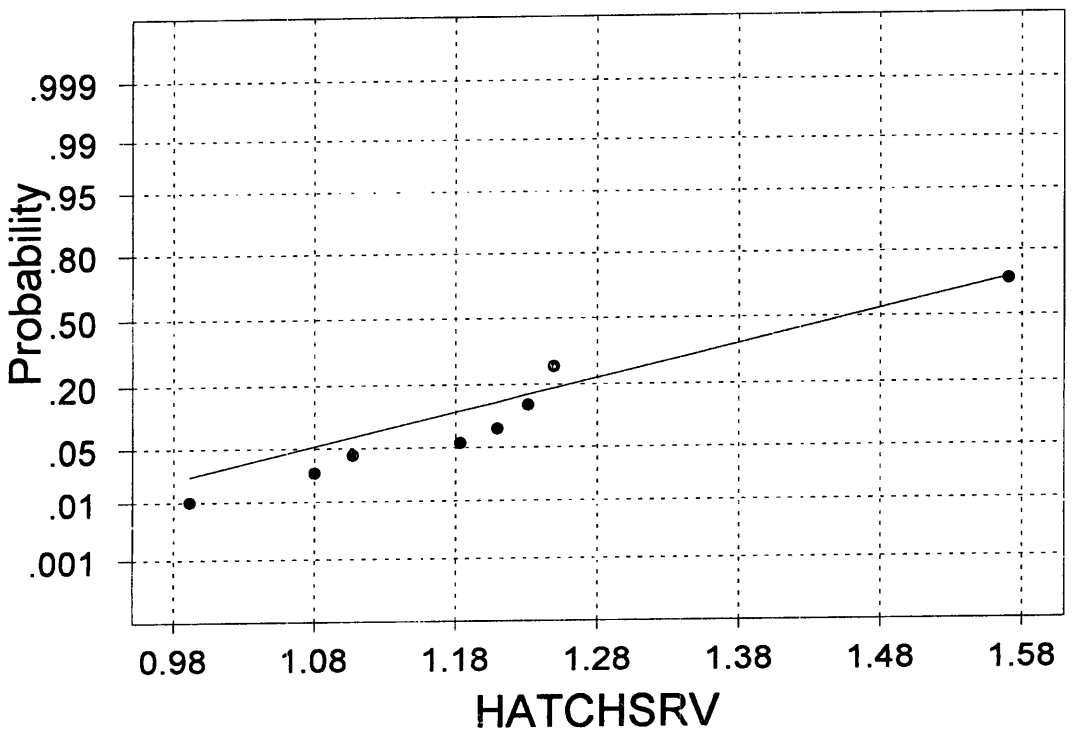
Factor	Type	Levels	Values						
STANCODE	fixed	7	1	2	3	4	5	6	7
FieldRep(STANCODE)	fixed	3	1	2	3				

Analysis of Variance for HATCH-D6

Source	DF	SS	MS	F	P
STANCODE	6	0.52804	0.08801	1.26	0.297
FieldRep(STANCODE)	14	1.78288	0.12735	1.82	0.067
Error	42	2.93614	0.06991		
Total	62	5.24705			

M

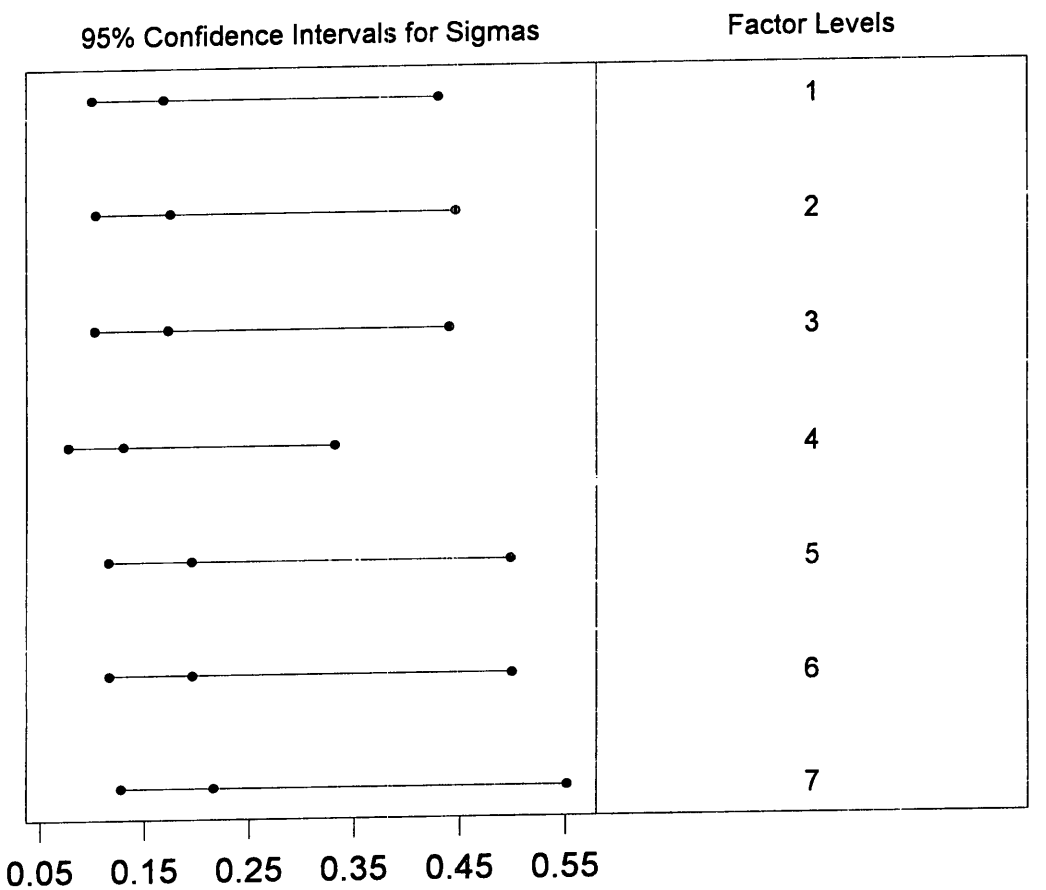
HATCHED FISH SURVIVAL (STATIONS)



Average: 1.44058
Std Dev: 0.177531
N of data: 63

W-test for Normality
R: 0.9768
p value (approx): 0.0318

HATCHED FISH SURVIVAL (STATIONS)



Bartlett's Test

Test Statistic: 2.240

p value : 0.896

Levene's Test

Test Statistic: 0.526

p value : 0.786

Analysis of Variance (Balanced Designs)

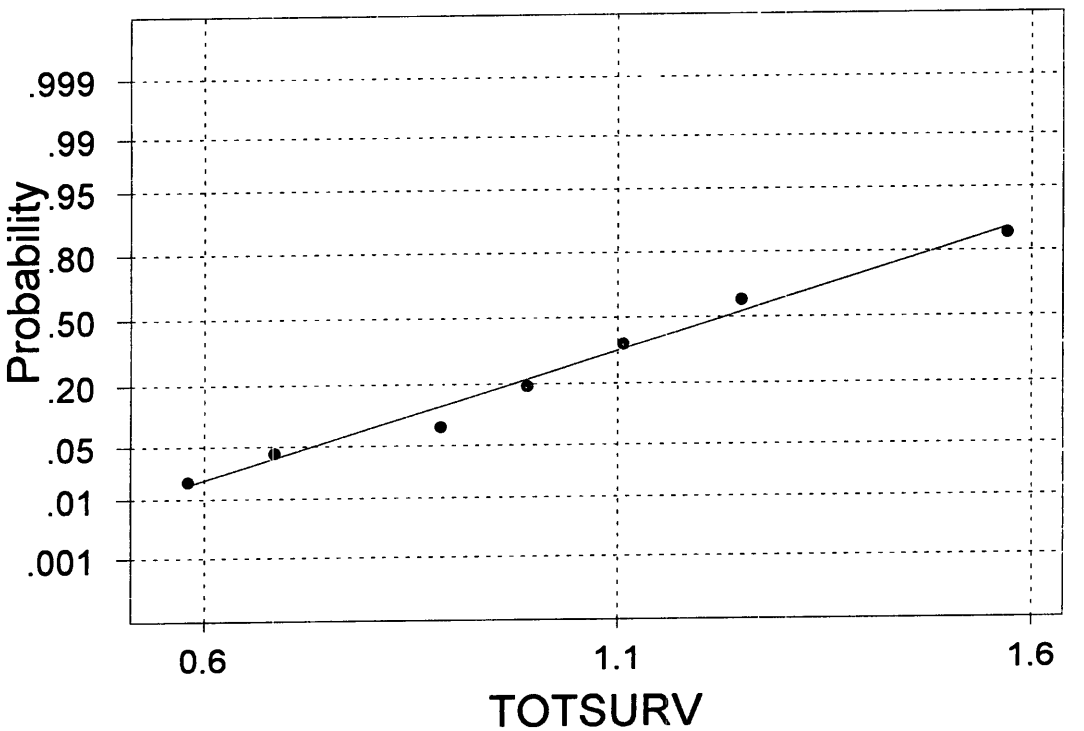
Factor	Type	Levels	Values						
STANCODE	fixed	7	1	2	3	4	5	6	7
FieldRep(STANCODE)	fixed	3	1	2	3				

Analysis of Variance for HATCHSRV

Source	DF	SS	MS	F	P
STANCODE	6	0.13544	0.02257	0.57	0.753
FieldRep(STANCODE)	14	0.14971	0.01069	0.27	0.995
Error	42	1.66891	0.03974		
Total	62	1.95407			

MT

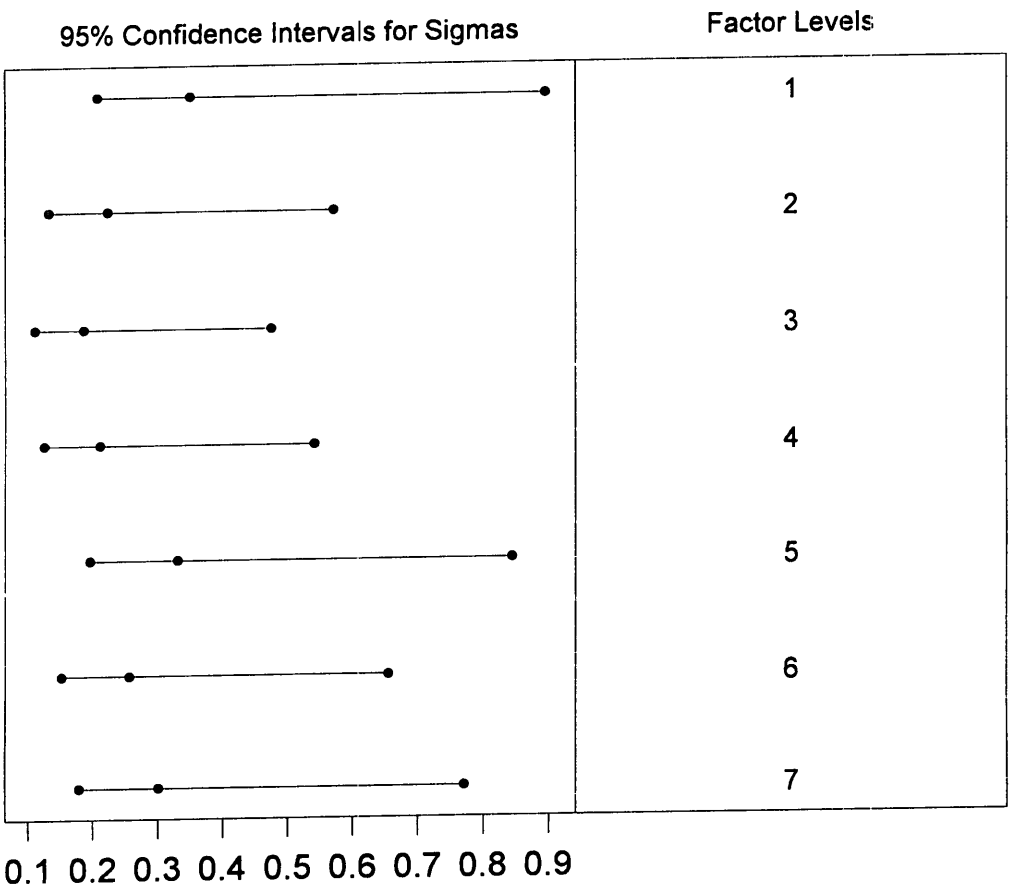
TOTAL FISH SURVIVAL (STATIONS)



Average: 1.21976
Std Dev: 0.268139
N of data: 63

W-test for Normality
R: 0.9913
p value (approx): > 0.1000

TOTAL FISH SURVIVAL (STATIONS)



Bartlett's Test

Test Statistic: 5.172

p value : 0.522

Levene's Test

Test Statistic: 0.593

p value : 0.735

Analysis of Variance (Balanced Designs)

Factor	Type	Levels	Values						
STANCODE	fixed	7	1	2	3	4	5	6	7
FieldRep(STANCODE)	fixed	3	1	2	3				

Analysis of Variance for TOTSURV

Source	DF	SS	MS	F	P
STANCODE	6	0.32749	0.05458	0.81	0.565
FieldRep(STANCODE)	14	1.31575	0.09398	1.40	0.195
Error	42	2.81448	0.06701		
Total	62	4.45772			

MTB >

COASTAL BIOANALYSTS BASELINE TEST INFO - 10-DAY FW SEDIMENT TESTS

TEST ORGANISMS

Species: H. AZTECA Source: CC

Age/Life stage JUVENILE 7-14 D (2-3 mm) Feeding: YCT 3/4 ml Day (750 µl)

Acclimation Water: Type: SFW Hardness: ~~334~~ 100 (Cond. PD) Acclimation Temperature: 23° Acclimation Photoperiod 16:8

Notes: DAY 0 WTS: (BEGIN, MID, END CUP ARRAY)

	TOTAL	TARE	NET	$\bar{X}$ INDIVID
1.	6.27	4.55	1.72	0.086
2.	6.80	5.16	1.64	0.082
3.	7.00	5.32	1.68	0.084

$\bar{X}$ 0.084

INIT/DATE/CALIB: MH 10/26/00 10.00 MH 10/30/00 9.99

TEST DESIGN

Chamber Size: 300 ml ____ 1000 ml ✓ 37000 ml ____ Other ____ Sediment Volume (ml) 200 Water Volume (ml) 800

Initial No. Organisms per Replicate: 20 No. Replicates: 3 Photoperiod: 16 L: 8 D Randomization Template No. NA

TEST SET UP

Date/Time Sediment & Water Added: 10/26/00 1330-1600 Date/Time Animals Added: 10/27/00

Set-up By (Initials): PD/GB/MH Notes: ____

INSTRUMENTATION

Stem Thermometer No. C1

✓ YSI DO Meter # 1 (SNE8014475

____ YSI DO Meter # 2 (SN91A026329)

____ SP PortapH2 Meter (852360)

____ Corning 240 pH Meter (SN5268)

✓ CP Digisense pH Meter (D9500563)

✓ Sartorius R160P Balance (40020093)

____ YSI SCT 33 Meter (H8016792)

____ Spartan ATC Refractometer (A366)

NOTES:

All times BEST

As Quality Assurance Officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: ____

P. Blasco 12/19/00

Signature Date

File: STF006A CBI TEST ID: VIMS 0003 HA

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0003 NA

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	1	22.6	23.4	23.4	23.1	23.2	23.1	22.9	22.9	22.5	22.1	22.7
	2	22.9	23.5	23.5	23.2	23.3	23.1	22.9	22.8	23.3	23.4	22.8
	3	23.1	23.4	23.5	23.2	23.3	23.1	22.8	22.8	23.0	23.4	22.8
	4	22.8	23.3	23.4	23.1	23.2	23.2	23.1	22.9	23.3	23.3	22.9
	5	22.8	23.3	23.3	23.1	22.9	23.2	23.1	23.0	23.4	23.1	23.1
	6	22.7	23.3	23.4	23.2	23.1	23.1	23.2	22.9	23.5	23.2	23.1
	7	22.6	23.4	22.9	23.2	22.8	23.3	23.1	22.9	23.3	23.0	23.0
	8	23.1	23.2	22.9	22.9	23.0	23.2	23.0	22.8	23.2	23.3	22.9
DISSOXYGEN (mg/l)	1	8.6	8.5	8.5	8.4	8.2	8.2	8.1	8.2	8.2	8.3	8.2
	2	8.6	8.5	8.5	8.3	8.1	8.3	8.0	8.3	8.3	8.3	8.3
	3	8.6	8.6	8.4	8.3	8.1	8.4	8.0	8.2	8.1	8.3	8.2
	4	8.6	8.6	8.6	8.2	8.2	8.3	8.2	8.2	8.3	8.2	8.2
	5	8.6	8.5	8.5	8.3	8.3	8.3	8.1	8.2	8.1	8.2	8.1
	6	8.5	8.4	8.6	8.4	8.1	8.4	8.2	8.1	8.2	8.3	8.2
	7	8.6	8.6	8.4	8.3	8.2	8.2	8.3	8.2	8.2	8.2	8.3
	8	8.6	8.6	8.4	8.3	8.1	8.1	8.1	8.2	8.2	8.1	8.1
REPL. NO:		1	3	2	1	2	3	1	2	1	3	2
INITIALS:		PD	PD	LA	LA	GB	GP	GD	GB	SMP	SMD	CA

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS0003 HA

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	9	23.1	23.5	23.4	23.1	23.0	23.1	23.2	23.0	23.4	23.4	23.1
	10	22.8	23.5	23.5	23.0	23.0	23.1	23.1	22.8	23.2	23.4	23.3
	11	22.9	23.3	23.5	22.8	23.1	23.2	23.1	22.7	23.2	22.8	23.4
	12	23.0	23.4	23.6	22.9	23.2	23.2	22.9	22.6	23.4	23.2	23.3
	13	23.1	23.4	23.5	23.0	22.8	23.2	23.3	22.9	23.1	23.1	23.2
	14	22.6	23.5	23.6	23.0	23.2	23.4	22.9	22.8	23.4	23.4	23.1
	15	22.7	23.4	23.6	22.9	22.9	23.3	22.9	23.0	23.6	23.4	23.2
	16	22.6	23.1	23.2	22.9	23.1	23.3	23.0	23.0	23.1	23.1	23.1
DISSOXYGEN (mg/l)	9	8.6	8.5	8.4	8.3	8.2	8.3	8.3	8.2	8.3	8.4	8.3
	10	8.6	8.5	8.4	8.4	8.3	8.2	8.2	8.3	8.4	8.2	8.3
	11	8.6	8.5	8.3	8.4	8.4	8.3	8.1	8.2	8.1	8.0	8.2
	12	8.6	8.6	8.5	8.3	8.3	8.4	8.1	8.1	8.1	8.0	8.1
	13	8.5	8.6	8.4	8.2	8.2	8.3	8.3	8.2	8.2	8.4	8.4
	14	8.6	8.5	8.3	8.4	8.1	8.2	8.3	8.2	8.4	8.2	8.3
	15	8.6	8.5	8.4	8.5	8.2	8.1	8.2	8.1	8.2	8.1	8.2
	16	8.6	8.4	8.5	8.5	8.2	8.3	8.1	8.1	8.2	8.1	8.2
REPL. NO:		1	3	2	1	2	3	1	2	1	3	2
INITIALS:		PO	PO	RM	GB	GB	LA	GA	GB	SMD	SMD	GB

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: Vim5 0003 HA

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	17	22.6	23.5	23.5	23.1	23.0	23.2	23.1	22.8	23.4	23.4	23.2
	18	23.1	23.6	23.6	23.1	22.9	23.1	23.2	22.9	23.5	23.3	23.3
	19	23.1	23.6	23.6	23.3	23.4	23.1	23.2	22.9	23.5	23.4	23.4
	20	22.8	23.5	23.4	23.2	23.2	22.9	23.1	22.8	23.6	23.1	23.4
	21	22.7	23.4	23.1	23.2	23.2	22.9	23.0	23.0	23.0	23.4	23.2
	22	23.0	23.4	23.2	23.2	23.1	22.9	23.0	22.8	23.4	23.4	23.3
DISSOXYGEN (mg/l)	17	8.6	8.5	8.5	8.3	8.3	8.4	8.4	8.2	8.2	8.3	8.2
	18	8.6	8.5	8.4	8.3	8.2	8.1	8.3	8.3	8.2	8.3	8.3
	19	8.6	8.6	8.4	8.4	8.3	8.2	8.2	8.1	8.2	8.2	8.2
	20	8.6	8.5	8.6	8.4	8.4	8.3	8.3	8.2	8.3	8.1	8.1
	21	8.6	8.4	8.5	8.4	8.3	8.2	8.1	8.2	8.2	8.2	8.1
	22	8.6	8.6	8.6	8.5	8.3	8.3	8.2	8.2	8.2	8.3	8.2
REPL. NO:		1	3	2	1	2	3	1	2	1	3	2
INITIALS:		PD	PD	GM	GM	GM	GM	GM	GM	SMD	SMD	GM

NOTES

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: 1MS 0003 MD

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
1	1	0	0	0	0	0	0	0	0	0	20
2		0	0	0	0	0	0	0	0	0	19
3		0	0	0	0	0	0	0	0	0	17
4		0	0	0	0	0	0	0	0	0	17
5		0,1E	0	0	0	0	0	0	0	0	17
6		0	0	0	0	0	0	0	0	0	1 (1)
7		0	0	0	0	0	0	0	0	0	20
8		0	0	0	0	0	0	0	0	0	15
9		0	0	0	0	0	0	0	0	0	20
10		0	0	0	0	0	0	0	0	0	4 (2)
11		0,2E	0	0	0	0	0,1E	0	0	0	18
12		0	0	0	0	0	0	0	0	0	20
13		0	0	0	0	0	0	0	0	0	20
14		0	0	0	0	0	0	0	0	0	19
15		0	0	0	0	0	0	0	0	0	19
16		0	0	0	0	0	0	0	0	0	19
TIME:		1310	1320	0835	0830	0840	0820	0835	1550	1450	1330-1630
INITIALS:		PP	GB	GA	GB	LA	LM	GB	SMD	SMD	AD/GB/MH

NOTES

(1) 1 live Cyathura polita

(2) 3 live " "

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: Ulms 0003 HA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
17	1	0	0	0	0	0	0	0	0	0	18
18		0	0	0	0	0	0	0	0	0	18
19		0	0	0	0	0	0	0	0	0	20
20		0, 1E	0	0	0	0	0	0	0	0	20
21		0	0	0	0	0	0	0	0	0	20
22		0	0	0	0	0	0	0	0	0	15
1	2	0	0	0	0	0	0	0	0	0	0 (1)
2		0	0	0	0	0	0	0	0	0	19
3		0	0	0	0	0	0	0	0	0	20
4		0	0	0	0	0	0	0	0	0	19
5		0	0	0	0	0	0	0	0	0	16
6		0	0	0	0	0	0	0	0	0	19
7		0	0	0	0	0	0	0	0	0	20
8		0, 1E	0	0	0	0	0	0	0	0	20
9		0	0	0	0	0	0	0	0	0	20
10		0	0	0	0	0	0	0	0	0	6 (2)
TIME:		1310	1335	0835	0830	0840	0820	0835	1550	1450	1330-1630
INITIALS:		PO	GA	GB	GB	GM	GB	GM	SMD	SMD	PO/GB/MM

NOTES

(1) Juvenile Callinectes sapidus ~ 0.6cm

(2) Several live C. polita

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0003 HA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
11	2	0	0	0	0	0	0,2E	0	0	0	19
12		0	0	0	0	0	0,1E	0	0	0	19
13		0	0	0	0	0	0	0	0	0	18
14		0	0	0	0	0	0,1E	0	0	0	20
15		0	0	0	0	0	0	0	0	0	19
16		0	0	0,2E	0	0	0	0	0	0	20
17		0	0	0	0	0	0	0	0	0	18
18		0	0	0	0	0	0	0	0	0	18
19		0	0	0	0	0	0	0	0	0	20
20		0	0	0	0	0	0	0	0	0	18
21		0	0	0	0	0	0,1E	0	0	0	20
22		0,2E	0	0	0	0	0	0	0	0	20
1	3	0	0,1E	0	0	0	0	0	0	0	12 ①
2		0	0	0	0	0	0	0	0	0	19
3		0	0	0	0	0	0,1E	0	0	0	19
4		0	0	0	0	0	0	0	0	0	19
TIME:		1310	1340	0840	0840	0840	0820	0835	1550	1450	1330-1630
INITIALS:		PD	GB	GA	GB	GA	GB	GA	SMD	SMD	PD/GB/MM

NOTES

① 1 C. polita, 1 gammarus

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS0003 MA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
5	3	0	0	0	0	0	0	0	0	0	14
6		0	0	0	0	0	0	0	0	0	16
7		0	0	0	0	0	0	0,1E	0	0	19
8		0	0	0	0	0	0	0	0	0	19
9		0	0	0	0	0	0,1E	0	0	0	19
10		0	0	0	0	0	0,1E	0	0	0	18 ①
11		0	0	0	0	0	0	0	0	0	20
12		0	0	0	0	0	0	0	0	0	20
13		0	0	0	0	0	0	0	0	0	20
14		0	0	0	0	0	0	0	0	0	18
15		0	0	0	0,1E	0	0	0	0	0	20
16		0	0	0	0	0	0	0	0	0	20
17		0	0	0	0	0	0	0	0	0	18
18		0	0	0	0	0	0	0	0	0	19
19		0	0	0	0	0	0	0	0	0	20
20		0	0	0	0	0	0	0	0	0	20
TIME:		1310	1340	0840	0840	0840	0820	0835	1550	1450	1330-1630
INITIALS:		PP	GA	GB	GB	GM	GB	GA	SMD	SMD	PD/GB/MM

NOTES: ① 1 gammarid

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0003 MA

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
4	3	0	0	0	0	0	0	0	0	0	20
22	↓	0	0	0	0	0	0	0	0	0	20
TIME:		1310	1340	0840	0840	0840	0820	0835	1550	1450	1330-1620
INITIALS:		PD	GM	GB	GB	GM	GB	CB	SMD	SMD	PD/GB/MM

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

ORGANISM DRY WEIGHT (mg) SEDIMENT TEST File:STF008B CBI TEST ID: VIMS 0003 HA

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
1	1	1	4.98	3.22	1.76	0.088	17	1	17	6.53	4.88	1.65	0.092
2		2	6.68	4.00	2.68	0.141	18		18	6.79	5.14	1.65	0.092
3		3	6.60	4.85	1.75	0.103	19		19	6.88	5.15	1.73	0.087
4		4	5.69	4.39	1.30	0.076	20		20	7.82	6.24	1.58	0.079
5		5	6.09	4.65	1.44	0.085	21		21	7.88	6.03	1.85	0.093
6		6	5.51	5.27	0.24	0.240	22		22	7.45	6.14	1.31	0.087
7		7	6.30	4.40	1.90	0.095	1	2	23	—	6.39	—	—
8		8	6.17	4.52	1.65	0.110	2		24	8.45	5.58	2.87	0.151
9		9	6.59	4.90	1.69	0.085	3		25	6.74	5.45	1.29	0.065
10		10	5.12	4.59	0.53	0.133	4		26	6.98	5.40	1.58	0.083
11		11	5.82	4.14	1.68	0.093	5		27	6.66	5.34	1.32	0.083
12		12	7.10	4.79	2.31	0.116	6		28	7.82	6.29	1.53	0.081
13		13	6.20	4.43	1.77	0.089	7		29	6.83	5.14	1.69	0.085
14		14	6.87	4.74	2.13	0.112	8		30	6.96	5.28	1.68	0.084
15		15	7.06	5.40	1.66	0.087	9		31	5.97	4.59	1.38	0.069
16		16	5.81	4.04 ~~3.~~ MH	1.77	0.093	10		32	5.71	4.82	0.89	0.148

TARE WT.: DATE 11/3/00 INITIALS: MH CALIB. (CLASS S 10 MG): 10.01

TOTAL WT.: DATE 11/9/00 INITIALS: PD CALIB. (CLASS S 10 MG): 9.99

NOTES

ORGANISM DRY WEIGHT (mg) SEDIMENT TEST File:STF008B CBI TEST ID: VIMS 0003 MA

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
11	2	33	7.36	5.80	1.56	0.082	5	3	49	7.81	6.04	1.77	0.126
12		34	7.22	5.66	1.56	0.082	6		50	6.44	5.03	1.41	0.088
13		35	6.18	4.72	1.46	0.081	7		51	7.41	5.49	1.92	0.101
14		36	5.99	4.10	1.89	0.095	8		52	7.76	5.38	2.38	0.125
15		37	5.76	4.11	1.65	0.087	9		53	6.84	5.29	1.55	0.082
16		38	6.14	4.77	1.37	0.069	10		54	7.77	6.21	1.56	0.087
17		39	6.62	5.14	1.48	0.082	11		55	6.77	5.21	1.56	0.078
18		40	5.56	4.13	1.43	0.079	12		56	8.29	5.91	2.38	0.119
19		41	6.36	4.61	1.75	0.088	13		57	9.10	6.48	2.62	0.131
20		42	6.78	5.37	1.41	~~0.08~~ 0.078 PD	14		58	7.64	5.77	1.87	0.104
21		43	6.88	4.98	1.90	0.095	15		59	7.86	6.05	1.81	0.091
22		44	8.79	6.11	2.68	0.134	16		60	7.62	5.67	1.95	0.098
1	3	45	5.73	4.71	1.02	0.085	17		61	7.54	5.81	1.73	0.096
2		46	8.32	5.47	2.85	0.150	18		62	8.10	6.01	2.09	0.110
3		47	6.11	4.59	1.52	0.080	19		63	9.05	6.61	2.44	0.122 PD
4		48	5.71	4.03	1.68	0.088	20		64	8.86	7.40	1.46	0.073

TARE WT.: DATE 11/3/00 INITIALS: MH CALIB. (CLASS S 10 MG): 10.01

TOTAL WT.: DATE 11/9/00 INITIALS: PD CALIB. (CLASS S 10 MG): 9.99

NOTES

ORGANISM DRY WEIGHT (mg) SEDIMENT TEST File:STF008B CBI TEST ID: U1MS 0003 MA

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
4	3	65	8.71	7.52	1.19	0.060							
22	↓	66	7.30	5.73	1.57	0.079							

TARE WT.: DATE _____ INITIALS: _____ CALIB. (CLASS S 10 MG): _____

TOTAL WT.: DATE 11/6/00 INITIALS: PD CALIB. (CLASS S 10 MG): 9.96

NOTES _____

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
1 POOLED	8.06	607	~~0.26~~ 0.3	144	53	
2 REPS	8.04	319	1.10	122	82	
3	7.91	467	0.5	106	57	
4	7.98	674	0.3	141	57	
5	8.02	338	2.7	123	84	
6	7.96	878	0.9	161	63	
7	8.15	364	4.4	152	108	
8	8.01	571	1.2	156	71	
9	7.45	269	0.4	96	46	
10	7.96	680	0.2	136	70	
11	7.87	271	0.5	96	45	
12	8.08	362	3.0	153	103	
13	7.95	607	1.0	132	56	
14	7.83	302	1.0	~~94~~ 140	56	
15	7.88	605	0.9	148	~~64~~ 71	
16	7.91	266	0.6	118	44	
17	8.01	498	1.4	160	73	
18	7.91	870	0.7	178	55	
19	7.98	489	1.3	138	69	
20	7.90	283	0.8	126	56	
21	7.76	239	0.4	130	46	
22	8.02	849	0.9	178	63	

Test Day 0 Date 10/27/00 Initials GB

TEST ID VIMS 0003 NA

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
1 POOLED	8.01	829	<0.1	162	75	
2 REPS	8.21	391	<0.1	162	116	
3	7.98	751	<0.1	138	49	
4	8.09	949	<0.1	180	71	
5	7.85	326	<0.1	144	69	
6	8.08	1740	<0.1	194	79	
7	8.18	451	<0.1	196	128	
8	8.09	869	<0.1	178	89	
9	7.26	247	<0.1	68	24	
10	8.04	1231	<0.1	180	68	
11	7.57	280	<0.1	84	36	
12	8.16	417	<0.1	222	143	
13	8.06	992	<0.1	204	55	
14	8.18	364	<0.1	164	109	
15	8.03	1076	<0.1	182	58	
16	7.55	263	<0.1	110	24	
17	7.91	660	<0.1	146	66	
18	7.72	1574	<0.1	210	43	
19	7.94	650	<0.1	134	67	
20	7.92	283	<0.1	84	41	
21	7.66	288	<0.1	116	31	
22	7.73	1673	<0.1	212	75	
~~23~~ 10						
~~24~~ 10						

Test Day 10 Date 1/16/00 Initials CS

TEST ID VIMS0003 HA

COASTAL BIOANALYSTS BASELINE TEST INFO - 10-DAY FW SEDIMENT TESTS

TEST ORGANISMS

Species: P. promelas Source: CC

Age/Life stage <48h embryo (Eggs collected 10/25/00 >1500) Feeding: Artemia nauplii @ hatch per SOP

Acclimation Water: Type: SFW Hardness: 95 Acclimation Temperature: 25°C Acclimation Photoperiod 16:8 L:D

Notes:

TEST DESIGN

Chamber Size: 300 ml ____ 1000 ml ✓ 37000 ml ____ Other ____ Sediment Volume (ml) 200 Water Volume (ml) 800

Initial No. Organisms per Replicate: 10 No. Replicates: 3 Photoperiod: 16 L: 8 D Randomization Template No. MA

TEST SET UP

Date/Time Sediment & Water Added: 10/26/00 1330-1600 Date/Time Animals Added: 10/27/00 1230-~~1835~~ 1335 PD

Set-up By (Initials): PD/GB/MU Notes:

INSTRUMENTATION

Stem Thermometer No. C1

✓ YSI DO Meter # 1 (SNE8014475

____ YSI DO Meter # 2 (SN91A026329)

____ SP PortapH2 Meter (852360)

____ Corning 240 pH Meter (SN5268)

✓ CP Digisense pH Meter (D9500563)

✓ Sartorius R160P Balance (40020093)

____ YSI SCT 33 Meter (H8016792)

____ Spartan ATC Refractometer (A366)

NOTES:

As Quality Assurance Officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments:

P. Bloco
Signature

12/19/00
Date

File: STF006A

CBI TEST ID: VIMS 0003 PPS

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0003 PPS

BEFORE RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	1		24.4	24.5	24.3	24.8	24.6	24.6	24.0	24.8	24.2	24.8
	2		24.6	24.4	24.0	24.1	24.0	24.5	24.2	24.4	24.4	24.4
	3		24.3	24.9	24.3	24.8	24.4	24.0	24.3	24.4	24.6	24.5
	4		24.4	24.0	24.0	24.7	24.5	24.5	24.5	25.0	24.6	24.4
	5		24.5	24.4	24.1	24.5	24.4	24.5	24.3	24.9	24.4	24.4
	6		24.6	24.5	24.1	24.6	24.7	24.0	24.5	24.7	24.3	24.5
	7		24.3	24.5	24.0	24.3	24.0	24.6	24.7	24.7	24.1	24.7
	8		24.3	24.8	24.3	24.7	24.4	24.4	24.3	24.8	24.4	24.0
DISSOLVED OXYGEN (mg/l)	1		8.2	8.1	8.0	7.7	7.7	7.6	7.4	7.6	7.9	7.6
	2		8.2	8.1	7.9	7.5	7.7	7.9	7.3	7.6	7.2	7.7
	3		8.1	8.2	7.9	7.6	7.5	7.9	7.6	7.5	7.8	7.9
	4		8.2	8.1	7.9	7.7	6.8	7.9	7.6	7.5	8.0	7.5
	5		8.2	8.1	8.0	7.5	7.6	7.6	7.4	7.8	7.9	6.9
	6		8.1	8.1	7.8	7.4	7.1	7.7	7.1	7.7	8.1	7.7
	7		8.2	8.2	7.9	7.9	7.5	8.0	7.6	8.0	7.8	7.7
	8		8.2	8.1	8.0	7.4	7.2	7.8	7.3	7.7	7.8	7.6
REPL. NO:		—	R3	1	1	2	3	2	1	3	2	1
INITIALS:		✓	PD	GM	MH	MH	MH	MH	MH	SMD	MH	MH

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: Vims 0003 PP5

BEFORE RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	9		24.6	24.4	24.1	24.2	24.5	24.3	24.3	24.6	24.4	24.2
	10		24.7	25.0	24.5	24.4	24.4	24.7	24.5	24.7	24.5	24.6
	11		24.6	24.7	24.0	24.9	24.0	24.4	24.4	24.3	24.5	24.1
	12		24.6	24.8	24.0	24.4	24.5	24.5	24.3	24.7	24.4	24.3
	13		24.3	24.5	24.3	24.4	24.9	24.5	24.3	24.7	24.1	24.2
	14		24.5	24.9	24.0	24.1	24.5	24.7	24.4	24.8	24.0	24.3
	15		24.7	24.5	24.1	24.7	24.7	24.5	24.0	24.8	24.3	24.3
	16		24.3	24.5	24.0	24.7	24.2	24.4	24.6	24.6	24.4	24.2
DISSOXYGEN (mg/l)	9		8.2	8.1	8.0	7.5	7.6	7.9	7.3	7.8	8.0	7.8
	10		8.1	8.2	8.1	7.8	7.7	8.0	7.8	8.0	8.0	7.8
	11		8.1	8.1	8.0	7.6	7.8	7.8	7.5	7.9	7.9	7.7
	12		8.2	8.2	8.0	7.5	7.5	7.9	7.5	7.9	7.8	7.8
	13		8.2	8.2	7.4	7.6	6.6	7.8	7.5	6.4	7.8	7.7
	14		8.2	8.2	8.0	7.2	7.8	7.9	7.8	7.7	7.8	7.8
	15		8.1	8.2	7.8	7.5	7.8	7.8	7.3	7.9	7.9	7.8
	16		8.2	8.1	8.0	7.4	7.8	7.6	7.9	7.7	7.8	7.7
REPL. NO:			3	1	1	2	3	2	1	3	2	1
INITIALS:			PD	GM	MH	MH	MH	MH	MH	SMD	MH	MH

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0003 PPS

BEFORE RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	17		24.4	24.7	24.3	24.9	24.4	24.4	24.6	24.5	24.0	24.5
	18		24.3	24.5	24.0	24.7	24.1	24.4	24.0	24.4	24.3	24.6
	19		24.3	24.8	24.1	24.8	24.1	24.8	24.5	24.5	24.5	24.3
	20		24.6	24.8	24.3	24.4	24.5	24.1	24.3	24.8	24.1	24.0
	21		24.4	24.1	24.1	24.7	24.0	24.6	24.4	24.8	24.0	24.4
	22		24.2	24.9	24.6	24.7	24.4	24.5	24.1	24.6	24.6	24.2
DISSOLVED OXYGEN (mg/l)	17		8.1	8.2	7.9	7.6	7.5	7.8	7.3	7.9	8.0	7.6
	18		8.2	8.2	8.0	7.7	7.8	8.0	7.4	8.0	8.0	7.6
	19		8.2	8.1	8.0	7.6	7.6	7.9	7.3	7.9	8.0	7.6
	20		8.2	8.1	7.9	7.5	6.3	7.9	7.3	7.5	8.0	7.8
	21		8.2	8.1	7.8	7.6	7.7	7.9	7.3	7.8	7.9	7.7
	22		8.2	8.2	8.1	7.7	6.3	7.9	7.5	7.6	7.9	7.9
REPL. NO:		—	3	1	1	2	3	2	1	3	2	1
INITIALS:		✓	PD	GM	MH	MH	MH	MH	MH	SMD	MH	MH

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS 0003 PPS

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	1		7.78	7.93	7.64	7.80	7.98	7.66	7.65	7.81	7.64	7.74
	2		8.06	7.90	7.81	7.82	7.89	7.70	7.72	7.70	7.57	7.70
	3		7.79	7.79	7.71	7.78	7.65	7.69	7.71	7.62	7.60	7.69
	4		7.84	7.80	7.74	7.92	7.50	7.79	7.88	7.69	7.78	7.68
	5		8.13	8.06	7.96	7.83	7.88	7.64	7.82	7.76	7.74	7.33
	6		7.90	7.80	7.79	7.80	7.68	7.64	7.62	7.75	7.79	7.70
	7		8.06	7.86	7.92	8.06	7.88	7.96	7.94	7.92	7.86	7.89
	8		7.95	8.01	7.87	7.77	7.80	7.69	7.84	7.70	7.63	7.70
CONDUCTIVITY (uS/cm)	1		916	683	543	431	383	354	383	338	343	325
	2		403	326	310	308	306	297	294	322	312	292
	3		630	521	~~320~~ MH 411	386	392	323	325	329	319	307
	4		1069	738	584	430	398	339	349	357	340	349
	5		430	369	320	313	308	295	299	320	303	291
	6		1403	1036	720	629	439	460	475	408	433	442
	7		487	400	313	331	304	309	318	325	319	348
	8		857	704	497	440	391	356	353	335	344	328
REPL. NO:			3	1	1	2	3	2	1	3	2	1
INITIALS:			PD	[illegible]	MH	MH	MH	MH	MH	SMD	MH	MH

BEFORE RENEWAL

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: Vims 0003 PPS

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	9		7.46	7.71	7.63	7.69	7.65	7.61	7.66	7.40	7.54	7.57
	10		7.79	7.88	7.89	7.87	7.86	7.82	7.83	7.84	7.89	7.73
	11		7.57	7.78	7.68	7.73	7.76	7.71	7.71	7.65	7.69	7.52
	12		8.16	8.23	8.08	8.04	7.91	7.90	8.06	7.98	7.97	7.92
	13		7.69	7.81	7.44	7.82	7.35	7.63	7.83	7.35	7.62	7.67
	14		7.83	7.72	7.84	7.41	8.02	7.72	7.76	7.72	7.75	7.70
	15		7.51	7.69	7.55	7.85	7.86	7.67	7.72	7.74	7.61	7.62
	16		7.61	7.79	7.76	7.56	7.72	7.46	7.72	7.56	7.48	7.58
CONDUCTIVTY (uS/cm)	9		281	266	263	275	283	267	282	286	289	278
	10		972	686	535	276	407	396	355	373	381	334
	11		291	267	264	273	288	271	267	295	272	276
	12		446	376	342	347	326	315	327	332	340	336
	13		922	628	475	456	397	349	339	355	341	317
	14		355	386	307	320	304	309	306	314	337	321
	15		798	652	503	461	405	~~309~~ 356	391	350	351	351
	16		313	271	276	271	270	279	286	303	282	284
REPL. NO:			3	1	1	2	3	2	1	3	2	1
INITIALS:			PP	GM	MH	MH	MH	MH	MH	SMD	MH	MH

Before renewal

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS 0003 PPS

BEFORE RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	17		7.90	7.85	7.76	7.85	7.67	7.71	7.59	7.69	7.68	7.68
	18		7.82	7.81	7.83	7.87	7.91	7.84	7.69	7.78	7.77	7.69
	19		7.97	7.63	7.82	7.84	7.65	7.71	7.69	7.73	7.57	7.58
	20		7.50	7.77	7.68	7.70	7.08	7.60	7.60	7.64	7.60	7.47
	21		7.58	7.77	7.57	7.66	7.67	7.56	7.44	7.62	7.53	7.54
	22		7.96	7.84	8.02	7.88	7.44	7.77	7.91	7.73	7.84	7.72
CONDUCTIVITY (uS/cm)	17		626	535	442	375	336	321	310	306	311	297
	18		1462	1137	852	549	399	394	404	379	350	385
	19		709	517	420	394	351	327	321	334	314	316
	20		307	275	~~24~~ 273 MH	286	287	280	295	298	289	293
	21		315	298	287	277	284	275	280	297	292	286
	22		1398	781	~~27~~ 676 MH	561	283	404	363	383	378	344
REPL. NO:		—	3	1	1	2	3	2	1	3	2	1
INITIALS:		—	PP	LA	MH	MH	MH	MH	MH	SMP	MH	MH

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: VIMS 0003 PP5

AFTER RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	1	24.7	24.6	24.6	24.1	24.2	24.4	24.0	24.1	25.2	24.0	
	2	24.6	24.7	24.7	24.2	24.3	24.1	24.0	24.1	24.6	24.2	
	3	24.5	24.7	24.7	24.0	24.4	24.4	24.0	24.0	25.1	24.1	
	4	24.8	24.5	24.5	24.0	24.3	24.5	24.0	24.0	25.2	24.0	
	5	24.7	24.6	24.6	24.0	24.1	24.4	24.1	24.1	25.2	24.1	
	6	24.2	24.8	24.6	24.1	24.0	24.1	24.1	24.0	24.8	24.0	
	7	24.5	24.6	24.7	24.0	24.3	24.3	24.1	24.1	25.0	24.0	
	8	24.7	24.6	24.6	24.2	24.4	24.6	24.0	24.0	24.9	24.2	
DISS OXYGEN (mg/l)	1	8.2	7.9	8.1	8.1	8.1	7.8	7.6	7.6	7.5	7.7	
	2	8.2	7.9	8.0	8.0	7.8	7.7	7.2	7.2	6.8	7.2	
	3	8.1	7.8	8.1	7.9	7.7	7.8	7.0	7.4	7.6	7.4	
	4	8.2	7.8	8.0	7.9	8.0	7.8	7.6	7.6	7.7	8.0	
	5	8.2	7.8	8.0	7.9	7.4	7.7	7.4	7.5	7.3	7.2	
	6	8.2	7.9	8.0	7.9	7.6	7.7	7.2	7.1	7.4	7.6	
	7	8.1	7.8	8.1	7.8	7.9	7.9	7.7	7.3	7.5	7.5	
	8	8.2	7.8	7.9	7.8	8.1	7.8	7.2	7.5	7.4	7.8	
REPL. NO:		1	3	2	3	1	2	1	3	2	1	
INITIALS:		MH	PP	LB	MH	MH	MH	MH	MH	SMP	MH	

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: Vims0003 PPS

AFTER RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	9	24.7	24.6	24.5	24.1	24.0	24.4	24.0	24.0	24.9	24.0	
	10	24.5	24.7	24.5	24.0	24.2	24.4	24.1	24.1	25.2	24.0	
	11	24.6	24.7	24.6	24.1	24.1	24.5	24.0	24.2	25.1	24.4	
	12	24.6	24.8	24.6	24.0	24.2	24.4	24.0	24.0	25.0	24.2	
	13	24.8	24.7	24.7	24.1	24.3	24.2	24.0	24.0	24.9	24.4	
	14	24.6	24.7	24.6	24.1	24.3	24.8	24.1	24.6	25.1	24.2	
	15	24.7	24.7	24.7	24.0	24.1	24.2	24.0	24.0	25.0	24.0	
	16	24.5	24.6	24.8	24.0	24.2	24.3	24.1	24.1	24.8	24.0	
DISSOLVED OXYGEN (mg/l)	9	8.2	8.0	8.0	8.1	8.2	7.8	7.2	7.6	7.6	7.4	
	10	8.2	8.0	8.1	8.0	8.0	8.1	7.6	7.8	7.8	7.8	
	11	8.2	7.8	8.0	8.1	8.2	7.8	7.0	7.6	7.7	7.6	
	12	8.2	7.9	8.0	7.8	8.1	7.9	7.2	7.3	7.2	7.2	
	13	8.2	7.8	8.0	8.0	8.1	7.7	7.0	7.0	7.2	7.5	
	14	8.2	7.8	7.9	8.0	7.9	8.0	7.6	7.6	7.4	7.2	
	15	8.2	8.0	8.0	8.1	7.7	7.8	7.2	7.4	7.3	7.2	
	16	8.2	7.9	8.1	8.1	8.0	7.8	7.5	7.7	7.2	7.6	
REPL. NO:		1	3	2	3	1	2	1		2	0	
INITIALS:		MH	PD	LP	MH	MH	MH	MH		SMD	MH	

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007A CBI TEST ID: UIMS 0003 PPS

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
TEMPERATURE (C)	17	24.2	24.7	24.8	24.2	24.2	24.4	24.2	24.1	25.2	24.4	
	18	24.4	24.8	24.9	24.1	24.2	24.4	24.0	24.0	24.8	24.4	
	19	24.4	24.7	24.9	24.0	24.4	24.3	24.1	24.0	24.8	24.2	
	20	24.5	24.7	24.2	24.0	24.0	24.5	24.0	24.0	25.2	24.0	
	21	24.1	24.7	24.6	25.1	24.7	24.4	24.4	24.0	25.1	24.2	
	22	24.7	24.6	24.6	24.0	24.1	24.5	24.0	24.0	25.2	24.0	
DISSOLVED OXYGEN (mg/l)	17	8.2	8.0	8.0	7.8	7.5	7.8	7.5	7.0	7.4	7.6	
	18	8.2	7.9	8.0	8.1	8.0	7.9	7.5	7.8	7.5	8.0	
	19	8.2	7.8	8.1	8.0	7.9	7.8	7.4	7.9	7.0	7.8	
	20	8.2	7.9	7.9	7.8	8.0	7.8	7.5	7.7	7.5	7.8	
	21	8.2	7.8	8.0	8.1	7.7	7.8	7.5	7.8	7.8	7.6	
	22	8.2	7.9	8.0	8.1	8.2	7.9	7.4	7.4	7.7	7.8	
REPL. NO:		1	3	2	3	1	2	1		2	1	
INITIALS:		MH	PP	LM	MH	MH	MH	MH		SMP	MH	

After renewal

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: VIMS0003 PPS

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	1	7.86	7.61	7.68	7.70	7.77	7.55	7.57	7.61	7.59	7.55	
	2	7.78	7.76	7.70	7.67	7.64	7.57	7.49	7.49	7.40	7.57	
	3	7.68	7.68	7.54	7.53	7.54	7.60	7.36	7.46	7.49	7.48	
	4	7.85	7.71	7.62	7.65	7.72	7.64	7.59	7.59	7.69	7.55	
	5	7.91	7.73	7.71	7.57	7.45	7.52	7.55	7.53	7.51	7.32	
	6	7.88	7.68	7.62	7.60	7.54	7.55	7.56	7.49	7.57	7.56	
	7	7.91	7.71	7.69	7.57	7.67	7.83	7.38	7.47	7.68	7.62	
	8	7.96	7.67	7.73	7.63	7.71	7.57	7.44	7.57	7.61	7.51	
CONDUCTIVITY (uS/cm)	1	749	544	456	374	340	329	331	306	353	313	
	2	306	329	293	285	293	284	286	301	321	294	
	3	510	448	404	~~389~~ 335	369	311	305	298	328	307	
	4	742	617	565	484	360	326	331	332	337	319	
	5	342	394	317	302	292	288	295	302	311	307	
	6	1126	828	601	389	416	~~301~~ 401	415	381	423	418	
	7	403	363	318	301	300	301	305	292	323	338	
	8	633	544	681	356	363	324	332	283	365	346	
REPL. NO:		1	3	2	3	1	2	1		2	1	
INITIALS:		MH	PO	CA	MH	MH	MH	MH		SMD	MH	

After Lavaun

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: Ulms 0003 PPS

AFTER RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
pH (S.U.)	9	7.55	7.54	7.60	7.52	7.61	7.47	7.35	7.37	7.51	7.46	
	10	7.83	7.66	7.69	7.61	7.74	7.72	7.55	7.58	7.67	7.55	
	11	7.59	7.50	7.71	7.60	7.60	7.58	7.40	7.46	7.35	7.38	
	12	8.09	7.79	7.86	7.68	7.76	7.72	7.55	7.65	7.72	7.62	
	13	7.79	7.55	7.68	7.53	7.50	7.61	7.42	7.45	7.47	7.40	
	14	7.68	7.51	7.48	7.49	7.60	7.64	7.23	7.45	7.54	7.27	
	15	7.71	7.52	7.56	7.64	7.65	7.56	7.32	7.47	7.41	7.49	
	16	~~255~~ 7.64	7.47	7.70	7.50	7.62	7.43	7.37	7.42	7.43	7.41	
CONDUCTIVITY (uS/cm)	9	247	279	264	266	264	270	270	269	293	276	
	10	766	568	462	372	336	347	316	373	378	360	
	11	250	284	267	260	278	270	274	276	294	264	
	12	283	359	312	302	312	299	304	301	339	341	
	13	621	862	435	385	339	334	321	304	342	319	
	14	245	324	292	277	286	298	284	305	324	319	
	15	619	493	438	352	348	340	356	309	345	343	
	16	255	294	268	273	271	273	265	280	298	279	
REPL. NO:		1	3	2	3	1	2	1		2	1	
INITIALS:		MH	PO	GM	MH	MH	MH	MH		SMD	MH	

NOTES

DAILY WATER QUALITY FW SEDIMENT TEST File:STF007B CBI TEST ID: ULMS 0003 PPS

AFTER RENEWAL

Parameter	Treatment	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	DAY 8	DAY 9	DAY 10
PH (S.U.)	17	7.86	7.61	7.59	7.55	7.55	7.61	7.51	7.43	7.49	7.45	
	18	7.74	7.63	7.69	7.73	7.63	7.61	7.48	7.56	7.61	7.53	
	19	7.72	7.70	7.68	7.57	7.61	7.58	7.42	7.54	7.34	7.46	
	20	7.74	7.49	7.61	7.38	7.57	7.48	7.35	7.44	7.41	7.40	
	21	7.57	7.50	7.61	7.55	7.51	7.67	7.51	7.46	7.48	7.56	
	22	7.88	7.69	7.88	7.69	7.79	7.63	7.60	7.59	7.60	7.34	
CONDUCTIVITY (uS/cm)	17	509	461	387	376	314	306	286	291	317	307	
	18	1076	846	681	486	442	340	366	333	355	366	
	19	507	499	384	342	335	319	299	301	322	319	
	20	269	299	264	270	278	279	280	276	300	287	
	21	274	282	280	280	275	281	284	270 ~~346~~	295	291	
	22	948	828	551	478	404	368	348	346 ~~270~~	362	342	
REPL. NO:		1	3	2	3	1	2	1		2	1	
INITIALS:		MH	PD	LP	MH	MH	MH	MH		SMD	MH	

NOTES

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: V1m50003 PPS

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
1	1	10E	9e1f	10f	10f	10f	10f	10f	9f	9f	9f
2		10E	10e	4e 6f	1e 9f	1e 9f	1e 9f	9f	8f	8f	8f
3		10E	10e	6e 4f	3e 7f	2e 7f 1df	2e 7f	7f	7f	7f	7f
4		10E	10e	5e 5f	10f	10f	10f	9f 1df	9f	9f	9f
5		10E	10e	4e 6f	2e 8f	2e 8f	2e 8f	8f	7f 1df	7f	7f
6		10E	9e 1df	6e 4f	10f	10f	10f	10f	10f	10f	10f
7		10E	9e 1df	7e 2f	4e 3f 2df	4e 3f	4e 3f	3f	3f	3f	3f
8		10E	10e	5e 5f	1e 9f	10f	9f 1df	9f	9f	9f	9f
9		10E	10e	2e 9f	10f	10f	10f	10f	10f	10f	10f
10		10E	8e 2f	1e 9f	1e 9f	1e 9f	1e 9f	9f	9f	9f	8f
11		10E	10e	10f	10f	10f	10f	10f	10f	10f	10f
12		10E	10e	1e 9f	10f	10f MH ~~9f 1df~~	10f	10f	9f 1df	9f	9f
13		10e	10e	10f	10f	10f	10f	9f	9f	9f	9f
14		10E	10e	5e 5f	10f	10f	10f	10f	10f	10f	10f
15		10E	10e	7e 3f	3e 7f	2e 8f	2e 8f	8f	8f	8f	8f
16		10E	10e	4e 6f	10f	10f	10f	10f	10f	10f	10f
TIME:		1130	1115	1100	1130	1130	1045	1045	1645	1030	0915
INITIALS:		PD	GM	MH/GB	MH	MH	MH	MH	SMD	MH	MH

NOTES

E = live embryo 6-1 BASKET BAD 10/31/00 REPLACED

F = live fish

df = dead fish

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIMS 0003 PP5

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
17	1	10E	6e2f2dof	3e5f	1e7f	1e 7f	1e7f	7f	7f	7f	7f
18		10E	10e	10f	10f	10f	10f	10f	10f	10f	10f
19		10E	10e	8e2f	3e 7f	2e 8f	2e 8f	8f	8f	8f	8f
20		10E	9e1f	2e8f	10f	10f	10f	10f	9f	9f	9f
21		10E	10e	3e7f	2e ~~8f~~ 8f	2e 8f	1e 9f	9f	8f	8f	7f 1df
22		10E	10e	9e1f	7e3f	7e 3f	7e3f	3f	3f	3f	3f
1	2	10E	10e	9e1f	3e7f	1e 9f	9f	9f	9f	9f	8f
2		10E	10e	6e4f	10f	10f	10f	8f	7f	7f	7f
3		10E	10e	8e2f	10f	10f	10f	10f	10f	10f	10f
4		10E	10e	4e6f	10f	10f	10f	10f	10f	10f	10f
5		10E	9e1df	7e2f	5e4f	5e 4f	5e4f	4f	4f	4f	4f
6		10E	10e	6e2f2df	3e5f	1e 7f	8f	7f	7f	7f	7f
7		10E	10e	5e5f	10f	10f	10f	10f	10f	10f	10f
8		10E	10e	8e1f1df	4e5f	8f1df	8f	8f	8f	8f	8f
9		10E	10e	2e8f	10f	10f	10f	10f	10f	10f	10f
10		10E	10e	6e4f	9e1df	1e 8f	8f	8f	8f	8f	8f
TIME:		1130	1130	1015	1130	1200	1100	1045	1645	1100	0915
INITIALS:		PA	LA	GA/MH	GB/MH	MH	MH	MH	SMD	MH	MH

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIAS 0003 PPS

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
11	2	10E	9e1f	5e5f	10f	9f1df	9f	9f	9f	9f	8f
12		10E	10e	6e4f	10f	10f	10f	10f	9f	9f	9f
13		10E	10e	7e3f	1e9f	1e9f	1e9f	9f	8f	8f	8f
14		10E	10e	9e1f	10f	8f2df	8f	8f	8f	8f	8f
15		10E	10e	3e7f	1e9f	10f	10f	10f	10f	10f	9f
16		10E	9e1df	8e1f	2e7f	2e7f	2e7f	7f	7f	7f	7f
17		10E	10e	7e2f1df	3e6f	1e7f1df	1e7f	8f	7f	7f	7f
18		10E	9e1f	2e8f	2e8f	10f	10f	10f	10f	10f	9f
19		10E	7e3df	5e2f	4e3f	7f	7f	6f1df	6f	6f	6f
20		10E	9e1f	5e5f	10f	10f	10f	10f	10f	10f	10f
21		10E	10e	3e7f	10f	10f	10f	10f	10f	10f	10f
22		10E	10e	6e4f	10f	10f	10f	10f	10f	10f	9f
1	3	10E	10e	4e6f	1e9f	1e9f	1e9f	9f	9f	9f	9f
2		10E	10e	1e9f	10f	10f	10f	10f	10f	10f	10f
3		10E	9e1f	4e6f	1e9f	1e9f	1e9f	10f	9f	9f	9f
4		10E	10e	6e4f	10f	10f	10f	10f	10f	10f	10f
TIME:		1130	1130	1015	1130	1200	1100	1050	1645	1100	0915
INITIALS:		PP	PP	PP	MH/GP	MH	MH	MH	SMD	MH	MH

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: Ulms 0003 pp5

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
5	3	10 E	10 e	7e3f	4e 6f	4e 6f	4e 6f	6f	6f	6f	6f
6		10 E	10 e	4e6f	10f	10f	10f	10f	10f	10f	10f
7		10 E	9e1f	4e5f	1e 9f	1e 9f	1e 9f	8f	8f	8f	8f
8		10 E	10 e	3e7f	10f	10f	10f	10f	10f	10f	10f
9		10 E	10 e	8e2f	4e 6f	10f	10f	10f	9f	9f	9f
10		10 E	10 e	7e3f	4e 6f	4e 6f ~~10f~~	4e 6f	6f	6f	6f	6f
11		10 E	10 e	10f	10f	10f	10f	10f	10f	10f	10f
12		10 E	9e1f	3e7f	1e 9f	1e 9f	1e9f	9f	9f	9f	9f
13		10 E	10 e	6e4f	1e 8f1df	1e 8f	1e 8f	8f	8f	8f	8f
14		10 E	10 e	6e4f	1e 9f	1e 9f	1e 9f	9f	9f, 1df	8f	8f
15		10 E	9e1f	7e3f	3e 5f2df	6f1df	6f	6f	6f	6f	6f
16		10 E	10 e	4e6f	10f	10f	10f	10f	10f	10f	9f
17		10 E	10 e	5e4f1df	2e 7f	2e 7f	2e 7f	7f	7f	7f	7f
18		10 E	10 e	3e7f	10f	10f	10f	10f	10f	10f	10f
19		10 E	10 e	3e 7f	1e 8f1df	1e 8f	9f	9f	9f	9f	9f
20		10 E	10 e	8e2f	2e 7f1df	7f1df	7f	7f	7f	7f	7f
TIME:		1130	1230	1050	1130	1200	1100	1100	1645	1100	0930
INITIALS:		PD	LB	GB	MH	MH	MH	MH	SMD	MH	MH

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

SURVIVAL - 10-DAY SEDIMENT TEST File:STF002C CBI TEST ID: VIAS 0003 PPS

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day10 LIVE
4	3	10E	10e	3e7f	2e8f	2e8f	2e8f	8f	8f	8f	8f
22	4	10E	10e	2e8f	10f	10f	10f	10f	10f	10f	10f
TIME:		1135	1230	1050	1100	1200	1100	1100	1645	1100	0945
INITIALS:		PD	GM	GM	MH	MH	MH	MH	SMD	MH	MH

NOTES

Note: Numbers indicate # observed dead days 1-9 and # live retrieved day 10. Note emmergent amphipods and molts in parantheses (e.g. E2 or M4)

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
1 POOLED	NA	NA	0.3	NA	NA	
2 REPS			1.2			
3			0.7			
4			2.0			
5			4.1			
6			1.2			
7			5.3			
8			1.4			
9			0.5			
10			0.3			
11			0.7			
12			4.2			
13			1.3			
14			1.4			
15			1.0			
16			0.7			
17			1.4			
18			1.0			
19			1.6			
20			1.1			
21			0.6			
22			1.2			

Test Day 0 Date 10/27/00 Initials LM

TEST ID V1 MS 0005 PPS

"TOTAL WATER QUALITY" - FW (DAY 1/DAY 10) (File:STF014A)

Treatment I.D.-Repl. No.	pH	Conductivity (uS/cm)	Tot. NH3 (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	
1 POOLED	NA	NA	0.4	NA	NA	
2 PPS			0.5			
3			0.3			
4			0.2			
5			0.9			
6			0.6			
7			1.6			
8			0.2			
9			0.3			
10			0.2			
11			0.3			
12			0.8			
13			0.5			
14			1.1			
15			0.5			
16			0.4			
17			0.4			
18			0.3			
19			0.3			
20			0.5			
21			0.5			
22			0.4			
~~23~~						

Test Day 10 Date 11/16 Initials GB

TEST ID UIMS 0003 PPS

COASTAL BIOANALYSTS, INC. 96-H ACUTE STATIC REF TEST (Form STF003A 3/1/97)

Treatment mg/L HCl	I.D.	Day 1 # Live	Day 2 # Live	Day 3 # Live	Day 4 # Live	Final % Live
Control	C-1	10	10	10	10	100
	C-2	10	10	10	10	
307	1-1	10	10	10	10	100
	1-2	10	10	10	10	
384	2-1	10	10	10	10	100
	2-2	10	10	10	10	
480	3-1	10	10	4	3	35
	3-2	10	7	4	4	
600	4-1	10	7	1	1	10
	4-2	10	7	3	1	
750	5-1	3	2	0	0	0
	5-2	0	0	0	0	
Observer:		GB	GB	GB	GB	
Time:		1330	1320	1310	1100	

Species: H. azteca Source: CC

Hatch date/time: 2-3 P.F.D. 2-3 mn Arrival date (non-CBI) 10/27/00

Acclimation water type: H:Cl SFW Salinity (g/kg) NA Hardness (mg/l) ~~96~~ 100

Acclimation temperature (range) 23 to 24

Feeding prior to test: maple leaves / rabbit pellets / yes

Feeding during test: 0.5 ml YCT / beaker clay 0 & 2

Chamber size: 300 ml ☒ 500 ml ☐ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☒ 250 ml ☐ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ✓ Other _____ Randomization Template Number: 2-1,2

SET UP: Date 10/30/00 Time Water Added 1215

Time Animals Added 1130 Set Up By GB

INSTRUMENTATION USED:

Stem Thermometer Number: M1

☐ YSI D.O. Meter # 1 (SNE8014475)

☒ CP Digisense pH Meter (D9500563)

☐ SP PortapH2 Meter (852360)

☒ YSI D.O. Meter # 2 (SN91A026329)

☐ Corning 240 pH Meter (SN5268)

☐ Sartorius R160P Balance (40020093

☐ Spartan ATC Refractometer (A366)

☐ YSI SCT 33 Meter (H8016792)

Other Horiba cond meter

TEST I.D.: HAART

COASTAL BIOANALYSTS, INC. 96-H ACUTE STATIC REF TEST (Form STF003A 3/1/97)

		Day 0	Day 1	Day 2	Day 3	Day 4
TEMP	C	23.1	23.5	23.6	23.4	23.4
	1	23.1	23.5	23.6	23.5	22.9
	2	23.1	23.6	23.5	23.5	22.9
	3	23.1	23.5	23.5	23.4	22.8
	4	23.1	23.6	23.6	23.5	22.8
	5	23.1	23.6	23.6	23.6	—
pH	C	7.88	7.76	7.60	7.80	7.73
	1	7.84	7.75	7.62	7.77	7.84
	2	7.85	7.77	7.65	7.79	7.83
	3	7.86	7.78	7.66	7.85	7.84
	4	7.86	7.78	7.66	7.84	7.79
	5	7.86	7.74	7.70	7.82	—
D.O. (mg/l)	C	8.6	8.5	8.6	8.6	8.5
	1	8.6	8.4	8.5	8.5	8.4
	2	8.6	8.5	8.3	8.5	8.4
	3	8.6	8.5	8.3	8.5	8.4
	4	8.6	8.4	8.4	8.4	8.4
	5	8.6	8.3	8.3	8.3	—
	C	301	NA	NA	NA	308
	1	777				791
	2	983				961
	3	1103				1106
	4	1309				1382
	5	1595			1683	—
Replicate # above meas.		2	1	2	2	1
Initials:		GB	GB	GB	GB	GB

NOTES

Quality Assurance:

As Quality Assurance officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments

NA - RT

Signature Date

TEST I.D.: HART

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

HAART

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
307.0000	20	0	0.0000	0.0000
384.0000	20	0	0.0000	0.0000
480.0000	20	13	0.6500	0.6500
600.0000	20	18	0.9000	0.9000
750.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 3.974
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

HAART

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	349.953	285.376	386.359
LC/EC 50.00	478.728	450.344	508.904

COASTAL BIOANALYSTS, INC. NPDES ACUTE REFERENCE/*Pimephales promelas* (Form PPART)

Conc. (mg/l) KCl	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
515	1-1	10	10	100
	1-2	10	10	
735	2-1	10	9	90
	2-2	9	9	
1050	3-1	9	4	35
	3-2	10	3	
1500	4-1	8	1	25
	4-2	5	0	
2143	5-1	0	0	0
	5-2	0	0	
Observer:		1305	1355	
Time:		MH	GB	

		Day 0	Day 1	Day 2
TEMP	C	24.5	24.3	24.1
	1	24.2	24.2	24.2
	2	24.2	24.0	24.2
	3	24.2	24.0	24.2
	4	24.1	24.0	24.2
	5	24.1	24.0	—
pH	C	7.79	7.86	7.87
	1	7.81	7.84	7.70
	2	7.81	7.85	7.79
	3	7.83	7.87	7.79
	4	7.86	7.87	7.78
	5	7.87	7.88	—
D.O. (mg/l)	C	8.2	8.0	8.0
	1	8.2	8.0	7.9
	2	8.2	7.9	7.8
	3	8.2	7.9	7.8
	4	8.2	7.9	7.7
	5	8.2	7.9	—
COND (uS)	C	270	N/A	276
	1	1156	↓	1149
	2	1553		1545
	3	2100		2080
	4	2860		2860
	5	3940	3750	—
Replicate # above meas.		1	2	1
Initials:		MH	MH	GB

Species: Pimephales promelas Source: CC

Hatch date/time: 10/30/00 1000 to 1600 SAME BATCH AS SOD TEST

Acclimation water: SFW Other:

Acclimation Temp. (range): 25 to 26

Feeding prior to test: *Artemia* 2X /d Other:

Feeding during test: Not fed ☒ Other:

Chamber size: 500 ml ☐ 1000 ml ☒ 8000 ml ☐ Other: ml

Test Volume: 250 ml ☐ 500 ml ☒ 4000 ml ☐ Other: ml

Initial no. animals per replicate 10 No. replicates 2

Photoperiod: 16L:8D ☒ Other: Randomization template no.: 6

SET UP: Date 10/31/00 Time Water Added 1330

Time Animals Added 1400 Set Up By MH

INSTRUMENTATION USED:

Stem Thermometer Number: A-1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Horiba Conductivity Meter (511001)

Other

NOTES:

Dilution water hardness: 98 mg/l

Dilution water alkalinity: 58 mg/l

Toxicant stock: KCL Sigma "Ultra"

Prep. of highest conc: 6430 mg/3L SFW

Balance calibration: 100 mg class S wt = 100.1

48-h LC50 mg/l

95% C.L. mg/l

Calculation method

TEST I.D.: PPART

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING LC/EC VALUES
Version 1.5

PPART

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Proportion Responding Adjusted for Controls
515.0000	20	0	0.0000	0.0000
735.0000	20	2	0.1000	0.1000
1050.0000	20	13	0.6500	0.6500
1500.0000	20	19	0.9500	0.9500
2143.0000	20	20	1.0000	1.0000

Chi - Square for Heterogeneity (calculated) = 0.329
Chi - Square for Heterogeneity
(tabular value at 0.05 level) = 7.815

PPART

Estimated LC/EC Values and Confidence Limits

Point	Exposure Conc.	95% Confidence Limits Lower	Upper
LC/EC 1.00	570.223	408.766	673.432
LC/EC 50.00	981.273	887.016	1085.654

(File STF013A) CBI TEST ID VIMS 0003

SEDIMENT-TREATMENT I.D. ASSIGNMENT:

	SEDIMENT I.D.	TREATMENT I.D.
2JMS0 -	42.461	1
	74.292	2
	47.811	3
	42.463	4
	65.813	5
	40.831	6
	74.293	7
	47.331	8
	68.681	9
	42.462	10
	65.811	11
	74.291	12
	47.332	13
	Lab control	14
	47.333	15
	68.682	16
	47.813	17
	40.033	18
	47.812	19

ASSIGNED BY: PB DATE: 10/24/00

(File STF013A) CBI TEST ID VIMS 0003

SEDIMENT-TREATMENT I.D. ASSIGNMENT:

SEDIMENT I.D.	TREATMENT I.D.
65.812	20
68-683	21
40.032	22

ASSIGNED BY: PB DATE: 10/24/00

FORM STF009B SEDIMENT CHARACTERISTICS
(rev. 8/1/00)

TEST I.D. VIMS 0003

(#) = vial # preserved specimens (Buff. formalin + Rose bengal)

Sediment I.D. 2JMSO-	Arrival Temp. (°C)	Sediment Appearance	Indigenous Organisms (note type if present) 1 mm sieve	0.5 mm sieve	0.25 mm sieve	Pore water pH (S.U.)*	Pore water NH_3-N (mg/l)*	Pore water Salinity (g/kg)*
40.03 #1	1.6	Muddy "soupy"	—	—	—	7.43	7.0	6
" #2	1.9	"soupy" mud	—	Amphipods, (few) diff. sp. (1)	—	7.42	8.7	5
" #3	1.7	Soupy mud	—	—	—	7.23	4.9	5
42.46 #1	1.8	shell w/barnacles sandy mud (dead)	amphipod (2)	—	—	7.31	2.1	3
" #2	1.8	gravel sandy mud, shell	—	—	—	7.35	1.9	3
" #3	2.0	gravel sandy mud, & shell	—	(3) Amphipod - diff sp.	—	7.38	2.1	3
47.33 #1	1.8	Soupy mud	—	—	—	7.45	7.9	2
#2	1.6	"	—	—	—	7.41	6.9	2
#3	1.5					7.39	6.2	2
47.81 #1	1.1	"	(4) chironomids	—	—	7.24	3.2	1
#2	1.1	"	(5) "	—	—	7.19	9.6	1
#3	1.0					7.15	1.2	1
Date/Initials:	PD/GB	10/20/00	2 10/24					

Note: See separate work sheet for percent water. TOC and grainsize analyses are subcontracted (collect sub-sample when inspecting for indigenous organisms)

*Pore water pH, ammonia and salinity (estuarine sediments only) are determined on test day -1 or 0. Other parameters should be checked on arrival.

FORM STF009B SEDIMENT CHARACTERISTICS
(rev. 8/1/00)

TEST I.D. VIMS 0003

Sediment I.D. 2-JMSO-	Arrival Temp. (°C)	Sediment Appearance	Indigenous Organisms (note type if present) 1 mm sieve	0.5 mm sieve	0.25 mm sieve	Pore water pH (S.U.)*	Pore water NH_3-N (mg/l)*	Pore water Salinity (g/kg)*
65.81 #1	1.1	thick mud	(5) isopods	(7) chironomids	—	6.46	4.0 ~~3.98~~	1
" #2	1.8	thick/soupy mud	(8) "	(8) "	(8) chironomids	6.86	5.1	2
" #3	1.5	thick/soupy mud	"		—	7.09	24.3	2
68.68 #1	1.6	thick mud	(9) Numerous large isopods	isopods chironomids	—	6.48	4.9	1
" #2	1.4	" "	(10) "	chironomids	—	6.80	0.12	2
" #3	1.3	" "	(11) "	isopods & chironomids	—	6.73	1.9	1
74.29 #1	1.4	muddy	—	—	—	7.23	25.3	1
" #2	1.5	trigs, debris soupy mud	—	—	—	7.20	8.4	2
" #3	1.4	Mud	—	—	—	7.07	32.4	1
~~#1~~								
~~" #2~~								
~~" #3~~								
Date/Initials:	PJ/GB 10/24/00							

Sieved

Note: See separate work sheet for percent water. TOC and grainsize analyses are subcontracted (collect sub-sample when inspecting for indigenous organisms)

*Pore water pH, ammonia and salinity (estuarine sediments only) are determined on test day -1 or 0. Other parameters should be checked on arrival.

FORM STF009B SEDIMENT CHARACTERISTICS
(rev. 8/1/00)

TEST I.D. VIMS 0003

Sediment I.D.	Arrival Temp. (°C)	Sediment Appearance	Indigenous Organisms (note type if present) 1 mm sieve	0.5 mm sieve	0.25 mm sieve	Pore water pH (S.U.)*	Pore water NH_3-N (mg/l)*	Pore water Salinity (g/kg)*
LAB Control	14.1	mud, sticks, leaves	—	—	—	6.97	5.5	0
Date/Initials:	PD/GB	10/29/03						

Note: See separate work sheet for percent water. TOC and grainsize analyses are subcontracted (collect sub-sample when inspecting for indigenous organisms)

*Pore water pH, ammonia and salinity (estuarine sediments only) are determined on test day -1 or 0. Other parameters should be checked on arrival.

SEDIMENT % WATER WORKSHEET (File:STF016A)

PAN#	Sample I.D.	Total Wet Wt (g)	Total Dry Wt (g)	Tare Wt. (g)	Net Wet Wt (g)	Net Dry Wt (g)	% H2O
1	40.03 1	32.9	12.5	1.3	31.6	11.2	65
2	"	43.7	16.6	1.3	42.4	15.3	64
3	40.03 2	44.1	15.8	1.3	42.8	14.5	66
4	"	43.4	15.8	1.3	42.1	14.5	66
5	40.03 3	44.7	16.6	1.3	43.4	15.3	65
6	"	46.0	17.4	1.3	44.7	16.1	64
7	42.46 1	46.1	28.4	1.3	44.8	27.1	40
8	"	40.9	25.4	1.3	39.6	24.1	40
9	42.46 2	46.5	29.1	1.3	45.2	27.8	38
10	"	38.5	24.4	1.3	37.2	23.1	38
11	42.46 3	39.0	21.8	1.3	37.7	20.5	46
12	"	40.9	22.8	1.3	39.6	21.5	46
13	47.33 1	26.7	7.8	1.3	25.4	6.5	74
14	"	30.8	8.9	1.3	29.5	7.6	86
15	47.33 2	35.0	12.0	1.3	33.7	10.7	68
16	"	42.2	14.4	1.3	40.9	13.1	68
17	47.33 3	38.8	13.2	1.3	37.5	11.9	68
18	"	39.0	13.3	1.3	37.7	12.0	68
19	47.81 1	33.7	11.7	1.3	32.4	10.4	68
20	"	36.9	12.7	1.3	35.6	11.4	68
21	47.81 2	37.2	11.5	1.3	35.9	10.2	72
22	"	38.9	11.9	1.3	37.6	10.6	72
23	47.81 3	35.3	10.5	1.3	34.0	9.2	73
24	"	33.3	9.9	1.3	32.0	8.6	73
25	LAB CONTROL	41.9	15.8	1.3	40.6	14.5	64

Tare Wt: Date 10/24/00 Class S Calib Wt 10.00 Initials PA
Wet Wt: Date 10/24/00 Class S Calib Wt 100.7 Initials PA
Dry Wt: Date 10/25/00 Class S Calib Wt 100.0 Initials MH

Incl #2C

CBI TEST ID VLMS 0003

SEDIMENT % WATER WORKSHEET (File:STF016A)

PAN #	Sample I.D.	Total Wet Wt (g)	Total Dry Wt (g)	Tare Wt. (g)	Net Wet Wt (g)	Net Dry Wt (g)	% H2O
26	LAB CONTROL	36.5	13.4	1.3	35.2	12.1	66
27	65.81 1	38.4	21.4	1.3	37.1	20.1	46
28	"	41.7	23.3	1.3	40.4	22.0	46
29	65.81 2	37.8	17.6	1.3	36.5	16.3	55
30	"	43.2	19.9	1.3	41.9	18.6	56
31	65.81 3	30.8	10.8	1.3	29.5	9.5	68
32	"	37.0	12.9	1.3	35.7	11.6	68
33	68.68 1	32.2	13.7	1.3	30.9	12.4	60
34	"	44.8	18.8	1.3	43.5	17.5	60
35	68.68 2	39.0	18.7	1.3	37.7	17.4	54
36	"	41.1	20.1	1.3	39.8	18.8	53
37	68.68 3	43.3	20.6	1.3	42.0	19.3	54
38	"	43.3	20.6	1.3	42.0	19.3	54
39	74.29 1	36.8	~~10.8~~ 11.7	1.3	35.3	10.4	~~249~~ 70
40	"	32.6	10.5	1.3	31.3	9.2	71
41	74.29 2	33.7	14.4	1.3	32.4	13.1	60
42	"	32.7	14.4	1.3	31.4	13.1	58
43	74.29 3	34.1	11.1	1.3	32.8	9.8	70
44	"	40.2	13.0	1.3	38.9	11.7	70

Tare Wt: Date 10/26/00 Class S Calib Wt 10.0 Initials PD
Wet Wt: Date 10/26/00 Class S Calib Wt 100.0 Initials PD
Dry Wt: Date 10/27/00 Class S Calib Wt 100.0 Initials MH

} - PD 1.26 MH 2.27

CBI TEST ID VIMS 0003

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240

CHAIN OF CUSTODY RECORD

ID NO. (PC/ NPDES)	PROJECT/ CASE NAME	DEQ REGION	OWNER ADDRESS
	AMBTOX		Central Office DEQ

SAMPLERS: (Signatures) Frank A. Richards

SITE LOCATION (Lat. & Long. optional)

STA. NO.	DATE	TIME	STATION LOCATION	COMP.	GRAB	NO. OF CONTAINERS	SEALED YES	PRESERVED YES	PICTURES TAKEN	TESTS TO BE RUN IN LAB: TOX tests					Observations, Field Tests, Remarks Made in Field
3-2	10/19	1115	JMS 40.03		✓	3				✓					
3-1	10/19		42.46		✓	3				✓					

Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
Frank A. Richards	1700 10/19/00	M. Roberts		0785 ~~10/20/00~~	
Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
M. Roberts	0745 10/20/00	D. Bruger			
Relinquished by: (Signature)	Date/ Time	Received in Laboratory by: (Signature)	Date/ Time	Seals in place? _____ Preservation OK? _____	Lab Remarks:

Original to Accompany Shipment; copy to Sampler; Copy to Transporter

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2- J M S 0 4 0 . 0 3	0 0 1 0 1 9	1 1 4 5	M	5 5

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
1 9 0 -	S E D T O X	7	6	6 0 6		M A R

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
		D			
	74995	74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS.)	LC/H
81614	84014	00024	00023	84008

LATITUDE: 7 1 1 0 1 3

LONGITUDE: -7 6 4 5 1 5 6

OTHER

COUNTY

COMMENTS

SUBSTATION B

3-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP °C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
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23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS040.03	001019	1245	M	50

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 7 11 01 3

LONGITUDE: -7 6 45 15 6

OTHER

COUNTY

COMMENTS

SUBSTATION C

3-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP °C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS040.03	001019	1115	M	50

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 7110113

LONGITUDE: -7645156

OTHER

COUNTY

COMMENTS

SUBSTATION A

3-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS042.46	001019	1400	M	30

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 7120997

LONGITUDE: -7647312

OTHER

COUNTY

COMMENTS

SUBSTATION A

#75

3-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS042.46	001019	1445	M	30

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

	IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 7120917

LONGITUDE: -76473112

OTHER

COUNTY

COMMENTS

SUBSTATION B

#354

3-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS042.46	001019	1515	M	30

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATITUDE: 7120 97

LONGITUDE: -7 6473 12

OTHER

COUNTY

COMMENTS

SUBSTATION C

3-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS047.33	001023	1240	M	90

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
		D			
	74995	74990		84007	84005

	IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS.)	LC/H
	81614	84014	00024	00023	84008

LATTITUDE: 713026

LONGITUDE: -76515553

OTHER

COUNTY

COMMENTS

SUBSTATION A

4-3

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP °C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS047.33	001023	1310	M	80

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 713026

LONGITUDE: -7651553

OTHER

COUNTY

COMMENTS

SUBSTATION B

4-3

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS047.33	001023	1350	M	90

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATITUDE: 713026

LONGITUDE: -76515553

OTHER

COUNTY

COMMENTS

SUBSTATION C

4-3

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP °C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS047.81	001023	1515	M	3

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

	IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 713331

LONGITUDE: -76522 80

OTHER

COUNTY

COMMENTS

SUBSTATION A

4-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS047.81	001023	1535	M	30

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
	74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS.)	LC/H
81614	84014	00024	00023	84008

LATTITUDE: 713331

LONGITUDE: -76522 80

OTHER

COUNTY

COMMENTS

SUBSTATION B

4-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP °C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS047.81	001013	1550	M	3

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 71331

LONGITUDE: -76522 80

OTHER

COUNTY

COMMENTS

SUBSTATION C

4-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP °C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Coastal Bioanalysts, Inc.

ENVIRONMENTAL SAMPLE INFORMATION/CHAIN OF CUSTODY

SAMPLE MATRIX/TYPE: SEDIMENT ✓ SOIL___ SURFACE WATER___ GROUND WATER___ OTHER_____

PROJECT I.D. VIMS 0003

SAMPLE I.D. LAB CONTROL SED

COLLECTION DATE/TIME: 10/24/00 0835

SAMPLING LOCATION/SITE: UN-NAMED TRIB OF SEVERN RIVER (NON TIDAL/FW.) RT 614 1/4 MILE E. OF US RT 17 WHITEMARSH VA

SAMPLING EQUIPMENT/METHODS: PLASTIC SHOVEL

SAMPLE CONTAINER: GLASS____ HDPE ✓ PTFE____ OTHER (SPECIFY):_____

METHOD OF SHIPMENT: HAND DELIVER TO LAB

IS SAMPLE CONSIDERED HAZARDOUS IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND/OR LOCAL LAWS?* YES____ NO ✓

I certify that the above information is correct: [signature] (SAMPLER SIGNATURE)

PETER F. DELINE (PRINT NAME) CBI (AFFILIATION) 10/24/00 (DATE)

*UNLESS PREVIOUSLY NEGOTIATED, SAMPLES DETERMINED TO BE HAZARDOUS WILL BE RETURNED AND SHIPMENT CHARGED AT COST PLUS 25%; OR COASTAL BIOANALYSTS WILL DISPOSE OF THE SAMPLES AT COST PLUS 25%.

****

Print & Sign Names

1. Relinquished by:_____ Date/time:_____

   Received by:_____ Date/time:_____

2. Relinquished by:_____ Date/time:_____

   Received by:_____ Date/time:_____

3. Relinquished by:_____ Date/time:_____

   Received by:_____ Date/time:_____

4. Relinquished by:_____ Date/time:_____

   Received by:_____ Date/time:_____

FORM QSF602A

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240

CHAIN OF CUSTODY RECORD

ID NO. (PC/NPDES)	PROJECT/ CASE NAME	DEQ REGION	OWNER ADDRESS
	AMBTOX		Central office DEQ

SAMPLERS: (Signatures)	SITE LOCATION (Lat. & Long. optional)
Mark Richards	James Rivers

STA. NO.	DATE	TIM'E	STATION LOCATION	COMP.	GRAB	NO. OF CONTAINERS	SEALED YES	PRESERVED YES	PICTURES TAKEN	TESTS TO BE RUN IN LAB: Kepone					Observations, Field Tests, Remarks Made in Field
2-2	10/25	1500	RM 65.81	✓		1				✓					
2-1	10/25	1330	RM 68.68	✓		1				✓					
1-1	10/25	1030	RM 74.29	✓		1				✓					
Dup 1	10/25	1330	RM 68.68	✓		1				✓					

Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
Mark A. Richards	1645 10/25/00	M. Roberts	PD [signature] M. Roberts	10/26/00 0850	[signature]
Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)

Relinquished by: (Signature)	Date/ Time	Received in Laboratory by: (Signature)	Date/ Time	Seals in place? _____ Preservation OK? _____ Lab Remarks:

Original to Accompany Shipment; copy to Sampler; Copy to Transporter

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS074.29	001025	1005	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 7 1 8 0 0 0

LONGITUDE: -7 7 0 3 7 8 0

OTHER

COUNTY

COMMENTS

SUBSTATION A

1-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS074.29	001025	1020	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 7190000

LONGITUDE: -77032 80

OTHER

COUNTY

COMMENTS

SUBSTATION B

1-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS074.29	001025	1050	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
	74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS.)	LC/H
81614	84014	00024	00023	84008

LATTITUDE: 719000

LONGITUDE: -7 7 0 3 1 8 0

OTHER

COUNTY

COMMENTS

SUBSTATION C

1-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS068.68	001055	1345	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 18 01 4

LONGITUDE: -77 07 23 9

OTHER

COUNTY

COMMENTS

SUBSTATION C

2-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS068.68	001025	1330	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

	IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 18 01 4

LONGITUDE: -77 07 23 9

OTHER

COUNTY

COMMENTS

SUBSTATION B

2-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS068.68	001025	1315	M	110

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 18 01 4

LONGITUDE: -77 07 23 9

OTHER

COUNTY

COMMENTS

SUBSTATION A

2-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP °C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS065.81	001025	1430	M	10

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

	IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 718070

LONGITUDE: -7704550

OTHER

COUNTY

COMMENTS

SUBSTATION A

2-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS065.81	001025	1445	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 7180070

LONGITUDE: -7704550

OTHER

COUNTY

COMMENTS

SUBSTATION B

2-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP °C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS065.81	001025	1510	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	SEDTOX	7	6	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 718070

LONGITUDE: -770955 0

OTHER

COUNTY

COMMENTS

SUBSTATION C

2-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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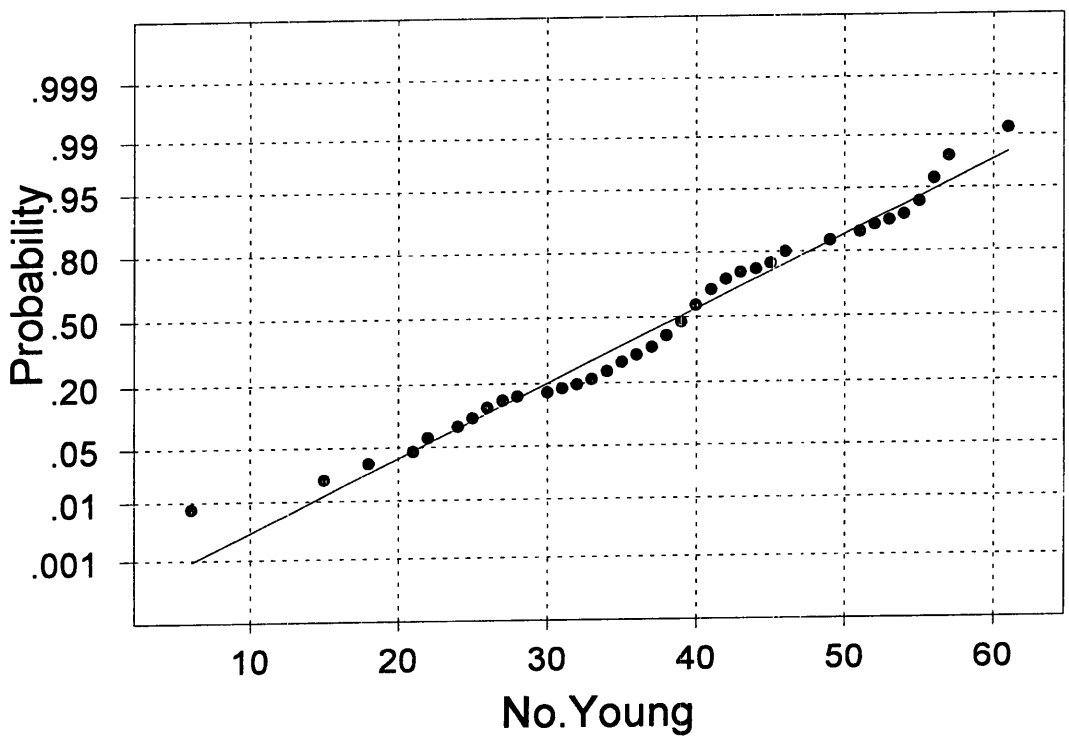
Table E1. Summary Water Quality – Water Column Tests (Freshwater Species)

Species	Treatment	Temp. (° C)		Conductivity (uS/cm)		pH (S.U.)		Diss. O_2 (mg/l)	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
P. promales	Control	24.6	0.3	280	4.9	7.64	0.09	8.0	0.2
	JMS074.29	24.7	0.3	267	11.7	7.71	0.12	7.9	0.2
	JMS072.08	24.7	0.3	256	20.0	7.74	0.14	7.9	0.2
	JMS068.68	24.7	0.3	241	15.9	7.75	0.16	8.0	0.1
	JMS065.81	24.7	0.3	231	11.9	7.68	0.10	7.9	0.2
C. dubia	Control	24.5	0.2	275	3.8	7.87	0.09	8.1	0.1
	JMS074.29	24.5	0.2	263	9.8	7.90	0.13	8.1	0.1
	JMS072.08	24.6	0.2	252	17.3	7.98	0.12	8.1	0.1
	JMS068.68	24.5	0.2	236	12.8	7.92	0.13	8.1	0.1
	JMS065.81	24.6	0.2	226	9.1	7.87	0.10	8.1	0.1
	1.6pptHWM	24.5	0.3	2712	88.6	7.84	0.06	8.1	0.1
	JMS047.81	24.5	0.3	2718	559.7	7.81	0.07	8.1	0.1
	JMS047.33	24.6	0.2	3586	1138.4	7.79	0.06	8.1	0.1

Table E2. Summary Water Quality – Water Column Tests (Estuarine Species)

Species	Treatment	Temp. (° C)		Salinity (g/kg)		pH (S.U.)		Diss. O_2 (mg/l)	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
C. variegatus	20 ppt Control	24.6	0.2	20.0	0.0	7.50	0.13	6.8	0.4
	1.2 ppt Control	24.7	0.3	1.5	0.4	7.60	0.18	7.4	0.5
	4.3 ppt Control	24.7	0.3	4.5	0.5	7.54	0.15	7.3	0.4
	JMS042.46	24.7	0.3	5.0	1.4	7.53	0.16	7.3	0.5
	JMS040.03	24.8	0.2	6.1	1.3	7.56	0.15	7.3	0.5
	JMS047.81	24.8	0.2	2.3	0.5	7.58	0.15	7.3	0.5
	JMS047.33	24.8	0.2	2.7	0.5	7.58	0.14	7.4	0.4
M. bahia	20 ppt Control	25.4	0.2	20.0	0.0	7.50	0.15	6.8	0.4
	1.2 ppt Control	25.5	0.5	1.2	0.0	7.79	0.08	8.1	0.1
	4.3 ppt Control	25.4	0.2	4.7	0.3	7.65	0.10	7.5	0.5
	JMS042.46	25.4	0.2	5.6	1.3	7.61	0.11	7.5	0.5
	JMS040.03	25.5	0.2	6.6	1.3	7.55	0.13	7.4	0.5
	JMS047.81	25.4	0.3	1.5	0.3	7.67	0.06	8.0	0.1
	JMS047.33	25.3	0.3	2.2	0.1	7.68	0.07	8.0	0.1

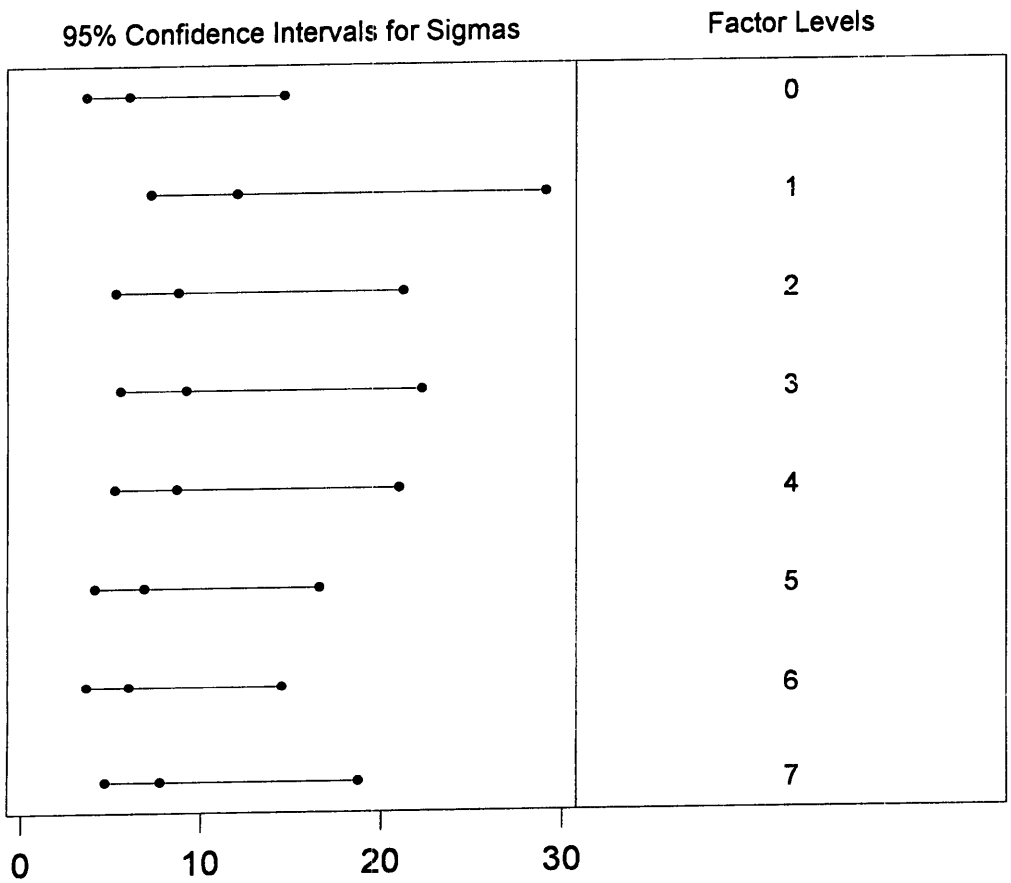
CERIODAPHNIA REPRODUCTION DAY 8



Average: 38.8375
Std Dev: 10.2444
N of data: 80

W-test for Normality
R: 0.9855
p value (approx): 0.0714

CERIODAPHNIA REPRODUCTION DAY 8



Bartlett's Test

Test Statistic: 6.958

p value : 0.433

Levene's Test

Test Statistic: 1.138

p value : 0.350

One-Way Analysis of Variance

```
Analysis of Variance on No.Young
Source      DF        SS        MS        F        p
TrtCode      7    3246.2     463.7     6.62    0.000
Error       72    5044.7      70.1
Total       79    8290.9
```

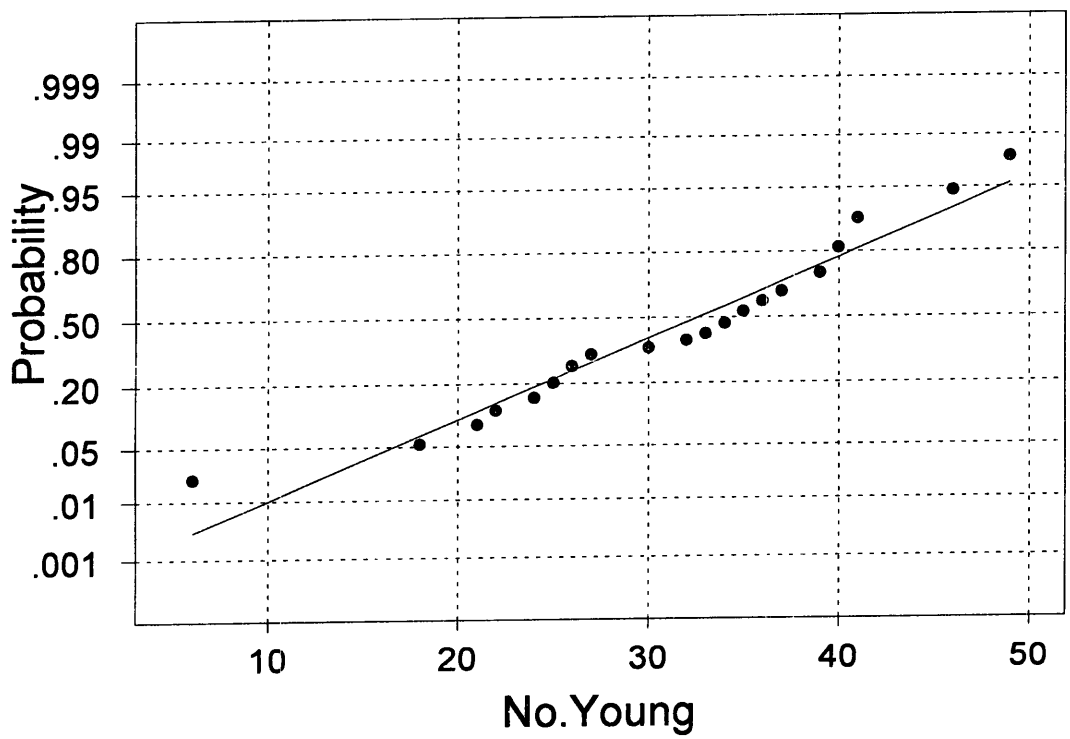
```
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level       N      Mean     StDev  --+---------+---------+---------+----
     0      10    41.900     6.045                     (----*----)
     1      10    42.200    12.035                     (----*----)
     2      10    45.600     8.771                        (-----*----)
     3      10    43.900     9.195                       (----*----)
     4      10    39.400     8.669                   (----*-----)
     5      10    36.000     6.848               (----*----)
     6      10    37.800     5.978                 (----*----)
     7      10    23.900     7.738   (----*----)
                                   --+---------+---------+---------+----
Pooled StDev =     8.371              20        30        40        50
```

```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.00917

Critical value = 2.68

Control = level 0 of TrtCode

 Level     Lower    Center     Upper ---------+---------+---------+---------+--
     1    -9.732     0.300    10.332                     (---------*---------)
     2    -6.332     3.700    13.732                         (---------*---------)
     3    -8.032     2.000    12.032                       (---------*---------)
     4   -12.532    -2.500     7.532                 (---------*----------)
     5   -15.932    -5.900     4.132               (---------*---------)
     6   -14.132    -4.100     5.932                 (---------*---------)
     7   -28.032   -18.000    -7.968   (---------*---------)
                                      ---------+---------+---------+---------+--
                                             -20       -10         0        10
```

NOTE: LEVEL 7=JMS047.33

M

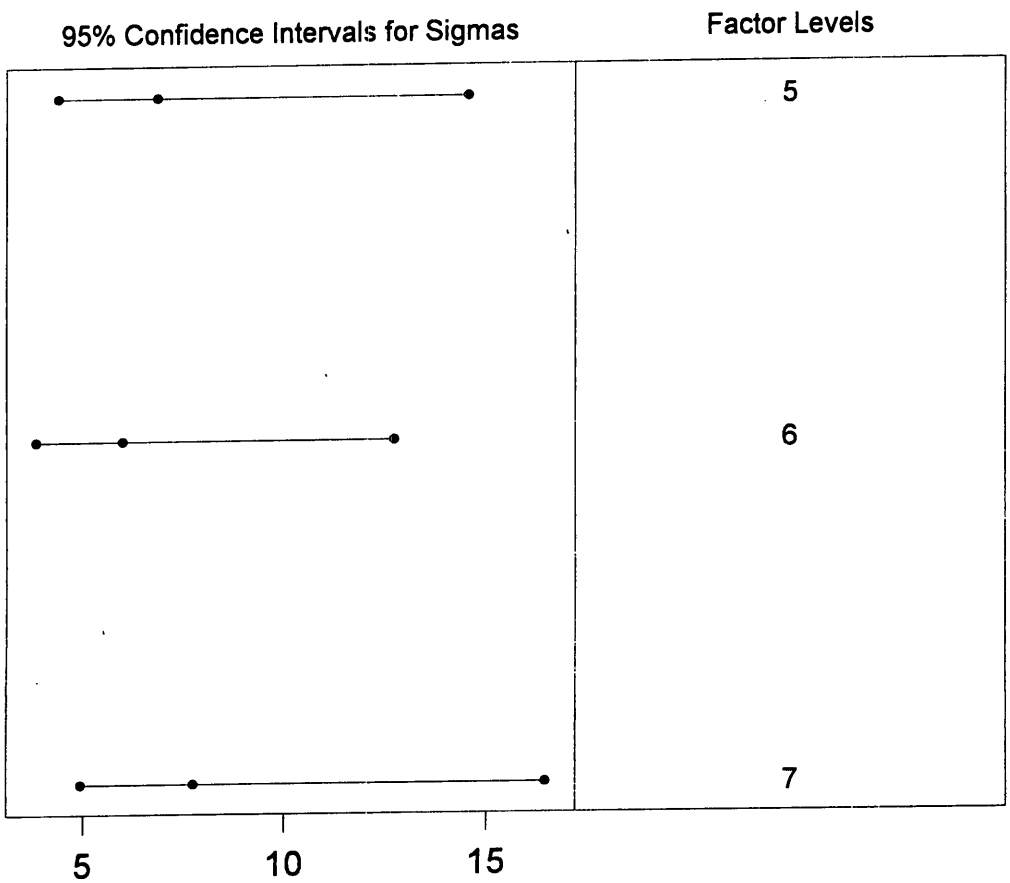
CERIODAPHNIA REPRODUCTION DAY 8 (SALINE ONLY)



Average: 32.5667
Std Dev: 9.14513
N of data: 30

W-test for Normality
R: 0.9726
p value (approx): > 0.1000

CERIODAPHNIA REPRODUCTION DAY 8 (SALINE)



Bartlett's Test

Test Statistic: 0.566

p value : 0.753

Levene's Test

Test Statistic: 0.234

p value : 0.793

```
Worksheet size: 100000 cells


MTB > Retrieve  'A:\VM3CDH2O.MTW'.
Retrieving worksheet from file: A:\VM3CDH2O.MTW
Worksheet was saved on 12/17/2000
MTB > Oneway 'No.Young' 'TrtCode';
SUBC>   Dunnett 5 5.
```

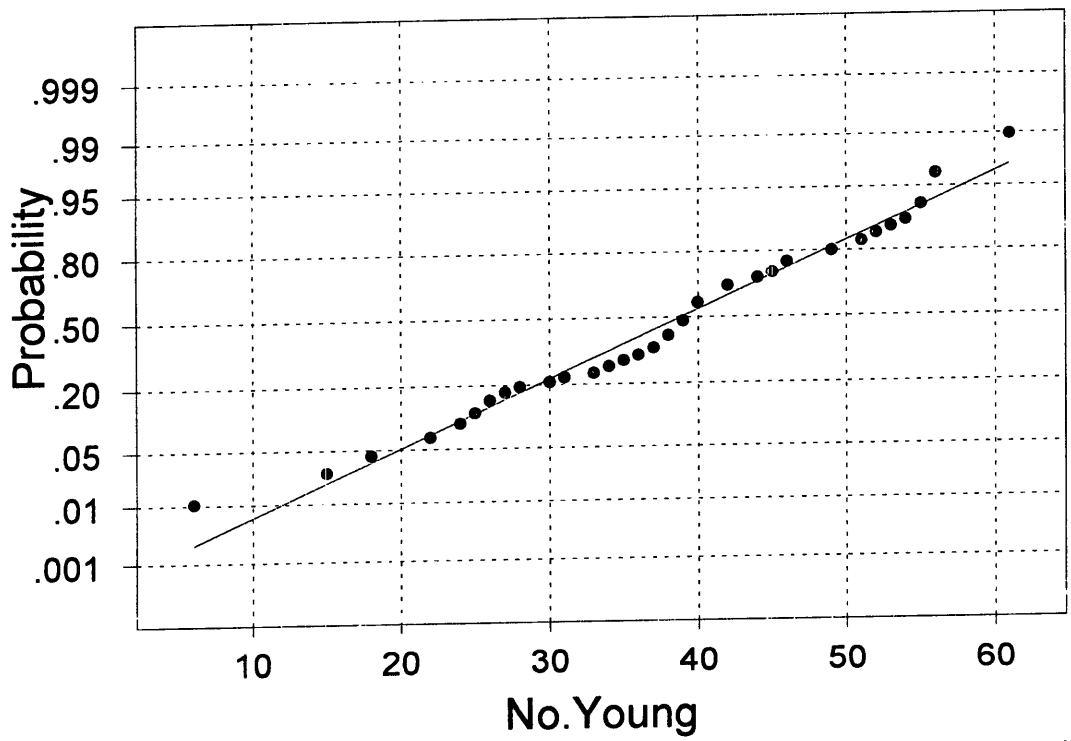
One-Way Analysis of Variance

```
Analysis of Variance on No.Young
Source     DF        SS        MS        F        p
TrtCode     2    1142.9     571.4    12.03    0.000
Error      27    1282.5      47.5
Total      29    2425.4
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  ---+---------+---------+---------+---
     5     10    36.000     6.848                     (-----*------)
     6     10    37.800     5.978                        (-----*-----)
     7     10    23.900     7.738   (-----*------)
                                   ---+---------+---------+---------+---
Pooled StDev =    6.892            21.0      28.0      35.0      42.0

Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.0273

Critical value = 2.33

Control = level 5 of TrtCode

 Level     Lower    Center     Upper --------+---------+---------+---------+---
     6    -5.382     1.800     8.982                     (----------*---------)
     7   -19.282   -12.100    -4.918 (----------*---------)
                                     --------+---------+---------+---------+---
                                         -14.0      -7.0      -0.0       7.0
```

NOTE: LEVEL 5 (CONTROL) = 1.6 PPT ASW; LEVEL 7=JMS047.33

```
MTB >
```

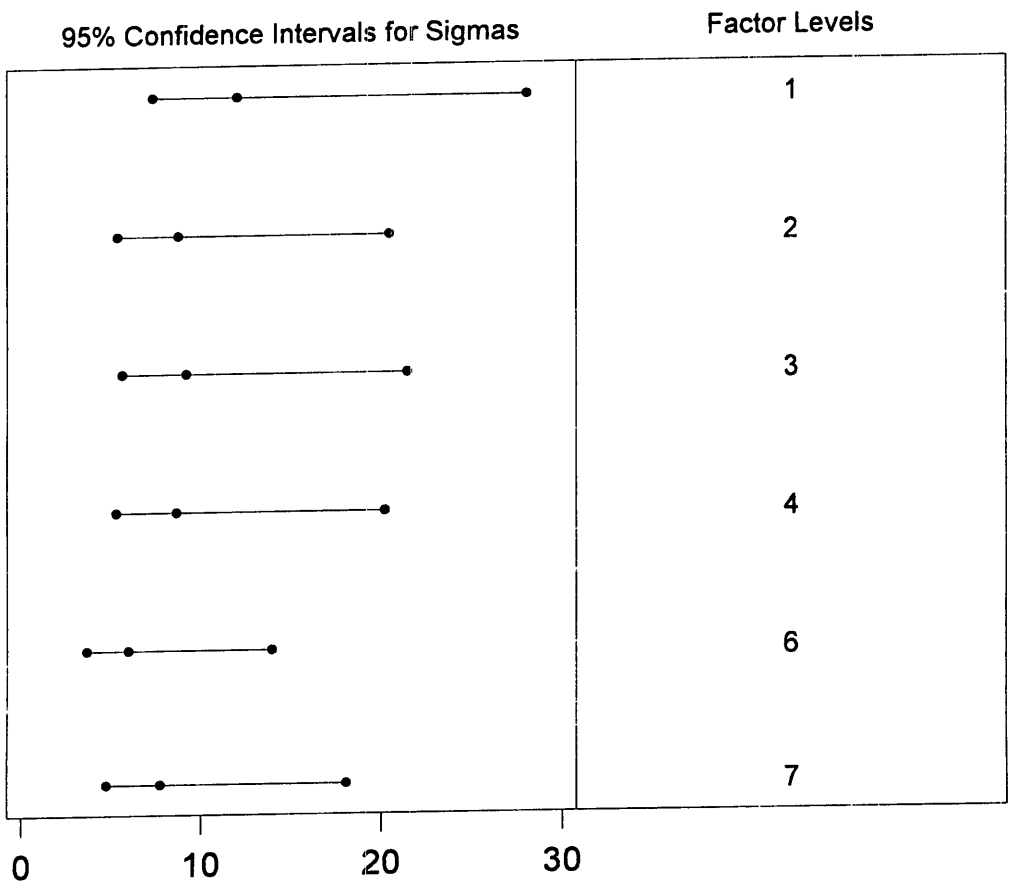
CERIODAPHNIA REPRODUCTION DAY 8 (STATIONS)



Average: 38.8
Std Dev: 11.1732
N of data: 60

W-test for Normality
R: 0.9878
p value (approx): > 0.1000

CERIODAPHNIA REPRODUCTION DAY 8(STATIONS)



Bartlett's Test

Test Statistic: 4.416

p value : 0.491

Levene's Test

Test Statistic: 1.037

p value : 0.406

One-Way Analysis of Variance

Analysis of Variance on No.Young

Source	DF	SS	MS	F	p
TrtCode	5	3071.8	614.4	7.73	0.000
Error	54	4293.8	79.5		
Total	59	7365.6			

Level	N	Mean	StDev
1	10	42.200	12.035
2	10	45.600	8.771
3	10	43.900	9.195
4	10	39.400	8.669
6	10	37.800	5.978
7	10	23.900	7.738

Pooled StDev = 8.917

```
Individual 95% CIs For Mean
Based on Pooled StDev
--+---------+---------+---------+----
                    (----*-----)
                       (-----*----)
                     (-----*-----)
                 (----*-----)
              (-----*----)
(-----*-----)
--+---------+---------+---------+----
 20        30        40        50
```

Tukey's pairwise comparisons

Family error rate = 0.0500
Individual error rate = 0.00462

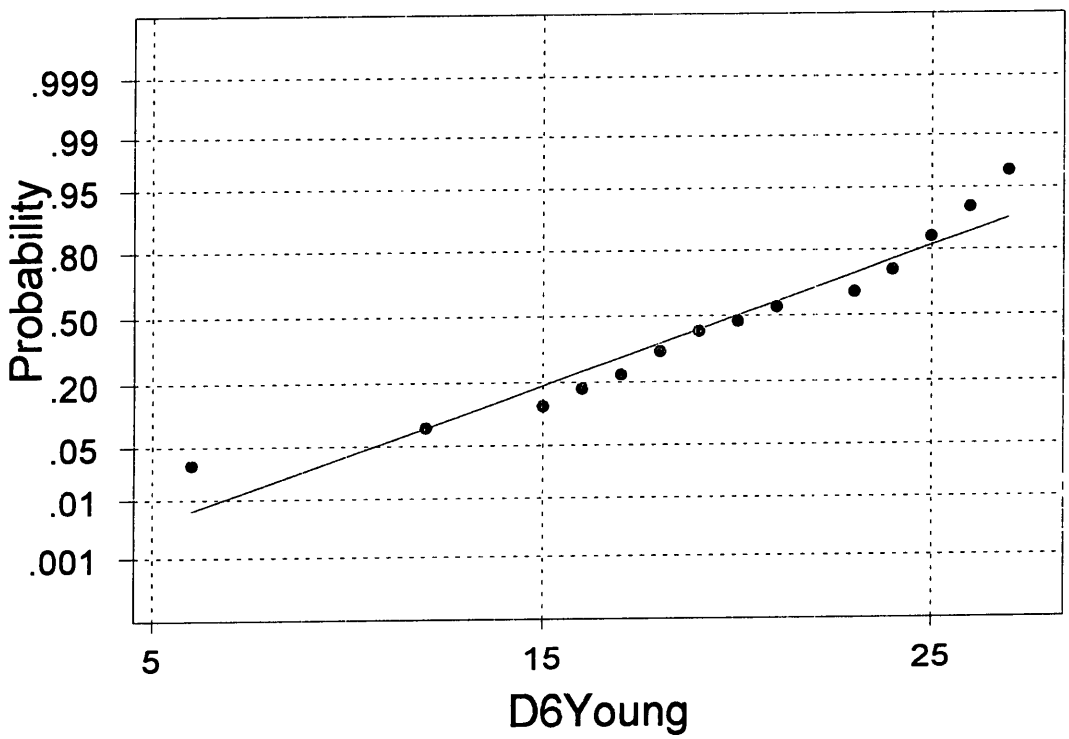
Critical value = 4.18

Intervals for (column level mean) - (row level mean)

	1	2	3	4	6
2	-15.19 8.39				
3	-13.49 10.09	-10.09 13.49			
4	-8.99 14.59	-5.59 17.99	-7.29 16.29		
6	-7.39 16.19	-3.99 19.59	-5.69 17.89	-10.19 13.39	
7	6.51 30.09	9.91 33.49	8.21 31.79	3.71 27.29	2.11 25.69

MTB >

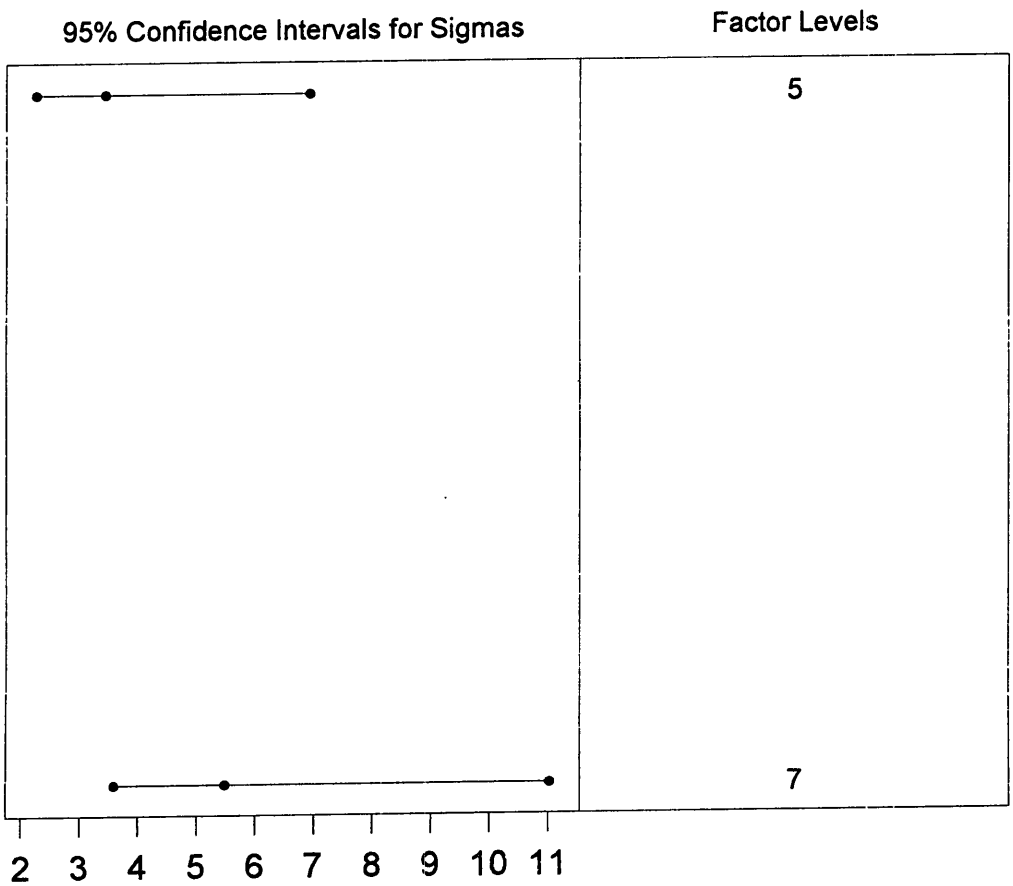
CERIODAPHNIA REPRODUCTION DAY 6



Average: 19.95
Std Dev: 5.21612
N of data: 20

W-test for Normality
R: 0.9653
p value (approx): > 0.1000

CERIODAPHNIA REPRODUCTION DAY 6



Bartlett's Test

Test Statistic: 1.787

p value : 0.181

Levene's Test

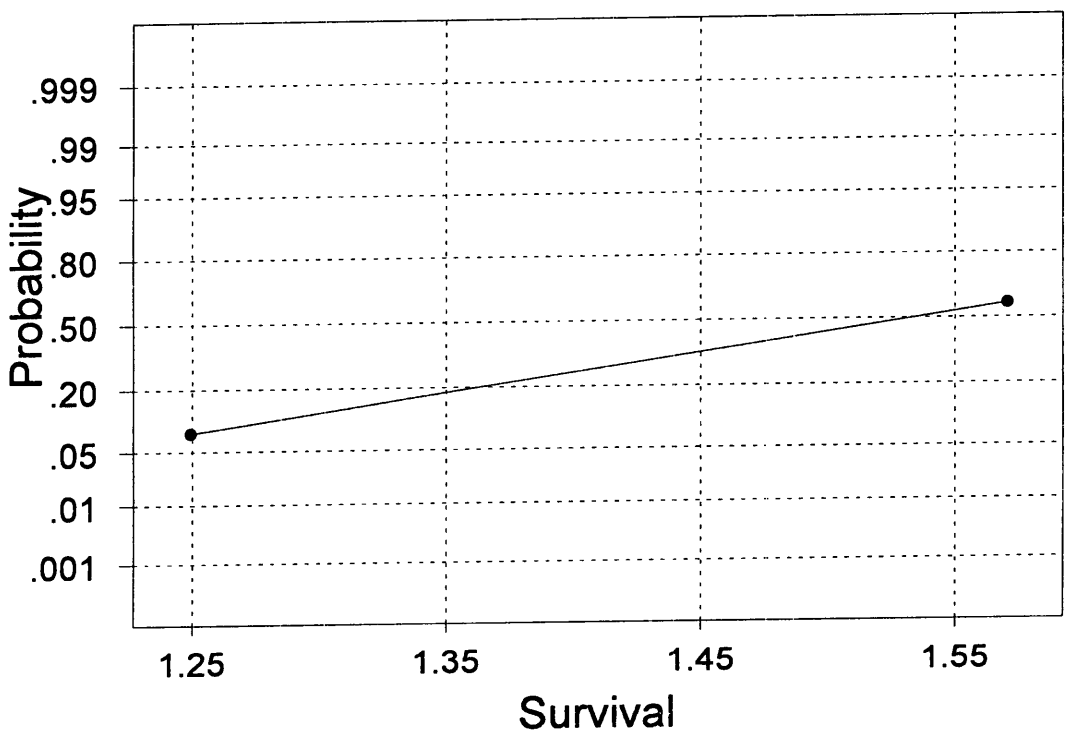
Test Statistic: 0.493

p value : 0.492

Two Sample T-Test and Confidence Interval

```
Twosample T for D6Young
TrtCode    N      Mean     StDev   SE Mean
5         10     22.60      3.44       1.1
7         10     17.30      5.48       1.7

95% C.I. for mu 5 - mu 7: ( 0.9,  9.7)
T-Test mu 5 = mu 7 (vs not =): T= 2.59  P=0.020  DF=  15

MTB >
```

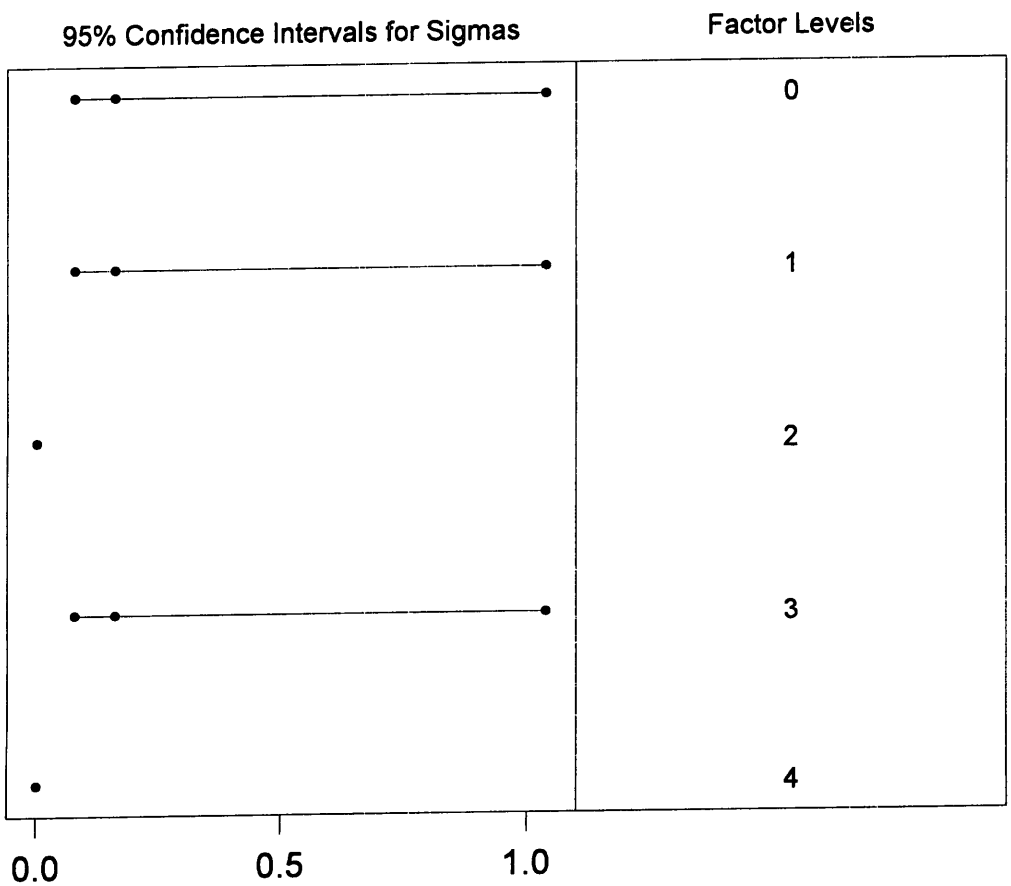
FATHEAD SURVIVAL DAY 8



Average: 1.52253
Std Dev: 0.117873
N of data: 20

W-test for Normality
R: 1.0000
p value (approx): > 0.1000

FATHEAD SURVIVAL DAY 8



Bartlett's Test

Test Statistic: -34.616

p value : 1.000

Levene's Test

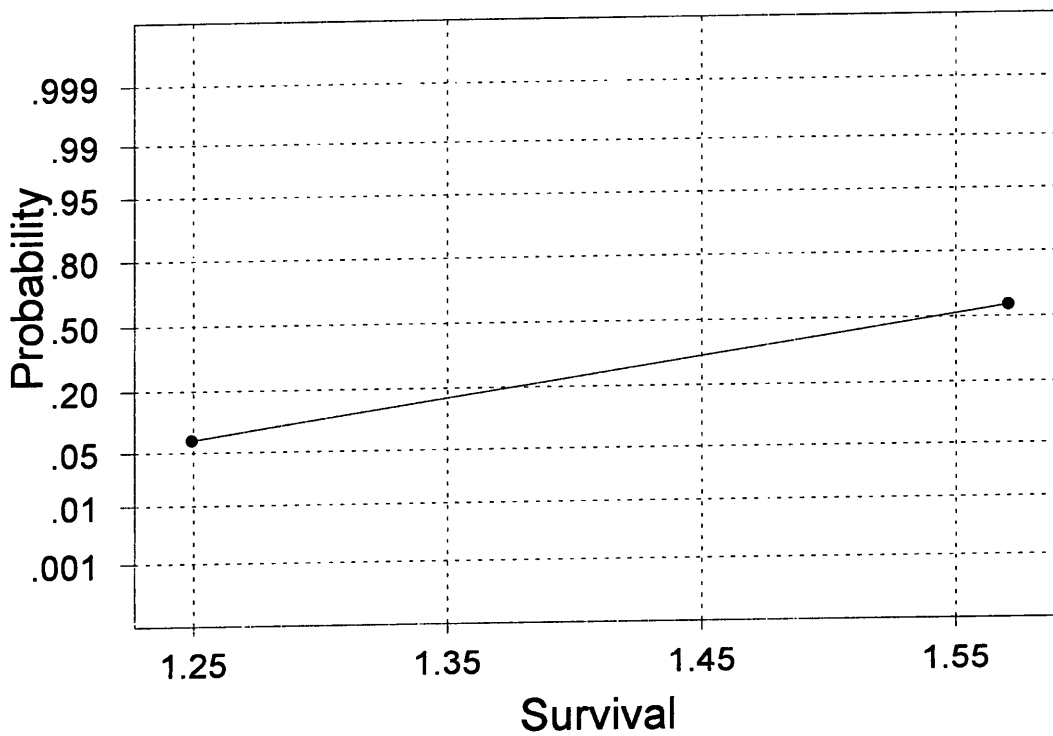
Test Statistic: 0.500

p value : 0.736

One-Way Analysis of Variance

```
Analysis of Variance on Survival
Source     DF        SS        MS        F        p
Trt         4    0.0311    0.0078     0.50    0.736
Error      15    0.2329    0.0155
Total      19    0.2640
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  -----+---------+---------+---------+-
     0      4    1.4904    0.1609   (------------*------------)
     1      4    1.4904    0.1609   (------------*------------)
     2      4    1.5708    0.0000           (------------*------------)
     3      4    1.4904    0.1609   (------------*------------)
     4      4    1.5708    0.0000           (------------*------------)
                                   -----+---------+---------+---------+-
Pooled StDev =    0.1246              1.40      1.50      1.60      1.70

Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.0156

Critical value = 2.73

Control = level 0 of Trt

 Level     Lower    Center     Upper -------+---------+---------+---------+----
     1   -0.2406   -0.0000    0.2406  (---------------*---------------)
     2   -0.1601    0.0804    0.3210       (---------------*---------------)
     3   -0.2406   -0.0000    0.2406  (---------------*---------------)
     4   -0.1601    0.0804    0.3210       (---------------*---------------)
                                      -------+---------+---------+---------+----
                                          -0.15      0.00      0.15      0.30

MTB >
```

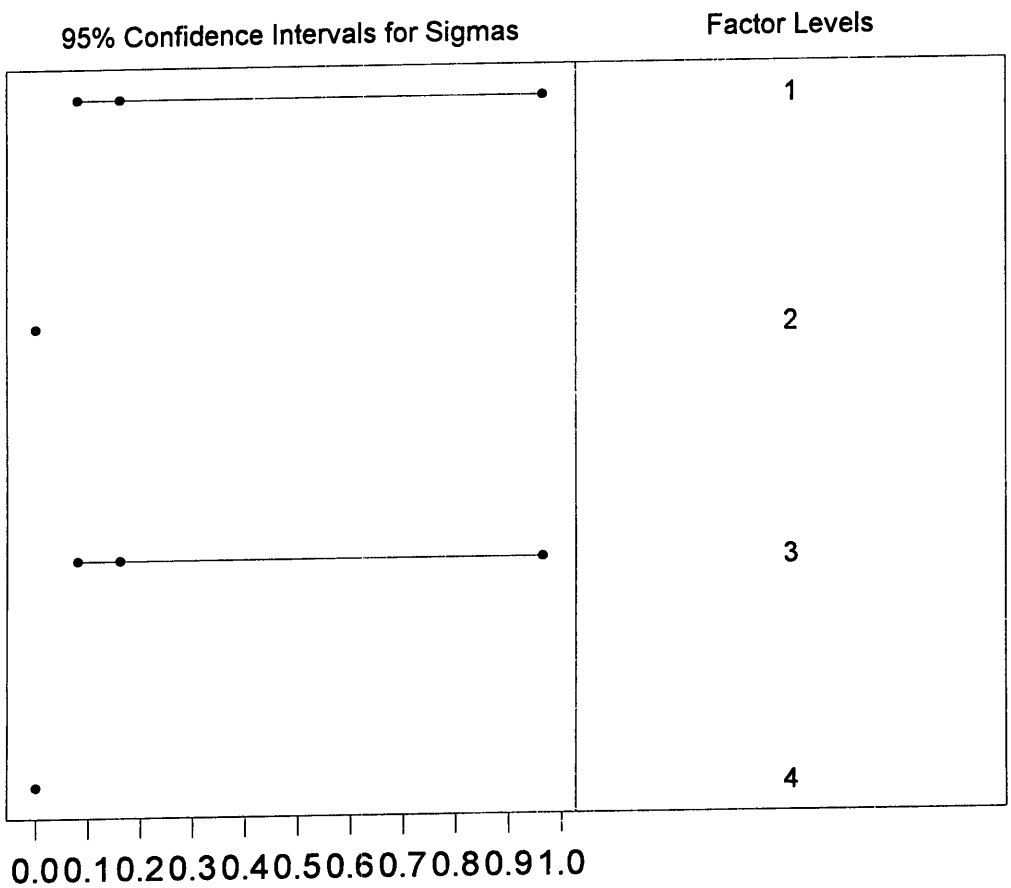
FATHEAD SURVIVAL DAY 8 (STATIONS)



Average: 1.53058
Std Dev: 0.109899
N of data: 16

W-test for Normality
R: 1.0000
p value (approx): > 0.1000

FATHEAD SURVIVAL DAY 8 (STATIONS)



Bartlett's Test

Test Statistic: -34.292

p value : 1.000

Levene's Test

Test Statistic: 0.667

p value : 0.588

One-Way Analysis of Variance

Analysis of Variance on Survival

Source	DF	SS	MS	F	p
Trt	3	0.0259	0.0086	0.67	0.588
Error	12	0.1553	0.0129		
Total	15	0.1812			

Level	N	Mean	StDev
1	4	1.4904	0.1609
2	4	1.5708	0.0000
3	4	1.4904	0.1609
4	4	1.5708	0.0000

Pooled StDev = 0.1138

```
Individual 95% CIs For Mean
Based on Pooled StDev
----+---------+---------+---------+--
 (-----------*-----------)
         (-----------*-----------)
 (-----------*-----------)
         (-----------*-----------)
----+---------+---------+---------+--
  1.40      1.50      1.60      1.70
```

Tukey's pairwise comparisons

Family error rate = 0.0500
Individual error rate = 0.0117

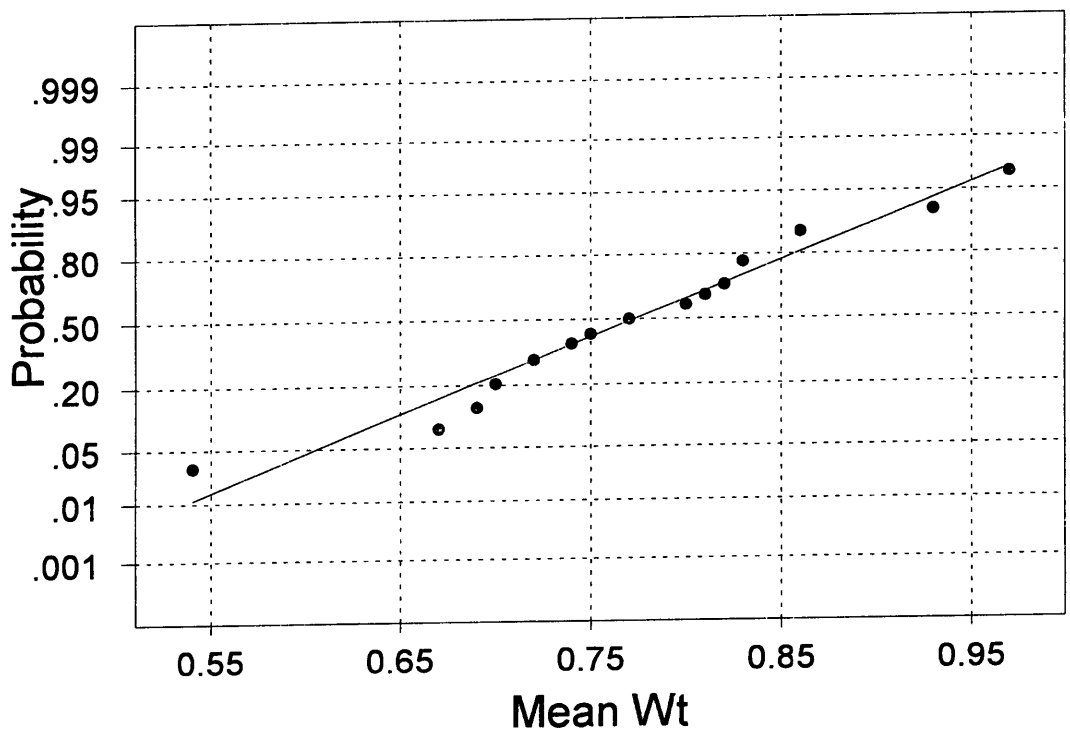
Critical value = 4.20

Intervals for (column level mean) - (row level mean)

	1	2	3
2	-0.3193 0.1585		
3	-0.2389 0.2389	-0.1585 0.3193	
4	-0.3193 0.1585	-0.2389 0.2389	-0.3193 0.1585

MTB

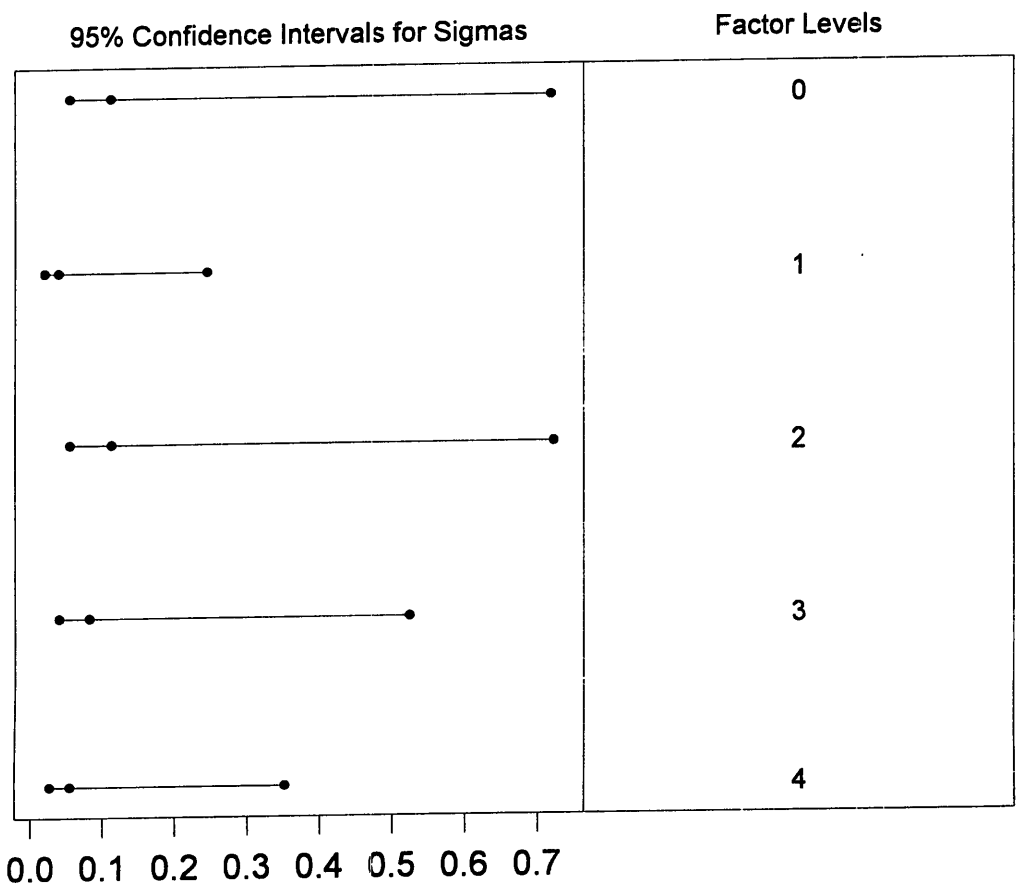
FATHEAD WEIGHT DAY 8



Average: 0.7725
Std Dev: 0.0959098
N of data: 20

W-test for Normality
R: 0.9810
p value (approx): > 0.1000

FATHEAD WEIGHT DAY 8



Bartlett's Test

Test Statistic: 3.920

p value : 0.417

Levene's Test

Test Statistic: 0.880

p value : 0.499

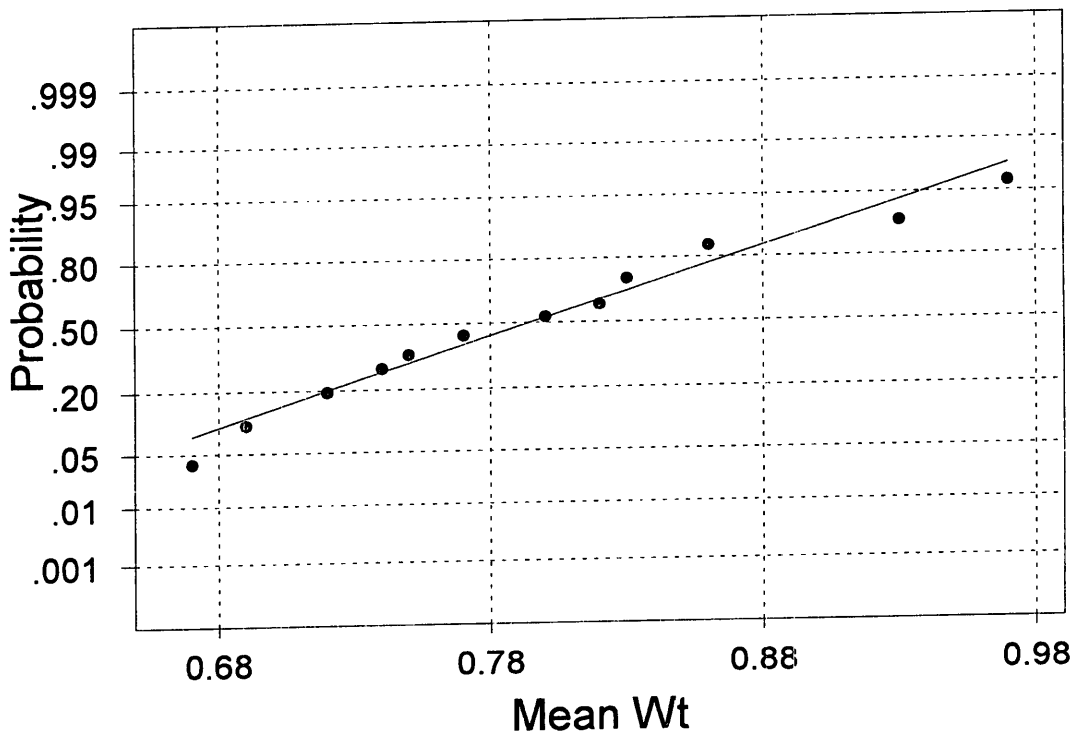
One-Way Analysis of Variance

```
Analysis of Variance on Mean Wt
Source      DF        SS        MS        F        p
Trt          4   0.06735   0.01684     2.35    0.101
Error       15   0.10742   0.00716
Total       19   0.17477
                                     Individual 95% CIs For Mean
                                     Based on Pooled StDev
 Level       N      Mean     StDev  -+---------+---------+---------+-----
     0       4   0.68750   0.11117   (--------*--------)
     1       4   0.80250   0.03775             (--------*--------)
     2       4   0.86250   0.11177                   (--------*--------)
     3       4   0.75500   0.08103         (--------*---------)
     4       4   0.75500   0.05447         (--------*---------)
                                     -+---------+---------+---------+-----
Pooled StDev =   0.08463            0.60      0.70      0.80      0.90

Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.0156

Critical value = 2.73

Control = level 0 of Trt

 Level     Lower    Center     Upper --------+---------+---------+---------+---
     1  -0.04836   0.11500   0.27836     (-------------*------------)
     2   0.01164   0.17500   0.33836          (-------------*------------)
     3  -0.09586   0.06750   0.23086 (-------------*------------)
     4  -0.09586   0.06750   0.23086 (-------------*------------)
                                     --------+---------+---------+---------+---
                                           0.00      0.12      0.24      0.36
```

NOTE: LEVEL 2 = JMS072.08

MTB >

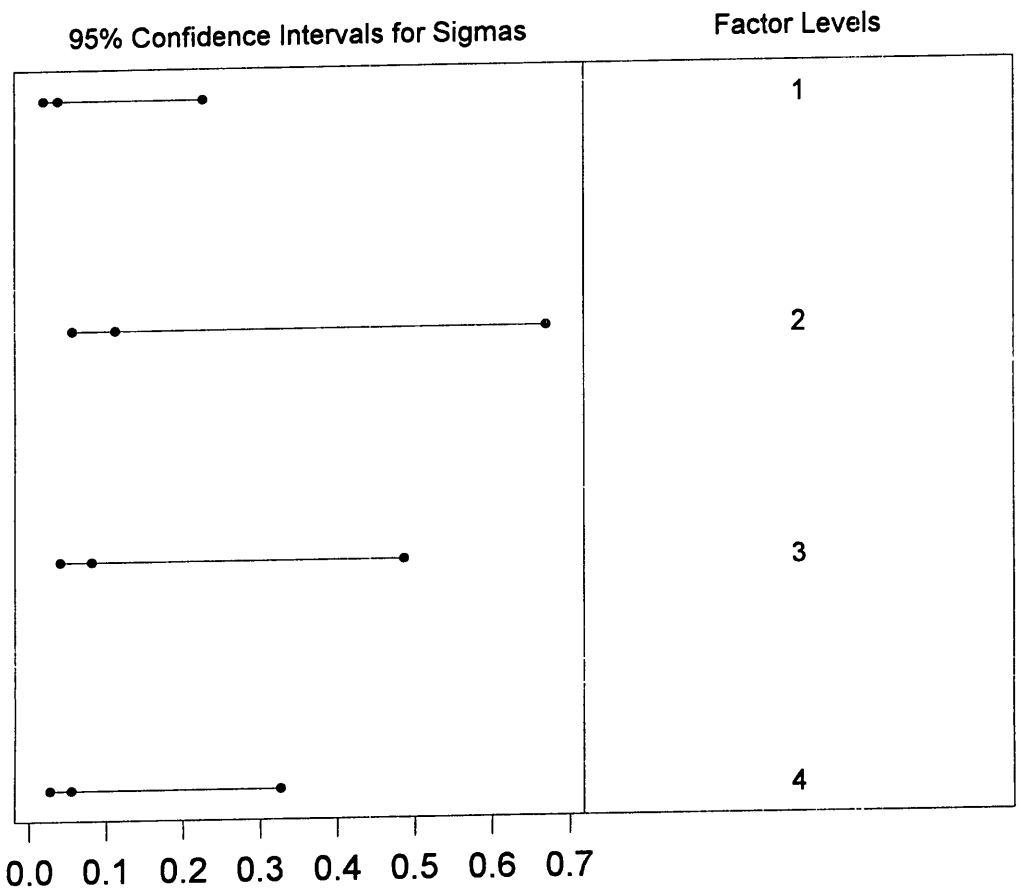
FATHEAD WEIGHT DAY 8 (STATIONS)



Average: 0.79375
Std Dev: 0.0822901
N of data: 16

W-test for Normality
R: 0.9836
p value (approx): > 0.1000

FATHEAD WEIGHT DAY 8 (STATIONS)



Bartlett's Test

Test Statistic: 3.228

p value : 0.358

Levene's Test

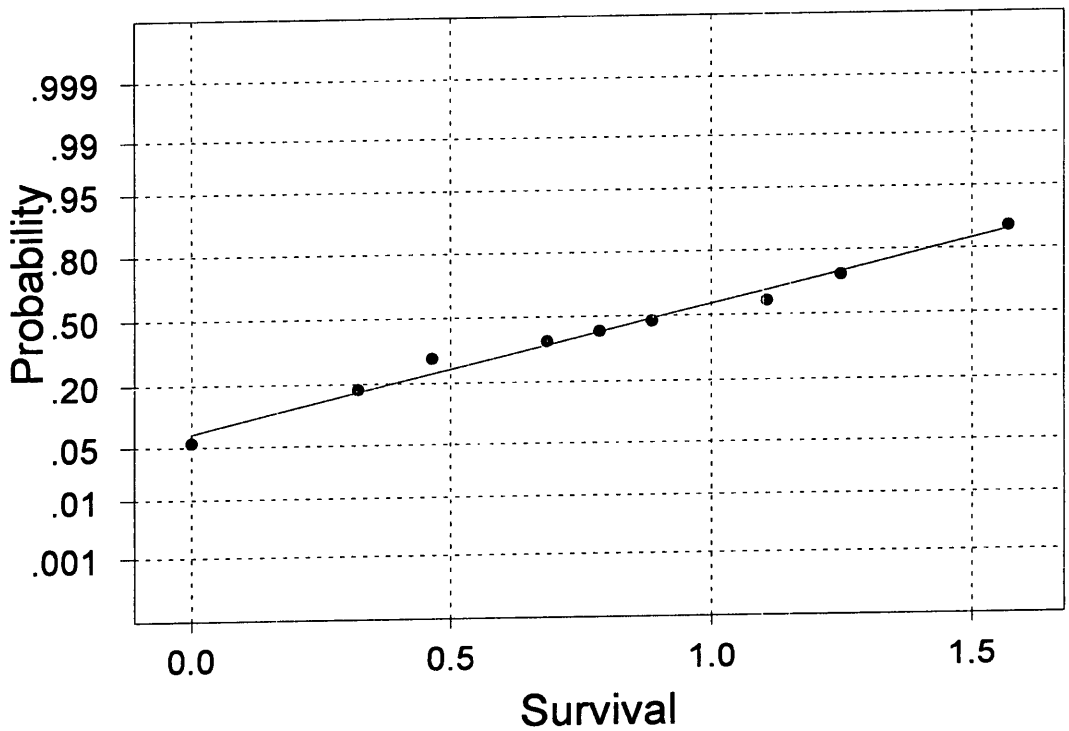
Test Statistic: 1.813

p value : 0.198

One-Way Analysis of Variance

```
Analysis of Variance on Mean Wt
Source     DF        SS        MS        F        p
Trt         3   0.03123   0.01041     1.78    0.205
Error      12   0.07035   0.00586
Total      15   0.10158

                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  -------+---------+---------+---------
     1      4   0.80250   0.03775         (---------*----------)
     2      4   0.86250   0.11177                (----------*---------)
     3      4   0.75500   0.08103   (---------*----------)
     4      4   0.75500   0.05447   (---------*----------)
                                   -------+---------+---------+---------
Pooled StDev =  0.07657                 0.720     0.800     0.880

Tukey's pairwise comparisons

    Family error rate = 0.0500
Individual error rate = 0.0117

Critical value = 4.20

Intervals for (column level mean) - (row level mean)

               1         2         3

     2  -0.22079
         0.10079

     3  -0.11329  -0.05329
         0.20829   0.26829

     4  -0.11329  -0.05329  -0.16079
         0.20829   0.26829   0.16079


MTB
```

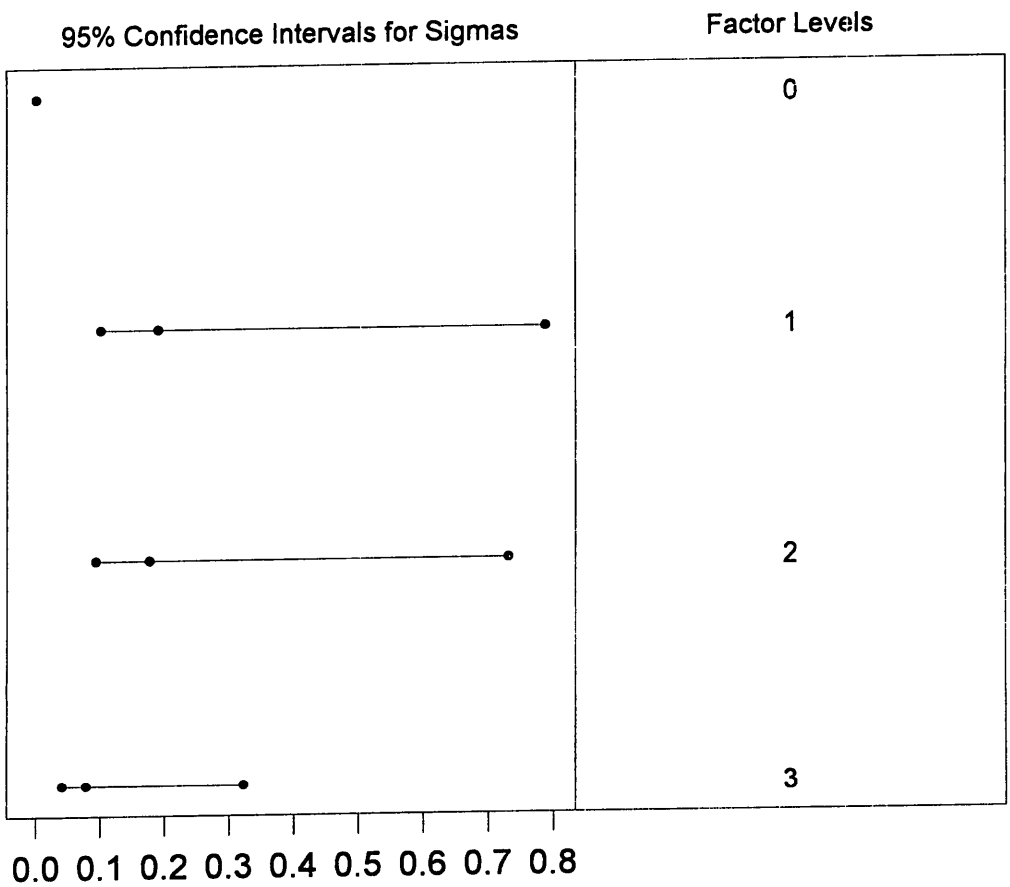
MYSID SURVIVAL DAY 8



Average: 0.896113
Std Dev: 0.547027
N of data: 20

W-test for Normality
R: 0.9937
p value (approx): > 0.1000

MYSID SURVIVAL DAY 8



Bartlett's Test

Test Statistic: -19.218

p value : 1.000

Levene's Test

Test Statistic: 2.006

p value : 0.154

One-Way Analysis of Variance

Analysis of Variance on Survival

Source	DF	SS	MS	F	p
TrtCode	3	5.3926	1.7975	98.20	0.000
Error	16	0.2929	0.0183		
Total	19	5.6855			

Level	N	Mean	StDev
0	5	1.5708	0.0000
1	5	0.6567	0.1901
2	5	0.1931	0.1762
3	5	1.1639	0.0777

Pooled StDev = 0.1353

```
Individual 95% CIs For Mean
Based on Pooled StDev
---------+---------+---------+-------
                                (-*--)
          (-*--)
(--*-)
                     (-*--)
---------+---------+---------+-------
       0.50      1.00      1.50
```

Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.0196

Critical value = 2.59

Control = level 0 of TrtCode

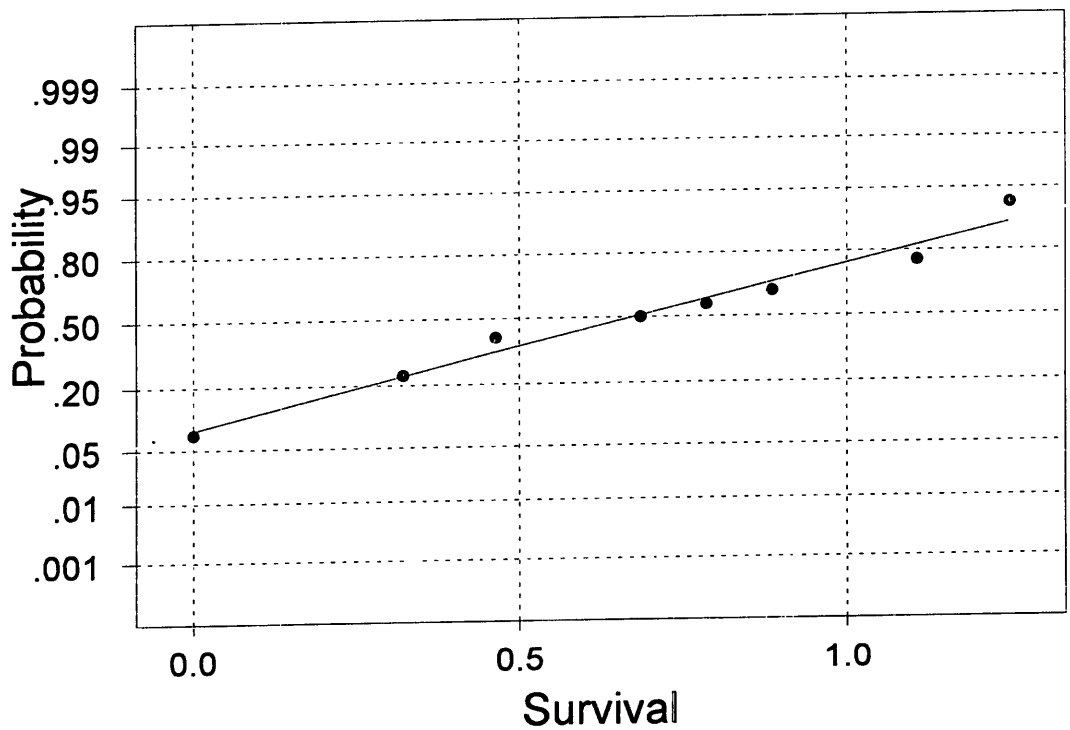
Level	Lower	Center	Upper
1	-1.1357	-0.9141	-0.6925
2	-1.5994	-1.3777	-1.1561
3	-0.6285	-0.4069	-0.1853

```
------+---------+---------+---------+-----
              (-----*-----)
(------*-----)
                              (-----*------)
------+---------+---------+---------+-----
    -1.40     -1.05     -0.70     -0.35
```

NOTE: LEVEL 1 = 4.3 PPT CONTROL, 2 = 42.46, 3 = 40.03

M

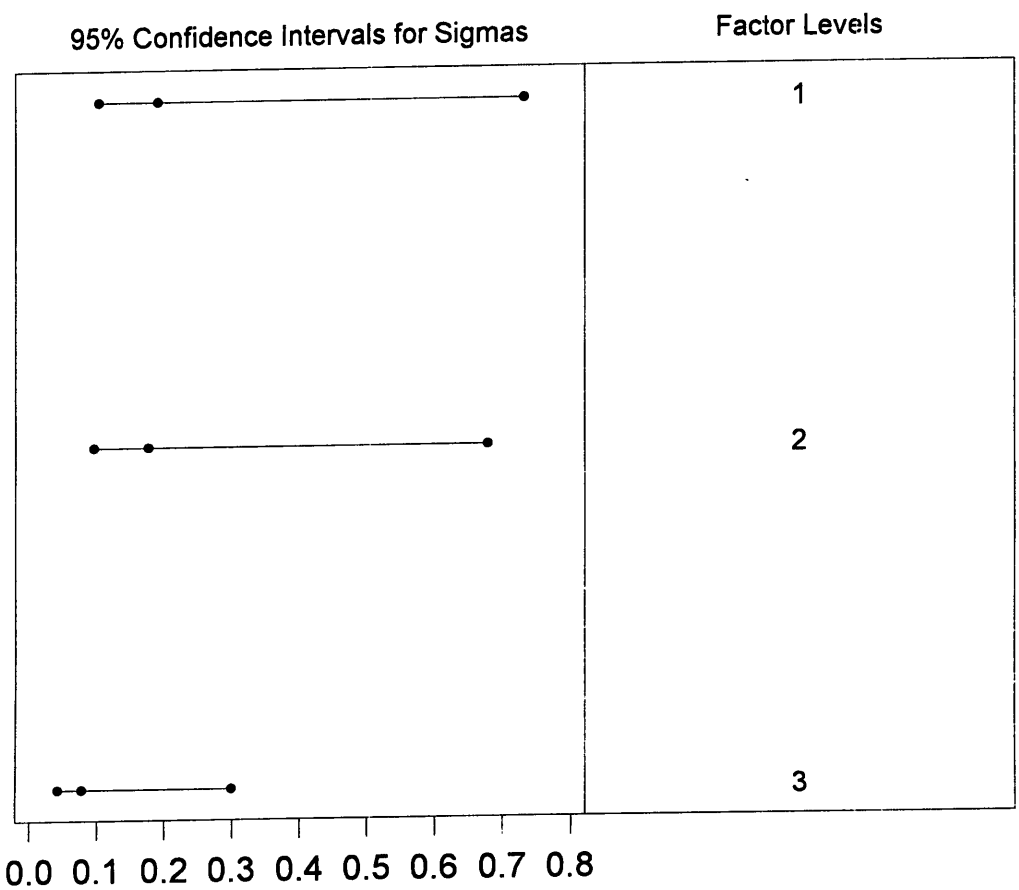
MYSID SURVIVAL (4.3 PPT)



Average: 0.671219
Std Dev: 0.435142
N of data: 15

W-test for Normality
R: 0.9858
p value (approx): > 0.1000

MYSID SURVIVAL (4.3 PPT)



Bartlett's Test

Test Statistic: 2.748

p value : 0.253

Levene's Test

Test Statistic: 0.756

p value : 0.491

One-Way Analysis of Variance

```
Analysis of Variance on Survival
Source     DF        SS        MS        F        p
TrtCode     2    2.3580    1.1790    48.30    0.000
Error      12    0.2929    0.0244
Total      14    2.6509
```

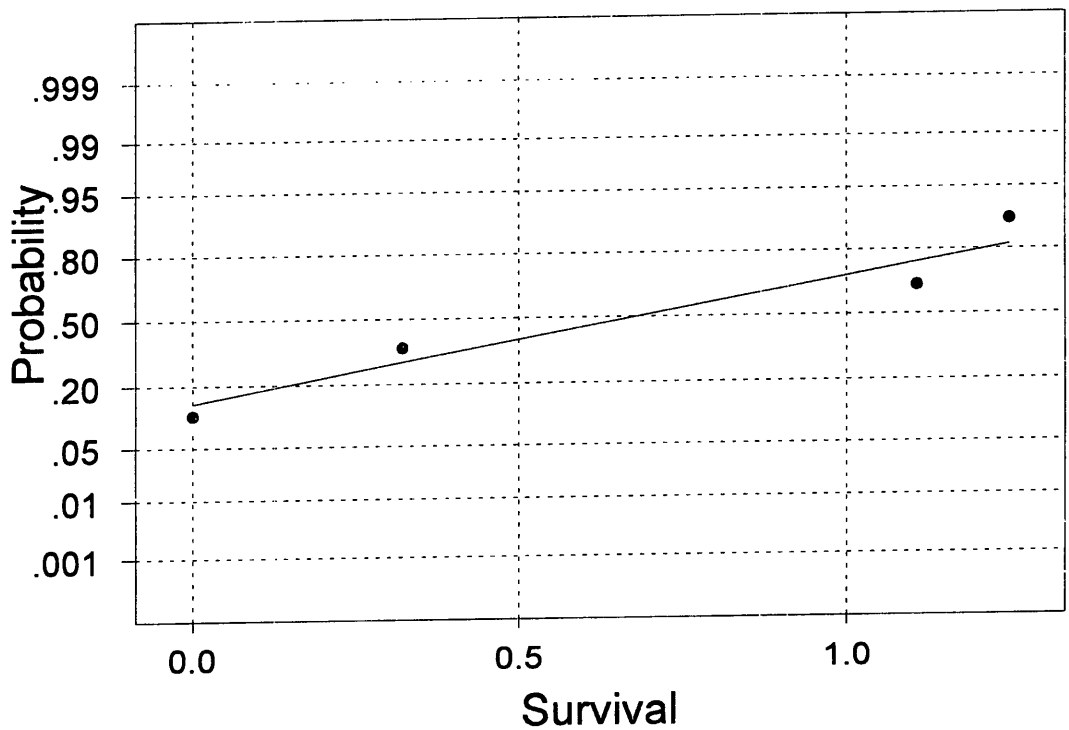
```
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  ---------+---------+---------+-------
     1      5    0.6567    0.1901                (----*---)
     2      5    0.1931    0.1762  (----*---)
     3      5    1.1639    0.0777                                (---*----)
                                   ---------+---------+---------+-------
Pooled StDev =    0.1562                     0.35      0.70      1.05
```

```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.0278

Critical value = 2.50

Control = level 1 of TrtCode

 Level     Lower    Center     Upper -+---------+---------+---------+---------+
     2   -0.7107   -0.4636   -0.2166  (------*------)
     3    0.2602    0.5072    0.7542                            (------*-------)
                                     -+---------+---------+---------+---------+
                                   -0.70     -0.35     -0.00      0.35      0.70
```

NOTE: 2=42.46, 3 = 40.03

```
MTB >
```

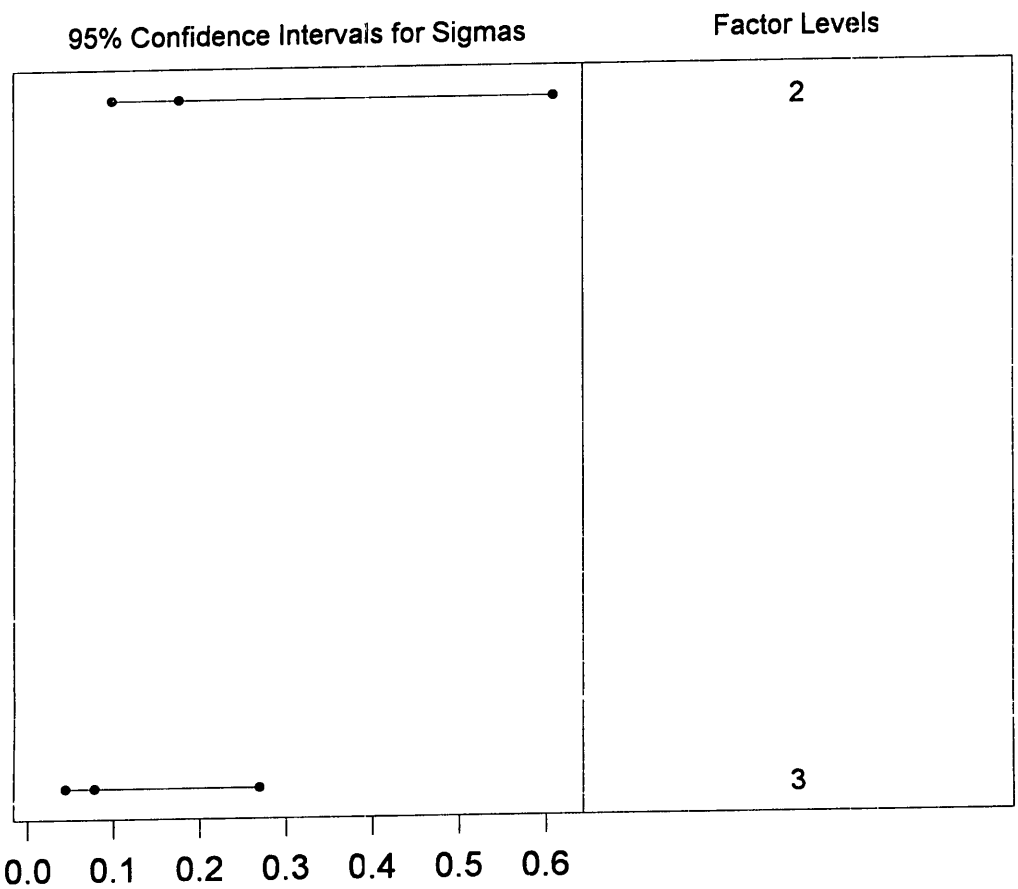
MYSID SURVIVAL DAY 8 (STATIONS)



Average: 0.678479
Std Dev: 0.527552
N of data: 10

W-test for Normality
R: 0.9519
p value (approx): > 0.1000

MYSID SURVIVAL DAY 8 (STATIONS)



Bartlett's Test

Test Statistic: 2.156

p value : 0.142

Levene's Test

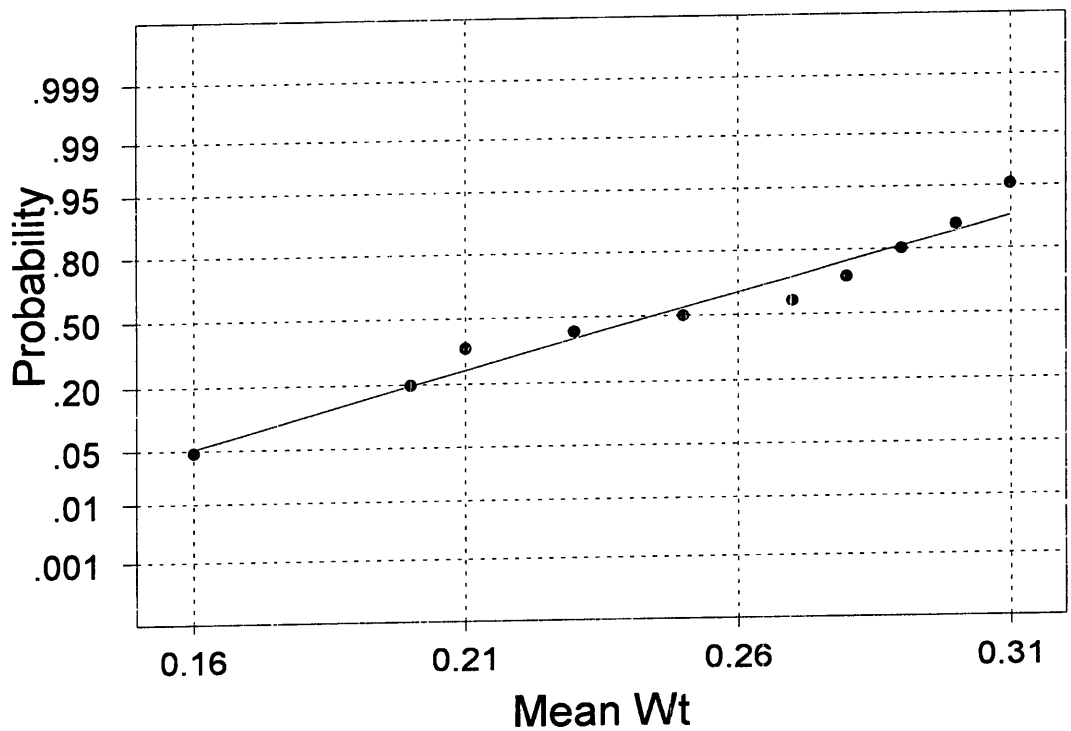
Test Statistic: 0.698

p value : 0.428

Two Sample T-Test and Confidence Interval

```
Twosample T for Survival
TrtCode  N      Mean     StDev   SE Mean
2        5     0.193     0.176     0.079
3        5    1.1639    0.0777     0.035

95% C.I. for mu 2 - mu 3: ( -1.192,  -0.749)
T-Test mu 2 = mu 3 (vs not =): T= -11.27  P=0.0001  DF=  5

MTB >
```

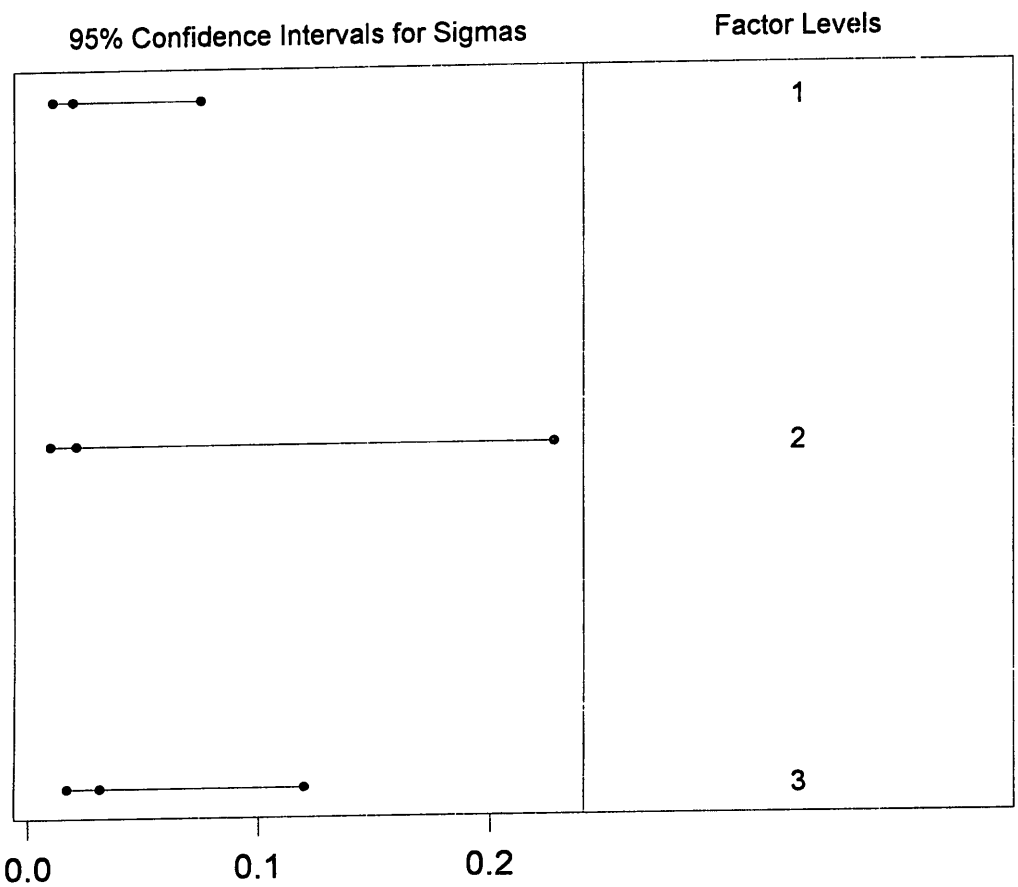
MYSID WEIGHT (4.3 PPT)



Average: 0.244615
Std Dev: 0.0475422
N of data: 13

W-test for Normality
R: 0.9786
p value (approx): > 0.1000

MYSID WEIGHT (4.3 PPT)



Bartlett's Test

Test Statistic: 0.862

p value : 0.650

Levene's Test

Test Statistic: 0.598

p value : 0.568

One-Way Analysis of Variance

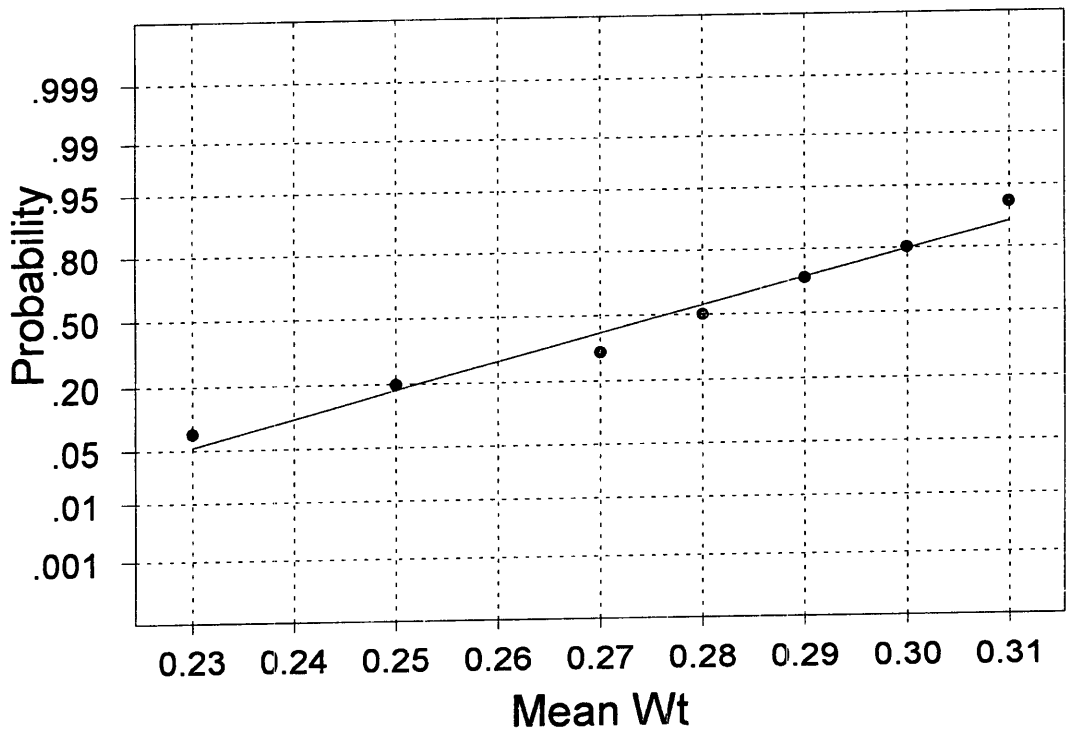
```
Analysis of Variance on Mean Wt
Source     DF        SS        MS        F        p
TrtCode     2  0.020856  0.010428    16.64    0.001
Error      10  0.006267  0.000627
Total      12  0.027123
```

```
                                  Individual 95% CIs For Mean
                                  Based on Pooled StDev
 Level      N      Mean     StDev  --------+---------+---------+--------
     1      5   0.19400   0.01949  (-----*------)
     2      3   0.27333   0.02082                  (-------*-------)
     3      5   0.27800   0.03114                     (-----*------)
                                  --------+---------+---------+--------
Pooled StDev =  0.02503                 0.200     0.240     0.280
```

```
Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.0274

Critical value = 2.58

Control = level 1 of TrtCode

 Level     Lower    Center     Upper --------+---------+---------+---------+---
     2   0.03217   0.07933   0.12650  (------------------*------------------)
     3   0.04315   0.08400   0.12485      (----------------*----------------)
                                      --------+---------+---------+---------+---
                                            0.050     0.075     0.100     0.125
```

MTB >

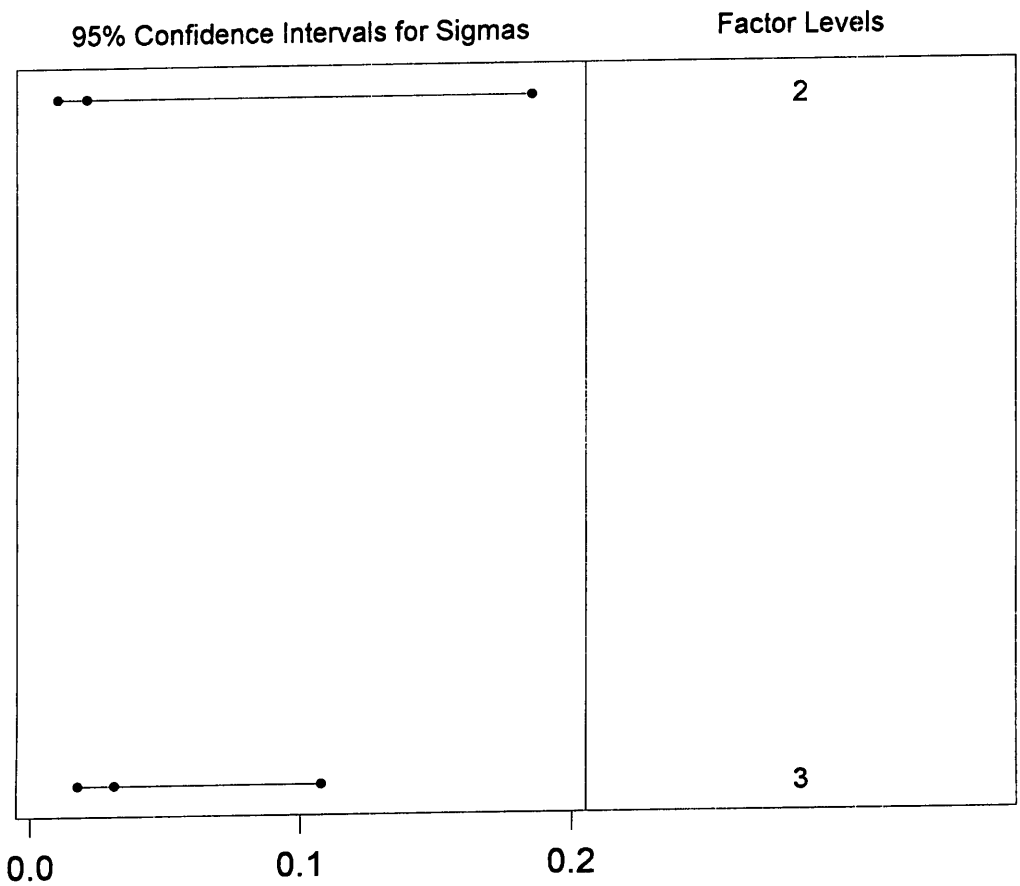
MYSID WEIGHT DAY 8 (STATIONS)



Average: 0.27625
Std Dev: 0.0261520
N of data: 8

W-test for Normality
R: 0.9831
p value (approx): > 0.1000

MYSID WEIGHT DAY 8 (STATIONS)



Bartlett's Test

Test Statistic: 0.325

p value : 0.569

Levene's Test

Test Statistic: 0.434

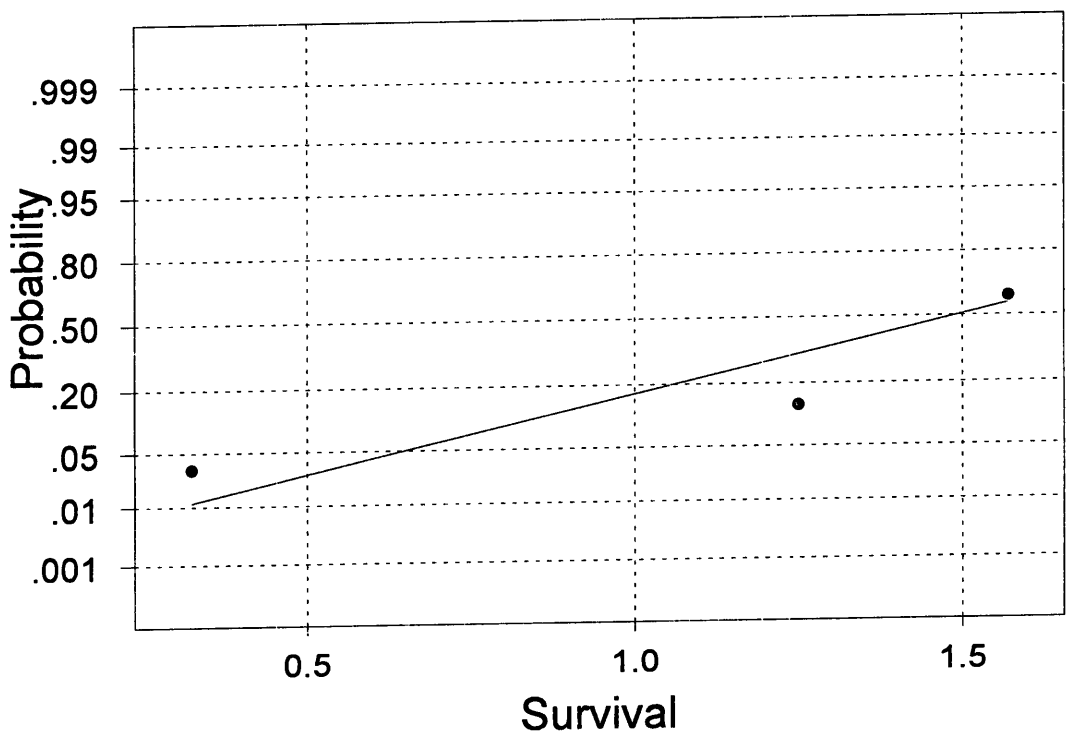
p value : 0.534

Two Sample T-Test and Confidence Interval

```
Twosample T for Mean Wt
TrtCode  N      Mean     StDev   SE Mean
2        3    0.2733    0.0208     0.012
3        5    0.2780    0.0311     0.014

95% C.I. for mu 2 - mu 3: ( -0.052,  0.043)
T-Test mu 2 = mu 3 (vs not =): T= -0.25  P=0.81  DF=  5
```

MT

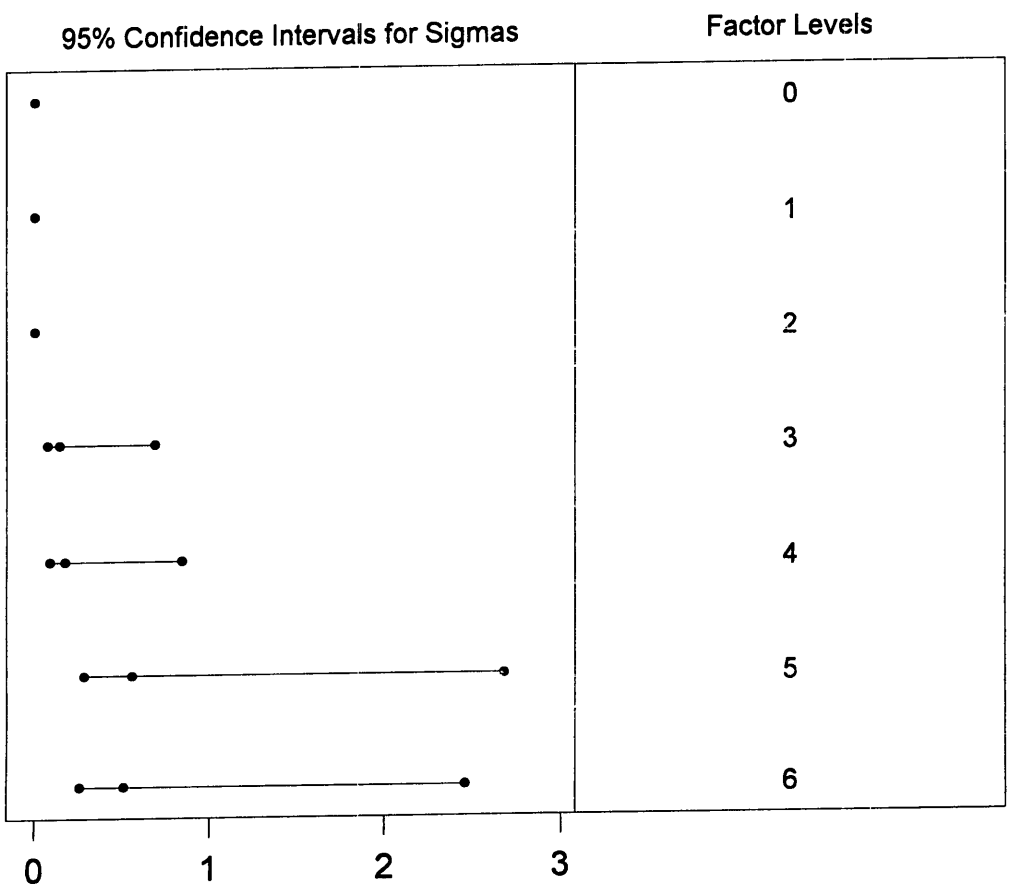
SHEEPSHEAD SURVIVAL DAY 8



Average: 1.45346
Std Dev: 0.304668
N of data: 35

W-test for Normality
R: 0.9037
p value (approx): < 0.0100

SHEEPSHEAD SURVIVAL DAY 8



Bartlett's Test

Test Statistic: -34.827

p value : 1.000

Levene's Test

Test Statistic: 1.150

p value : 0.361

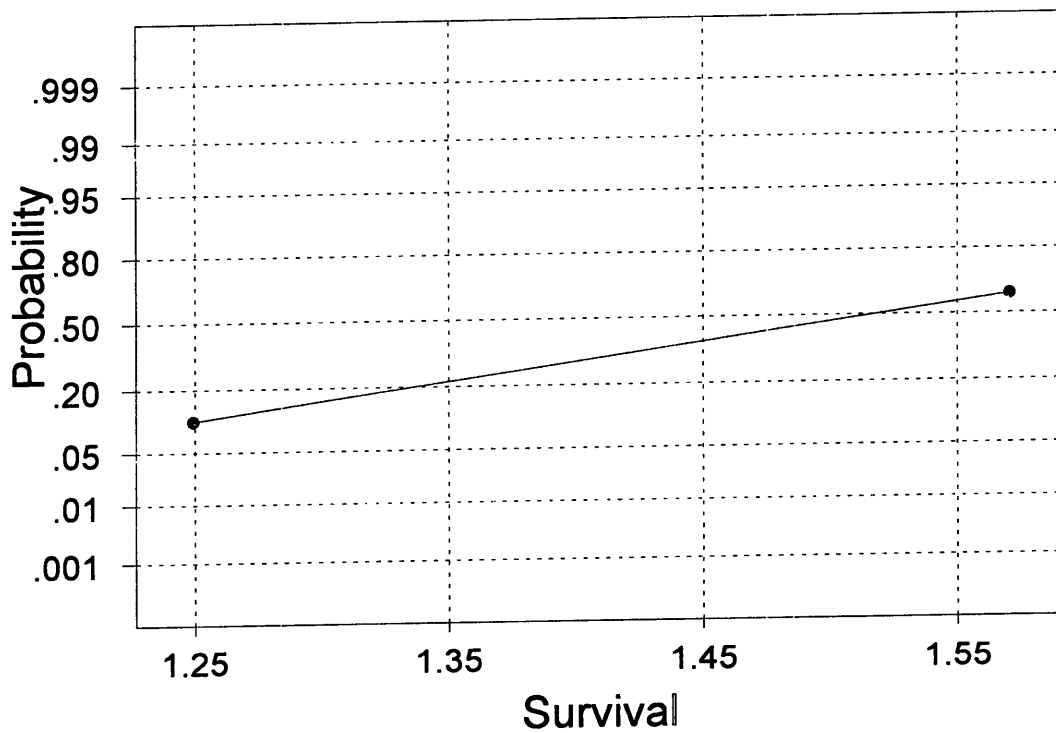
```
MTB > Kruskal-Wallis 'Survival' 'TrtCode'.
```

Kruskal-Wallis Test

LEVEL	NOBS	MEDIAN	AVE. RANK	Z VALUE
0	5	1.571	21.5	0.82
1	5	1.571	21.5	0.82
2	5	1.571	21.5	0.82
3	5	1.571	18.2	0.05
4	5	1.571	14.9	-0.73
5	5	1.571	17.5	-0.12
6	5	1.249	10.9	-1.67
OVERALL	35		18.0	

```
H = 4.62  d.f. = 6  p = 0.593
H = 9.52  d.f. = 6  p = 0.147 (adjusted for ties)

M
```

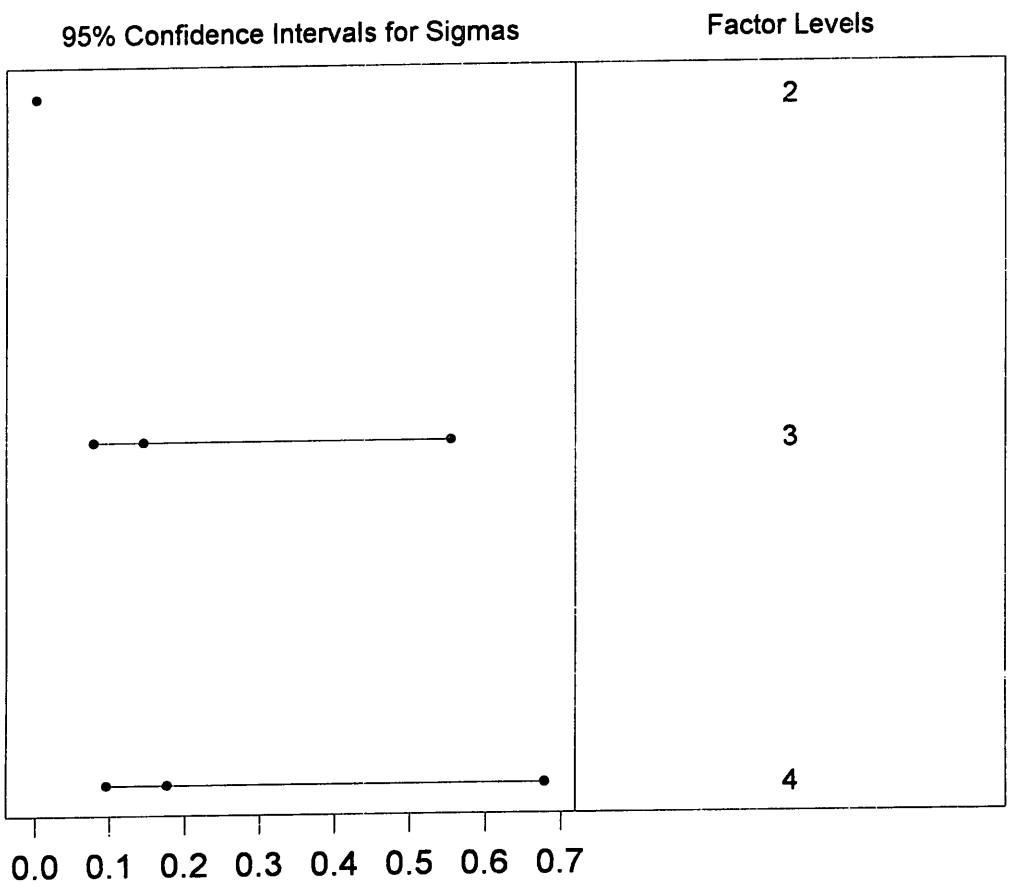
SHEEPSHEAD SURVIVAL DAY 8 (4.3 PPT)



Average: 1.50645
Std Dev: 0.133217
N of data: 15

W-test for Normality
R: 1.0000
p value (approx): > 0.1000

SHEEPSHEAD SURVIVAL DAY 8 (4.3 PPT)



Bartlett's Test

Test Statistic: -21.401

p value : 1.000

Levene's Test

Test Statistic: 1.200

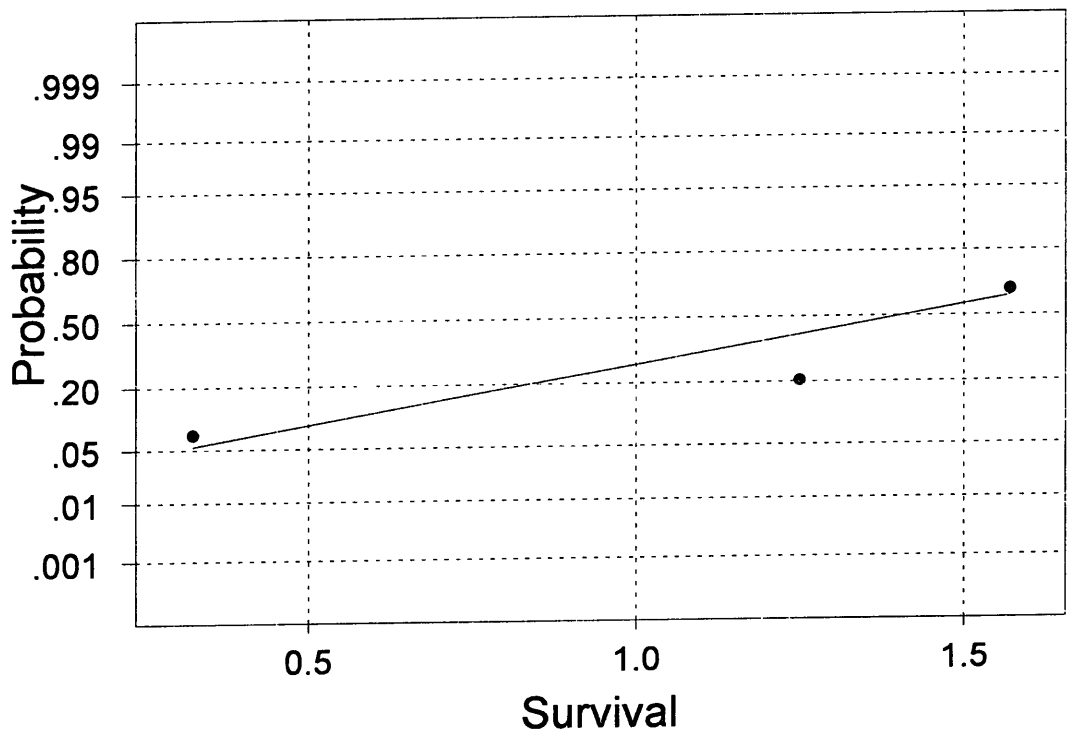
p value : 0.335

One-Way Analysis of Variance

```
Analysis of Variance on Survival
Source      DF        SS        MS         F        p
TrtCode      2    0.0414    0.0207      1.20    0.335
Error       12    0.2070    0.0173
Total       14    0.2485
                                     Individual 95% CIs For Mean
                                     Based on Pooled StDev
 Level       N      Mean     StDev  -+---------+---------+---------+-----
     2       5    1.5708    0.0000             (----------*----------)
     3       5    1.5064    0.1439        (----------*---------)
     4       5    1.4421    0.1762   (---------*----------)
                                     -+---------+---------+---------+-----
Pooled StDev =    0.1314            1.32      1.44      1.56      1.68

Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.0278

Critical value = 2.50

Control = level 2 of TrtCode

 Level     Lower    Center     Upper ---------+---------+---------+---------+--
     3   -0.2720   -0.0644    0.1433        (-----------------*----------------)
     4   -0.3364   -0.1287    0.0790  (----------------*----------------)
                                     ---------+---------+---------+---------+--
                                           -0.24     -0.12      0.00      0.12
```

MTB

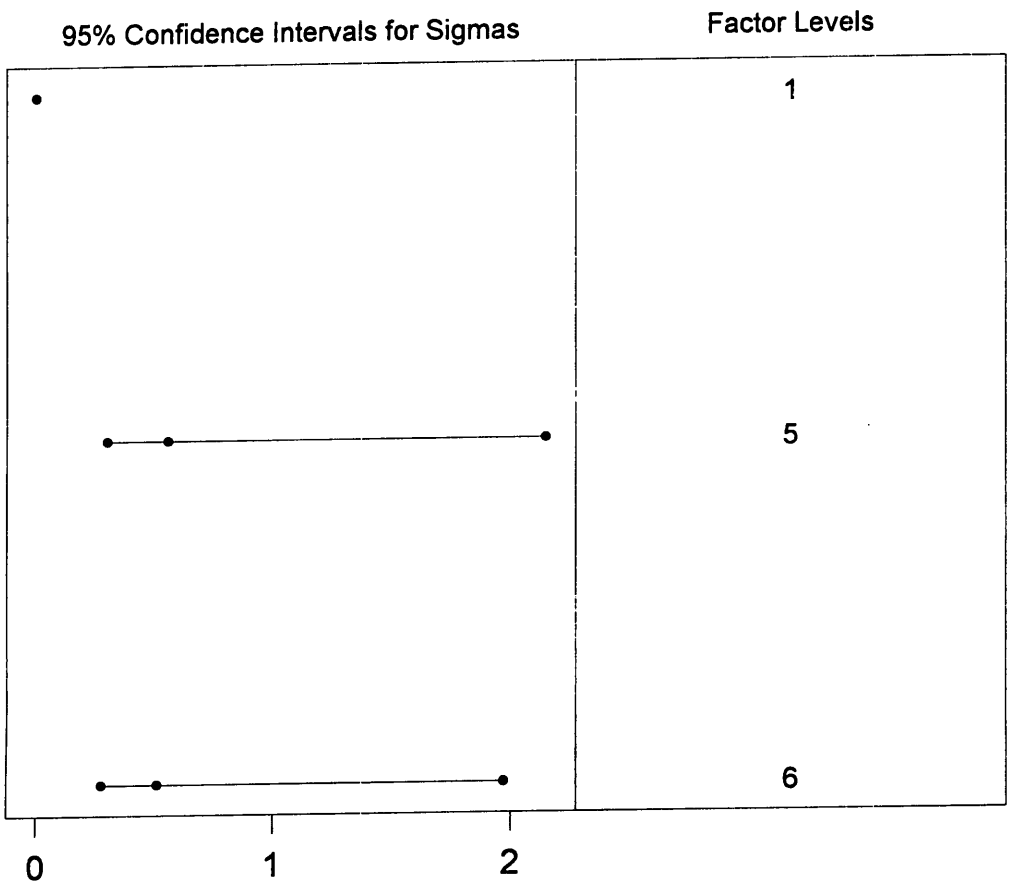
SHEEPSHEAD SURVIVAL DAY 8 (1.2 PPT)



Average: 1.36136
Std Dev: 0.436652
N of data: 15

W-test for Normality
R: 0.9361
p value (approx): 0.0469

SHEEPSHEAD SURVIVAL DAY 8 (1.2 PPT)



Bartlett's Test

Test Statistic: -10.970

p value : 1.000

Levene's Test

Test Statistic: 0.907

p value : 0.430

One-Way Analysis of Variance

```
Analysis of Variance on Survival
Source     DF        SS        MS        F        p
TrtCode     2     0.370     0.185     0.97    0.408
Error      12     2.299     0.192
Total      14     2.669
```

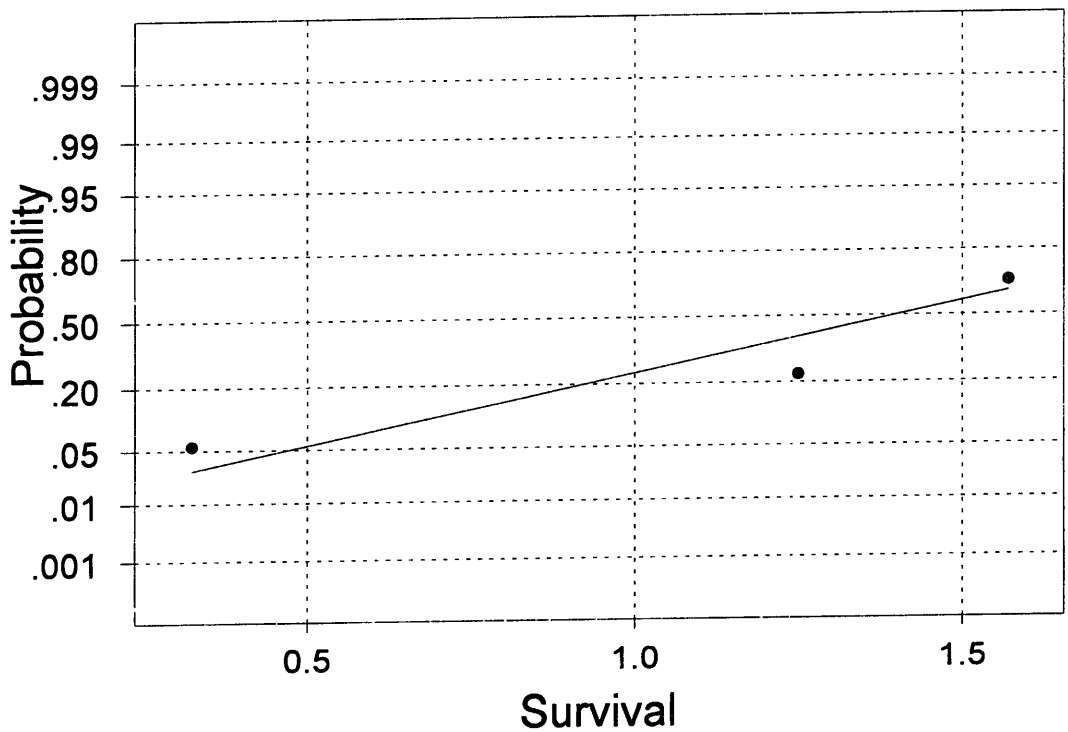
```
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level      N      Mean     StDev  ---------+---------+---------+-------
     1      5    1.5708    0.0000              (-----------*-----------)
     5      5    1.3210    0.5586       (-----------*-----------)
     6      5    1.1923    0.5125    (-----------*-----------)
                                   ---------+---------+---------+-------
Pooled StDev =    0.4377                     1.05      1.40      1.75
```

Dunnett's intervals for treatment mean minus control mean

```
    Family error rate = 0.0500
Individual error rate = 0.0278

Critical value = 2.50

Control = level 1 of TrtCode

 Level     Lower    Center     Upper -------+---------+---------+---------+----
     5   -0.9419   -0.2498    0.4422    (-----------------*----------------)
     6   -1.0706   -0.3785    0.3135 (-----------------*----------------)
                                     -------+---------+---------+---------+----
                                         -0.80     -0.40     -0.00      0.40
```

MTB >

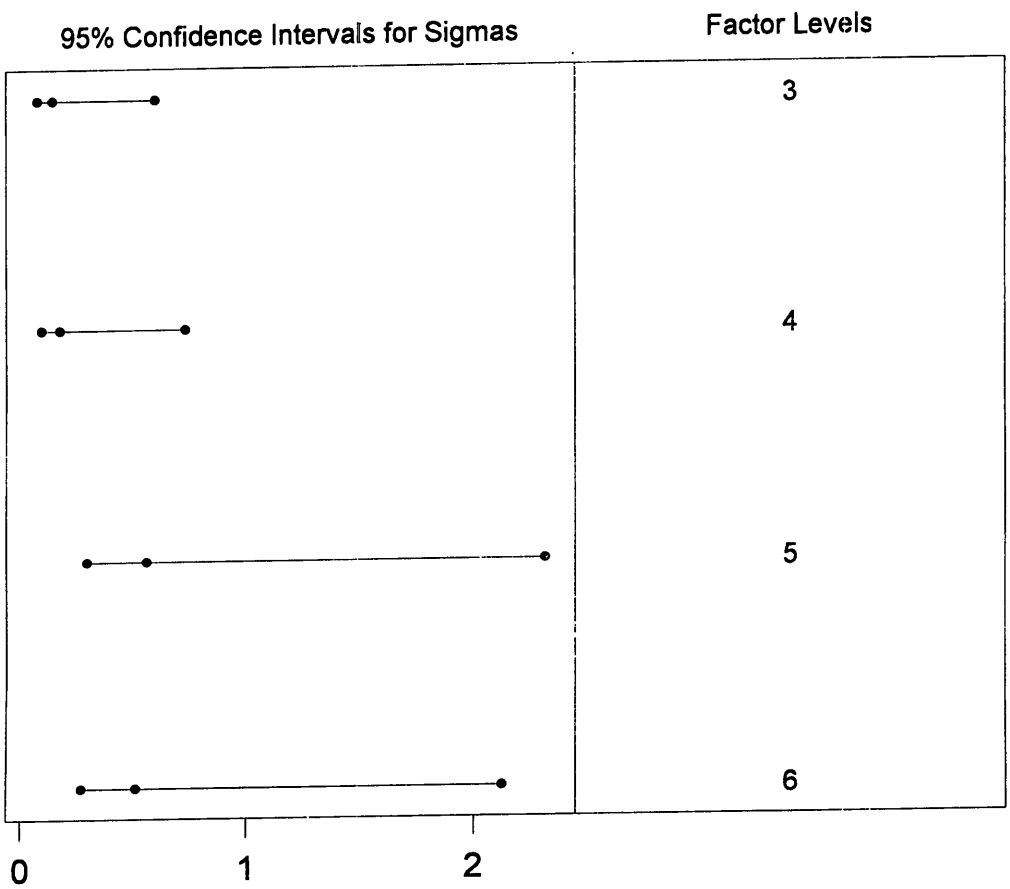
SHEEPSHEAD SURVIVAL DAY 8 (STATIONS)



Average: 1.36545
Std Dev: 0.383511
N of data: 20

W-test for Normality
R: 0.9200
p value (approx): < 0.0100

SHEEPSHEAD SURVIVAL DAY 8 (STATIONS)



Bartlett's Test

Test Statistic: 8.821

p value : 0.032

Levene's Test

Test Statistic: 0.507

p value : 0.683

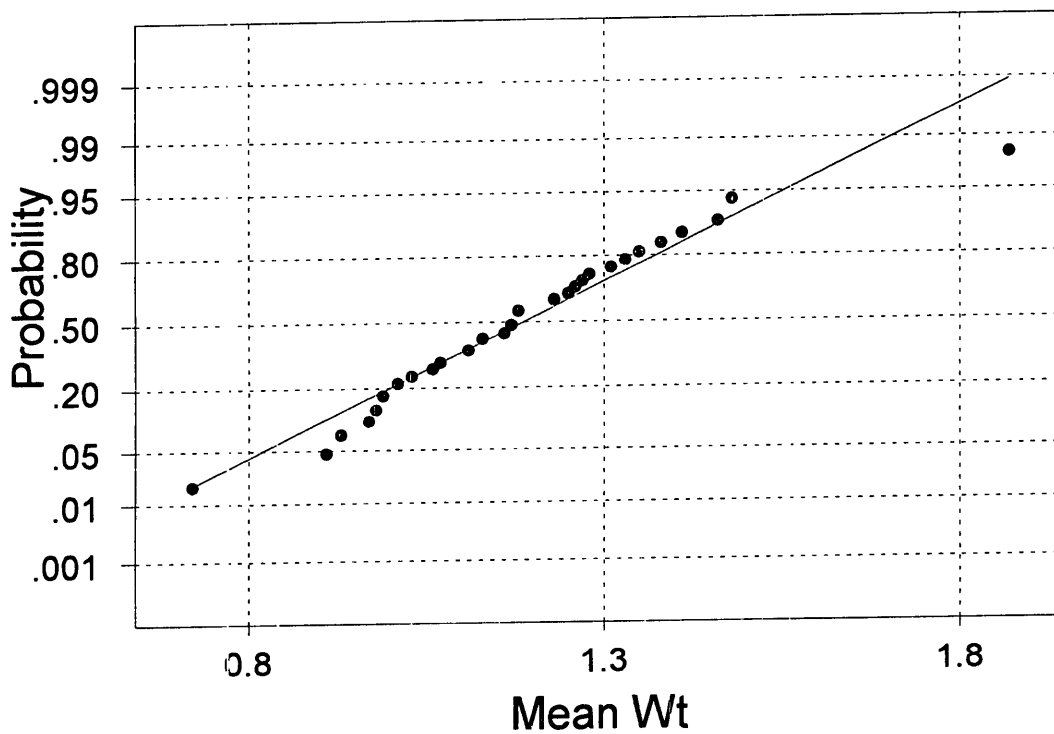
Kruskal-Wallis Test

LEVEL	NOBS	MEDIAN	AVE. RANK	Z VALUE
3	5	1.571	12.2	0.74
4	5	1.571	10.4	-0.04
5	5	1.571	11.5	0.44
6	5	1.249	7.9	-1.13
OVERALL	20		10.5	

H = 1.52 d.f. = 3 p = 0.677
H = 2.14 d.f. = 3 p = 0.543 (adjusted for ties)

MT

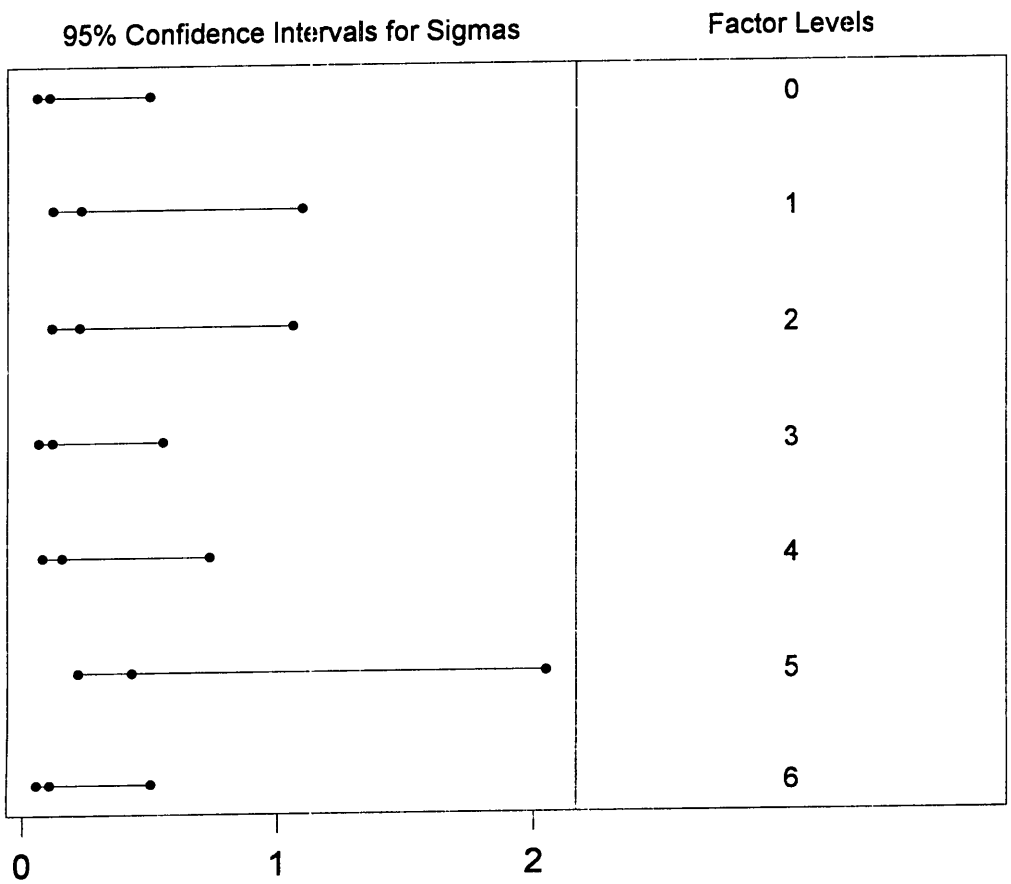
SHEEPSHEAD WEIGHT DAY 8



Average: 1.18629
Std Dev: 0.2118
N of data: 35

W-test for Normality
R: 0.9730
p value (approx): 0.0912

SHEEPSHEAD WEIGHT DAY 8



Bartlett's Test

Test Statistic: 13.369

p value : 0.037

Levene's Test

Test Statistic: 0.961

p value : 0.469

One-Way Analysis of Variance

Analysis of Variance on Mean Wt

Source	DF	SS	MS	F	P
TrtCode	6	0.1581	0.0263	0.54	0.773
Error	28	1.3671	0.0488		
Total	34	1.5252			

Level	N	Mean	StDev
0	5	1.3100	0.1042
1	5	1.1840	0.2284
2	5	1.2160	0.2209
3	5	1.2200	0.1145
4	5	1.1220	0.1525
5	5	1.1640	0.4272
6	5	1.0880	0.1052

Pooled StDev = 0.2210

```
Individual 95% CIs For Mean
Based on Pooled StDev
------+---------+---------+---------+
            (---------*----------)
      (---------*---------)
        (---------*---------)
        (---------*---------)
  (---------*---------)
    (---------*---------)
(---------*----------)
------+---------+---------+---------+
    1.00      1.20      1.40      1.60
```

Dunnett's intervals for treatment mean minus control mean

Family error rate = 0.0500
Individual error rate = 0.0108

Critical value = 2.73

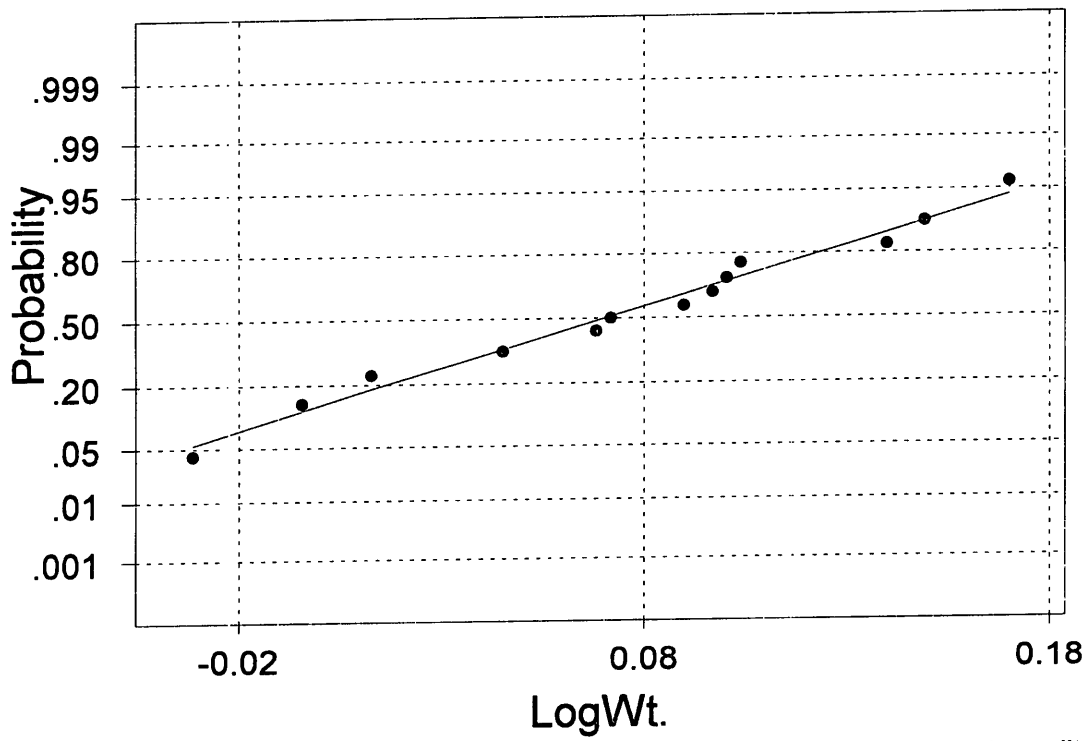
Control = level 0 of TrtCode

Level	Lower	Center	Upper
1	-0.5075	-0.1260	0.2555
2	-0.4755	-0.0940	0.2875
3	-0.4715	-0.0900	0.2915
4	-0.5695	-0.1880	0.1935
5	-0.5275	-0.1460	0.2355
6	-0.6035	-0.2220	0.1595

```
-----+---------+---------+---------+------
      (--------------*--------------)
       (--------------*---------------)
       (--------------*---------------)
  (--------------*---------------)
    (--------------*--------------)
 (--------------*--------------)
-----+---------+---------+---------+------
    -0.50     -0.25      0.00      0.25
```

MTB

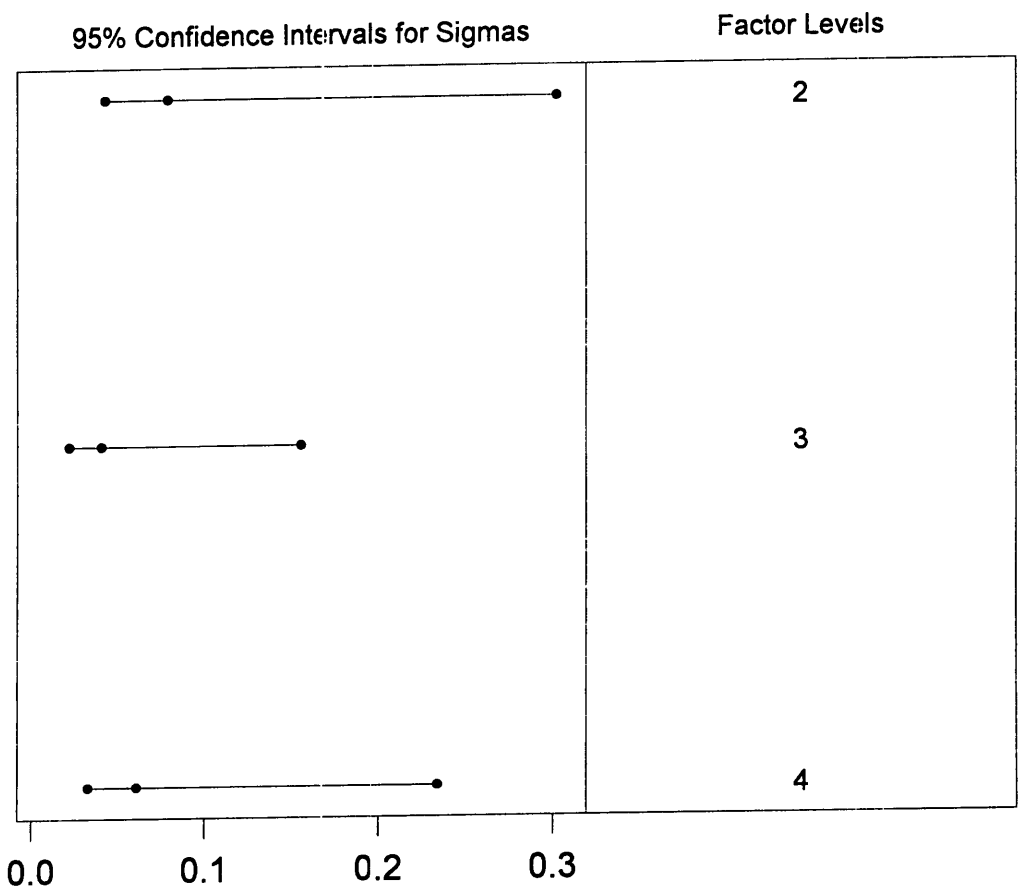
SHEEPSHEAD WEIGHT DAY 8 (4.3 PPT)



Average: 0.0702436
Std Dev: 0.059913
N of data: 15

W-test for Normality
R: 0.9917
p value (approx): > 0.1000

SHEEPSHEAD WEIGHT DAY 8 (4.3 PPT)



Bartlett's Test

Test Statistic: 1.489

p value : 0.475

Levene's Test

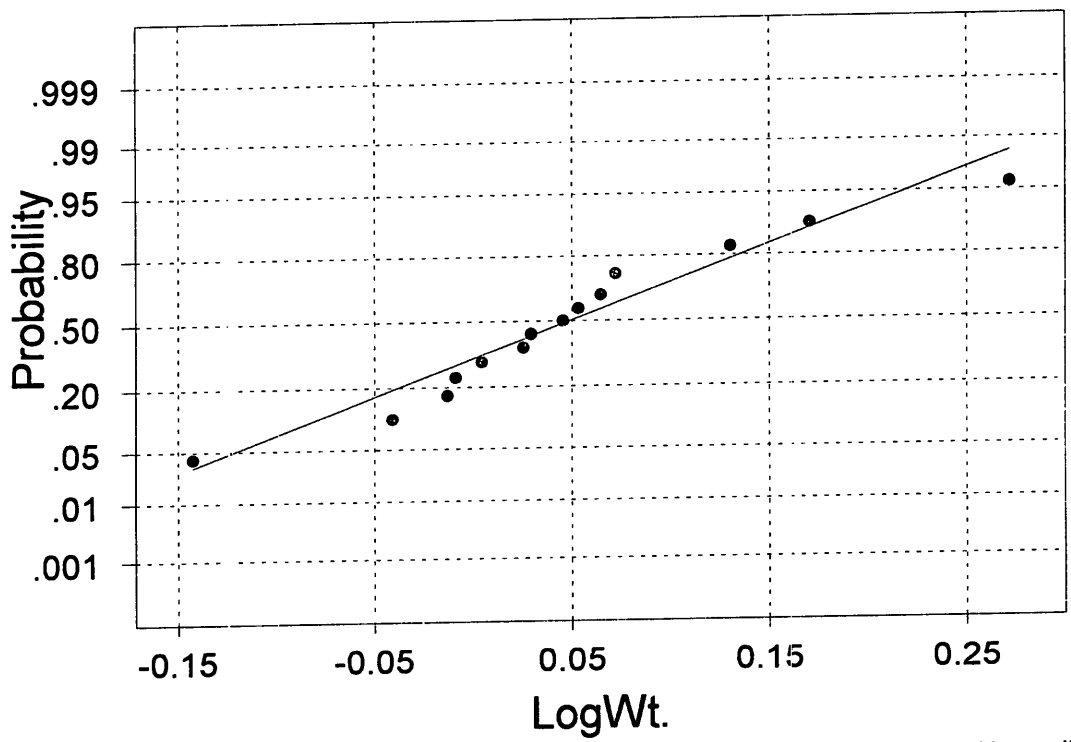
Test Statistic: 0.997

p value : 0.398

One-Way Analysis of Variance

```
Analysis of Variance on LogWt.
Source      DF        SS        MS        F        p
TrtCode      2   0.00425   0.00213     0.55    0.588
Error       12   0.04600   0.00383
Total       14   0.05025
                                     Individual 95% CIs For Mean
                                     Based on Pooled StDev
 Level       N      Mean     StDev   ---+---------+---------+---------+---
     2       5   0.07923   0.07859          (-----------*-----------)
     3       5   0.08485   0.04043           (-----------*-----------)
     4       5   0.04666   0.06075  (-----------*-----------)
                                     ---+---------+---------+---------+---
Pooled StDev =   0.06192              0.000     0.050     0.100     0.150

Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.0278

Critical value = 2.50

Control = level 2 of TrtCode

 Level     Lower    Center     Upper --+---------+---------+---------+---------
     3  -0.09228   0.00562   0.10352         (---------------*---------------)
     4  -0.13047  -0.03257   0.06533 (---------------*---------------)
                                     --+---------+---------+---------+---------
                                    -0.120    -0.060    -0.000     0.060

MTB >
```

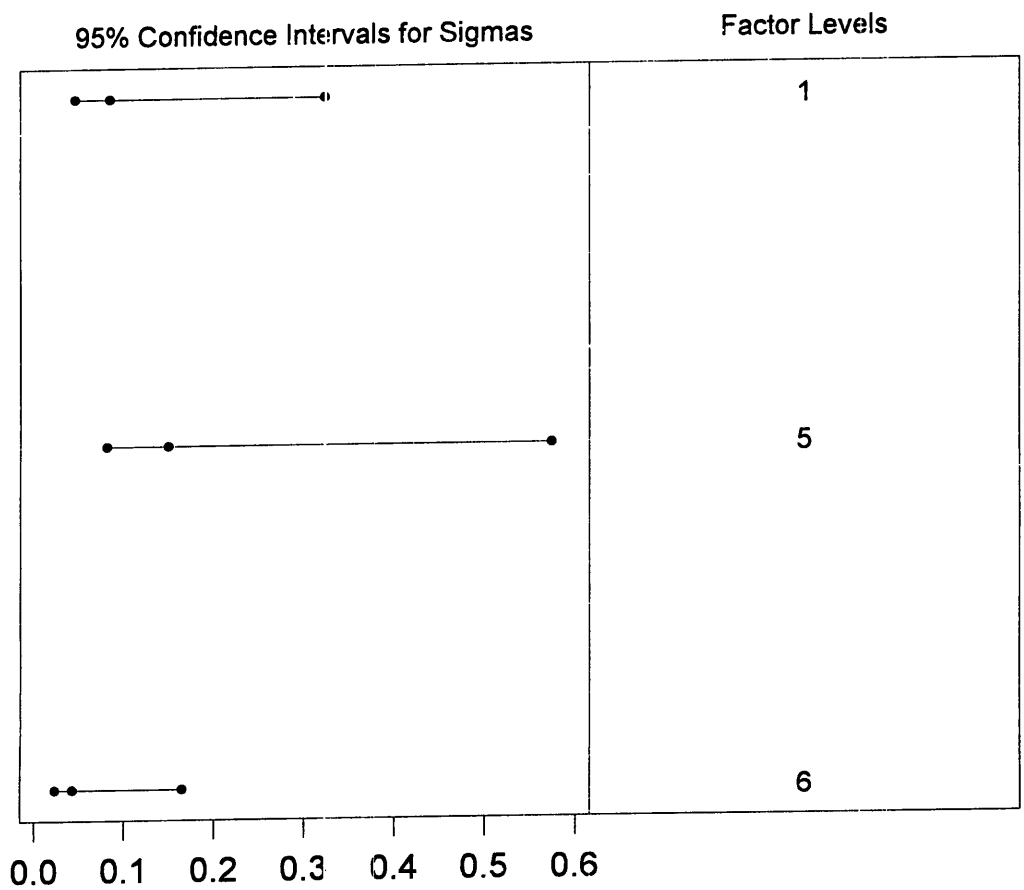
SHEEPSHEAD WEIGHT DAY 8 (1.2 PPT)



Average: 0.0488296
Std Dev: 0.0953472
N of data: 15

W-test for Normality
R: 0.9655
p value (approx): > 0.1000

SHEEPSHEAD WEIGHT DAY 8 (1.2 PPT)



Bartlett's Test

Test Statistic: 4.909

p value : 0.086

Levene's Test

Test Statistic: 0.949

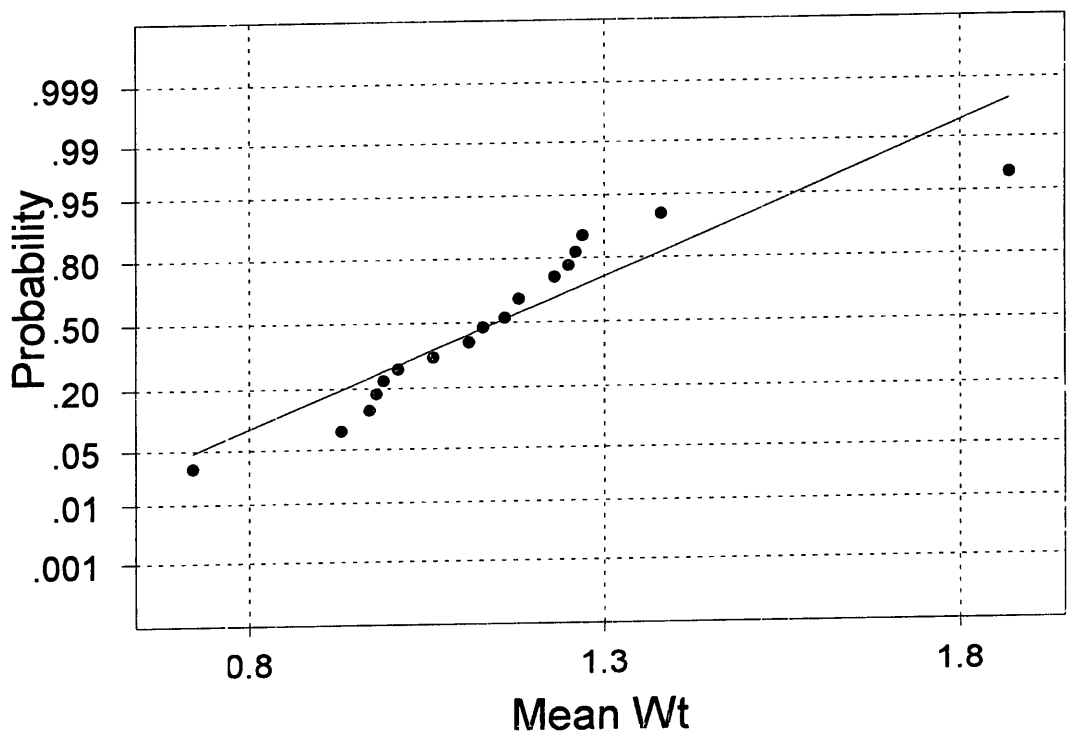
p value : 0.414

One-Way Analysis of Variance

```
Analysis of Variance on LogWt.
Source      DF        SS        MS        F        p
TrtCode      2    0.0027    0.0013     0.13    0.880
Error       12    0.1246    0.0104
Total       14    0.1273
                                   Individual 95% CIs For Mean
                                   Based on Pooled StDev
 Level       N      Mean     StDev  ----------+---------+---------+------
     1       5    0.0669    0.0840       (-------------*-------------)
     5       5    0.0447    0.1492    (-------------*-------------)
     6       5    0.0350    0.0427   (-------------*-------------)
                                   ----------+---------+---------+------
Pooled StDev =    0.1019                   0.000     0.070     0.140

Dunnett's intervals for treatment mean minus control mean

    Family error rate = 0.0500
Individual error rate = 0.0278

Critical value = 2.50

Control = level 1 of TrtCode

 Level     Lower    Center     Upper -----+---------+---------+---------+------
     5   -0.1833   -0.0222    0.1389   (-------------------*-------------------)
     6   -0.1930   -0.0319    0.1292  (-------------------*-------------------)
                                     -----+---------+---------+---------+------
                                       -0.160    -0.080     0.000     0.080
```

M

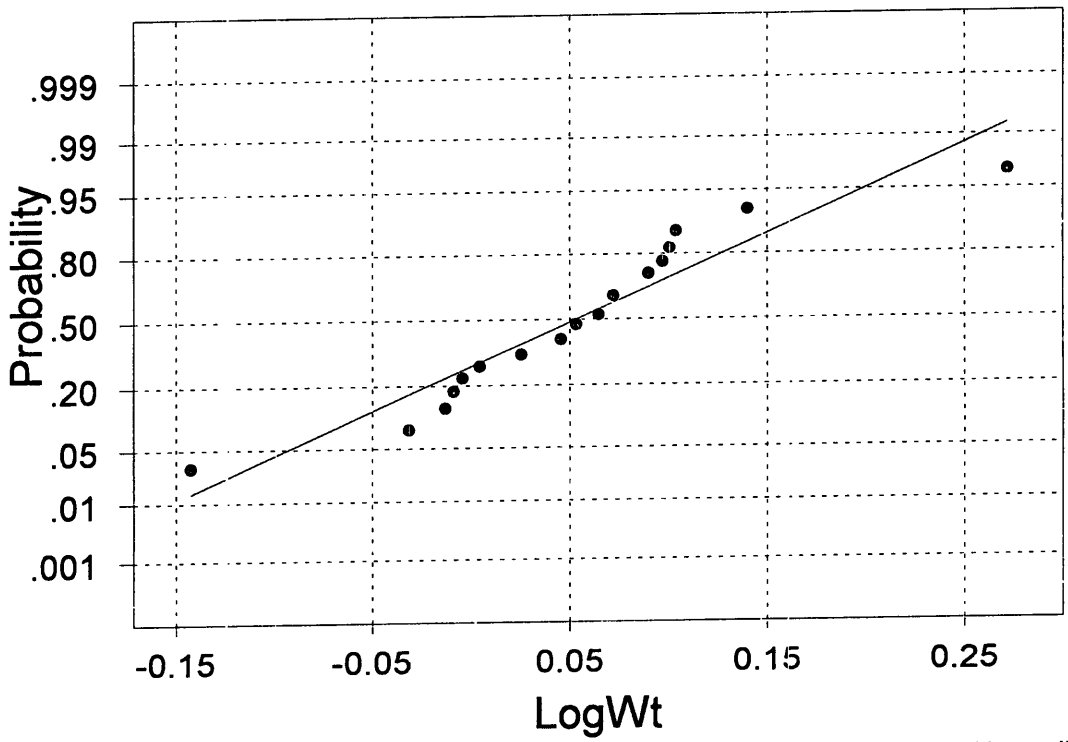
SHEEPSHEAD WEIGHT DAY 8 (STATIONS)



Average: 1.1485
Std Dev: 0.225768
N of data: 20

W-test for Normality
R: 0.9186
p value (approx): < 0.0100

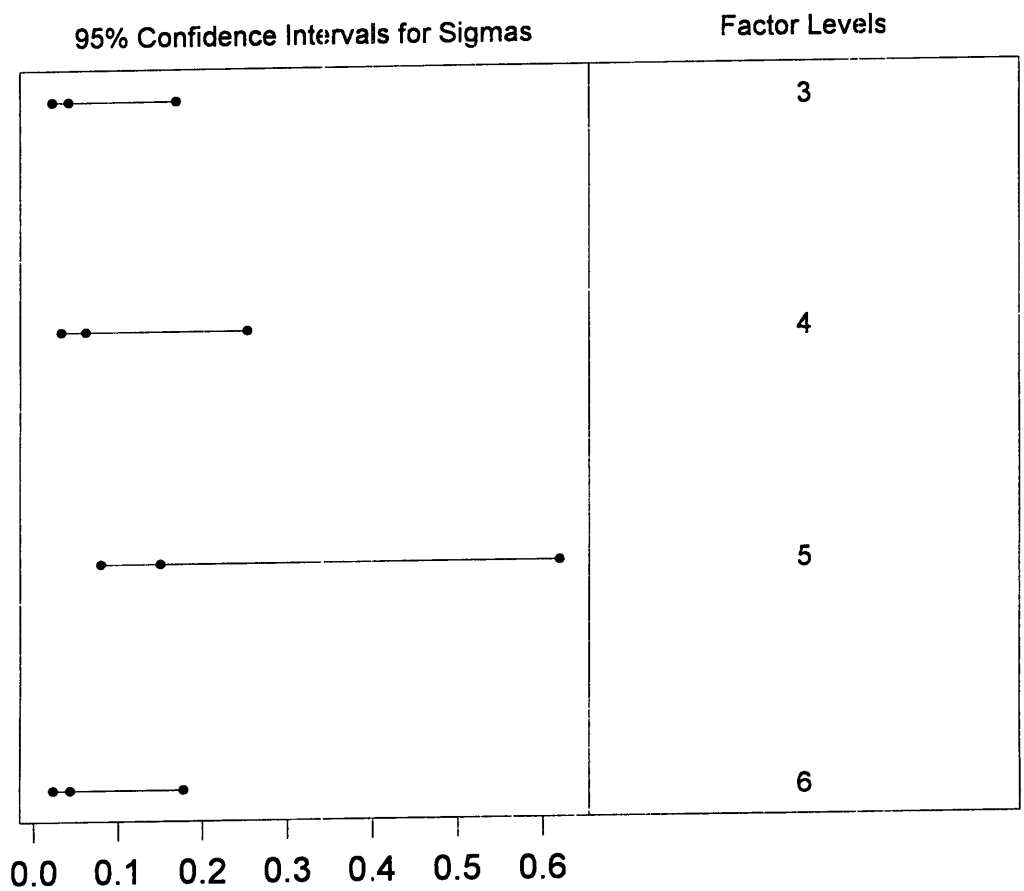
SHEEPSHEAD WEIGHT DAY 8 (STATIONS)



Average: 0.0527807
Std Dev: 0.0810883
N of data: 20

W-test for Normality
R: 0.9502
p value (approx): 0.0498

SHEEPSHEAD WEIGHT DAY 8 (STATIONS)



Bartlett's Test

Test Statistic: 8.988

p value : 0.029

Levene's Test

Test Statistic: 1.225

p value : 0.333

One-Way Analysis of Variance

Analysis of Variance on LogWt

Source	DF	SS	MS	F	p
TrtCode	3	0.00725	0.00242	0.33	0.805
Error	16	0.11769	0.00736		
Total	19	0.12493			

Level	N	Mean	StDev
3	5	0.08485	0.04043
4	5	0.04666	0.06075
5	5	0.04465	0.14925
6	5	0.03497	0.04269

Pooled StDev = 0.08576

```
Individual 95% CIs For Mean
Based on Pooled StDev
--------+---------+---------+--------
        (------------*-------------)
  (-------------*------------)
  (------------*-------------)
(-------------*------------)
--------+---------+---------+--------
      0.000     0.060     0.120
```

Tukey's pairwise comparisons

Family error rate = 0.0500
Individual error rate = 0.0113

Critical value = 4.05

Intervals for (column level mean) - (row level mean)

	3	4	5
4	-0.11715 0.19353		
5	-0.11514 0.19553	-0.15333 0.15734	
6	-0.10546 0.20521	-0.14365 0.16702	-0.14565 0.16502

MTB >

CBI BASELINE INFO - FRESHWATER CHRONIC TESTS FORM STF211-AMB

TEST ORGANISMS

Species: P. promelas Source: ~~CBI~~ CC

Hatch/Release Date(s) & Time(s): 10/18/00 1200 to 1330 Arrival Date (non-CBI source): 10/18/00

Acclimation Water: Type SFW Hardness 81 Temperature Range (C) 25-26

Feeding Prior to Test: Artemia 2X /day Not fed ____ Other ____

TEST DESIGN

Chamber Size: 1000 ml ✓ 300 ml ____ Other ____ Test Volume: 750 ml ____ 200 ml ____ Other 500 ml

Initial No. Organisms per Replicate: 10 No. Replicates: 4 Photoperiod: 16 L: 8 D Randomization Template No. 3

Feeding During Test: Artemia 2X /day Other: ____

TEST SET UP

Set-up Date: 10/18/00 Time Water Added 1550 Time Animals Added 1600 Set-up By (Initials) MH / GB

INSTRUMENTATION

Stem Thermometer No. C1

____ YSI DO Meter # 1 (SNE8014475

✓ YSI DO Meter # 2 (SN91A026329)

____ SP PortapH2 Meter (852360)

____ Corning 240 pH Meter (SN5268)

✓ CP Digisense pH Meter (D9500563)

✓ Sartorius R160P Balance (40020093)

____ YSI SCT 33 Meter (H8016792)

✓ Horiba Conductivity Meter

NOTES: Station 4-1, 4-3, 3-1, 3-2 not tested due to salinity of porewater. Because C. dubia expected to be more sensitive to salinity effects (based on EPA NaCl tolerance data NOEL for C. dubia ≈ 1‰, P. promelas 2‰) only C. dubia tested w/ lower salinity samples (4-1, 4-3) per MAR instructions. PBL.

As Quality Assurance Officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: ____

P. Blasco 12/19/00

Signature Date

CBI TEST ID: VIMS0003 CPP

DAILY WATER QUALITY File:ETF012-AMB CBI TEST ID: VFM5003 CPP

Parameter	Treatment	Day: 0	Day: 1	Day: 1	Day: 2	Day: 2	Day: 3	Day: 3	Day: 4	Day: 4	Day: 5	Day: 5
TEMPERATURE (C)	C	24.1	24.2	24.3	24.5	25.5	24.9	24.5	25.1	24.4	24.8	24.9
	1	24.3	24.4	24.4	24.4	25.1	24.8	24.3	25.1	24.5	24.8	25.3
	2	24.3	24.2	24.4	24.4	25.2	24.7	24.4	25.1	24.7	24.7	25.3
	3	24.4	24.2	24.6	24.3	25.1	24.9	24.2	25.1	25.0	24.7	25.1
	4	24.6	24.1	24.4	24.3	24.7	24.9	24.3	25.1	25.5	24.7	24.7
	5											
	6											
	7											
CONDUCTIVITY (uS/cm)	C	285	285	288	283 ~~289~~ MH	285	260	280	275	279	278	277
	1	265	251	247	251	248	248	270	264	278	271	270
	2	225	232	230	234	226	230	266	259	277	271	271
	3	219	222	220	225	214	221	244	239	260	250	247
	4	213	217	216	220	213	216	233	228	246	237	234
	5											
	6											
	7											
REPL. NO:		1	2	4	3	1	3	2	4	1	3	4
INITIALS:		GA	MH	GA	MH	MH	MH	MH	SMD	GA	MH	MH

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal

DAILY WATER QUALITY File:ETF012-AMB

CBI TEST ID: VIMS0003 CPP

Parameter	Treatment	Day: 6	Day: 6	Day: 7	Day: 7	Day: 8	Day: 8	Day:	Day:	Day:	Day:	Day:
TEMPERATURE (C)	C	24.6	24.4	24.2	24.9	24.6						
	1	24.7	24.5	24.3	24.8	24.9						
	2	24.5	24.5	24.3	24.8	25.1						
	3	24.5	24.5	24.3	24.9	25.1						
	4	24.7	24.7	24.3	25.1	25.0						
	5											
	6											
	7											
CONDUCTIVITY (uS/cm)	C	278	271	282	283	285						
	1	280	281	286	276	282						
	2	282	269	281	268	277						
	3	263	254	247	252	260						
	4	254	240	251	237	244						
	5											
	6											
	7											
REPL. NO:		1	3	3	2	2						
INITIALS:		MH	MH	GA	MH	GA						

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal

DAILY WATER QUALITY File:ETF012-AMB CBI TEST ID: VIm50U3 CPP

Parameter	Treatment	Day: 0	Day: 1	Day: 1	Day: 2	Day: 2	Day: 3	Day: 3	Day: 4	Day: 4	Day: 5	Day: 5
pH	C	7.79	7.76	7.73	7.61	7.67	7.43	7.57	7.48	7.82	7.67	7.69
	1	7.82	7.81	7.82	7.69	7.77	7.42	7.69	7.56	7.85	7.63	7.84
	2	7.91	7.80	8.16	7.68	7.91	7.53	7.67	7.48	7.93	7.67	7.68
	3	8.13	7.82	8.20	7.74	7.98	7.53	7.54	7.41	7.84	7.68	7.74
	4	7.75	7.69	7.65	7.64	7.58	7.52	7.77	7.58	7.93	7.63	8.05
	5											
	6											
	7											
DISSOLVED OXYGEN (mg/l)	C	8.2	8.0	8.1	8.0	8.2	7.7	7.9	7.7	8.1	7.7	8.2
	1	8.2	8.0	8.1	8.0	8.2	7.6	7.8	7.7	8.2	7.6	8.2
	2	8.2	7.9	8.1	8.0	8.2	7.6	7.9	7.8	8.2	7.6	8.0
	3	8.2	8.0	8.1	7.9	8.2	7.7	8.0	8.0	8.2	7.5	8.0
	4	8.2	8.0	8.1	7.9	8.2	7.7	8.1	8.0	8.1	7.5	8.1
	5											
	6											
	7											
REPL. NO:		1	2	4	3	1	4	2	4	1	3	4
INITIALS:		GD	MH	GD	MH	MH	MH	MH	SMD	GD	MH	MH

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal.

DAILY WATER QUALITY File:ETF013-AMB

CBI TEST ID: VIMS0003 CAP

Parameter	Treatment	Day: 4	Day: 6	Day: 7	Day: 7	Day: 8	Day: 9	Day:	Day:	Day:	Day:	Day:
pH	C	7.53	7.71	7.66	7.67	7.55						
	1	7.54	7.78	7.68	7.94	7.57						
	2	7.58	7.84	7.72	7.80	7.54						
	3	7.54	7.74	7.70	7.77	7.53						
	4	7.59	7.68	7.65	7.67	7.49						
	5											
	6											
	7											
DISS OXYGEN (mg/l)	C	7.5	8.1	8.1	8.1	7.9						
	1	7.4	8.0	8.1	8.0	7.8						
	2	7.4	8.0	8.1	8.1	7.6						
	3	7.3	7.9	8.0	8.1	8.0						
	4	[illegible]	8.0	7.9	8.1	7.9						
	5											
	6											
	7											
REPL. NO:		1	3	2	2	2						
INITIALS:		MH	MH	CB	MH	CB						

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal.

SURVIVAL - 8-DAY AMBIENT TEST File:ETF002-AMB CBI TEST ID: VTMSDD03 CPP

Treatment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Avg. % Live
S&W control	1	10	10	10	10	10	10	10	10	98
	2	10	10	10	10	10	10	10	10	
L	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	9	9	
	5									
i-1	1	10	10	9	9	9	9	MH ~~10~~ 9	9	98
	2	10	10	10	10	10	10	10	10	
	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
1	5									
i-B	1	10	10	10	10	10	10	10	10	100
	2	10	10	10	10	10	10	10	10	
	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
2	5									
DATE:		10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	
TIME:		1145	1145	~~10~~ 1932	1310	1045	1225	1235	0915	
INITIALS:		CB	MH	MH	CB	MH	MH	MH	MH	

NOTES

SURVIVAL - 8-DAY AMBIENT TEST File:ETF002-AMB CBI TEST ID: VIMSDA3 CPP

Treatment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Avg. % Live
2-1 [3]	1	10	10	10	10	10	10	10	10	98
	2	10	10	10	10	9	9	9	9	
	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
	5									
2-2 [4]	1	10	10	~~9~~ 10	10	10	10	10	10	100
	2	10	10	10	10	10	10	10	10	
	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
	5									
	1	~~10~~								
	2									
	3									
	4									
	5									
DATE:		10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	
TIME:		1145	1145	1530	1310	1045	1225	~~MH~~ 1235	0915	
INITIALS:		GM	MH	MH	GM	MH	MH	MH	MH	

NOTES

ORGANISM DRY WEIGHT (mg) File:ESTF008-AMB CBI TEST ID: YIMS 0003 CPP

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
C	1	1	12.54	5.50	7.04	0.70	3 (2-1)	1	16	14.88	6.28	8.60	0.86
	2	2	13.25	5.20	8.05	0.81		2	17	14.40	7.48	6.92 (9)	0.77
	3	3	10.30	4.86	5.44	0.54		3	18	14.22	7.07	7.15	0.72
	4	4	12.27	5.96	6.31 (9)	0.70		4	19	13.38	6.70	6.68	0.67
	5	~~5~~		~~4.89~~ ①				5	~~20~~		~~7.31~~		
1 (1-1)	1	6	12.16	4.99	7.17 (9)	0.80	4 (2-2)	1	21	14.50	6.78	7.72	0.77
	2	7	12.89	5.41	7.48	0.75		2	22	14.44	6.25	8.19	0.82
	3	8	13.25	4.95	8.30	0.83		3	23	13.44	6.03	7.41	0.74
	4	9	13.77	5.51	8.26	0.83		4	24	12.46	6.10	6.86	0.69
	5	~~10~~		~~5.59~~				5	~~25~~		~~5.81~~		
2 (1-8)	1	11	13.18	4.86	8.32	0.83		1					
	2	12	13.30	6.11	7.19	0.72		2					
	3	13	14.90	5.65	9.25	0.93		3					
	4	14	16.64	6.92	9.72	0.97		4					
	5	~~15~~		~~7.45~~				5					

NOTES:

TARE WT.: DATE 10/25/00 INITIALS: MH CALIB. (CLASS S 10 MG): 9.99

TOTAL WT.: DATE 10/30/00 INITIALS: [illegible] CALIB. (CLASS S 10 MG): 10.00

NOTES: ① MADE TOO MANY PANS

CBI BASELINE INFO - FRESHWATER CHRONIC TESTS FORM STF211-AMB

TEST ORGANISMS

Species: C. Dubia Source: CBI

Hatch/Release Date(s) & Time(s): 10/17/00 1630 to 2100 Arrival Date (non-CBI source): NA

Acclimation Water: Type SEW Hardness 93 Temperature Range (C) 24.2-25.3

Feeding Prior to Test: ~~Artemia~~ Selenastrum + YCT 1X /day Not fed ____ Other ____

TEST DESIGN

Chamber Size: 1000 ml ____ 300 ml ____ Other 30 ml Test Volume: 750 ml ____ 200 ml ____ Other 15 ml

Initial No. Organisms per Replicate: 1 No. Replicates: 10 Photoperiod: 16 L: 8 D Randomization Template No. 3

Feeding During Test: ~~Artemia~~ Selenastrum 1X /day Other: ____

TEST SET UP

Set-up Date: 10/18/00 Time Water Added 1400 Time Animals Added 1415 Set-up By (Initials) CB

INSTRUMENTATION

Stem Thermometer No. C-1

____ YSI DO Meter # 1 (SNE8014475

✓ YSI DO Meter # 2 (SN91A026329)

____ SP PortapH2 Meter (852360)

____ Corning 240 pH Meter (SN5268)

✓ CP Digisense pH Meter (D9500563)

____ Sartorius R160P Balance (40020093)

____ YSI SCT 33 Meter (H8016792)

✓ Horiba Conductivity Meter

NOTES:

Also tested 4-1 + 4-2 samples using 1.6‰ artificial seawater as control. Samples 3-1, 3-2 not tested per MHR instructions (too saline) - PPP.

As Quality Assurance Officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: ____

P Blasco 12/19/00

Signature Date

CBI TEST ID: VIMS000 CCO

DAILY WATER QUALITY File:ETF012-AMB CBI TEST ID: VIMS003 CCD-SFW Group

Parameter	Treatment	Day: 0	Day: 1	Day: 1	Day: 2	Day: 2	Day: 3	Day: 3	Day: 4	Day: 4	Day: 5	Day: 5
TEMPERATURE (C)	C	24.3	24.1	24.3	24.3	24.3	24.5	24.7	24.8	24.8	24.0	24.3
	1	24.4	24.5	24.5	24.4	24.4	24.6	24.6	24.9	24.9	24.1	24.1
	2	24.5	24.6	24.8	24.4	24.5	24.6	24.5	25.0	24.9	24.3	24.1
	3	24.3	24.7	24.1	24.6	24.6	24.6	24.4	24.9	24.9	24.1	24.3
	4	24.3	24.5	24.3	24.6	24.6	24.7	24.3	25.0	25.0	24.3	24.3
	5											
	6											
	7											
CONDUCTIVITY (uS/cm)	C	284	282	275	271	276	279	272	270	275	264	273
	1	248	245	242	265	246	253	270	269	270	273	267
	2	230	225	225	233	227	231	271	268	269	270	270
	3	219	215	216	223	218	220	247	249	248	249	247
	4	213	211	212	217	213	215	235	234	233	235	233
	5											
	6											
	7											
REPL. NO:		1	5	5	7	7	1	1	8	8	3	3
INITIALS:		LB	LB	GB	LB	LB	PD	PD	LB	GB	LB	GB

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal

DAILY WATER QUALITY File:ETF012-AMB

CBI TEST ID: VIMS0003 CSD SPW Group

Parameter	Treatment	Day: 6	Day: 6	Day: 7	Day: 7	Day: 8	Day:	Day:	Day:	Day:	Day:	Day:
TEMPERATURE (C)	C	24.5	24.4	24.2	24.5	25.2						
	1	24.4	24.4	24.6	24.6	25.2						
	2	24.3	24.4	24.7	24.7	25.1						
	3	24.3	24.5	24.6	24.7	25.1						
	4	24.5	24.6	24.7	24.8	25.1						
	5											
	6											
	7											
CONDUCTIVITY (uS/cm)	C	282	276	271	275	273						
	1	270	271	271	271	269						
	2	272	259	258	258	260						
	3	250	244	242	240	242						
	4	235	231	232	230	231						
	5											
	6											
	7											
REPL. NO:		3	3	10	10	8						
INITIALS:		GM	GM	GM	GM	GM						

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal

DAILY WATER QUALITY File:ETF012-AMB CBI TEST ID: VJm500 CCO [illegible]

Parameter	Treatment	Day: 0	Day: 1	Day: 1	Day: 2	Day: 2	Day: 3	Day: 3	Day: 4	Day: 4	Day: 5	Day: 5
pH	C	7.75	7.97	7.83	7.79	7.68	7.83	7.69	7.86	7.91	7.86	7.85
	1	7.83	7.92	7.88	7.35	7.78	7.86	7.77	7.83	7.91	7.82	7.91
	2	7.96	7.91	8.21	7.68	8.04	7.87	7.73	7.83	7.94	7.86	8.07
	3	8.18	7.89	8.24	7.74	8.07	7.87	7.71	7.61	7.92	7.79	7.79
	4	7.72	7.85	7.69	7.78	7.69	7.85	7.78	7.81	8.03	7.82	8.16
	5											
	6											
	7											
DISS OXYGEN (mg/l)	C	8.2	8.1	8.1	8.0	8.1	8.0	8.2	8.1	8.2	8.1	8.2
	1	8.2	8.1	8.2	2.9	8.1	8.0	8.1	8.0	8.1	8.0	8.2
	2	8.2	8.0	8.2	8.0	8.1	8.0	8.2	8.0	8.1	7.9	8.1
	3	8.2	8.0	8.2	8.0	8.1	7.9	8.2	7.9	8.2	8.0	8.1
	4	8.2	8.0	8.2	8.0	8.1	8.0	8.2	8.1	8.1	7.9	8.1
	5											
	6											
	7											
REPL. NO:		1	5	5	7	7	1	1	8	8	3	3
INITIALS:		GA	GA	GB	GB	GB	PD	PD	GA	GB	GB	GB

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal.

DAILY WATER QUALITY File:ETF013-AMB

CBI TEST ID: VFMS0003 CCO SFW GROUP

Parameter	Treatment	Day: 6	Day: 6	Day: 7	Day: 7	Day: 8	Day:	Day:	Day:	Day:	Day:	Day:
PH	C	8.08	7.97	8.04	7.85	8.00						
	1	8.12	8.13	8.10	8.11	8.03						
	2	8.14	8.11	8.09	8.06	8.06						
	3	8.05	7.92	8.06	7.97	7.98						
	4	8.00	7.85	8.00	7.90	7.92						
	5											
	6											
	7											
DISS OXYGEN (mg/l)	C	8.1	8.1	8.1	8.2	8.1						
	1	8.0	8.1	8.0	8.2	8.0						
	2	8.1	8.0	8.0	8.2	8.1						
	3	8.0	8.1	8.1	8.1	8.0						
	4	7.9	8.1	8.0	8.1	8.0						
	5											
	6											
	7											
REPL. NO:		3	3	10	10	8						
INITIALS:		GA	GA	GA	GA	GA						

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal.

CERIODAPHNIA REPRODUCTION (FORM ETF060-AMB)

Treatment I.D.	Rep. #	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
SFW Control	1	0	0	4	7	0	14	16	0
	2	0	0	0	5	9	1	14	12
	3	0	0	6	0	9	16	12	0
	4	0	0	4	7	0	14	18	14
	5	0	0	5	0	8	10	14	0
	6	0	0	6	0	7	12	14	0
	7	0	0	6	3	0	14	12	0
	8	0	0	6	9	0	14	16	0
	9	0	0	3	0	7	16	16	0
	10	0	0	4	0	3	18	14	0
1-1 [1]	1	0	0	4	6	0	12	18	12
	2	0	0	4	8	0	8	12	8
	3	0	0	6	0	8	12	14	0
	4	0	0	5	0	0	14	16	14
	5	0	0	4	0	6	10	14	0
	6	0	0	2	0	4	12	14	0
	7	0	0	6	3	0	14	16	16
	8	0	0	6	8	0	16	12	12
	9	0	0	6	4	0	18	18	0
	10	0	0	0	0	3	4	0	8
1-B [2]	1	0	0	4	12	0	12	14	0
	2	0	0	4	8	0	14	18	12
	3	0	0	4	2	8	14	12	0
	4	0	0	6	9	0	16	16	14
	5	0	0	4	0	8	12	14	0
	6	0	0	6	3	10	14	12	0
	7	0	0	6	7	0	12	18	13
	8	0	0	4	6	0	14	16	0
	9	0	0	6	6	0	16	14	0
	10	0	0	4	4	0	14	14	0
2-1 [3]	1	0	0	4	8	0	12	16	15
	2	0	0	6	7	0	14	14	12
	3	0	0	2	0	9	14	13	0
	4	0	0	2	8	0	10	18	17
	5	0	0	5	0	7	12	15	0
	6	0	0	6	0	6	14	12	0
	7	0	0	6	6	0	14	14	11
	8	0	0	4	7	0	16	17	0
	9	0	0	6	6	0	12	14	0
	10	0	0	6	0	0	10	12	0
2-2 [4]	1	0	0	6	6	0	12	16	0
	2	0	0	4	8	0	12	10	17
	3	0	0	6	0	5	10	12	0
	4	0	0	3	9	0	8	13	13
	5	0	0	5	0	7	16	14	0
	6	0	0	6	0	7	8	10	0
	7	0	0	3	7	0	16	19	0
	8	0	0	5	0	0	10	18	13
	9	0	0	4	7	0	12	15	0
	10	0	0	2	0	0	12	8	0
Initials:		GB	GB	GD	GD	GB	GB	GD	GB
Time:		1045	1400	1600	1400	NA	1055	1410	1320

Note: D = dead;

VTM50003 CCO

DAILY WATER QUALITY File:ETF012-AMB

CBI TEST ID: VIMSOPR3 1.6‰ LCO

Parameter	Treatment	Day: 0	Day: 1	Day: 1	Day: 2	Day: 2	Day: 3	Day: 3	Day: 4	Day: 4	Day: 5	Day: 5
TEMPERATURE (C)	C	24.2	24.8	24.9	24.7	24.8	24.6	24.7	24.5	24.2	24.2	24.2
	1	24.3	24.9	24.9	24.9	24.7	24.6	24.7	24.3	24.4	24.3	24.3
	2	24.5	24.9	24.9	24.9	25.0	24.7	24.6	24.4	24.5	24.5	24.2
	3											
	4											
	5											
	6											
	7											
CONDUCTIVITY (uS/cm)	C	2780	2680	2840	2850	2710	2830	2910	2770	2650	2640	2700
	1	2530	2540	2500	2510	2520	2530	2410	2360	2030	2070	2060
	2	3300	3300	3410	3400	3500	3360	2030	2040	2310	2330	2350
	3											
	4											
	5											
	6											
	7											
REPL. NO:		1	5	5	7	7	1	1	8	8	3	3
INITIALS:		GM	GB	GB	GM	GM	PD	PD	GM	GB	GB	GM

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal

DAILY WATER QUALITY File:ETF012-AMB

CBI TEST ID: VTm50D03 1.69 CCD

Parameter	Treatment	Day: 6	Day: 6	Day: 7	Day: 7	Day: 8	Day:	Day:	Day:	Day:	Day:	Day:
TEMPERATURE (C)	C	24.3	24.1	24.2	24.5	25.0						
	1	24.1	24.2	24.4	24.4	25.0						
	2	24.3	24.3	24.5	24.6	25.0						
	3											
	4											
	5											
	6											
	7											
CONDUCTIVITY (uS/cm)	C	2560	2670	2600	2620	2530						
	1	2080	3730	3800	4000	3820						
	2	2590	5640	5870	6100	5840						
	3											
	4											
	5											
	6											
	7											
REPL. NO:		3	3	10	10	8						
INITIALS:		LM	LM	LM	LM	LM						

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal

DAILY WATER QUALITY File:ETF013-AMB

CBI TEST ID: VJm50D03 1.6% CCB

Parameter	Treatment	Day: 0	Day: 1	Day: 1	Day: 2	Day: 2	Day: 3	Day: 3	Day: 4	Day: 4	Day: 5	Day: 5
pH	C	7.76	7.92	7.83	7.78	7.79	7.76	7.74	7.82	7.78	7.82	7.85
	1	7.64	7.91	7.84	7.83	7.78	7.79	7.77	7.75	7.91	7.83	7.90
	2	7.60	7.86	7.78	7.74	7.71	7.71	7.78	7.72	7.90	7.80	7.78
	3											
	4											
	5											
	6											
	7											
DISS OXYGEN (mg/l)	C	8.2	8.0	8.1	8.0	8.1	8.0	8.2	8.1	8.2	8.1	8.1
	1	8.2	8.0	8.1	8.0	8.1	8.0	8.1	8.0	8.2	8.0	8.2
	2	8.2	7.9	8.1	8.0	8.1	8.0	8.2	8.0	8.2	8.0	8.1
	3											
	4											
	5											
	6											
	7											
REPL. NO:		1	5	5	7	7	1	1	8	8	3	3
INITIALS:		GM	GM	GM	GM	GM	PD	PD	GM	GM	GM	GM

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal.

DAILY WATER QUALITY File:ETF013-AMB

CBI TEST ID: VIMS0003 CCD

Parameter	Treatment	Day: 6	Day: 6	Day: 7	Day: 7	Day: 8	Day:	Day:	Day:	Day:	Day:	Day:
pH	C	7.96	7.91	7.92	7.91	7.83						
	1	7.91	7.75	7.88	7.84	7.70						
	2	7.93	7.82	7.89	7.84	7.77						
	3											
	4											
	5											
	6											
	7											
DISS OXYGEN (mg/l)	C	8.1	8.2	8.1	8.2	8.1						
	1	8.0	8.1	8.0	8.2	8.0						
	2	8.0	8.1	8.0	8.2	8.0						
	3											
	4											
	5											
	6											
	7											
REPL. NO:		3	3	10	10	8						
INITIALS:		GB	GB	GB	GB	GB						

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal.

CERIODAPHNIA REPRODUCTION (FORM ETF060-AMB)

Treatment I.D.	Rep. #	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
1.6 GB	1	0	0	4	7	0	14	16	0
	2	0	0	3	6	0	12	12	0
~~1.2~~ 1.0	3	0	0	4	0	8	12	13	0
HWM	4	0	0	4	7	0	16	8	0
control	5	0	0	6	0	6	12	16	6
	6	0	0	2	0	6	12	12	0
HC	7	0	0	6	0	5	14	15	0
	8	0	0	4	0	8	12	17	0
1.6‰	9	0	0	6	0	3	12	13	0
	10	0	0	2	0	3	10	6	0
	1	0	0	0	8	0	18	13	0
	2	0	0	4	9	0	10	17	0
	3	0	0	4	0	5	14	16	0
4-1	4	0	0	6	7	0	12	12	12
	5	0	0	4	0	8	10	12	0
	6	0	0	4	0	5	16	11	0
	7	0	0	6	7	0	10	16	0
1	8	0	0	4	0	9	12	15	0
	9	0	0	3	3	0	16	15	0
	10	0	0	3	0	4	10	8	0
	1	0	0	0	6	0	10	9	0
	2	0	0	0	3	9	0	10	0
	3	0	0	3	0	4	11	0	0
4-3	4	0	0	4	5	0	14	12	0
	5	0	0	6	0	6	14	0	0
	6	0	0	6	0	0	0	0	0
	7	0	0	4	4	0	10	9	0
2	8	0	0	4	3	0	12	9	2
	9	0	0	2	4	0	12	7	1
	10	0	0	4	0	5	8	7	0
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	Initials:	GB	GB	ID	GB	GB	GB	GB	GB
	Time:	1015	1420	1530	1420	1150	1145	1445	1400

Note: D = dead;

VIMS003 CCD - 1.6% HWM

CBI BASELINE INFO - SALTWATER CHRONIC TESTS FORM STF210-AMB

TEST ORGANISMS

Species: C. variegatus Source: CBI

Hatch/Release Date(s) & Time(s): 10/17/00 1700 to 10/18/00 1200 Arrival Date (non-CBI source): NA

Acclimation Water: Type HWM Salinity 20 Temperature Range (C) 25-26

Feeding Prior to Test: Artemia 2X /day Not fed ____ Other ____

TEST DESIGN

Chamber Size: 1000 ml ✓ 300 ml ____ Other ____ Test Volume: 750 ml ✓ 200 ml ____ Other ____

Initial No. Organisms per Replicate: 10 No. Replicates: 5 Photoperiod: 16 L: 8 D Randomization Template No. 3

Feeding During Test: Artemia 2X /day Other: ____

TEST SET UP

Set-up Date: 10/18/00 Time Water Added 1730 Time Animals Added 1750 Set-up By (Initials) PD/KB

INSTRUMENTATION

Stem Thermometer No. C1

____ YSI DO Meter # 1 (SNE8014475

✓ YSI DO Meter # 2 (SN91A026329)

____ SP PortapH2 Meter (852360)

____ Corning 240 pH Meter (SN5268)

✓ CP Digisense pH Meter (D9500563)

✓ Sartorius R160P Balance (40020093)

____ YSI SCT 33 Meter (H8016792)

✓ Spartan ATC Refractometer (A366)

NOTES: ____

As Quality Assurance Officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: ____

P. Blanco — Signature

12/19/00 — Date

CBI TEST ID: VFM500 CCV

DAILY WATER QUALITY File:ETF013-AMB

CBI TEST ID: VIM50003 CCV

Parameter	Treatment	Day: 0	Day: 1	Day: 2	Day: 3	Day: ~~4~~3	Day: 4	Day: 5	Day: 6	Day: 6	Day: 7	Day: 8
TEMPERATURE (C)	C	25.8	24.6	24.4	24.3	24.7	24.6	24.3	24.2	24.5	24.6	24.7
	1	25.9	24.8	24.5	24.2	24.9	24.7	24.3	24.4	24.6	24.2	24.8
	2	25.8	24.8	24.5	24.4	24.7	24.8	24.3	24.4	24.6	24.7	24.6
	3	25.7	24.9	24.6	24.5	25.0	24.7	24.2	24.0	24.4	24.8	24.6
	4	25.9	24.9	24.7	24.5	24.8	24.8	24.4	24.4	24.7	24.2	24.9
	5	25.7	24.8	24.7	24.2	24.9	24.9	24.5	24.6	25.0	24.9	24.9
	6	25.6	24.7	24.8	24.3	24.9	24.9	24.5	24.6	25.0	24.8	24.8
	7											
SALINITY (g/kg)	C	20	20	20	20	20	20	20	20	20	20	20
	1	1.2	1.2	1.2	1.3	1.9	2.0	2.1	1.4	1.2	2.2	1.0
	2	4.3	4.3	4.3	4.3	SMD 3.0	CA 3.1	3.1	5.3 ~~2.3~~ MH	3.5	4.7	3.6
	3	3.1	3.2	3.5	7.0	6.1	6.1	5.9	5.0	3.5	7.2	4.0
	4	4.8	4.6	5.0	8.2	8.1	8.1	7.4	5.1	5.0	5.1	5.8
	5	1.2	1.4	1.6	2.0	2.5	2.6	2.9	2.3	3.0	3.1	2.7
	6	2.1	2.1	2.1	2.2	3.1	3.1	3.1	2.0	3.1	3.6	3.1
	7											
REPL. NO:		1	1	3	1	2	3	2	1	3	3	1
INITIALS:		CA	MLT	MLT	MH	SMD	CA	CA	MH	MH	CA	MH

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal

DAILY WATER QUALITY File:ETF013-AMB

CBI TEST ID: VIMS0003 SCV

Parameter	Treatment	Day: 0	Day: 1	Day: 2	Day: 3	Day: 3	Day: 4	Day: 5	Day: 6	Day: 6	Day: 7	Day: 8
pH	C	7.72	7.65	7.47	7.39	7.56	7.41	7.30	7.27	7.78	7.47	7.44
	1	7.87	7.92	7.70	7.45	7.48	7.39	7.52	7.37	7.84	7.66	7.43
	2	7.70	7.69	7.76	7.44	7.66	7.44	7.44	7.34	7.76	7.38	7.37
	3	7.44	7.78	7.77	7.37	7.69	7.53	7.43	7.40	7.71	7.34	7.32
	4	7.61	7.78	7.69	7.49	7.78	7.56	7.41	7.34	7.77	7.49	7.28
	5	7.61	7.86	7.75	7.35	7.73	7.51	7.53	7.18	7.74	7.61	7.46
	6	7.62	7.73	7.80	7.44	7.72	7.48	7.48	7.36	7.79	7.55	7.44
	7											
DISS OXYGEN (mg/l)	C	7.3	7.2	6.9	6.5	7.2	7.0	6.8	5.8	7.2	6.8	6.1
	1	8.1	8.0	7.3	6.8	7.6	7.1	7.2	6.4	7.8	8.0	6.7
	2	8.1	7.9	7.4	6.9	7.1	7.1	7.1	6.6	8.0	7.7	6.7
	3	8.0	8.0	7.5	6.9	7.7	7.0	6.9	6.6	7.9	7.7	6.4
	4	8.0	8.0	7.6	7.0	7.8	7.2	6.8	6.4	7.9	7.4	6.0
	5	8.0	8.0	7.5	7.0	7.9	7.2	6.7	6.4	8.0	7.5	6.3
	6	7.9	8.0	7.5	7.0	7.8	7.1	6.7	7.0	7.9	7.5	6.6
	7											
REPL. NO:		1	4	1	2	2	3	1	1	2	4	1
INITIALS:		GB	MH	PD	MH	MH	GB	GB	MH	MH	GB	MH

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal.

SURVIVAL - 8-DAY AMBIENT TEST File:ETF002-AMB CBI TEST ID: VI MS DD CCV

Treatment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Avg. % Live
2.5‰ HWM	1	10	10	10	10	10	10	10	10	100
	2	10	10	10	10	10	10	10	10	
C	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
	5	10	10	10	10	10	10	10	10	
1.25‰ HWM	1	10	10	10	10	10	10	10	10	100
	2	10	10	10	10	10	10	10	10	
1	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
	5	10	10	10	10	10	10	10	10	
4.39‰ HWM	1	10	10	10	10	10	10	10	10	100
	2	10	10	10	10	10	10	10	10	
2	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
	5	10	10	10	10	10	10	10	10	
DATE:		10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	
TIME:		1245	1545	1351	1520	1000	1037	1147	1200	
INITIALS:		MH	MH	MH	GB	MH	MH	MH	GB	

NOTES

SURVIVAL - 8-DAY AMBIENT TEST File:ETF002-AMB CBI TEST ID: VIMSOD03 CCV

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Avg. % Live
3-1 [3]	1	10	10	10	10	10	MH ~~9~~ 10	10	10	98
	2	10	10	10	10	10	10	10	10	
	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
	5	10	10	10	10	10	10	10	9	
3-2 [4]	1	10	10	10	10	10	10	10	10	96
	2	10	10	10	10	10	10	10	10	
	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	9	
	5	10	10	10	10	10	9	9	9	
4-1 [5]	1	10	10	10	10	10	10	10	10	82
	2	10	10	10	10	10	10	10	10	
	3	10	10	9	9	1	1	1	1	
	4	10	10	10	10	10	10	10	10	
	5	10	10	10	10	10	10	10	10	
DATE:		10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	
TIME:		1245	1545	1351	1526	1000	1038	1145	1200	
INITIALS:		MH	MH	MH	GM	MH	MH	MH	GB	

NOTES

SURVIVAL - 8-DAY AMBIENT TEST File:ETF002-AMB CBI TEST ID: VIM30U03 CCV

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Avg. % Live
4-3	1	10	10	10	10	9	9	9	9	
	2	10	10	9	9	9	9	9	9	
6	3	10	10	10	10	10	10	10	10	78
	4	10	10	10	10	10	10	10	10	
	5	10	10	10	10	1	1	1	1	
	1	10								
	2									
	3									
	4									
	5									
	1									
	2									
	3									
	4									
	5									
DATE:		10/19	10/20	10/21	1520	10/23	10/24	10/25	10/26	
TIME:		1245	1545	1351	10/22	1000	1038	1145	1200	
INITIALS:		MH	MH	MH	GB	MH	MH	MH	GB	

NOTES

ORGANISM DRY WEIGHT (mg) File:ESTF008-AMB CBI TEST ID: VIMSOD CCV

Treatment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treatment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
C	1	26	19.47	6.14	13.33	1.33	3 (3-1)	1	41	19.17	5.34	13.83	1.38
	2	27	18.31	5.49	12.82	1.28		2	42	18.23	5.50	12.73	1.27
	3	28	20.83	6.22	14.61	1.46		3	43	16.94	4.69	12.25	1.23
	4	29	18.73	5.63	13.10	1.31		4	44	15.31	4.26	11.05	1.11
	5	30	18.21	6.50	11.71	1.17		5	45	15.18	5.16	10.02 (9)	1.11
1 1.2‰	1	31	20.67	5.91	14.76	1.48	4 (3-2)	1	46	17.33	4.85	12.48	1.25
	2	32	19.94	6.47	13.47	1.35		2	47	17.10	4.47	12.63	1.26
	3	33	16.06	5.39	10.67	1.07		3	48	16.45	5.14	11.81	1.18
	4	34	17.53	6.40	11.13	1.11		4	49	13.34	4.93	8.41 (9)	0.93
	5	35	15.11	6.04	9.07	0.91		5	50	13.58	4.69	8.89 (9)	0.99
2 4.3‰	1	36	19.49	5.35	14.14	1.41	5 (4-1)	1	51	15.17	4.60	10.57	1.06
	2	37	20.27	5.47	14.80	1.48		2	52	17.11	5.52	11.59	1.16
	3	38	15.54	5.65	9.89	0.99		3	53	6.72	4.85	1.87 (1)	1.87
	4	39	16.76	5.04	11.72	1.17		4	54	15.07	4.97	10.10	1.01
	5	40	16.22	5.93	10.29	1.03		5	55	12.48	5.28	7.20	0.72

NOTES:

TARE WT.: DATE 10/25/00 INITIALS: MH CALIB. (CLASS S 10 MG): 9.99

TOTAL WT.: DATE 10/30/00 INITIALS: GM CALIB. (CLASS S 10 MG): 10.00

NOTES

ORGANISM DRY WEIGHT (mg) File:ESTF008-AMB CBI TEST ID: YIMS 0003 CCV

Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.	Treat-ment	Repl. No.	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
6 (4-5)	1	56	14.98	4.84	10.14(9)	1.13		1					
	2	57	15.91	5.33	10.58(9)	1.18		2					
	3	58	16.95	5.19	11.76	1.18		3					
	4	59	15.42	5.71	9.71	0.97		4					
	5	60	6.66	5.68	0.98(1)	0.98		5					
	1							1					
	2							2					
	3							3					
	4							4					
	5							5					
	1							1					
	2							2					
	3							3					
	4							4					
	5							5					

NOTES:

TARE WT.: DATE 10/25/00 INITIALS: MH CALIB. (CLASS S 10 MG): 9.99

TOTAL WT.: DATE 10/30/00 INITIALS: GB CALIB. (CLASS S 10 MG): 10.00

NOTES

CBI BASELINE INFO - SALTWATER CHRONIC TESTS FORM STF210-AMB

TEST ORGANISMS

Species: M. bahia Source: CBI

Hatch/Release Date(s) & Time(s): 10/11/00 ~~to~~ Arrival Date (non-CBI source): NA

Acclimation Water: Type HWM Salinity 20 Temperature Range (C) 25-26

Feeding Prior to Test: Artemia 2x /day Not fed ____ Other ____

TEST DESIGN

Chamber Size: 1000 ml ✓ 300 ml ____ Other ____ Test Volume: 750 ml ✓ 200 ml ____ Other 500 ml

Initial No. Organisms per Replicate: 10 No. Replicates: 5 Photoperiod: 16 L: 8 D Randomization Template No. 6

Feeding During Test: Artemia 2x /day Other: ____

TEST SET UP

Set-up Date: 10/18/00 Time Water Added 1710 Time Animals Added 1715 Set-up By (Initials) MJB

INSTRUMENTATION

Stem Thermometer No. M1

____ YSI DO Meter # 1 (SNE8014475)
✓ YSI DO Meter # 2 (SN91A026329)

____ SP PortapH2 Meter (852360)
____ Corning 240 pH Meter (SN5268)
✓ CP Digisense pH Meter (D9500563)

✓ Sartorius R160P Balance (40020093)
____ YSI SCT 33 Meter (H8016792)
✓ Spartan ATC Refractometer (A366)

NOTES: ____

As Quality Assurance Officer for this test I certify that no significant deviations from accepted protocol occurred during routine inspections (unless otherwise noted below) and that the data accurately reflect the test as it was performed by CBI.

Comments: ____

P. Blanco
Signature

12/19/00
Date

CBI TEST ID: VIMS 0003 cmB

DAILY WATER QUALITY File:ETF013-AMB

CBI TEST ID: VIm50063 CMB

Parameter	Treatment	Day: 0	Day: 1	Day: 2	Day: 3	Day: 3	Day: 4	Day: 5	Day: 6	Day: 6	Day: 7	Day: 8
TEMPERATURE (C)	C	25.8	25.0	25.5	25.3	25.4	25.6	25.2	25.6	25.1	25.3	25.4
	1	25.9	25.0	~~2~~	—	~~25.4~~ MH	—	—	—	—	—	—
	2	25.8	25.0	25.6	25.2	25.4	25.6	25.4	25.5	25.1	25.4	25.2
	3	25.7	25.1	25.5	25.3	25.4	25.7	25.6	25.5	25.0	25.5	25.2
	4	25.9	25.1	25.5	25.3	25.5	25.8	25.5	25.7	25.2	25.5	25.3
	5	25.7	25.1	—	—	—	—	—	—	—	—	—
	6	25.6	25.0	—	—	—	—	—	—	—	—	—
	7											
SALINITY (g/kg)	C	20	20	20	20	20	20	20	20	20	20	20
	1	1.2	1.2	—	—	—	—	—	—	—	—	—
	2	4.3	4.3	4.3	4.3	4.8	4.8	5.2	5.0	4.8	5.0	4.7
	3	3.1	3.5	3.5	7.0	7.0	~~3~~ 7.0 GB	6.1	5.0	6.8	5.8	5.3
	4	4.8	5.0	5.0	8.2	8.2	7.1	7.2	5.3	9.0	9.1	6.2
	5	1.2	1.8	—	—	—	—	—	—	—	—	—
	6	2.1	2.2	—	—	—	—	—	—	—	—	—
	7											
REPL. NO:		4	5	3	1	2	3	2	1	3	3	2
INITIALS:		MH	MH	MH	MH	MH	GB	MH	MH	MH	GB	MH

NOTES

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal

DAILY WATER QUALITY Filc:ETF013-AMB CBI TEST ID: VIMSAD03 CMB

Parameter	Treatment	Day: 0	Day: 1	Day: 2	Day: 3	Day: 3	Day: 4	Day: 5	Day: 6	Day: 6	Day: 7	Day: 5
PH	C	7.72	7.64	7.45	7.36	7.68	7.44	7.37	7.22 ~~7.25~~ MH	7.80	7.49	7.36 ~~7.55~~
	1	7.87	7.71	—	—	—	—	—	—	—	—	—
	2	7.70	7.71	7.56	7.43	7.76	7.75	7.65	7.53 ~~7.39~~ MH	7.86	7.63	7.55 ~~7.63~~
	3	7.55	7.81	7.47	7.52	7.89	7.65	7.49	7.39 ~~7.33~~ MH	7.61	7.65	7.63 ~~7.48~~
	4	7.44	7.68	7.56	7.41	7.85	7.61	7.44	7.25	7.72	7.56	7.48
	5	7.61	7.73	—	—	—	—	—	—	—	—	—
	6	7.61	7.74	—	—	—	—	—	—	—	—	—
	7											
DISS OXYGEN (mg/l)	C	~~8.1~~ 7.3 ⑥	7.4	6.8	6.2	7.2	6.7	6.8	6.0	7.2	7.1	6.1
	1	8.1	8.0	—	—	—	—	—	—	—	—	
	2	8.2	8.0	7.4	6.6	8.0	7.9	7.8	6.2	8.1	7.7	6.9
	3	8.1	7.9	7.4	6.7	8.0	7.7	7.6	6.1	8.0	7.6	7.0
	4	8.1	7.9	7.6	6.6	7.9	7.5	7.4	6.2	8.0	7.8	6.9
	5	8.1	7.9	—	—	—	—	—	—	—	—	—
	6	8.1	7.9	—	—	—	—	—	—	—	—	—
	7											
REPL. NO:							3	2	1	3	3	2
INITIALS:		MH	MH	MH	MH	MH	GB	LB	MH	MH	CB	MH

NOTES

⑥ ASCT KNOG ON METER

**Renewal days: First column - data for measurements before renewal; Second column - data for measurements after renewal.

SURVIVAL - 8-DAY AMBIENT TEST File:ETF002-AMB CBI TEST ID: YMS0003 CMB

Treatment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Avg. % Live
0.25 control C	1	10	10	10	10	10	10	10	10	100
	2	10	10	10	10	10	10	10	10	
	3	10	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	10	
	5	10	10	10	10	10	10	10	10	
1.25 control 1	1	0	–	–	–	–	–	–	–	0
	2	0	–	–	–	–	–	–	–	
	3	0	–	–	–	–	–	–	–	
	4	0	–	–	–	–	–	–	–	
	5	0	–	–	–	–	–	–	–	
4.39 control 2	1	7	6	5	3	3	3	2	2	38
	2	5	4	3	2	2	2	2	2	
	3	8	7	7	~~6~~ 7	MH ~~4~~ 5	5	MH ~~0~~ ~~4~~ 5 MH	5	
	4	7	6	6	5	5	5	5	~~5~~ 4 MH	
	5	7	6	6	6	6	6	6	6	
DATE:		10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	
TIME:		1300	1530	1500	1530	1400	1135	1200	945	
INITIALS:		MH	MH	MH	CM	MH	MH	MH	MH	

NOTES

SURVIVAL - 8-DAY AMBIENT TEST File:ETF002-AMB CBI TEST ID: VIM50003 Cma

Treatment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Avg. % Live
3-1 [3]	1	2	2	1	1	1	1	1	1	6
	2	0	–	–	–	–	–	–	–	
	3	4	1	1	1	1	1	1	1	
	4	2	0	–	–	–	–	–	–	
	5	2	2	2	2	2	1	1	1	
3-2 [4]	1	10	10	10	10	10	9	9	9	84
	2	10	10	10	10	10	9	9	9	
	3	10	10	9	9	9	8	8	8	
	4	10	9	9	9	9	8	8	8	
	5	10	10	10	10	10	8	8	8	
4-1 [5]	1	0	–	–	–	–	–	–	–	0
	2	0	–	–	–	–	–	–	–	
	3	0	–	–	–	–	–	–	–	
	4	0	–	–	–	–	–	–	–	
	5	0	–	–	–	–	–	–	–	
DATE:		~~10/19/00 1300~~	10/20	10/21	10/22	10/23	10/24	10/25	10/26	
TIME:		1300	1530	1500	1530	1030	1135	1200	945	
INITIALS:		MH	MH	MH	GA	MH	MH	MH	MH	

NOTES

SURVIVAL - 8-DAY AMBIENT TEST File:ETF002-AMB CBI TEST ID: VIMS0003 CMB

Treat-ment	Repl. No.	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Avg. % Live
4-3 (6)	1	0								0
	2	0								
	3	0								
	4	0								
	5	0								
	1									
	2									
	3									
	4									
	5									
	1									
	2									
	3									
	4									
	5									
	DATE:									
	TIME:									
	INITIALS:									

NOTES

MYSID FECUNDITY AND DRY WEIGHT (mg) FORM ETF211-AMB

Treatment	Rep	♀ w/eggs	♀ no eggs	Males	Immatures	Pan No.	Total Wt.	Tare Wt.	Net Total	Mean Wt.
C	1	IIII		IIIIII		61	8.82	5.61	3.21	0.32
	2	III	II	IIII	I	62	8.38	5.54	2.84	0.28
	3	III	II	IIIII		63	7.54	4.90	2.64	0.26
	4	IIII	I	IIIII		64	8.39	5.47	2.92	0.29
	5	II	I	IIIIII	I	65	8.89	5.15	3.74	0.37
1	1					–				
	2					–				
	3					–				
1.2‰	4					–				
Sample I.D.	5					–				
2	1		I	I		66	4.70	4.29	0.41	0.21
	2			II		67	4.96	4.64	0.32	0.16
	3		I	I	III	68	5.86	4.84	1.02	0.20
4.3‰	4			I	III	69	5.99	5.20	0.79	0.20
Sample I.D.	5		II	I	III	70	5.53	4.31	1.22	0.20
3	1			I		71	4.74	4.46	0.28	0.28
	2					–		–		
	3			I		72	5.90	5.65	0.25	0.25
3-1	4					–		–		
Sample I.D.	5			I		73	5.05	4.76	0.29	0.29
4	1	III	I	IIIII		74	7.30	4.76	2.54	0.28
	2	IIII	I	IIII		75	8.76	5.99	2.77	0.31
	3	II	I	IIII	I	76	8.47	6.31	2.16	0.27
3-2	4	IIII		III	I	77	7.73	5.87	1.86	0.23
Sample I.D.	5	I	I	IIIIII		78	9.22	6.86	2.36	0.30
5	1					–				
	2					–				
	3					–				
4-1	4					–				
Sample I.D.	5					–				
6	1									
	2									
	3									
	4									
Sample I.D.	5									
7	1									
	2									
	3									
	4									
Sample I.D.	5									
8	1									
	2									
	3									
	4									
Sample I.D.	5									

NOTES:

SEXED BY: MH TARE WT.: DATE: 10/25 INITIALS: MH CALIB. (CLASS S 10 MG): 9.99

TOTAL WT: DATE: 1-/27 INITIALS: MH CALIB. (CLASS S 10 MG): 10.01

CRL TEST ID:

COASTAL BIOANALYSTS, INC. NPDES ACUTE REFERENCE TEST/*Ceriodaphnia dubia* (Form CDART)

Conc. (mg/l)	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival	Conc (mg/l)	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	5	5	95	560	3-1	5	2	25
	C-2	5	5			3-2	5	1	
	C-3	5	5			3-3	5	0	
	C-4	5	4			3-4	5	2	
274	1-1	5	5	100	800	4-1	1	0	0
	1-2	5	5			4-2	2	0	
	1-3	5	5			4-3	0	0	
	1-4	5	5			4-4	0	0	
392	2-1	5	5	100	1143	5-1	0	0	0
	2-2	5	5			5-2	0	0	
	2-3	5	5			5-3	0	0	
	2-4	5	5			5-4	1	0	
Observer:		CB	CB						
Time:		1610	1610						

		Day 0	Day 1	Day 2
TEMP	C	24.3	24.3	24.1
	1	24.4	24.4	24.1
	2	24.4	24.5	24.2
	3	24.4	24.5	24.2
	4	24.3	24.4	24.2
	5	24.4	24.6	24.2
pH	C	7.86	NA	7.80
	1	7.86		7.77
	2	7.86		7.80
	3	7.86		7.77
	4	7.87		7.83
	5	7.87		7.93
D.O. (mg/l)	C	~~7.8~~ 8.2		8.1
	1	8.2		8.1
	2	8.2		8.0
	3	8.2		8.1
	4	8.2		8.0
	5	8.2		8.0
COND (uS)	C	277		278
	1	745		690
	2	960		908
	3	1270		1226
	4	1660		1568
	5	2260		2150
Replicate # above meas.		1	3	4
Initials:		PD	CB	CB

Species: Ceriodaphnia dubia Source: CBI

Harvest date/time 10/17/00 1730 to 10/18/00 1200

Acclimation water: SFW Other:

Acclimation Temp. (range): 24.3 to 25.1

Feeding prior to test: YCT/Selenastrum 1x /d Other

Feeding during test: Not fed ☐ YCT/Selenastrum 2+ hr. prior

Chamber size: 30 ml ☒ 100 ml ☐ Other: ml

Test volume: 15 ml ☒ 25 ml ☐ Other: ml

Initial no. organisms per replicate: 5 No. replicates: 4

Photoperiod: 16L:8D ☒ Other: Randomization template no. 18

SET UP: Date 10/18/00 Time Water Added 1700

Time Animals Added 1710 Set Up By CB

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Horiba Conductivity Meter (511001)

Other

NOTES:

Dilution water hardness: 95 mg/l

Dilution water alkalinity: 60 mg/l

Toxicant stock: KCl Sigma "Ultra"

Prep. of highest conc: 572mg/500ml SFW

Balance Calibration: 100mg class S wt= mg

48-h LC50 513.0 mg/l

95% C.L. 478.6-549.9 mg/l

Calculation method SK

TEST I.D.: CDART

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 10/18/00 TEST NUMBER: CDART DURATION: 48 H
TOXICANT : KCL
SPECIES: C DUBIA

RAW DATA: ---	Concentration (PPM)	Number Exposed	Mortalities
	.00	20	1
	274.00	20	0
	392.00	20	0
	560.00	20	15
	800.00	20	20
	1143.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 513.00
95% LOWER CONFIDENCE: 478.58
95% UPPER CONFIDENCE: 549.90

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

COASTAL BIOANALYSTS, INC. NPDES ACUTE REFERENCE/*Pimephales promelas* (Form PPART)

Conc. (mg/l)	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
515	1-1	9	9	95
	1-2	10	10	
735	2-1	10	9	70
	2-2	7	5	
1050	3-1	5	2	25
	3-2	5	3	
1500	4-1	0	–	0
	4-2	0	–	
2143	5-1	0	–	6
	5-2	0	–	
Observer:		GD	SMD	
Time:		1540	1500	

		Day 0	Day 1	Day 2
TEMP	C	25.0	24.1	24.2
	1	25.0	24.3	24.2
	2	24.5	24.3	24.1
	3	24.6	24.2	24.1
	4	24.6	24.0	–
	5	24.7	24.1	–
pH	C	7.75	7.74	7.72
	1	7.80	7.73	7.77
	2	7.79	7.75	7.77
	3	7.79	7.76	7.76
	4	7.79	7.71	–
	5	7.77	7.74	–
D.O. (mg/l)	C	8.2	8.1	8.0
	1	8.2	8.0	8.0
	2	8.2	8.1	8.0
	3	8.2	8.1	8.0
	4	8.2	8.0	–
	5	8.2	7.9	–
COND (uS)	C	275	NA	284
	1	1080		1114
	2	1512		1530
	3	1892		1896
	4	2490	2420	–
	5	3830	3770	–
Replicate # above meas.		1	2	1
Initials:		MH	GD	SMD

Species: Pimephales promelas Source: CC

Hatch date/time: 10/18/00 1200 to 1330

Acclimation water: SFW Other:

Acclimation Temp. (range): 25.3 to 26.0

Feeding prior to test: *Artemia* 2X /d Other:

Feeding during test: Not fed ☒ Other:

Chamber size: 500 ml ☐ 1000 ml ☒ 8000 ml ☐ Other: ml

Test Volume: 250 ml ☐ 500 ml ☒ 4000 ml ☐ Other: ml

Initial no. animals per replicate 10 No. replicates 2

Photoperiod: 16L:8D ☒ Other: Randomization template no.: 1-6,2

SET UP: Date 10/19/00 Time Water Added 1345

Time Animals Added 1400 Set Up By MH

INSTRUMENTATION USED:

Stem Thermometer Number:

☐ YSI D.O. Meter # 1 (SNE8014475)
☒ CP Digisense pH Meter (D9500563)
☐ Sartorius R160P Balance (40020093)
☐ YSI SCT 33 Meter (H8016792)
☒ YSI D.O. Meter # 2 (SN91A026329)
☐ Corning 240 pH Meter (SN5268)
☐ SP PortapH2 Meter (852360)
☒ Horiba Conductivity Meter (511001)

Other

NOTES:

Dilution water hardness: 95 mg/l

Dilution water alkalinity: 60 mg/l

Toxicant stock: KCL Sigma "Ultra"

Prep. of highest conc: 64:30 mg/3L SFW

Balance calibration: 100 mg class S wt = 100.1

48-h LC50 954.6 mg/l

95% C.L. 763.8 - 956.1 mg/l

Calculation method TSIC

TEST I.D.: PPART

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 10/19/00 TEST NUMBER: PPARTCC DURATION: 48 H
TOXICANT : KCL
SPECIES: P PROMELAS

RAW DATA: --- ----	Concentration (PPM)	Number Exposed	Mortalities
	.00	20	0
	515.00	20	1
	735.00	20	6
	1050.00	20	15
	1500.00	20	20
	2143.00	20	20

SPEARMAN-KARBER TRIM: 5.00%

SPEARMAN-KARBER ESTIMATES: LC50: 854.57
95% LOWER CONFIDENCE: 763.81
95% UPPER CONFIDENCE: 956.11

COASTAL BIOANALYSTS, INC. NPDES ACUTE REFERENCE - *Mysidopsis bahia* (Form MBART)

Conc. (mg/l)	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
343	1-1	10	10	100
	1-2	10	10	
490	2-1	10	9	50
	2-2	5	1	
700	3-1	6	3	35
	3-2	8	4	
1000	4-1	0	0	0
	4-2	0	0	
1429	5-1	0	0	0
	5-2	0	0	
Observer:		1430	1400	
Time:		PP	MH	

		Day 0	Day 1	Day 2
TEMP	C	25.1	25.1	24.7
	1	25.1	25.0	24.7
	2	25.1	25.0	24.6
	3	25.2	25.0	24.7
	4	25.2	25.1	—
	5	25.2	25.1	—
pH	C	7.88	7.86	7.77
	1	7.88	7.81	7.79
	2	7.89	7.79	7.79
	3	7.88	7.76	7.74
	4	7.86	7.74	—
	5	7.88	7.76	—
D.O. (mg/l)	C	7.3	7.0	7.1
	1	7.3	7.1	7.1
	2	7.3	7.1	7.1
	3	7.3	7.2	7.0
	4	7.3	7.2	—
	5	7.3	7.2	—
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	20	20
	4	20	20	—
	5	21	20	—
Replicate # above meas.		1	2	1
Initials:		PD	PD	MH

Species: Mysidopsis bahia Source: CBI

Hatch Date/Time: 10/11/00

Acclimation water: HWM ASW ☑ Other: _____ Salinity: 20

Acclimation Temp. (range): 25 to 26

Feeding prior to test: Artemia 2X/d ✓ Other: _____

Feeding during test: Not fed ☐ Artemia 1X/d ✓ Other: _____

Chamber size: 300 ml ☐ 500 ml ☑ 1000 ml ☐ Other: _____ ml

Test volume: 200 ml ☐ 250 ml ☒ 500 ml ☐ Other: _____ ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☑ Other: _____ Randomization template no. 6

SET UP: Date 10/18/00 Time Water Added 1300

Time Animals Added 1330 Set Up By PD

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☐ YSI D.O. Meter # 1 (SNE8014475)
- ☑ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☑ YSI D.O. Meter # 2 (SN91A026329)
- ☐ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☑ Spartan ATC Refractometer (A366)

Other _____

NOTES: _____

Toxicant stock: KCl Sigma "Ultra"

Prep. of highest conc: 2860 mg/2L HWM

Balance Calibration: 100 mg class S wt = 100.1 mg

48-h LC50: 555.2 mg/l

95% C.L. 497.2-619.8 mg/l

Calculation method TSK

TEST I.D.: mBART

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 101800 TEST NUMBER: MBART DURATION: 48 H
TOXICANT : KCL
SPECIES: M BAHIA

RAW DATA: ---	Concentration (PPM)	Number Exposed	Mortalities
	.00	20	0
	343.00	20	0
	490.00	20	10
	700.00	20	13
	1000.00	20	20
	1429.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 555.15
95% LOWER CONFIDENCE: 497.21
95% UPPER CONFIDENCE: 619.84

COASTAL BIOANALYSTS, INC. NPDES ACUTE REFERENCE - *Cyprinodon variegatus* (Form CVART)

Conc. (mg/l)	I.D.	Day 1 # Live	Day 2 # Live	Final % Survival
Control	C-1	10	10	100
	C-2	10	10	
432	1-1	10	10	100
	1-2	10	10	
720	2-1	10	10	95
	2-2	10	9	
1200	3-1	8	6	45
	3-2	4	3	
2000	4-1	2	1	10
	4-2	1	1	
3333	5-1	0	0	0
	5-2	0	0	
Observer:		PD	PD	
Time:		1100	1122	

		Day 0	Day 1	Day 2
TEMP	C	25.1	24.6	24.1
	1	25.1	24.6	24.1
	2	25.1	24.6	24.2
	3	25.2	24.7	24.1
	4	25.1	24.7	24.3
	5	25.1	24.6	—
pH	C	7.89	7.88	7.86
	1	7.88	7.86	7.85
	2	7.88	7.85	7.83
	3	7.88	7.89	7.81
	4	7.86	7.77	7.82
	5	7.85	7.76	—
D.O. (mg/l)	C	7.3	7.1	7.0
	1	7.3	7.1	7.1
	2	7.3	7.2	7.1
	3	7.3	7.1	7.1
	4	7.3	7.1	7.2
	5	7.3	7.2	—
SALIN (g/kg)	C	20	20	20
	1	20	20	20
	2	20	20	20
	3	20	21	20
	4	21	21	21
	5	22	22	—
Replicate # above meas.		1	2	1
Initials:		PD/MH	PD	PD

NOTES:

Species: Cyprinodon variegatus Source: CBI

Hatch Date/Time: 10/17/00 1800 - 10/18/00 1200

Acclimation water: HWM ASW ☒ Other: Salinity: 20

Acclimation Temp. (range): 25 to 26

Feeding prior to test: Artemia 2X /d Other:

Feeding during test: Not fed ☒ Artemia /d Other:

Chamber size: 300 ml ☐ 500 ml ☐ 1000 ml ☒ Other: ml

Test volume: 200 ml ☐ 250 ml ☐ 500 ml ☒ Other: ml

Initial no. organisms per replicate: 10 No. replicates: 2

Photoperiod: 16L:8D ☒ Other: Randomization template no. 6

SET UP: Date 10/23/00 Time Water Added 1200

Time Animals Added 1300 Set Up By PD/MH

INSTRUMENTATION USED:

Stem Thermometer Number: A1

- ☒ YSI D.O. Meter # 1 (SNE8014475)
- ☒ CP Digisense pH Meter (D9500563)
- ☐ Sartorius R160P Balance (40020093)
- ☐ YSI SCT 33 Meter (H8016792)
- ☒ YSI D.O. Meter # 2 (SN91A026329)
- ☒ Corning 240 pH Meter (SN5268)
- ☐ SP PortapH2 Meter (852360)
- ☒ Spartan ATC Refractometer (A366)

Other

Toxicant stock: KCl Sigma "Ultra"

Prep. of highest conc: 10g/3L HWM

Balance Calibration: 100 mg class S wt = mg

48-h LC50: ~~1194.44~~ 1200 mg/l

95% C.L. 1041.4 - 1382.7 mg/l

Calculation method

TEST I.D.: CVART

TRIMMED SPEARMAN-KARBER METHOD. VERSION 1.5

DATE: 102300 TEST NUMBER: CVART DURATION: 48 H
TOXICANT : KCL
SPECIES: C VARIEGATUS

RAW DATA:	Concentration (PPM)	Number Exposed	Mortalities
	.00	20	0
	432.00	20	0
	720.00	20	1
	1200.00	20	11
	2000.00	20	18
	3333.00	20	20

SPEARMAN-KARBER TRIM: .00%

SPEARMAN-KARBER ESTIMATES: LC50: 1199.99
95% LOWER CONFIDENCE: 1041.41
95% UPPER CONFIDENCE: 1382.73

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date	101700	102000	102300				
Temp. (°C)	1.6	5.5	1.9				
Conduct. (uMHOS)	265	263	303				
Salinity (g/kg)	NA	NA	NA				
pH	8.46	8.45	8.69				
Diss. Oxygen (mg/l)	12.4	12.6	11.4				
Tot. Chlorine (mg/l)	ND	ND.	ND				
NH3-N (mg/l)	<1.0	<1.0	<1.0				
Hard (mg/l CaCO3)	83	112	102				
Alkln (mg/l CaCO3)	62	64	57				
Color/Appearance[1]	CY	CY	CY				
Initials/Date	GB 10/18	10/20 PD	GB 10/24				

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								~~ACUTE~~
Sample Date	101700	101700	101700	102000	102000	102000	102300	102300
Temp. (°C)	24.3	25.1	25.7	24.6	25.6	25.9	24.4	25.8
Salinity (g/kg)	NA	NA	NA	NA	NA	NA	NA	NA
D.O. (mg/l)	9.3	9.1	10.2	9.6	8.9	10.7	9.0	9.0
Aeration Rate	mod	mod	mod	MOD	mod	MOD	MOD	mod
Aeration Time (min)	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0
Adjust. D.O. (mg/l)	8.2	8.2	8.1	8.2	8.1	8.2	8.1	8.1
pH	7.82	7.91	7.83	7.80	7.88	8.05	8.26	8.28
Tot Chlorine (mg/l)	ND	ND	ND	ND	ND	ND	ND	ND
Initials/Date	GB 10/18	GB 10/19	GB 10/20	MH 10/21	GB 10/22	MH 10/23	MH GB 10/24	GB 10/25

DILUTION WATER CHARACTERISTICS: SFW: ✓ HWM:								~~ACUTE~~
Temp. (°C)	24.1	24.2	24.3	24.5	25.0	24.0	24.3	24.3
Conduct. (uMHOS)	285	277	278	277	285	275	273	269
Salinity (g/kg)	NA	NA	NA	NA	NA	NA	NA	NA
pH	7.79	7.96	7.98	7.95	8.07	8.07	8.02	8.01
Diss. Oxygen (mg/l)	8.2	8.1	8.2	8.2	8.2	8.2	8.2	8.2
Hard (mg/l CaCO3)	93	100	100	100	100	98	98	98
Alkln (mg/l CaCO3)	57	63	63	63	63	58	58	58
Initials/Date	GB 10/18	GB 10/19	GB 10/20	PD 10/21	GB 10/22	GB 10/23	GB 10/24	GB 10/25

SAMPLE ID: 25m5074.29 TEST ID: VIm5060 03

1-1

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date	101700	102000	102300				
Temp. (°C)	1.9	4.2	2.2				
Conduct. (uMHOS)	225	269	246				
Salinity (g/kg)	NA	NA	NA				
pH	8.80	7.98	8.59				
Diss. Oxygen (mg/l)	11.9	12.2	11.9				
Tot. Chlorine (mg/l)	ND	N.D.	ND				
NH3-N (mg/l)	<1.0	<1.0	<1.0				
Hard (mg/l CaCO3)	108	109	110				
Alkln (mg/l CaCO3)	58	61	65				
Color/Appearance[1]	CY	CY	CY				
Initials/Date	GB 10/18	PD 10/20	GB 10/24				

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								~~ACUTE~~
Sample Date	101700	101700	101700	102000	102000	102000	102300	102300
Temp. (°C)	24.1	25.3	25.6	24.7	25.4	25.5	24.3	25.1
Salinity (g/kg)	NA	NA	NA	NA	NA	NA	NA	NA
D.O. (mg/l)	9.1	9.6	10.4	9.7	9.0	10.2	9.0	9.1
Aeration Rate	mod	mod	mod	mod	mod	mod	mod	mod
Aeration Time (min)	1.0	1.0	2.5	2.0	1.5	1.0	1.0	1.0
Adjust. D.O. (mg/l)	8.2	8.2	8.2	8.2	8.2	8.2	8.1	8.1
pH	7.91	8.31	8.16	7.67	8.02	8.24	8.11	8.15
Tot Chlorine (mg/l)	ND	ND	ND	ND	ND	ND	ND	ND
Initials/Date	GB 10/18	GB 10/19	GB 10/20	MH 10/21	GB 10/22	MH 10/23	GB 10/24	GB 10/25

DILUTION WATER CHARACTERISTICS: SFW: ✓ HWM:								~~ACUTE~~
Temp. (°C)	24.1	24.3	24.3	24.5	25.0	24.0	24.3	24.3
Conduct. (uMHOS)	285	277	278	277	285	275	273	269
Salinity (g/kg)	NA	NA	NA	NA	NA	NA	NA	NA
pH	7.79	7.96	7.98	7.95	8.07	8.07	8.02	8.01
Diss. Oxygen (mg/l)	8.2	8.1	8.2	8.2	8.2	8.2	8.2	8.2
Hard (mg/l CaCO3)	93	100	100	100	100	98	98	98
Alkln (mg/l CaCO3)	57	63	63	63	63	58	58	58
Initials/Date	GB 10/18	GB 10/19	GB 10/20	PD 10/21	GB 10/22	GB 10/23	GB 10/24	GB 10/25

SAMPLE ID: 2JMS074.08 (2) 1-B TEST ID: VJMS0003

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date	101700	102000	102300				
Temp. (°C)	1.9	6.1	2.4				
Conduct. (uMHOS)	222	259	234				
Salinity (g/kg)	NA	NA	NA				
pH	8.91	7.92	7.85				
Diss. Oxygen (mg/l)	12.7	12.6	11.8				
Tot. Chlorine (mg/l)	ND	N.D	ND				
NH3-N (mg/l)	<1.0	<1.0	<1.0				
Hard (mg/l CaCO3)	89	106	80				
Alkln (mg/l CaCO3)	54	54	68				
Color/Appearance[1]	CY	CY	CY				
Initials/Date	GB 10/18	PD 10/20	GB 10/24				

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								~~ACUTE~~
Sample Date	101700	101700	101700	102000	102000	102000	102300	102300
Temp. (°C)	24.4	25.2	25.6	24.6	25.3	24.3	25.5	25.9
Salinity (g/kg)	NA	NA	NA	NA	NA	NA	NA	NA
D.O. (mg/l)	9.9	9.7	9.5	9.6	10.1	9.9	9.4	9.5
Aeration Rate	mod	mod	mod	mod	mod	mod	mod	mod
Aeration Time (min)	1.5	1.5	1.5	1.5	2.0	2.0	1.5	1.5
Adjust. D.O. (mg/l)	8.2	8.2	8.1	8.2	8.2	8.2	8.2	8.2
pH	8.13	8.36	8.22	8.07	7.92	7.79	7.98	8.01
Tot Chlorine (mg/l)	ND	ND	ND	ND	ND	ND	ND	ND
Initials/Date	GB 10/18	GB 10/19	GB 10/20	MH 10/21	GB 10/22	MH 10/23	GB 10/24	GB 10/25

DILUTION WATER CHARACTERISTICS: SFW: ✓ HWM:								~~ACUTE~~
Temp. (°C)	24.1	24.3	24.3	24.5	25.0	24.0	24.3	24.3
Conduct. (uMHOS)	285	277	278	277	285	275	273	269
Salinity (g/kg)	NA	NA	NA	NA	NA	NA	NA	NA
pH	7.79	7.96	7.98	7.95	8.07	8.07	8.02	8.01
Diss. Oxygen (mg/l)	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
Hard (mg/l CaCO3)	93	100	100	100	100	98	98	98
Alkln (mg/l CaCO3)	57	63	63	63	63	58	58	58
Initials/Date	GB 10/18	GB 10/19	GB 10/20	PD 10/21	GB 10/22	GB 10/23	GB 10/24	GB 10/25

SAMPLE ID: 2JM5068.68 TEST ID: VIMS0003

2-1

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date	101700	102000	102316				
Temp. (°C)	1.9	9.0	2.6				
Conduct. (uMHOS)	213	237	229				
Salinity (g/kg)	NA	NA	NA				
pH	7.65	8.54	7.67				
Diss. Oxygen (mg/l)	12.9	12.4	11.9				
Tot. Chlorine (mg/l)	ND	N.D.	ND				
NH3-N (mg/l)	2.3	<1.0	3.4				
Hard (mg/l CaCO3)	91	96	108				
Alkln (mg/l CaCO3)	55	54	60				
Color/Appearance[1]	CY	CY	CY				
Initials/Date	GB 10/18	PD 10/20	GB 10/21				

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								~~ACUTE~~
Sample Date	101700	101700	101700	102000	102000	102000	102300	102300
Temp. (°C)	24.6	25.1	25.7	24.5	24.7	24.2	25.6	25.8
Salinity (g/kg)	NA	NA	NA	NA	NA	NA	NA	NA
D.O. (mg/l)	8.7	10.2	9.9	9.8	9.3	9.9	9.3	9.5
Aeration Rate	mod	mod	mod	MOD	mod	MOD	mod	mod
Aeration Time (min)	0.5	2.0	2.0	2.0	1.5	1.5	1.0	1.0
Adjust. D.O. (mg/l)	8.2	8.2	8.2	8.2	8.1	8.2	8.2	8.2
pH	7.75	~~8.37~~ 7.68	7.72	7.75	8.11	8.35	7.81	7.91
Tot Chlorine (mg/l)	ND	ND	NA	NA	ND	ND	ND	ND
Initials/Date	GB 10/18	GB 10/19	GB 10/20	MH 10/21	GB 10/22	MH 10/23	GB 10/24	GB 10/25

DILUTION WATER CHARACTERISTICS: SFW: ✓ HWM:								~~ACUTE~~
Temp. (°C)	24.1	24.2	24.3	24.5	25.1	24.0	24.3	24.3
Conduct. (uMHOS)	285	272	278	277	285	275	273	269
Salinity (g/kg)	NA	NA	NA	NA	NA	NA	NA	NA
pH	7.79	7.96	7.98	7.95	8.07	8.07	8.02	8.01
Diss. Oxygen (mg/l)	8.2	8.1	8.2	8.2	8.2	8.2	8.2	8.2
Hard (mg/l CaCO3)	93	100	100	100	100	98	98	98
Alkln (mg/l CaCO3)	57	63	63	63	63	58	58	58
Initials/Date	GB 10/18	GB 10/19	GB 10/20	PD 10/21	GB 10/22	GB 10/23	GB 10/24	GB 10/25

SAMPLE ID: 2Jm5065.81 TEST ID: VFm9603

2-2

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date	101700	102000	102300				
Temp. (°C)	1.8	3.8	3.2				
Conduct. (uMHOS)	2450	2060	3710				
Salinity (g/kg)	1.2	1.1	3.2				
pH	7.64	8.30	7.69				
Diss. Oxygen (mg/l)	12.0	12.6	12.2				
Tot. Chlorine (mg/l)	ND	ND.	ND				
NH3-N (mg/l)	<1.0	<1.0	<1.0				
Hard (mg/l CaCO3)	540	304	560				
Alkln (mg/l CaCO3)	54	48	68				
Color/Appearance[1]	CY	CY	CY				
Initials/Date	GB 10/18	PD 10/20	GB 10/21				

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								~~ACUTE~~
Sample Date	101700	101700	101700	102000	102000	102000	102300	102300
Temp. (°C)	25.7	25.2	25.4	24.5	24.8	25.1	25.1	25.4
Salinity (g/kg)	ND	ND	ND	ND	ND	ND	ND	ND
D.O. (mg/l)	9.4	9.3	8.9	9.6	8.9	8.9	9.1	8.9
Aeration Rate	mod	mod	mod	mod	mod	mod	mod	mod
Aeration Time (min)	1.5	1.5	1.5	1.5	0.5	0.5	0.5	0.5
Adjust. D.O. (mg/l)	8.2	8.2	8.1	8.2	8.2	8.2	8.2	8.2
pH	7.61	7.87	7.73	7.93	7.77	7.78	7.74	7.84
Tot Chlorine (mg/l)	ND	ND	ND	ND	ND	ND	ND	ND
Initials/Date	GB 10/18	GB 10/19	GB 10/20	MH 10/21	GB 10/22	GB 10/23	GB 10/24	GB 10/25

DILUTION WATER CHARACTERISTICS: SFW: ✓ + HWM: ✓ @ ~~1.2~~ 1.6‰								~~ACUTE~~
Temp. (°C)	25.3	25.1	24.6	25.0	25.0	24.0	24.5	24.8
Conduct. (uMHOS)	2760	2840	2780	2750	2850	2700	2600	2610
Salinity (g/kg)	~~ND~~ 1.1	ND	ND	ND*	ND	ND	ND	ND
pH	7.81	7.84	7.81	7.91	8.02	7.90	8.01	7.88
Diss. Oxygen (mg/l)	8.1	8.1	8.1	8.1	8.2	8.1	8.1	8.1
Hard (mg/l CaCO3)	441	441	441	470	470	470	470	470
Alkln (mg/l CaCO3)	60	60	60	57	57	57	57	57
Initials/Date	GB 10/18	GB 10/19	GB 10/20	GB 10/21	GB 10/22	GB 10/23	GB 10/24	GB 10/25

*1.6

SAMPLE ID: 2JM5047.81 TEST ID: VJM50003 CCD

4-1

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date	101700	102000	102300				
Temp. (°C)	1.7	3.4	2.2				
Conduct. (uMHOS)	3320	2400	5800				
Salinity (g/kg)	~~1.2~~ 1.6	2.0	5.3				
pH	7.73	8.24	7.97				
Diss. Oxygen (mg/l)	11.5	12.2	12.3				
Tot. Chlorine (mg/l)	<ND	N.D.	ND				
NH3-N (mg/l)	<1.0	<1.0	<1.0				
Hard (mg/l CaCO3)	640	382	620				
Alkln (mg/l CaCO3)	58	53	69				
Color/Appearance[1]	CY	CY	CY				
Initials/Date	GB 10/18	PD 10/20	GB 10/21				

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								~~ACUTE~~
Sample Date	101700	101700	101700	10/20/00	102000	102000	102300	102300
Temp. (°C)	25.6	24.3	25.2	24.3	25.1	25.3	25.1	25.3
Salinity (g/kg)	ND	ND	ND	ND	ND	ND	ND	ND
D.O. (mg/l)	8.9	8.9	9.2	9.7	9.5	8.9	9.3	9.2
Aeration Rate	mod	mod	mod	mod	mod	mod	mod	mod
Aeration Time (min)	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0
Adjust. D.O. (mg/l)	8.1	8.1	8.1	8.2	8.2	8.1	8.2	8.2
pH	7.79	7.80	7.78	7.90	7.89	7.76	7.82	7.87
Tot Chlorine (mg/l)	ND	ND	ND	ND	ND	ND	ND	ND
Initials/Date	GB 10/20	GB 10/19	GB 10/20	MH 10/21	GB 10/22	GB 10/23	GB 10/24	GB 10/25

DILUTION WATER CHARACTERISTICS: SFW: ✓ + HWM: ✓ @ 1.6‰								~~ACUTE~~
Temp. (°C)	25.3	25.1	24.6	25.0	25.0	24.0	24.5	24.8
Conduct. (uMHOS)	2760	2840	2780	2750	2850	2700	2600	2600
Salinity (g/kg)	~~ND~~ 1.6	ND	ND	ND*	ND	ND	ND	ND
pH	7.81	7.84	7.81	7.80	8.02	7.90	8.01	7.88
Diss. Oxygen (mg/l)	8.1	8.1	8.1	8.1	8.2	8.1	8.1	8.1
Hard (mg/l CaCO3)	441	441	441	470	470	470	470	470
Alkln (mg/l CaCO3)	60	60	60	57	57	57	57	57
Initials/Date	GB 10/19	GB 10/19	GB 10/20	GB 10/21	GB 10/22	GB 10/23	GB 10/24	GB 10/25

*1.6

SAMPLE ID: 2Jm5047.33 TEST ID: Vrm500 CCD

4-3

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date	101700	102000	102300				
Temp. (°C)	2.1	1.6	1.8				
Conduct. (uMHOS)	NA	NA	NA				
Salinity (g/kg)	3.1	PD ~~3.4~~ 7.0	4.1				
pH	7.57	7.99	7.36				
Diss. Oxygen (mg/l)	12.8	12.3	11.9				
Tot. Chlorine (mg/l)	ND	N.D.	ND				
NH3-N (mg/l)	<1.0	<1.0	<1.0				
Hard (mg/l CaCO3)	1250	729	920				
Alkln (mg/l CaCO3)	61	49	63				
Color/Appearance[1]	C	C, Y(S)	C				
Initials/Date	GB 10/18	PD 10/20	GB 10/24				

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								ACUTE
Sample Date	101700	102000	102300					
Temp. (°C)	25.7	26.0	25.6					
Salinity (g/kg)	3.1	~~3.4~~ 7.0	4.1					
D.O. (mg/l)	9.6	9.3	9.1					
Aeration Rate	mod	mod	mod					
Aeration Time (min)	1.5	2	1.0					
Adjust. D.O. (mg/l)	8.1	8.1	8.1					
pH	7.55	7.88	7.74					
Tot Chlorine (mg/l)	ND	ND	ND					
Initials/Date	GB 10/18	PD 10/21	GB 10/24					

DILUTION WATER CHARACTERISTICS: SFW: ✓ HWM:								ACUTE
Temp. (°C)	25.8	25.8	25.6	25.1	25.5	25.3		
Conduct. (uMHOS)	NA	NA	NA	NA	NA	NA		
Salinity (g/kg)	20	4.3	20	4.8	20	4.5		
pH	7.72	7.70	7.76	7.91	7.64	7.88		
Diss. Oxygen (mg/l)	~~8~~ 7.3	8.2	7.4	8.1	7.4	8.1		
Hard (mg/l CaCO3)	NA	NA	NA	NA	NA	NA		
Alkln (mg/l CaCO3)	NA	NA	NA	NA	NA	NA		
Initials/Date	GB 10/18	GB ~~10/20~~ 10/18	MH 10/21	MH 10/21	MH 10/24	MH 10/24		

SAMPLE ID: 25M5042.46 TEST ID: VIM50W03 LCV: CMB

3-1

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:								
Sample Date	101700	102000	102300					
Temp. (°C)	2.2	3.2	1.9					
Conduct. (uMHOS)	NA	NA	NA					
Salinity (g/kg)	54.8	~~3.9~~ PO 8.2	9.0					
pH	7.46	7.93	7.81					
Diss. Oxygen (mg/l)	11.8	12.3	11.8					
Tot. Chlorine (mg/l)	ND	N.D.	ND					
NH3-N (mg/l)	<1.0	5.3	<1.0					
Hard (mg/l CaCO3)	860	850	1540					
Alkln (mg/l CaCO3)	67	54	69					
Color/Appearance[1]	C	C, Y(S)	C					
Initials/Date	CB 10/18	PO 10/20	CB 10/24					

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								ACUTE
Sample Date	101700	102000	102300					
Temp. (°C)	25.9	26.0	25.7					
Salinity (g/kg)	48	3.9	9.0					
D.O. (mg/l)	9.7	9.4	9.1					
Aeration Rate	mod	mod	mod					
Aeration Time (min)	1.5	2	1.0					
Adjust. D.O. (mg/l)	8.1	8.1	8.1					
pH	7.44	7.86	7.82					
Tot Chlorine (mg/l)	ND	ND	ND					
Initials/Date	CB 10/18	PO 10/21	CB 10/24					

DILUTION WATER CHARACTERISTICS:	SFW: ✓			HWM:				ACUTE
Temp. (°C)	25.8	25.8	25.6	25.1	25.5	25.3		
Conduct. (uMHOS)	NA	NA	NA	NA	NA	NA		
Salinity (g/kg)	20	~~20~~ 4.3 MH	20	4.8	20	4.5		
pH	7.72	7.70	7.76	7.91	7.69	~~7.82~~ 7.88		
Diss. Oxygen (mg/l)	8.1	8.2	7.4	8.1	7.4	8.1		
Hard (mg/l CaCO3)	NA	NA	NA	NA	NA	NA		
Alkln (mg/l CaCO3)	NA	NA	NA	NA	NA	NA		
Initials/Date	CB 10/18	CB 10/18	MH 10/21	MH 10/21	MH 10/24	MH 10/24		

SAMPLE ID: 2JMS040.03 TEST ID: VJMS0003 CLV CMD

3-2

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date							
Temp. (°C)							
Conduct. (uMHOS)							
Salinity (g/kg)							
pH			See				
Diss. Oxygen (mg/l)				CCO			
Tot. Chlorine (mg/l)					Sheet		
NH3-N (mg/l)							
Hard (mg/l CaCO3)							
Alkln (mg/l CaCO3)							
Color/Appearance[1]							
Initials/Date							

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								ACUTE
Sample Date	101700	102000	102300					
Temp. (°C)	25.7	24.5	25.1					
Salinity (g/kg)	1.2	1.1	3.2					
D.O. (mg/l)	9.4	9.6	~~9.5~~ 9.1					
Aeration Rate	mod	mod	mod					
Aeration Time (min)	1.5	1.5	1.0					
Adjust. D.O. (mg/l)	8.2	8.2	8.2					
pH	7.61	7.93	7.82					
Tot Chlorine (mg/l)	ND	ND	ND					
Initials/Date	GB 10/18	MH 1021	GB 10/24					

DILUTION WATER CHARACTERISTICS:	SFW:	HWM: ✓						ACUTE
Temp. (°C)	25.8	25.9	25.5	25.5	25.5	25.2		
Conduct. (uMHOS)	NA	NA	NA	NA	NA	NA		
Salinity (g/kg)	20	1.2	20	1.2	20	1.3		
pH	7.72	7.87	~~7.64~~ 7.78	7.75	7.64	7.95		
Diss. Oxygen (mg/l)	7.3	8.1	7.4	8.2	7.4	8.1		
Hard (mg/l CaCO3)	NA	NA	NA	NA	NA	NA		
Alkln (mg/l CaCO3)	NA	NA	NA	NA	NA	NA		
Initials/Date	GB 10/18	GB 10/18	MH 10/21	MH 10/21	MH 10/24	MH 10/24		

SAMPLE ID: 2Jms04781 TEST ID: VJms0103 CCV, CMB

4-1

COASTAL BIOANALYSTS INC. AMBIENT SAMPLE/DILUTION WATER DATA (Form ETF202B-AMB)

INITIAL (ARRIVAL) SAMPLE CHARACTERISTICS:							
Sample Date							
Temp. (°C)							
Conduct. (uMHOS)							
Salinity (g/kg)							
pH		See					
Diss. Oxygen (mg/l)			CCD				
Tot. Chlorine (mg/l)				SKRex			
NH3-N (mg/l)							
Hard (mg/l CaCO3)							
Alkln (mg/l CaCO3)							
Color/Appearance[1]							
Initials/Date							

[1] C-Clear O-Opaque Y-Yellow B-Brown Bl-Black G-Green T-Turbid Sl -Solids (S-Slight M-Moderate V-Very Much)

SAMPLE ADJUSTMENT/POST-ADJUSTMENT MEASUREMENTS:								ACUTE
Sample Date	101700	102000	102300					
Temp. (°C)	25.6	24.3	25.1					
Salinity (g/kg)	2.1	~~1.2~~ 2.0	5.3					
D.O. (mg/l)	8.9	9.6	9.3					
Aeration Rate	mod	MOD	mod					
Aeration Time (min)	0.5	1.0	1.0					
Adjust. D.O. (mg/l)	8.1	8.2	8.2					
pH	7.61	7.90	7.81					
Tot Chlorine (mg/l)	ND	ND	ND					
Initials/Date	GB 10/18	MH 10/21	GB 10/24					

DILUTION WATER CHARACTERISTICS:	SFW:		HWM: ✓					ACUTE
Temp. (°C)	25.8	25.9	25.6	25.5	25.5	25.2		
Conduct. (uMHOS)	NA	NA	NA	NA	NA	NA		
Salinity (g/kg)	20	1.2	20	1.2	20	1.3		
pH	7.72	7.82	~~7.7~~ 7.78	7.75	7.64	7.95		
Diss. Oxygen (mg/l)	7.3	8.1	7.4	8.2	7.4	8.1		
Hard (mg/l CaCO3)	NA	NA	NA	NA	NA	NA		
Alkln (mg/l CaCO3)	NA	NA	NA	NA	NA	NA		
Initials/Date	GB 10/18	GB 10/18	MH 10/21	MH 10/21	MH 10/24	MH 10/24		

SAMPLE ID: 2JM5047.33 TEST ID: VIM50003 CCV, CMB

4-3

Subject: **Station Mislabelling**
Date: Fri, 20 Oct 2000 22:17:26 -0400
From: "Morris H. Roberts, Jr." <mrob@ccsinc.com>
To: "De Lisle, Peter" <pdelisle@coastalbio.com>
CC: "Richards, Mark A." <marichards@deq.state.va.us>

There were two types of station labeling error, one related to station mile and the other an inversion of station label.

As noted in the attached table, Station 1_1, located just downstream of the Benjamin Harrison Bridge, was correctly labeled as 1_1 on 10/17, but incorrectly labeled as 1_B on 10/20. The correct river mile for this station is 74.29.

The station in Tar Bay was correctly labeled as 1_B on 10/17 but incorrectly labeled as 1_1 on 10/20. The correct river mile for this station is 72.08 (not 74.08 as written on the labels).

Call me using my beeper number (804-6452-8014) if you have any questions. I have a cell phone available both in my car and in the boat, so I should be able to call back tomorrow within an hour if the need arises (worst case is that I'm on my way to the Cattail Creek site, and because of tides, I cannot go back to the "Mother Ship"). If I remember to bring my car cell phone, there should be no significant delay.

mory

Station1_1 vs Station1_B.xls	**Name:** Station1_1 vs Station1_B.xls **Type:** Microsoft Excel Worksheet (application/x-msexcel) **Encoding:** base64

Location	Date	Correct Station Label	Station Label Used	Collection Time	River Miles
Benjamin Harrison Bridge	10/17/00	1_1	1_1	1700	74.29
	10/20/00	1_1	1_B	1800	74.29
Tar Bay	10/17/00	1_B	1_B	1625	72.08
	10/20/00	1_B	1_1	1700	72.08

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240

CHAIN OF CUSTODY RECORD

ID NO. (PC/NPDES)	PROJECT/ CASE NAME	DEQ REGION	OWNER ADDRESS
	AMBTOX		Central office DEQ

SAMPLERS: (Signatures) Mark A. Richards

SITE LOCATION (Lat. & Long. optional)

STA. NO.	DATE	TIME	STATION LOCATION	COMP.	GRAB	NO. OF CONTAINERS	SEALED YES	PRESERVED YES	PICTURES TAKEN	TESTS TO BE RUN IN LAB: H2O TOX. Tests					Observations, Field Tests, Remarks Made in Field
1-base	10/17	16:25	James R.	✓		2		✓		✓					
1-1	10/17	17:00		✓		2		✓		✓					
2-1	10/17	14:05		✓		2		✓		✓					
2-2	10/17	15:15		✓		2		✓		✓					
3-1	10/17	12:05		✓		2		✓		✓					
3-2	10/17	13:15		✓		2		✓		✓					
4-1	10/17	11:15		✓		2		✓		✓					
4-3	10/7	10:05		✓		2		✓		✓					

Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
Mark A. Richards	19:03 10/17/00	M. Roberts	M. Roberts	0502 10/18/00	[illegible]
Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
Relinquished by: (Signature)	Date/ Time	Received in Laboratory by: (Signature)	Date/ Time	Seals in place? _____ Preservation OK? _____	Lab Remarks:

Original to Accompany Shipment; copy to Sampler; Copy to Transporter

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS047.33	001017	1005	M	90

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
	74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS.)	LC/H
81614	84014	00024	00023	84008

LATTITUDE: 371302 6

LONGITUDE: 7 651553

OTHER

COUNTY

COMMENTS **WATER TOX SAMPLE**

4_3

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS074.29	001017	1700	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 19 00 0

LONGITUDE: -77 13 18 0

OTHER

COUNTY

COMMENTS

Water Toxicity Sample

1_1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS074.29	001017	1700	M	/00

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7		606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 19 00 0

LONGITUDE: -77 13 18 0

OTHER

COUNTY

COMMENTS

Water Toxicity Sample

1_1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS074.08	001017	1625	M	65

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

	IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 18 28 0

LONGITUDE: -77 11 02 2

OTHER

COUNTY

COMMENTS

Water Toxicity Sample

1_BASE

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS074.08	001017	1625	M	65

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 18 28 0

LONGITUDE: -77 11 02 2

OTHER

COUNTY

COMMENTS

Water Toxicity Sample

1_BASE

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS047.33	001017	1005	M	90

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7		606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 13 02 6

LONGITUDE: -76 51 55 3

OTHER

COUNTY

COMMENTS **WATER TOX SAMPLE**

4_3

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS040.03	001017	1315	M	90

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 371101 3

LONGITUDE: -7645156

OTHER

COUNTY

COMMENTS **WATER TOX SAMPLE**

3_2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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25				
27				

Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
A T	2- J M S 0 4 0 . 0 3	0 0 1 0 1 7	1315	M	90

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
1 9 0 -	T O X H 2 O	7	1	6 0 6		M A R

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 3 7 1 1 0 1 3

LONGITUDE: -7 6 4 5 1 5 6

OTHER

COUNTY

COMMENTS **WATER TOX SAMPLE**

3_2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (µ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS047.81	001017	1115	M	30

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
		D			
	74995	74990		84007	84005

	IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS.)	LC/H
	81614	84014	00024	00023	84008

LATTITUDE: 371331

LONGITUDE: -7652280

OTHER

COUNTY

COMMENTS **WATER TOX SAMPLE**

4_1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS047.81	001017	1115	M	32

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 13 33 1

LONGITUDE: -76 52 28 0

OTHER

COUNTY

COMMENTS **WATER TOX SAMPLE**

4_1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
T	2-JMS065.81	001017	1515	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 3718070

LONGITUDE: -7704550

OTHER

COUNTY

COMMENTS: WATER TOX SAMPLE

2_2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS065.81	001017	1515	M	100

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 37 18 07 0

LONGITUDE: -77 04 55 0

OTHER

COUNTY

COMMENTS: **WATER TOX SAMPLE**

2_2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
A T	2- J M S 0 6 8 . 6 8	0 0 1 0 1 7	1 6 0 5	M	9 5

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
1 9 0 -	T O X H 2 O	7	1	6 0 6		M A R

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 3 7 1 8 0 1 4

LONGITUDE: -7 7 0 7 2 3 9

OTHER

COUNTY

COMMENTS

Water Toxicity Sample

2_1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS068.68	001017	1605	M	75

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7		606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 371801 4

LONGITUDE: -77072 39

OTHER

COUNTY

COMMENTS

Water Toxicity Sample

2_1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS042.46	001017	1205	M	30

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7	1	606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW	SWL	SPWL	HOURS	YIELD

TISSUE	TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
		D			
	74995	74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS.)	LC/H
81614	84014	00024	00023	84008

LATTITUDE: 371209 6

LONGITUDE: -76 47 31 2

OTHER

COUNTY

COMMENTS: WATER TOX SAMPLE

3_1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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Virginia Department of Environmental Quality

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	2-JMS042.46	001017	1205	M	30

CATALOG-NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190-	TOXH2O	7		606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	# OF ALIQUOTS	AIR TEMP. (C°) (00020)	BAROMETER PRESSURE (00025)

	SWL	SPWL	HOURS	YIELD
GW				

TISSUE	TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
		D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS.) (00023)	LC/H (84008)

LATTITUDE: 371209 6

LONGITUDE: -76 47 31 2

OTHER

COUNTY

COMMENTS: **WATER TOX SAMPLE**

3_1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP ° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240

CHAIN OF CUSTODY RECORD

ID NO. (PC/ NPDES)	PROJECT/ CASE NAME	DEQ REGION	OWNER ADDRESS

SAMPLERS: (Signatures)	SITE LOCATION (Lat. & Long. optional)

STA. NO.	DATE	TIM'E	STATION LOCATION	COMP.	GRAB	NO.OF CONTAINERS	SEALED YES	PRESERVED YES	PICTURES TAKEN	TESTS TO BE RUN IN LAB: TOX					Observations, Field Tests, Remarks Made in Field
1-B	10/20	1800	James R.	✓					●	✓					
1-1		1700		✓					●	✓					
2-1		1545		✓					●	✓					
2-2		1515		✓					●	✓					
4-1		1435		✓					●	✓					
4-3		1420		✓					●	✓					
3-1		1400		✓					●	✓					
3-2		1345		✓					●	✓					

Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
[signature]	18:45 10/20/00	M. Roberts			
Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
M. Roberts	1615 10/20/00	[signature]			
Relinquished by: (Signature)	Date/ Time	Received in Laboratory by: (Signature)	Date/ Time	Seals in place? _____ Preservation OK? _____	Lab Remarks:

Original to Accompany Shipment; copy to Sampler; Copy to Transporter

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	INF	SURVEY DEPTH
AT	JMS078.08	001020	1800		88

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	D	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

Tl— base ?

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	SMF	SURVEY DEPTH
IT	JMS074.29	001020	1700		50

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H207OX			606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW — TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

1-12

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	SMF	SURVEY DEPTH
AT	JMS068.68	001020	1545		80

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW — TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	D	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995		74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

2-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
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gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	SMF	SURVEY DEPTH
AT	JMS065.81	001020	1515		8 U

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM) (74995)	D	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

2-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	MF	SURVEY DEPTH
AT	JMS047.81	001020	~~1545~~ 1435	M	~~85~~ 30

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

4-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
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gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	SMF	SURVEY DEPTH
AT	JMS047.33	001020	1420		SO

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW—TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	D	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995		74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

4-3

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT
OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	JMS042.46	001020	1400		35

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H2OTOX			606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW — TISSUE

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

3-1

DEPTH (m)	FIELD DATA			
	D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	(N)/F	SURVEY DEPTH
AT	JMS040.03	001020	1345		85

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW—TISSU

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

3-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
629 EAST MAIN STREET, RICHMOND, VIRGINIA 23240

CHAIN OF CUSTODY RECORD

ID NO. (PC/NPDES)	PROJECT/ CASE NAME	DEQ REGION	OWNER ADDRESS
	AMBTOX		Central office DEQ

SAMPLERS: (Signatures) Mark Richards

SITE LOCATION (Lat. & Long. optional)

STA. NO.	DATE	TIME	STATION LOCATION	COMP.	GRAB	NO. OF CONTAINERS	SEALED YES	PRESERVED YES	PICTURES TAKEN	TESTS TO BE RUN IN LAB: Tox Test (H2O)	Tox Test (sed)					Observations, Field Tests, Remarks Made in Field
1-Base	10/23	17:40	James River													
1-1	10/23	17:55														
2-1	10/23	17:20														
2-2	10/23	17:00														
3-1	10/23	1155														
3-2	10/23	1135														
4-1	10/23	1455				5				✓	✓					
4-3	10/23	1340				5				✓	✓					

Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)
Mark A. Richards	19:30 10/23	Morris H. Roberts	Morris H. Roberts	10/24/00	D. Briggs
Relinquished by: (Signature)	Date/ Time	Received by: (Signature)	Relinquished by: (Signature)	Date/ Time	Received by: (Signature)

Relinquished by: (Signature)	Date/ Time	Received in Laboratory by: (Signature)	Date/ Time	Seals in place? _____ Preservation OK? _____	Lab Remarks:

Original to Accompany Shipment; copy to Sampler; Copy to Transporter

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	SVF	SURVEY DEPTH
AT	JMS0 74.29	001023	1755		85

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW

SWL	SPWL	HOURS	YIELD

TISSUE

TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
	D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

L-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

ROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	M/F	SURVEY DEPTH
AT	JMSO 72.08	001023	1740		70

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H2OTOX			606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW

SWL	SPWL	HOURS	YIELD

TISSU

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

1 – Base

DEPTH (m)	FIELD DATA			
	D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	MF	SURVEY DEPTH
AT	JMS0 68.68	001023	1720		75

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW

SWL	SPWL	HOURS	YIELD

TISSUE

TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

2-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	SVF	SURVEY DEPTH
AT	JMS0 65.81	001023	1700		90

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H207OX			606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME (C°) (00020)	BAROMETER PRESSURE (00025)

GW

SWL	SPWL	HOURS	YIELD

TISSUE

TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
	D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

3-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	MVF	SURVEY DEPTH
AT	JMS047.81	001023	1455		B0

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME (C°) (00020)	BAROMETER PRESSURE (00025)

GW

SWL	SPWL	HOURS	YIELD

TISSUE

TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
	D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

4-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT
OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED	TIME COLLECTED	M/F	SURVEY DEPTH
AT	JMS047.33	001023	1240		90

Y Y M M D D

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H2OTOX			606		MAR

SPECIAL STUDY NUMBER	%FRB	WEATHER	TIDE	FLOW SEVERITY	SECCHI DEPTH (m)	FIELD pH
00116	00002	00041	00067	01351	00078	00400

RESIDUAL CHLORINE	FLOW RATE	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°)	BAROMETER PRESSURE
50060	00061			00020	00025

GW — TISSU

SWL	SPWL	HOURS	YIELD

TIS (NUM)	SPECIES (NUM)	SAMPLE NO.	TIS (ALPHA)	SPECIES (ALPHA)
74995	D 74990		84007	84005

IND/SAMPLE	SEX	LENGTH (INCHES)	WEIGHT (LBS)	LC/H
81614	84014	00024	00023	84008

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

4-3

DEPTH (m)	FIELD DATA			
	D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (YYMMDD)	TIME COLLECTED	SMF	SURVEY DEPTH
AT	JMS042.46	001023	1155		26

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME (C°) (00020)	BAROMETER PRESSURE (00025)

GW

SWL	SPWL	HOURS	YIELD

TISSUE

TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
	D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

3-1

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DCLS LAB USE ONLY

PROG. CODE	STATION ID	DATE COLLECTED (Y Y M M D D)	TIME COLLECTED	MF	SURVEY DEPTH
AT	JMS040.03	001023	1135		60

CATALOG NUMBER	GROUP CODE	PRIORITY CODE	CONTAINER #	UNIT CODE	REGION CODE	COLLECTOR
190 -	H20TOX			606		MAR

SPECIAL STUDY NUMBER (00116)	%FRB (00002)	WEATHER (00041)	TIDE (00067)	FLOW SEVERITY (01351)	SECCHI DEPTH (m) (00078)	FIELD pH (00400)

RESIDUAL CHLORINE (50060)	FLOW RATE (00061)	COLLECTION SPAN	#OF ALIQUOTS	AIR TIME.(C°) (00020)	BAROMETER PRESSURE (00025)

GW

SWL	SPWL	HOURS	YIELD

TISSUE

TIS (NUM) (74995)	SPECIES (NUM) (74990)	SAMPLE NO.	TIS (ALPHA) (84007)	SPECIES (ALPHA) (84005)
	D			

IND/SAMPLE (81614)	SEX (84014)	LENGTH (INCHES) (00024)	WEIGHT (LBS) (00023)	LC/H (84008)

LATTITUDE

LONGITUDE

OTHER

COUNTY

COMMENTS

H_2O Toxicity

3-2

DEPTH (m)	FIELD DATA: D.O. PROBE (mg/l) 00299	TEMP° C 00010	COND. (μ MHOS/CM) 00094	SALINITY (ppt) 00096
3				
5				
7				
9				
11				
13				
15				
17				
19				
21				
23				
25				
27				

gsl/CL: 7/947/95(deqform)

Appendix C

Quality Control/Quality Assurance Data for Chemical Analyses
Provided by the Virginia Division of Consolidated Laboratories

				AMBIENT TOXICITY STUDY : SEDIMENT				
					April 26, 2001			
				Limits :				
				Pre-digestion Spikes:		70-130 %		
				Post-digestion Spikes:		75-125 %		
April 26, 2001								
LCS					620214		Duplicate	
+/- 30%	% Recovery				Pre-digestion	Post-digestion	Post-digestion	
				AT Sediment	% Recovery	% Recovery	% Recovery	
Be	Not Certified			Be	98	96	100	
Cr	114			Cr	75	92	93	
Ni	105			Ni	90	97	98	
Cu	103			Cu	93	94	95	
Zn	101			Zn	92	98	100	
As	103			As	88	96	98	
Se	102			Se	93	92	91	
Sb	Not Certified			Ag	78	97	102	
Tl	Not Certified			Cd	99	97	97	
Pb	107			Sb	9	106	108	
Al	112			Tl	101	101	101	
Fe	103			Pb	94	99	98	
Mn	99			Al *				
Ag	96			Mn *				
Cd	104			Zn *				
	*	Spike concentration less than 30 % of native concentration of						
		analyte: spike recovery calculation not possible.						

			AMBIENT TOXICITY STUDY : SEDIMENT							
				April 26, 2001						
			Limits :							
				Pre-digestion Spikes:		70-130 %				
				Post-digestion Spikes:		75-125 %				
644704		Duplicate		644709	Duplicate		Duplicate		644721	
Pre-digestion	Post-digestion	Post-digestion		Pre-digestion	Pre-digestion	Post-digestion	Post-digestion		Pre-digestion	Post-digestion
% Recovery	% Recovery	% Recovery		% Recovery	% Recovery	% Recovery	% Recovery		% Recovery	% Recovery
101	101	99		102	102	99	99		102	97
125	103	104		107	94	108	100		103	92
112	105	106		106	100	107	102		104	99
110	101	104		102	101	101	99		108	95
124	99	114		90	97	100	86		128	87
96	98	100		90	90	100	99		91	99
91	99	93		88	90	97	98		86	94
94	101	101		94	94	91	101		96	85
100	99	100		101	101	99	101		101	100
12	111	111		57	56	109	112		52	106
102	105	103		106	106	105	105		103	103
108	105	103		98	100	100	102		106	94

Duplicate
Post-digestion
% Recovery
101
91
100
94
76
97
89
99
100
106
103
94

AMBIENT TOXICITY STUDY : SEDIMENT

Nov. 01, 2000

Acceptable Range : 85 - 115 %

LFB	% Recovery	804458	Pre-digestion % Recovery	Duplicate Pre-digestion % Recovery	Post-digestion % Recovery	Duplicate Post-digestion % Recovery
Be	98	Be	98	87	94	96
Cr	105	Cr	79	75	95	102
Ni	103	Ni	84	87	99	100
Cu	103	Cu	94	97	99	97
As	98	As	89	86	96	96
Se	98	Se	93	84	94	100
Ag	109	Ag	106	102	98	99
Cd	100	Cd	99	99	95	97
Sb	104	Sb	40	23	96	100
Tl	103	Tl	98	96	98	99
Pb	102	Pb	96	92	97	97
Al	101	Mn	94	90	102	114
Fe	106	Zn	91	90	91	93
Fe	99					
Mn	101					

	Pre-digestion	Duplicate Pre-digestion	Post-digestion	Duplicate Post-digestion
805123	% Recovery	% Recovery	% Recovery	% Recovery
Be	89	93	102	98
Cr	90	97	100	102
Ni	98	100	101	101
Cu	97	100	101	100
As	90	92	100	98
Se	82	78	84	89
Ag	98	99	100	101
Cd	94	94	98	101
Sb	67	8	100	102
Tl	96	102	104	104
Pb	96	98	104	104
Mn	86	85	100	102
Zn	92	96	94	95

AMBIENT TOXICITY STUDY - SEDIMENT

Nov. 06, 2000

% Recovery

+/- 10%

ICV	1	2	3
Be	109	108	
Cr	104	107	
Ni	105	108	
Cu	105	110	
Zn	104	110	98
As	104	107	
Se	101	110	97
Ag	98	106	
Cd	102		
Sb	99	104	
Tl	104	108	
Pb	104	108	
Al			100
Fe			97
Mn	106		99
Hg	96		

Nov. 06, 2000

+/- 30%

LCS	% Recovery	Duplicate
Be	Not Certified	Not Certified
Cr	111	105
Ni	107	109
Cu	105	107
Zn	101	104
As	104	106
Se	108	111
Ag	100	110
Cd	107	109
Sb	Not Certified	Not Certified
Tl	Not Certified	Not Certified
Pb	103	110
Al	117	101
Fe	108	109
Mn	109	111
Hg	106	109

AMBIENT TOXICITY STUDY - SEDIMENT

Sept. 01, 2000

+/- 30% LCS (NIST2711)	% Recovery	Duplicate
Be	Not Certified	Not Certified
Cr	108	106
Ni	104	107
Cu	103	113
Zn	97	105
As	98	104
Se	95	96
Sb	Not Certified	Not Certified
Tl	Not Certified	Not Certified
Pb	103	110
Al	105	103
Fe	103	102
Mn	106	112
Ag	94	112
Cd	97	104
Hg	101	93

Sept. 01, 2000

+/- 10% ICV	% Recovery 1	2	3	1 dup	2 dup	3 dup
Be	106	100		102	96	
Cr	95	98		91	102	
Ni	99	100		97	101	
Cu	99	97		94	99	
Zn	108	100	102	109	105	102
As	103	98		103	99	
Se	99	93	97	100	100	97
Sb	93	101		92	105	
Tl	96	99		97	102	
Pb	93	96		95	100	
Al			102			102
Fe			93			93
Mn			102			102
Ag	95					
Cd	104					
Hg	107					

AMBIENT TOXICITY STUDY - SEDIMENT

Sept. 21, 2000

+/- 10%	% Recovery		
ICV	1	2	3
Be	93		
Cr	99		
Ni	99		
Cu	99		
Zn	100		101
As	100		
Se	104	103	108
Sb	100		
Tl	101		
Pb	100		
Al			91
Fe			96
Mn			101
Ag	100	96	
Cd	101	99	
Hg	102		

Sept. 21, 2000

+/- 30%	% Recovery	
LCS (NIST2711)		Duplicate
Be	Not Certified	Not Certified
Cr	102	121
Ni	101	107
Cu	103	108
Zn	102	107
As	103	105
Se	109	115
Sb	Not Certified	Not Certified
Tl	Not Certified	Not Certified
Pb	100	105
Al	86	101
Fe	95	104
Mn	106	115
Ag	101	102
Cd	101	102
Hg	95	97

Ambient Toxicity Project

DCMET/TCMET QC Data for Samples Reported Out DEC2000

QCS Spikes - alternate source standard

LIMS #	Analysis Date													
Element		Cr	Mn	Ni	Cu	Zn	As	Se	Ag	Cd	Sb	Tl	Pb	Al
640881	Oct 17	136	103	91	108	131	102	104	104	100	100	101	100	95
642556	Oct 25	104	122	115	123	126	109	98	104	106	108		110	
642568		96		89	99		93	92	94	98	97		94	

Ambient Toxicity Project

DCMET/TCMET QC Data for Samples Reported Out DEC2000

Spike Recovery Data

LIMS #	Analysis Date	Cr	Mn	Ni	Cu	Zn	As	Se	Ag	Cd	Sb	Tl	Pb	Al	Be
Element															
640881	Oct 18	99	99	75	100	105	101	96	96	101	100	102	102	95	
640883		107		90	110		95	106	97	100	94	102	97		
640893		105	101	99	102	83	103	98	100	99	100	101	99	100	
640894		100		103	104	137	104	94	93	99	102	100	73		
642556	Oct 25	102	120	116	122	100	112	99	98	102	105		107		94
642557		100		92	90	81	109	100	100	104	112		105		104
642567		106	116	107	109	104	106	101	101	107	101		114		105
642568		102		88	113	117	102	93	95	102	101		99		99
642571			108									109		92	

DEQ CLEAN METALS QC DATA

						Ambient Toxicity Project											
			DCMETS/TCMETS QC Data for Samples Reported Out JAN2001														
			Results in ppb														
		RDL	1.20	0.78	0.75	0.69	3.00	1.00	1.00	0.72	1.00	0.81	1000	1000	1000	1000	0.2
		STD	4.42	4.68	4.43	4.72	4.10	5.03	5.40	4.58	4.82	4.58	0.99	1.10	1.00	0.97	5.1
		QC	4.77	4.67	4.65	4.78	4.35	1.21	0.97	4.82	0.81	4.50	10.10	10.01	10.00	10.00	4.8
LIMS#	Sample ID	bottle#	Al	Mn	Ni	Cu	Zn	As	Se	Cd	Sb	Pb	Ca	Mg	Na	K	Hg
James	**River**	Salt	Water		Received		10/18/00										
640797	Total	2418	880	110	1.17	2.11	5.47	0.74	0.40	0.00	0.07	0.98	30	60	480	20	0.4
		Spk															4.98
		%Rec															90
640871	Diss	2439	8.10	6.40	0.59	1.12	1.10	0.57	0.31	0.00	0.10	0.00	65	180	1500	60	0.5
		Spk	11.80	10.04	4.56	4.88	5.20			5.01		4.77					
		%Rec	74	71	80	75	80			100		95					

Analytical Results

15-Aug-01

Results are reported to two significant figures, rounded to the nearest 5 ng/g
All results are reported in ng/g.

	Blank	618780	618780Dup	618781	620225	620227	620228	642274	643031
1,4-Dichlorobenzene	BQL	BQL	BQL	10	BQL	BQL	BQL	BQL	BQL
Isophorone	60	15	10	15	25	30	20	BQL	25
Naphthalene	BQL	40	60	380	35	50	30	BQL	50
2-Methylnaphthalene	BQL	20	20	80	15	BQL	BQL	BQL	BQL
Acenaphthylene	BQL	BQL	BQL	15	BQL	BQL	BQL	BQL	BQL
Dimethyl phthalate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Acenaphthene	BQL	BQL	BQL	25	BQL	BQL	BQL	BQL	BQL
Dibenzofuran	BQL	BQL	BQL	25	BQL	BQL	BQL	BQL	BQL
Fluorene	BQL	10	15	BQL	BQL	15	BQL	BQL	BQL
Diethyl phthalate	BQL	25	BQL	BQL	20	40	BQL	60	45
Phenanthrene	BQL	60	160	230	30	BQL	BQL	BQL	50
Anthracene	BQL	45	45	110	BQL	BQL	BQL	BQL	BQL
Di-N-butylphthalate	BQL	240	160	140	110	170	150	310	270
Fluoranthene	BQL	350	290	230	50	55	BQL	50	110
Pyrene	BQL	470	390	320	60	60	25	45	120
Butylbenzylphthalate	BQL	45	55	BQL	BQL	30	45	85	50
Benzo[a]anthracene	BQL	230	230	160	30	30	BQL	20	55
Chrysene	BQL	240	230	160	40	55	BQL	25	75
Bis[2-ethylhexyl]phthalate	BQL	410	310	180	260	290	170	290	430
Di-N-octylphthalate	BQL	70	45	BQL	10	20	BQL	20	50
Benzo[b]fluoranthene	BQL	300	290	190	35	45	BQL	30	85
Benzo[k]fluoranthene	BQL	190	210	140	35	35	BQL	20	50
Benzo[e]pyrene	BQL	180	190	120	25	30	BQL	20	20
Benzo[a]pyrene	BQL	290	280	200	35	35	BQL	20	60
Perylene	BQL	810	790	460	170	170	110	120	120
Indeno[1,2,3-cd]pyrene	BQL	160	170	110	20	20	BQL	15	45
Dibenz[a,h]anthracene	BQL	40	40	25	BQL	BQL	BQL	BQL	BQL
Benzo{g,h,i]perylene	BQL	210	180	150	25	25	BQL	15	60

Reporting Limits = 25 ng/g (part per billion)
Compounds reported 10-25 ppb are estimated concentrations
BQL = < 10 ppb

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Soxhlet Duplicate Sample #618780
8/15/01

Department of Environmental Quality

DATE COLLECTED: 08/23/2000 DATE RECEIVED: 08/24/2000 DATE EXTRACTED: 08/07/2001

Results are reported to two significant figures
All results are reported in ng/g.

COMPOUND	618780	618780 dup	difference
1,4-Dichlorobenzene	BQL	BQL	NA
Isophorone	15	10	NA
Naphthalene	40	60	NA
2-Methylnaphthalene	20	20	NA
Acenaphthylene	BQL	BQL	NA
Dimethyl phthalate	BQL	BQL	NA
Acenaphthene	BQL	BQL	NA
Dibenzofuran	BQL	BQL	NA
Fluorene	10	15	NA
Diethyl phthalate	25	BQL	NA
Phenanthrene	60	160	100
Anthracene	45	45	0
Di-N-butylphthalate	240	160	80
Fluoranthene	350	290	60
Pyrene	470	390	80
Butylbenzylphthalate	45	55	10
Benzo[a]anthracene	230	230	0
Chrysene	240	230	10
Bis[2-ethylhexyl]phthalate	410	310	100
Di-n-octylphthalate	70	45	25
Benzo[b]fluoranthene	300	290	10
Benzo[k]fluoranthene	190	210	NA
Benzo[e]pyrene	180	190	10
Benzo[a]pyrene	290	280	10
Perylene	810	790	20
Indeno[1,2,3-cd]pyrene	160	170	10
Dibenz[a,h]anthracene	40	40	NA
Benzo{g,h,i]perylene	210	180	30

ANALYST:GJOHNSON DATE COMPLETED:08/23/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Percent Recovery Report
Laboratory Control Soxhlet
Sand

8/15/01

Virginia Department of Environmental Quality

DATE COLLECTED: 08/23/2000 DATE RECEIVED: 8/24/2000 DATE EXTRACTED: 08/07/2001

Compound Name	% Recovery	Pass/Fail	Control Limits
2-Chlorophenol	35	P	9-57
1,2,4-Trichlorobenzene	66	P	2-105
4-Chloro-3-Methylphenol	81	P	21-105
Acenaphthene	74	P	31-104
2,4-Dinitrotoluene	57	P	20-84
Pentachloroanisole	81	P	47-104
Lindane	73	P	45-102
Aldrin	88	P	41-107
Fluoranthene	93	P	38-124
Tetrachlorobiphenyl	88	P	39-124
Gamma Chlordane	96	P	32-125
Dieldrin	87	P	54-109
Endrin	89	P	39-133
DDT	68	P	37-115
Hexachlorobiphenyl	97	P	31-134
Methoxychlor	89	P	41-126
Bis-(2-ethylhexyl)phthalate	106	P	38-150

ANALYST:GJOHNSON DATE COMPLETED: 08/23/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Percent Recovery Report
Matrix Spike Soxhlet
Sample # 618780

8/15/01

Virginia Department of Environmental Quality

DATE COLLECTED: 08/23/2000 DATE RECEIVED: 8/24/2000 DATE EXTRACTED: 08/07/2001

Compound Name	% Recovery	Pass/Fail	Control Limits
2-Chlorophenol	21	P	9-57
1,2,4-Trichlorobenzene	31	P	2-105
4-Chloro-3-Methylphenol	81	P	21-105
Acenaphthene	48	P	31-104
2,4-Dinitrotoluene	71	P	20-84
Pentachloroanisole	64	P	47-104
Lindane	105	P	45-102
Aldrin	61	P	41-107
Fluoranthene	92	P	38-124
Tetrachlorobiphenyl	57	P	39-124
Gamma Chlordane	125	P	32-125
Dieldrin	103	P	54-109
Endrin	96	P	39-133
DDT	52	P	37-115
Hexachlorobiphenyl	73	P	31-134
Methoxychlor	104	P	41-126
Bis-(2-ethylhexyl)phthalate	118	P	38-150

ANALYST:GJOHNSON DATE COMPLETED: 08/23/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Surrogate Percent Recovery Report

8/15/01

Virginia Department of Environmental Quality

SOXHLET EXTRAC' DATE EXTRACTED: 08/07/2001

Sample #	Trifluorocresol	Bromononane	Octanophenone	Dibromobiphenyl	Isodrin
Blank	37	59	109	77	75
618780	47	61	63	82	65
618780 duplicate	43	71	100	85	74
618781	44	57	101	78	61
620225	85	69	76	79	71
620227	48	41	72	57	62
620228	37	30	111	65	105
642274	38	27	85	64	90
643031	92	91	62	125	101
Lab Control	52	27	83	83	77
Matrix Spike	68	78	82	82	72
Control Limits	14-85	34-95	46-103	51-110	50-107

.

ANALYST:GJOHNSON DATE COMPLETED: 08/23/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Soxhlet Duplicate Sample #618779
8/16/01

Department of Environmental Quality

DATE COLLECTED: 08/23/2000 DATE RECEIVED: 08/24/2000 DATE EXTRACTED: 08/09/2001

Results are reported to two significant figures
All results are reported in ng/g.

COMPOUND	618779	618779 dup	difference
1,4-Dichlorobenzene	20	25	NA
Isophorone	15	20	NA
Naphthalene	210	250	NA
2-Methylnaphthalene	110	140	NA
Acenaphthylene	65	80	NA
Dimethyl phthalate	BQL	BQL	NA
Acenaphthene	30	60	NA
Dibenzofuran	35	55	NA
Fluorene	50	75	NA
Diethyl phthalate	15	10	NA
Phenanthrene	270	600	330
Anthracene	160	320	160
Di-N-butylphthalate	140	20	120
Fluoranthene	510	780	270
Pyrene	610	970	360
Butylbenzylphthalate	50	45	5
Benzo[a]anthracene	450	490	40
Chrysene	420	420	0
Bis[2-ethylhexyl]phthalate	280	240	40
Di-n-octylphthalate	35	30	5
Benzo[b]fluoranthene	520	560	40
Benzo[k]fluoranthene	330	220	110
Benzo[e]pyrene	320	320	0
Benzo[a]pyrene	520	510	10
Perylene	820	780	40
Indeno[1,2,3-cd]pyrene	320	300	20
Dibenz[a,h]anthracene	80	75	5
Benzo{g,h,i]perylene	300	330	30

ANALYST:GJOHNSON DATE COMPLETED:08/23/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Surrogate Percent Recovery Report

8/16/01

Virginia Department of Environmental Quality

SOXHLET EXTRAC' DATE EXTRACTED: 08/09/2001

Sample #	Trifluorocresol	Bromononane	Octanophenone	Dibromobiphenyl	Isodrin
Blank	NA	74	109	70	79
618779	58	66	87	80	71
618779 duplicate	66	68	71	80	79
620223	63	60	92	71	84
620224	67	55	77	75	90
620226	81	73	68	78	90
642261	71	83	105	79	82
643035	83	61	80	80	69
644722	76	70	81	89	75
Lab Control	66	68	71	80	79
Matrix Spike	86	69	85	88	84
Control Limits	14-85	34-95	46-103	51-110	50-107

.

ANALYST:GJOHNSON DATE COMPLETED: 08/23/2001

Spreadsheet for All Three Data Sets - Organochlorine - Ambient Toxicity Project

Date Acquired	September 7, 2001
Date Data Entered	September 13, 2001
Analysts	Gail Johnson and D. Scott Winters
Compound Class	Organochlorine

Set #1

	Blank 1	618779	618779D	618780	618781	619615	619616	619617	619618
HCCP	3	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
a-BHC & HCB & Diallate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
b-BHC & g-BHC	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
d-BHC	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Heptachlor	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Aldrin	5	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Isodrin	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Heptachlor Epoxide	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
g-Chlordane	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endosulfan I & a-Chlordane	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dieldrin	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDE	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin & Endosulfan II	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorbenzylate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDD	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin Aldehyde & Kepone	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endosulfan Sulfate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDT	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin Ketone	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methoxychlor	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

Set #2

	Blank 2	620223	620224	620225	620226	620227	620228	620228D	642261
HCCP	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
a-BHC & HCB & Diallate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
b-BHC & g-BHC	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
d-BHC	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Heptachlor	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Aldrin	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Isodrin	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Heptachlor Epoxide	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
g-Chlordane	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endosulfan I & a-Chlordane	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dieldrin	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDE	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin & Endosulfan II	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorbenzylate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDD	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin Aldehyde & Kepone	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endosulfan Sulfate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDT	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin Ketone	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methoxychlor	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

Set #3

	Blank 3	642274	642274D	643031	643035	643067	644705	644710	644722
HCCP	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
a-BHC & HCB & Diallate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
b-BHC & g-BHC	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
d-BHC	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Heptachlor	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Aldrin	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Isodrin	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Heptachlor Epoxide	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
g-Chlordane	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endosulfan I & a-Chlordane	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dieldrin	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDE	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin & Endosulfan II	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorbenzylate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDD	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin Aldehyde & Kepone	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endosulfan Sulfate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
DDT	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Endrin Ketone	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methoxychlor	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

All results are reported in ng/g.
Reporting Limits = 2.0 ng/g (part per billion)(wet weight basis)
Reporting Limits = 6.0 ng/g (part per billion)(dry weight basis)
BQL = < 2.0 ppb wet weight basis
BQL = < 6.0 ppb dry weight basis

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Soxhlet Duplicate: #1 - 618779D; #2 - 620228D; #3 - 642274D
9/14/01

Department of Environmental Quality

	Set #1		**Set #2**		**Set #3**	
COMPOUND	618779	618779D	620228	620228D	642274	642274D
HCCP	BQL	BQL	BQL	BQL	BQL	BQL
a-BHC & HCB & Diallate	BQL	BQL	BQL	BQL	BQL	BQL
b-BHC & g-BHC	BQL	BQL	BQL	BQL	BQL	BQL
d-BHC	BQL	BQL	BQL	BQL	BQL	BQL
Heptachlor	BQL	BQL	BQL	BQL	BQL	BQL
Aldrin	BQL	BQL	BQL	BQL	BQL	BQL
Isodrin	BQL	BQL	BQL	BQL	BQL	BQL
Heptachlor Epoxide	BQL	BQL	BQL	BQL	BQL	BQL
g-Chlordane	BQL	BQL	BQL	BQL	BQL	BQL
Endosulfan I & a-Chlordane	BQL	BQL	BQL	BQL	BQL	BQL
Dieldrin	BQL	BQL	BQL	BQL	BQL	BQL
DDE	BQL	BQL	BQL	BQL	BQL	BQL
Endrin & Endosulfan II	BQL	BQL	BQL	BQL	BQL	BQL
Chlorbenzylate	BQL	BQL	BQL	BQL	BQL	BQL
DDD	BQL	BQL	BQL	BQL	BQL	BQL
Endrin Aldehyde & Kepone	BQL	BQL	BQL	BQL	BQL	BQL
Endosulfan Sulfate	BQL	BQL	BQL	BQL	BQL	BQL
DDT	BQL	BQL	BQL	BQL	BQL	BQL
Endrin Ketone	BQL	BQL	BQL	BQL	BQL	BQL
Methoxychlor	BQL	BQL	BQL	BQL	BQL	BQL

All results are reported in ng/g.

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/14/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Percent Recovery Report
Laboratory Control Soxhlet
Spike #1, #2, and #3: Sand

Virginia Department of Environmental Quality

DATE ANALYZED: 09/07/2001

Compound Name	Spike Level (pg/uL)	Set #1 Spike #1	Set #1 % Recovery	Set #2 Spike #2	Set #2 % Recovery	Set #3 Spike #3	Set #3 % Recovery
a-BHC	1000	382	38	430	43	498	50
b-BHC & g-BHC	1000	1169	117	1143	114	2266	227
d-BHC	1000	745	75	884	88	769	77
Heptachlor	1000	882	88	792	79	914	91
Aldrin	1000	812	81	733	73	1097	110
Heptachlor Epoxide	1000	1130	113	653	65	1061	106
Endosulfan I	1000	861	86	844	84	996	100
Dieldrin	1000	1181	118	1023	102	1484	148
DDE	1000	1608	161	999	100	1783	178
Endrin	1000	1402	140	1706	171	2427	243
DDD	1000	957	96	1228	123	1866	187
Endosulfan Sulfate & DDT	1000	948	95	482	48	543	54
Endrin Ketone	1000	672	67	86	9	85	9
Methoxychlor	1000	2687	269	2764	276	2592	259

*Insufficient historical data to determine control limits.

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Percent Recovery Report
Matrix Spike Soxhlet
Spike #1 - 618779; Spike #2 - 620228; Spike #3 - 644724

Virginia Department of Environmental Quality

DATE ANALYZED: 09/07/2001

Compound Name	Spike Level (pg/uL)	Set #1 Spike #1 618779	Set #1 % Recovery	Set #2 Spike #2 620228	Set #2 % Recovery	Set #3 Spike #3 644724	Set #3 % Recovery
a-BHC	1000	327	33	421	42	444	44
b-BHC & g-BHC	1000	526	53	1822	182	1943	194
d-BHC	1000	571	57	834	83	684	68
Heptachlor	1000	487	49	387	39	582	58
Aldrin	1000	683	68	813	81	746	75
Heptachlor Epoxide	1000	734	73	897	90	939	94
Endosulfan I	1000	284	28	900	90	952	95
Dieldrin	1000	811	81	1182	118	1134	113
DDE	1000	1270	127	1416	142	906	91
Endrin	1000	1079	108	1371	137	1554	155
DDD	1000	1031	103	1066	107	1048	105
Endosulfan Sulfate & DDT	1000	345	35	730	73	392	39
Endrin Ketone	1000	299	30	104	10	96	10
Methoxychlor	1000	2116	212	2500	250	2608	261

*Insufficient historical data to determine control limits.

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Surrogate Percent Recovery Report

Virginia Department of Environmental Quality

Sample #	Tetrachlorometaxylene
GPC	100
Blank 1	98
618779	147
618779D	126
618780	82
618781	121
619615	113
619616	58
619617	82
619618	74
618779SPK	60
Spike 1	40
Blank 2	50
620223	59
620224	75
620225	69
620226	91
620227	57
620228	72
620228D	65
642261	53
620228SPK	53
Spike 2	98
Blank 3	117
642274	103
642274D	64
643031	74
643035	104
643067	113
644705	96
644710	93
644722	103
644724SPK	93
Spike 3	115

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Soxhlet Duplicate: #1 - 618779D; #2 - 620228D; #3 - 642274D

Department of Environmental Quality

	Set #1		Set #2		Set #3	
COMPOUND	618779	618779D	620228	620228D	642274	642274D
PCB-001	BQL	BQL	BQL	BQL	BQL	BQL
PCB-005+008	BQL	BQL	BQL	BQL	BQL	BQL
PCB-018	BQL	BQL	BQL	BQL	BQL	BQL
PCB-028+031	BQL	BQL	BQL	BQL	BQL	BQL
PCB-52	BQL	BQL	BQL	BQL	BQL	BQL
PCB-44	BQL	BQL	BQL	BQL	BQL	BQL
PCB-101	BQL	BQL	BQL	BQL	BQL	BQL
PCB-66	BQL	BQL	BQL	BQL	BQL	BQL
PCB-81+77	BQL	BQL	BQL	BQL	BQL	BQL
PCB-110	BQL	BQL	BQL	BQL	BQL	BQL
PCB-87	BQL	BQL	BQL	BQL	BQL	BQL
PCB-151	BQL	BQL	BQL	BQL	BQL	BQL
PCB-118	2.0	BQL	BQL	BQL	BQL	BQL
PCB-105	BQL	BQL	BQL	BQL	BQL	BQL
PCB-153	BQL	BQL	BQL	BQL	BQL	BQL
PCB-141	2.0	BQL	BQL	BQL	BQL	BQL
PCB-126	BQL	BQL	BQL	BQL	BQL	BQL
PCB-138	BQL	BQL	BQL	BQL	BQL	BQL
PCB-187	BQL	BQL	BQL	BQL	BQL	BQL
PCB-183	BQL	BQL	BQL	BQL	BQL	BQL
PCB-128	BQL	BQL	BQL	BQL	BQL	BQL
PCB-156	BQL	BQL	BQL	BQL	BQL	BQL
PCB-169	5.0	7.0	5.0	3.4	3.8	2.4
PCB-180	BQL	BQL	BQL	BQL	BQL	BQL
PCB-170	BQL	BQL	BQL	BQL	BQL	BQL
PCB-195	BQL	BQL	BQL	BQL	BQL	BQL
PCB-206	BQL	BQL	1.2	BQL	BQL	BQL

All results are reported in ng/g.

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Percent Recovery Report
Laboratory Control Soxhlet
Spike #1, #2, and #3: Sand

Virginia Department of Environmental Quality

DATE ANALYZED: 09/07/2001

Compound Name	**Spike Level (pg/uL)**	**Set #1**		**Set #2**		**Set #3**	
		Spike #1	**% Recovery**	**Spike #2**	**% Recovery**	**Spike #3**	**% Recovery**
PCB-52	1000	876	88	809	81	941	94
PCB-44	1000	710	71	581	58	417	42
PCB-101	1000	901	90	851	85	1302	130
PCB-66	1000	1001	100	1403	140	1642	164
PCB-87	1000	707	71	632	63	683	68
PCB-118	1000	1726	173	1923	192	2032	203
PCB-105	1000	700	70	820	82	590	59
PCB-153	1000	830	83	951	95	929	93
PCB-138	1000	1089	109	1308	131	803	80
PCB-187	1000	787	79	1259	126	1020	102
PCB-183	1000	838	84	1268	127	918	92
PCB-180	1000	832	83	823	82	938	94

*Insufficient historical data to determine control limits.

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Surrogate Percent Recovery Report

Virginia Department of Environmental Quality

Sample #	Tetrachlorometaxylene
GPC	100
Blank 1	98
618779	147
618779D	126
618780	82
618781	121
619615	113
619616	58
619617	82
619618	74
618779SPK	60
Spike 1	40
Blank 2	50
620223	59
620224	75
620225	69
620226	91
620227	57
620228	72
620228D	65
642261	53
620228SPK	53
Spike 2	98
Blank 3	117
642274	103
642274D	64
643031	74
643035	104
643067	113
644705	96
644710	93
644722	103
644724SPK	93
Spike 3	115

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

Spreadsheet for All Three Data Sets - Organophosphate - Ambient Toxicity Project

Date Acquired	September 7, 2001
Date Data Entered	September 13, 2001
Analysts	Gail Johnson and D. Scott Winters
Compound Class	Organophosphate

Set #1

	Blank 1	618779	618779D	618780	618781	619615	619616	619617	619618
Dichlorvos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Mevinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
TEPP	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Thionazion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Demeton	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethoprop	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tributylphosphate SS	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Naled	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dicrotophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Sulfotep + Phorate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Monocrotophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dimethoate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Terbufos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Monophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Diazinon	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Disulfoton+Phosphamidon+Dichlorofenthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorpyrifos(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Parathion(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ronnel	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fenitrothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Malithion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorpyrifos+Aspon	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fenthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Parathion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Trichlornate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorfenvinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Crotoxyphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tetrachlorvinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tokuthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Folex	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fensulfothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Carbophenothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bolstar	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Famfur	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Triphenylphosphate SS	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phosmet	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
EPN	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Leptophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Guthion(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Guthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Coumaphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dioxathion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

Set #2

	Blank 2	620223	620224	620225	620226	620227	620228	620228D	642261
Dichlorvos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Mevinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
TEPP	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Thionazion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Demeton	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethoprop	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tributylphosphate SS	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Naled	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dicrotophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Sulfotep + Phorate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Monocrotophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dimethoate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Terbufos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Monophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Diazinon	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Disulfoton+Phosphamidon+Dichlorofenthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorpyrifos(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Parathion(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ronnel	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fenitrothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Malithion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorpyrifos+Aspon	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fenthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Parathion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Trichlornate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorfenvinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Crotoxyphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tetrachlorvinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tokuthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Folex	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fensulfothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Carbophenothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bolstar	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Famfur	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Triphenylphosphate SS	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phosmet	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
EPN	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Leptophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Guthion(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Guthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Coumaphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dioxathion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

Set #3

	Blank 3	642274	642274D	643031	643035	643067	644705	644710	644722
Dichlorvos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Mevinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
TEPP	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Thionazion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Demeton	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethoprop	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tributylphosphate SS	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Naled	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dicrotophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Sulfotep + Phorate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Monocrotophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dimethoate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Terbufos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Monophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Diazinon	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Disulfoton+Phosphamidon+Dichlorofenthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorpyrifos(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Parathion(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ronnel	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fenitrothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Malithion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorpyrifos+Aspon	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fenthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Parathion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Trichlornate	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Chlorfenvinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Crotoxyphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tetrachlorvinphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Tokuthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Folex	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Fensulfothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Carbophenothion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bolstar	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Famfur	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Triphenylphosphate SS	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phosmet	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
EPN	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Leptophos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Guthion(methyl)	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Guthion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Coumaphos	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
Dioxathion	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

All results are reported in ng/g.
Reporting Limits = 2.0 ng/g (part per billion)(wet weight basis) unless otherwise noted
Reporting Limits = 6.0 ng/g (part per billion)(dry weight basis) unless otherwise noted
TEPP = 5.0 ng/g (wet weight), 15 ng/g (dry weight)
Dimethoate = 3.0 ng/g (wet weight), 9 ng/g (dry weight)
Chlorfenvinphos = 3.0 ng/g (wet weight), 9 ng/g (dry weight)
Bolstar & Famfur = 3.0 ng/g (wet weight), 9 ng/g (dry weight)
BQL = < 2.0 ng/g (wet weight), < 6 ng/g (dry weight)

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Soxhlet Duplicate: #1 - 618779D; #2 - 620228D; #3 - 642274D
9/13/01

Department of Environmental Quality

	Set #1		**Set #2**		**Set #3**	
COMPOUND	618779	618779D	620228	620228D	642274	642274D
Dichlorvos	BQL	BQL	BQL	BQL	BQL	BQL
Mevinphos	BQL	BQL	BQL	BQL	BQL	BQL
TEPP	BQL	BQL	BQL	BQL	BQL	BQL
Thionazion	BQL	BQL	BQL	BQL	BQL	BQL
Demeton	BQL	BQL	BQL	BQL	BQL	BQL
Ethoprop	BQL	BQL	BQL	BQL	BQL	BQL
Naled	BQL	BQL	BQL	BQL	BQL	BQL
Dicrotophos	BQL	BQL	BQL	BQL	BQL	BQL
Sulfotep + Phorate	BQL	BQL	BQL	BQL	BQL	BQL
Monocrotophos	BQL	BQL	BQL	BQL	BQL	BQL
Dimethoate	BQL	BQL	BQL	BQL	BQL	BQL
Terbufos	BQL	BQL	BQL	BQL	BQL	BQL
Monophos	BQL	BQL	BQL	BQL	BQL	BQL
Diazinon	BQL	BQL	BQL	BQL	BQL	BQL
Disulfoton+Phosphamidon+Dichlorofenthion	BQL	BQL	BQL	BQL	BQL	BQL
Chlorpyrifos(methyl)	BQL	BQL	BQL	BQL	BQL	BQL
Parathion(methyl)	BQL	BQL	BQL	BQL	BQL	BQL
Ronnel	BQL	BQL	BQL	BQL	BQL	BQL
Fenitrothion	BQL	BQL	BQL	BQL	BQL	BQL
Malithion	BQL	BQL	BQL	BQL	BQL	BQL
Chlorpyrifos+Aspon	BQL	BQL	BQL	BQL	BQL	BQL
Fenthion	BQL	BQL	BQL	BQL	BQL	BQL
Parathion	BQL	BQL	BQL	BQL	BQL	BQL
Trichlornate	BQL	BQL	BQL	BQL	BQL	BQL
Chlorfenvinphos	BQL	BQL	BQL	BQL	BQL	BQL
Crotoxyphos	BQL	BQL	BQL	BQL	BQL	BQL
Tetrachlorvinphos	BQL	BQL	BQL	BQL	BQL	BQL
Tokuthion	BQL	BQL	BQL	BQL	BQL	BQL
Folex	BQL	BQL	BQL	BQL	BQL	BQL
Fensulfothion	BQL	BQL	BQL	BQL	BQL	BQL
Ethion	BQL	BQL	BQL	BQL	BQL	BQL
Carbophenothion	BQL	BQL	BQL	BQL	BQL	BQL
Bolstar	BQL	BQL	BQL	BQL	BQL	BQL
Famfur	BQL	BQL	BQL	BQL	BQL	BQL
Phosmet	BQL	BQL	BQL	BQL	BQL	BQL
EPN	BQL	BQL	BQL	BQL	BQL	BQL
Leptophos	BQL	BQL	BQL	BQL	BQL	BQL
Guthion(methyl)	BQL	BQL	BQL	BQL	BQL	BQL
Guthion	BQL	BQL	BQL	BQL	BQL	BQL
Coumaphos	BQL	BQL	BQL	BQL	BQL	BQL
Dioxathion	BQL	BQL	BQL	BQL	BQL	BQL

Results are reported to two significant figures
All results are reported in ng/g.

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Percent Recovery Report
Laboratory Control Soxhlet
Spike #1, #2, and #3: Sand

9/13/01

Virginia Department of Environmental Quality

DATE COLLECTED: 08/23/2000
DATE RECEIVED: 8/24/2000
DATE ANALYZED: 09/07/2001

Compound Name	Spike Level (pg/uL)	Set #1 Spike #1	Set #1 % Recovery	Set #2 Spike #2	Set #2 % Recovery	Set #3 Spike #3	Set #3 % Recovery
TEPP	2000	396	20	278	14	187	9
Dicrotophos	2000	1859	93	1465	73	1365	68
Sulfotep + Phorate	2000	2090	105	1437	72	721	36
Monocrotophos	2000	2239	112	1327	66	1233	62
Malithion	2000	2213	111	1632	82	1487	74
Parathion	2000	2167	108	1612	81	1437	72
EPN	2000	2219	111	1533	77	1367	68

*Insufficient historical data to determine control limits.

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Percent Recovery Report
Matrix Spike Soxhlet
Spike #1 - 618779; Spike #2 - 620228; Spike #3 - 644724

9/13/01

Virginia Department of Environmental Quality

DATE COLLECTED: 08/23/2000
DATE RECEIVED: 8/24/2000
DATE ANALYZED: 09/07/2001

Compound Name	Spike Level (pg/uL)	Set #1 Spike #1 618779	Set #1 % Recovery	Set #2 Spike #2 620228	Set #2 % Recovery	Set #3 Spike #3 644724	Set #3 % Recovery
TEPP	2000	369	18	371	19	356	18
Dicrotophos	2000	1748	87	1032	52	1872	94
Sulfotep + Phorate	2000	1556	78	1384	69	1231	62
Monocrotophos	2000	1652	83	1612	81	1889	94
Malithion	2000	1895	95	1400	70	2037	102
Parathion	2000	1850	93	1352	68	1979	99
EPN	2000	1862	93	1221	61	1925	96

*Insufficient historical data to determine control limits.

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

COMMONWEALTH OF VIRGINIA
Department of General Services
VIRGINIA DIVISION OF CONSOLIDATED SERVICES

Surrogate Percent Recovery Report

Date: 9/13/2001

Virginia Department of Environmental Quality

SOXHLET EXTRACTION
DATE EXTRACTED: 08/09/2001

Sample #	Tributylphosphate	Triphenylphosphate
GPC	99	113
Blank 1	71	70
618779	76	190
618779D	74	71
618780	70	69
618781	70	79
619615	88	87
619616	63	59
619617	72	67
619618	60	58
618779SPK	75	69
Spike 1	89	92
Blank 2	49	62
620223	80	86
620224	70	80
620225	74	83
620226	98	105
620227	68	73
620228	66	71
620228D	81	98
642261	79	82
620228SPK	68	113
Spike 2	81	86
Blank 3	78	79
642274	86	83
642274D	49	62
643031	83	74
643035	92	86
643067	74	72
644705	100	137
644710	54	77
644722	85	81
644724SPK	93	92
Spike 3	68	71

ANALYSTS: GLJohnson and DSWinters

DATE COMPLETED: 09/13/2001

Sample Id	Date Analyzed	Kepone Dry Wgt Concentration (ppm)	Date Collected	Time Collected	Sample Depth (m)	Latitude Deg_min	Longitude Deg_min
2-JMS042.46	12/5/00	<0.01	10/19/00	1515	3.0	37_12.097	76_47.312
2-JMS040.03	12/5/00	<0.01	10/19/00	1200	5.0	37_11.013	76_45.156
2-JMS068.49	12/5/00	0.06	8/23/00	1640	3.3	37_18.272	77_07.256
2-JMS050.55	12/5/00	<0.01	8/24/00	1305	7.5	37_13.112	76_55.264
2-JMS068.68	12/5/00	<0.01	10/25/00	1330	11.0	37_18.014	77_07.239
2-JMS047.33	12/6/00	<0.01	10/23/00	1330	9.0	37_13.026	76_51.553
2-JMS052.52	12/6/00	<0.01	8/24/00	1200	1.0	37_14.311	76_56.592
2-JMS073.63	12/6/00	<0.01	8/22/00	1550	1.0	37_19.233	77_12.305
2-JMS068.64	12/6/00	<0.01	8/23/00	1110	7.0	37_18.026	77_07.208
2-JMS047.81	12/6/00	<0.01	10/23/00	1530	3.0	37_13.331	76_52.280
2-JMS074.25	12/6/00	<0.01	8/22/00	1330	1.8	37_19.111	77_13.154
2-JMS056.12	12/6/00	<0.01	8/24/00	1045	1.2	37_16.413	76_59.086
2-JMS066.35	12/6/00	<0.01	8/23/00	1800	1.5	37_18.355	77_04.445
2-JMS065.81	12/6/00	<0.01	10/25/00	1500	10.0	37_18.070	77_04.550
2-JMS044.08	12/7/00	<0.01	8/24/00	1440	7.5	37_13.179	76_48.344
2-CHK012.12	12/7/00	<0.01	8/1/00	1940	1.0	37_21.373	76_54.068
2-JMS068.64d	12/7/00	<0.01	8/23/00	1110	7.0	37_18.026	77_07.208
2-JMS074.29	12/7/00	<0.01	10/25/00	1030	10.0	37_19.000	77_13.180
2-JMS047.33d	12/7/00	<0.01	10/23/00	1330	9.0	37_13.026	76_51.553
2-JMS068.68d	12/7/00	<0.01	10/25/00	1330	11.0	37_18.014	77_07.239
2-JMS067.56	12/7/00	<0.01	8/23/00	1330	9.0	37_18.291	77_06.238
2-JMS073.63d	12/7/00	<0.01	8/22/00	1550	1.0	37_19.233	77_12.305
2-JMS046.73	12/7/00	<0.01	8/24/00	1725	3.5	37_13.381	76_51.221

Table 2. Kepone Quality Assurance/Quality Control Samples

QA/QC Sample Identification	Date Analyzed	Kepone Dry Wgt Concentration (ppm)		
Blank Samples				
Lab Blk 12/4/00	12/5/00	<0.01		
Lab Blk 12/5/00	12/6/00	<0.01		
Lab Blk 12/6/00	12/7/00	<0.01		
Lab Blk 12/7/00	12/8/00	<0.01		
Equip Blk 10/25/00	12/7/00	<0.01		
Replicate Analysis	Date Analyzed	Conc. (ppm)	RPD	
2-JMS068.49	12/5/00	0.06	12.6	
2-JMS068.49a	12/8/00	0.05	6.2	
2-JMS068.49b	12/8/00	0.05	6.2	
Mean Concentration		0.0533		
Matrix Spike Duplicates	Date Analyzed	Conc. (ppm)	RPD	Recovery%
Carter Cr sed@0.105ppm	12/5/00	0.0954	5.2	90.9
Carter Cr sed@0.105ppm	12/5/00	0.0881	2.9	83.8
Carter Cr sed@0.105ppm	12/5/00	0.0886	2.3	84.4
Mean Concentration		0.0907		86.4
Linearity spiked samples	Date Analyzed	Measured	Expected	Recovery%
Carter Cr sed Matrix bkgrd	12/5/00	<0.01	0	na
Carter Cr sed@0.0105ppm	12/5/00	0.0109	0.0105	103.8
Carter Cr sed@0.105ppm	12/5/00	0.0954	0.105	90.8
Carter Cr sed@1.05ppm	12/5/00	0.931	1.05	88.7
R Squared		0.99998722		
X Coefficient(s)		0.88689852		