

of Engineer Research and Development Center

Sampling, Chemical Analysis, and Bioassessment in Accordance with CWA Section 404

Houston Ship Channel Expansion Channel Improvement Project, North of Morgan's Point Houston Ship Channel, Texas (Part 5 of 6: Appendix 7, CDFATE Model Report)

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FINAL

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Appendix 7: Tier III Biological Testing of HSC ECIP NMP

TIER III BIOLOGICAL TESTING OF HOUSTON SHIP CHANNEL EXPANSION CHANNEL IMPROVEMENT PROJECT (HSC ECIP) (NORTH OF MORGAN'S POINT) SEDIMENTS

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1 INTRODUCTION

In this 404 evaluation, a modified elutriate test (MET), otherwise known as an effluent elutriate test (EET), was conducted according to guidance (Appendix B of the Upland Testing Manual 2003). In 404 evaluations (40 CFR Section 230 Subpart G); it is recommended (but not required) that a multi-species testing approach be used (USEPA/USACE 1998) to assess potential effects of the dredged material placed into open water. The receiving system for the discharge was identified as marine/estuarine. Therefore, standard acute (96 hour) toxicity tests described in the Inland Testing Manual (USEPA/USACE 1998) that employ the fish *Menidia beryllina* and the mysid shrimp *Americamysis bahia* were used to assess the EETs.

2 METHODS

2.1 Sediment Compositing

Discrete sediments from each representative sample composite were combined in equal volumes and homogenized in a 7 gal high density polyethylene (HDPE) bucket (e.g., HSCNEW-NMP-06A, 06-B, 06A&C combined in equal volume to create HSCNEW-NMP-06) on 9 October 2018 (up to 3 days after collection depending on the sampling site). A total of 6 gallons of each composite was generated. Homogenization was performed with a 0.43 hp Lightnin[™] homogenizer (Rochester, New York) with stainless steel (SS) dual impeller (7" diameter). Mixing was conducted for a minimum of 2 minutes or until uniform consistency was achieved. The 7 gallon HDPE buckets were pre-cleaned prior to homogenization with soap, water, isopropyl alcohol, and rinsed with reverse osmosis water. Props and shafts of the mixer and other tools utilized in the mixing were also cleaned following the same procedure between sites. The composited sediments were left in the 7 gallon bucket and placed in cold storage. Additional information on sample nomenclature and compositing can be found in Table 1 and Appendix A. Sediment Compositing Log.

Table 1. Summary of test materials.

Table summarizes the nomenclature for sediment composites and site water (SW) used in the biological testing evaluation.

Location	Matrix
HSC-NMP-1	Sediment
HSC-NMP-1	Water
HSC-NMP-2	Sediment
HSC-NMP-2	Water
HSC-NMP-3	Sediment
HSC-NMP-3	Water
HSC-NMP-4	Sediment
HSC-NMP-4	Water
HSC-NMP-5	Sediment
HSC-NMP-5	Water
HSC-NMP-6	Sediment
HSC-NMP-6	Water
HSC-NMP-7	Sediment
HSC-NMP-7	Water
HSC-NMP-8	Sediment
HSC-NMP-8	Water
HSC-NMP-9	Sediment
HSC-NMP-9	Water
HSC-NMP-10	Sediment
HSC-NMP-10	Water
HSC-NMP-11	Sediment
HSC-NMP-11	Water

2.2 Biological Testing

Bioassays were conducted by the ERDC Environmental Laboratory (ERDC-EL, Vicksburg, MS) in basic accordance with standard guidance (USEPA 2002; USEPA/USACE 1998; RIA USEPA/USACE, 2003; HSC NMP SAP, 2018). The aquatic toxicity testing facility at the ERDC-EL consists of three laboratories containing five (5) temperature and humidity controlled environmental rooms (Darwin, St. Louis, MO, USA) and four (4) temperature controlled water baths. Elutriate testing was conducted in the environmental rooms. Relevant equipment for processing samples and fulfilling all requirements of laboratory bioassays (e.g., pH meters, DO meters, temperature probes, ammonia probes, refractometers, centrifuges, etc.) were available. Bioassays were conducted to assess the potential for biological effects of dredged material released into the water column during DM discharge (elutriate toxicity tests), using two taxonomically and functionally dissimilar species. Elutriate toxicity tests employed the mysid shrimp *A. bahia* and the fish *M. beryllina*.

2.2.1 Elutriate Bioassays

Modified elutriates were prepared by the ERDC-EL Environmental Chemistry Branch according to guidance (Upland Testing Manual 2003, Appendix B). Briefly, 150 g/L sediment (dry weight, calculated from sediment wet-dry ratios in Appendix B. Sediment Wet-Dry Ratios) was be added to site-collected water at sufficient total volume to accommodate analytical chemistry and biological test requirements. The sediment-water slurry was agitated via aeration to maintain the suspension for 60 minutes, followed by 24 hours settling. The resulting sample was the 100% (undiluted) elutriate used in chemical and biological analysis. Each sediment elutriate composite was prepared using a separate site-water associated with that sampling location (Table 1). The supernatant was siphoned and used for testing. This supernatant was defined as the 100% elutriate. Elutriate bioassays were conducted for 96-hours using the 100% elutriate; where toxicity was expected due to elevated ammonia concentrations, additional 50% and 10% elutriate concentrations were added. All concentrations, including the control and reference waters, were replicated five times. The standard test organisms A. bahia (formerly Mysidopsis bahia) and M. beryllina and were used in survival tests in basic accordance with dredged material evaluation guidance (USEPA/USACE 1991, 1998, 2003). All elutriate toxicity tests were conducted at 20 ± 1 °C in temperature and humidity controlled environmental rooms (Darwin, St. Louis, MO, USA).

Other than the reference sediment, all of the site waters collected for elutriate preparation had low salinities (\approx 0 to 22 ppt) that were outside the tolerance ranges of the standard test organisms (25 to 30 ppt; USEPA / USACE, 1998). The salinity of each site water was individually adjusted to approximately 30 ppt by incrementally adding \approx 151 to 570 g/19L Crystal Sea® Marinemix prior to elutriate preparation. The salinity adjusted site waters were then used to prepare the elutriate test waters, as described above.

2.2.2 Elutriate toxicity bioassay: *Americamysis bahia* (4-day old)

The mysid shrimp A. bahia was exposed to the sediment elutriate water at 4-days old (specified range: 1 to 5 days with no more than a 24-h range in age; USEPA/USACE 1998). Shrimp were shipped overnight from Aquatic Biosystems (ABS, Fort Collins, CO, USA), immediately observed for potential shipment impacts and fed brine shrimp (Artemia) upon receipt. Mysid shrimp were held for 72-hours (received at the appropriate age to be 4-day old) prior to testing for acclimation and observation. The control water and dilution water was reconstituted seawater (30 ppt) prepared using Crystal Sea® Marinemix. Each test concentration included five (5) replicate, 1 L glass beakers containing 400 mL test media and ten (10) A. bahia each. The larger beaker size and two daily feeding rations were used to avoid aggressive interactions and potential for cannibalism during the exposure. Test acceptability criteria included water parameters (temperature, pH, salinity, dissolved oxygen) within the specified range (USEPA/USACE 1991, 1998), at least ninety (90%) survival in the performance control and sensitivity to a reference toxicant (e.g., KCI) within acceptable control chart ranges (± two (2) S.D. from the mean). The ninety six (96) hour tests were conducted from 29 October to 2 November 2018, according to USEPA/USACE (1998). The measurement endpoint was survival.

2.2.3 Elutriate toxicity bioassay: Menidia beryllina

The inland silverside *M. beryllina* was exposed to the sediment elutriate water at twelve (12) days old (specified range: 1 to 14 days with no more than a 24-h range in age; USEPA/USACE 1998). Fish were shipped overnight from Aquatic Biosystems (ABS, Fort Collins, CO, USA) immediately observed for potential shipment impacts and fed brine shrimp (*Artemia*) upon receipt. The *M. beryllina* were held for 72-hours (received at 9 days old) prior to testing for acclimation and observation. The control water and dilution water was reconstituted seawater (30 ppt) prepared using Crystal Sea® Marinemix. Each test concentration included five (5) replicate, 600 mL glass beakers containing 400 mL test media and ten (10) *M. beryllina* each. Fish were fed at 24-h and 72-h to maintain health. Test acceptability criteria included water parameters (temperature, pH, salinity, dissolved oxygen) within the specified range (USEPA/USACE 1991, 1998), at least ninety (90%) survival in the performance control and sensitivity to a reference toxicant (e.g., KCI) within acceptable control chart ranges (± two (2) S.D. from the mean). The ninety six (96) hour tests were conducted from 29 October to 2 November, according to USEPA/USACE (1998). The measurement endpoint was survival.

2.2.4 Reference toxicity tests for elutriate bioassays

Reference toxicant tests were conducted on each batch of test organisms to assess test organism sensitivity relative to historic information recorded in-house laboratory control charts. The selected reference toxicant was potassium chloride (KCI). Reagent grade KCI was weighed and completely dissolved into the appropriate reconstituted waters for each test species (described above). Five concentrations (3 replicates each) were prepared (100, 50, 25, 12.5, 6.25%) with the previously described number of organisms in each replicate. The 100% concentration used was 2.0 g/L for *M. beryllina* and 1.0 g/L

for *A. bahia*. The endpoint measured was survival after a 48- or 96-hour exposure. The median effects endpoints generated in the reference toxicity tests were compared to historic information recorded in ERDC or vendor control charts (\pm two (2) S.D. from the mean).

2.2.5 Water Quality Parameters

Water quality during bioassay testing was measured using either a Yellow Springs Instruments (YSI) Model 556 multiprobe system (Yellow Springs, OH) or a Thermo Scientific Orion Star[™] A329 (Thermo Orion Electron Corp., Beverly, MA) for temperature, salinity, pH, and Dissolved Oxygen (D.O.). Total ammonia-N and pH was measured using a 720A ion-selective electrode (ISE) meter (Thermo Orion Electron Corp., Beverly, MA) equipped with a 95-12 ammonia-sensitive electrode and a 9107BN automatic temperature compensating pH triode (Thermo Orion Electron Corp., Beverly, MA). Total overlying water ammonia-N during bioassays was also measured using LeMotte titration kits (Chestertown, MD, USA). Note that both ammonia measurement methods determined ammonia as total ammonia-nitrogen (-N). Total ammonia and un-ionized ammonia were calculated based on molecular mass and measured pH, temperature and salinity in the test water (see EPA 1989), specifically using the following equation:

Un-ionized ammonia = [(17*NH₃)] / [(14*(1+10^((0.09018+(2729.92/(pH+273.15)) +((0.1552 - (0.0003142 * Temperature)) * ((19.9273 * salinity) / (1000 - (1.2005109 * salinity)))))-pH)))]

2.3 Statistical Analysis

The process by which elutriates were tested is summarized in Figure 1. Statistical analysis was performed when survival in the undiluted (100%) elutriate water was reduced by more than 10% relative to the dilution water control, as specified by guidance (USEPA / USACE 1998, 2003). Statistical analyses are conducted using Toxcalc® statistical software (Version 5.0, Tidepool Scientific Software, McKinleyville, CA). Data normality was determined by the Shapiro-Wilk's Test and homogeneity of variance by Bartlett's Test. If survival was not reduced by at least 10% relative to the dilution water, no statistics were performed. If at least a 10% reduction was observed, initially a two sample t-test was performed to compare the undiluted (100%) elutriate to the dilution water control. If that was statistically significant, then treatment differences (dilution water, 10%, 50% and 100% elutriates) were performed by one way ANOVA and Dunnett's Method (one-tailed analysis); the Bonferroni t-test was performed in the case of uneven replicates. If normality could not be achieved, Steel's Many-One Rank test (one-tailed analysis) was used. If applicable, the lethal median concentration producing 50% mortality (LC50) in elutriate or reference toxicity test dilutions is determined by the Spearman-Karber method using Toxcalc® (version 5.0, Tidepool Scientific Software, McKinleyville, CA).

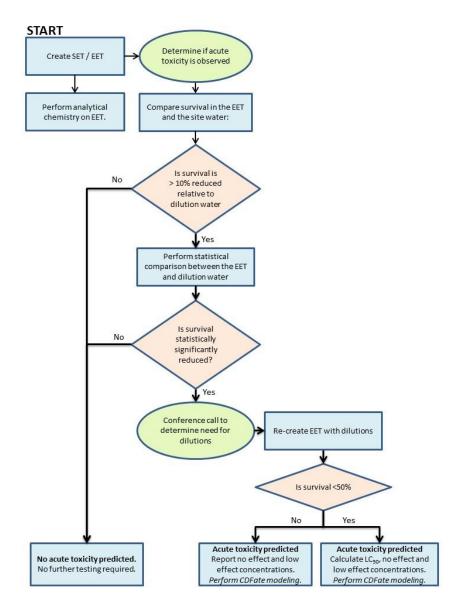


Figure 1. Elutriate testing decision flowchart.

3 RESULTS

Elutriate toxicity tests were conducted during the week of 29 October 2018. The elutriates were prepared from project sediments within 3 weeks of compositing (9 October 2018) at the initiation of the bioassays. All elutriate toxicity testing used a freshly prepared elutriate (aged <24-h).

3.1 Elutriate bioassay: Americamysis bahia (96-h method)

Water quality parameters (Appendix D. Elutriate bioassay water quality parameters) were within the acceptability ranges specified by testing guidance (US EPA / US ACE 1991, 1998, 2003). Survival in the laboratory performance control (96%) met the \geq 90% requirement (Table 2). The LC50 value for the KCl reference toxicity test conducted on 29 October 2018 was 0.61 (0.55 – 0.69) g/L. This value was within two standard deviations around the mean LC50 values from ERDC control chart data (0.40 – 0.82 g/L). This indicates that the test organisms were within the historic sensitivity range.

Survival was at least 86% (range: 86 – 100%) in all eleven site waters (Table 2). Survival in the undiluted (100%) elutriates ranged from 25 to 94% (Table 2). Survival was both reduced by at least 10% and statistically significantly different (by one-tailed t-test) for NMP-1, -4, -7, and -8. There was no acute toxicity observed in the other elutriates.

For elutriates in which significant mortality was observed, multiple treatment comparisons using Dunnett's test were performed to determine NOEC and LOEC values, which are summarized in Table 3. Mortality was only high enough in NMP-1 and NMP-7 to calculate LC50 values; the LC50 values for NMP-1 and NMP-7 were 89 and 79%, respectively.

Total ammonia-N concentrations in the undiluted elutriates ranged from 1.4 to 20.7 mg/L and calculated un-ionized concentrations (0.08 to 1.11 mg/L). The ammonia-N and un-ionized ammonia concentrations and comparison to known toxicity thresholds (Kennedy et al 2015, Melby et al 2018) are summarized in Table 4. Since some of the ammonia levels were well above concentrations that are known to cause acute effects to this organism, there is a strong line of evidence that ammonia was high enough to cause mortality in all of the elutriates where acute toxicity was observed (NMP-1, -4, -7, and -8).

The *A. bahia* elutriate bioassay did not indicate acute toxicity for the 7 of the 11 tested sediment elutriates (NMP-2, -3, -5, -6, -9, -10, and -11). Statistically significant acute toxicity was determined for NMP-1, -4, -7, -8.

3.2 Elutriate bioassay: *Menidia beryllina*

Water quality parameters (Appendix D. Elutriate bioassay water quality parameters) were within the acceptability ranges specified by testing guidance (US EPA / US ACE 1991, 1998, 2003). Survival in the laboratory performance control (98%) met the \geq 90% requirement (Table 2). The LC50 value for the KCl reference toxicity test conducted on 29 October 2018 was 1.46 (1.34 – 1.59) g/L. This value was within two standard deviations around the mean LC50 values from ERDC control chart data (1.07 – 1.52 g/L). This indicates that the test organisms were within the historic sensitivity range.

Survival was at least 94% (range: 94 – 100%) in all eleven site waters (Table 2). Survival in the undiluted (100%) elutriates ranged from 0 to 100%. Survival was both reduced by at least 10% and statistically significantly different (by one-tailed t-test) for NMP-1, -4, -6, -7, -8, -10, and -11. There was no acute toxicity observed in the other elutriates.

For elutriates in which significant mortality was observed, multiple treatment comparisons using Dunnett's test were performed to determine NOEC and LOEC values, which are summarized in Table 3. Mortality was only high enough in NMP-1, - 6, and -7 to calculate LC50 values; the LC50 values for NMP-1, - 6, and -7 were 88, 95 and 59%, respectively.

Total ammonia-N concentrations in the undiluted elutriates ranged from 1.29 to 23.5 mg/L and calculated un-ionized concentrations (0.08 to 1.11 mg/L). The ammonia concentrations and comparison to known toxicity thresholds (Kennedy et al 2015, Melby et al 2018) are summarized in Table 4. Since some of the ammonia levels were well above concentrations that are known to cause acute effects to this organism, there is a strong line of evidence that ammonia was high enough to cause mortality in all of the elutriates where acute toxicity was observed (NMP-1, -4, -6, -7, -8, -11).

The *M. beryllina* elutriate bioassay did not indicate acute toxicity for the 5 of the 11 tested elutriates (NMP-2, -3, -5, -9). Statistically significant acute toxicity was determined for NMP-1, -4, -6, -7, -8, -10 and -11.

3.3 Ammonia Toxicity Background

Ammonia is an important contaminant to consider in toxicity bioassays, especially when employing fish species (USEPA 1989, 1999, 2009) or embryo development tests (Kennedy et al. 2015). The unionized fraction of ammonia, which is dependent on water temperature, pH and to a lesser extent salinity, is often most responsible for causing toxicity in elutriate testing (Kennedy et al., 2015).

Based on LC50 ranges for *A. bahia* (0.23 – 1.7 mg/L UIA) at similar temperatures and pH values taken from the literature (Miller et al 1990; Boardman et al., 2004; Kennedy et al 2015) and a NOEC value reported in Melby et al (2018) of 0.5 mg/L un-ionized ammonia, the un-ionized concentrations in the NMP-1, -4, and -7 elutriates were sufficiently high to cause toxicity. The NMP-5, -6, -8, -10, and -11 elutriates had elevated ammonia which may have caused some mortality.

Based on LC50 ranges for *M. beryllina* (0.75 – 1.94 mg/L UIA) taken from the literature (Boardman et al 2004, Miller et al 1990, Li 1997, Kennedy et al 2015) and NOEC values reported in Melby et al (2018) of 0.6 mg/L un-ionized ammonia, the un-ionized concentrations in the NMP-1, -4, and -7 elutriates were sufficiently high to cause toxicity. The NMP-5, -6, -8, -10 and -11 elutriates had elevated ammonia which may have caused some mortality.

in all of the elutriates in which acute toxicity was observed were high enough to cause mortality to the test organisms based on literature reported values for ammonia toxicity (Melby et al., 2018). Therefore, there is a line of evidence that ammonia was an important determinant of the toxicity observed in both test organisms.

Table 2. Elutriate toxicity results.

Percent survival data presented as means and one standard deviation. Indication of 10% reduction and statistical significance between the 100% elutriate and control/dilution by t-test is provided (yes/no). Statistical significance in multiple comparisons is indicated by an asterisk and boldface.

Sediment Elutriate	Treatment	96-h Americamysis (%)	Reduced > 10%?	Stat Sig?	96-h <i>Menidia</i> (%)	Reduced > 10%?	Stat Sig?
Control	NA	96 ± 9			98 ± 4		
	Site water	91 ± 6			100 ± 0		
HSC-NMP-1	10%	92 ± 4	No		96 ± 5	No	
	50%	86 ± 11	No		96 ± 9	No	
	100%	40 ± 22*	Yes	Yes	38 ± 22*	Yes	Yes
	Site water	100 ± 0	No		94 ± 5	No	
HSC-NMP-2	10%	100 ± 0	No		98 ± 4	No	
	50%	94 ± 5	No		100 ± 0	No	
	100%	94 ± 9	No		94 ± 9	No	
HSC-NMP-3	Site water	96 ± 5			100 ± 0		
	100%	94 ± 9	No		100 ± 0	No	
	Site water	92 ± 8			96 ± 5		
	10%	98 ± 4	No		98 ± 4	No	
HSC-NMP-4	50%	90 ± 7	No		92 ± 8	No	
	100%	64 ± 15*	Yes	Yes	60 ± 19*	Yes	Yes
	Site water	96 ± 9			100 ± 0	No	
	10%	98 ± 4	No		90 ± 10	No	
HSC-NMP-5	50%	86 ± 15	No		96 ± 9	No	
	100%	88 ± 4	No		96 ± 5	No	
	Site water	86 ± 5			96 ± 5	No	
	10%	94 ± 9	No		90 ± 12	No	
HSC-NMP-6	50%	100 ± 0	No		90 ± 7	No	
	100%	90 ± 7	No		46 ± 5*	Yes	Yes
	Site water	86 ± 11			100 ± 0		
HSC-NMP-7	10%	100 ± 0	No		98 ± 4	No	

Sediment Elutriate	Treatment	96-h Americamysis (%)	Reduced > 10%?	Stat Sig?	96-h <i>Menidia</i> (%)	Reduced > 10%?	Stat Sig?
	50%	96 ± 5	No		82 ± 4*	Yes	Yes
	100%	25 ± 16*	Yes	Yes	0 ± 0*	Yes	Yes
	Site water	94 ± 5			98 ± 4	No	
	10%	98 ± 4	No		94 ± 5	No	
HSC-NMP-8	50%	92 ± 8	No		98 ± 4	No	
	100%	70 ± 10*	Yes	Yes	60 ± 16*	Yes	Yes
	Site water	94 ± 13			96 ± 5	No	
	10%	92 ± 8	No		94 ± 5	No	
HSC-NMP-9	50%	90 ± 7	No		90 ± 12	No	
	100%	94 ± 5	No		98 ± 4	No	
	Site water	94 ± 5			100 ± 0	No	
	10%	96 ± 5	No		94 ± 5	No	
HSC-NMP-10	50%	94 ± 5	No		100 ± 0	No	
	100%	88 ± 13	No		71 ± 12*	Yes	Yes
	Site water	86 ± 11			100 ± 0	No	
	10%	96 ± 5	No		94 ± 8	No	
HSC-NMP-11	50%	100 ± 0	No		98 ± 4	No	
	100%	84 ± 9	Yes	Yes	54 ± 9*	Yes	Yes

Sample	Endpoint	96-h Americamysis bahia	96-h Menidia beryllina
	NOEC	50	50
HSC-NMP-1	LOEC	100	100
	LC50	89 (75 – 105)	88 (77 – 100)
	NOEC	100	100
HSC-NMP-2	LOEC	NA (1)	NA (1)
	LC50	NA (1)	NA (1)
	NOEC	100	100
HSC-NMP-3	LOEC	NA (1)	NA (1)
	LC50	NA (1)	NA (1)
	NOEC	50	50
HSC-NMP-4	LOEC	100	100
	LC50	NA (1)	NA (1)
	NOEC	100	100
HSC-NMP-5	LOEC	NA (1)	NA (1)
	LC50	NA (1)	NA (1)
	NOEC	100	50
HSC-NMP-6	LOEC	NA (1)	100
	LC50	NA (1)	95 (78 – 117)
	NOEC	50	10
HSC-NMP-7	LOEC	100	50
	LC50	79 (73 – 86)	59 (52 – 66)
	NOEC	50	50
HSC-NMP-8	LOEC	100	100
	LC50	NA (1)	NA (1)
	NOEC	100	100
HSC-NMP-9	LOEC	NA (1)	NA (1)
	LC50	NA (1)	NA (1)
	NOEC	100	50
HSC-NMP-10	LOEC	NA (1)	100
	LC50	NA (1)	NA (1)
	NOEC	100	50
HSC-NMP-11	LOEC	NA (1)	100
	LC50	NA (1)	NA (1)

Table 3. Summary of toxicity reference values.

Footnotes:

(1) NA = not applicable due to no observed toxicity; LOEC = lowest observed effect concentration; NOEC = no observed effect concentration; LC50 = median lethal concentration

Table 4. Ammonia concentrations in elutriates.

Data are presented relative to toxicity reference values for Americamysis bahia (A) and Menidia beryllia (B).

Control	Total Ammonia-N,	Initial Un-ionized	Final Un-ionized	Significant	Un-ionized Ammonia	Un-ionized Ammonia
Control	averaged (mg/L)	Ammonia (mg/L)	Ammonia (mg/L)	Toxicity?	Threshold (mg/L)	Threshold Exceeded?
0	<0.5	<0.03	<0.03		0.5	No
HSC-NMP-1						
0	0.56	<0.03	0.02	No	0.5	No
10	2.15	0.08	0.07	No	0.5	No
50	9.77	0.52	0.44	No	0.5	Yes
100	18.75	0.92	1.03	Yes	0.5	Yes
HSC-NMP-2						
0	0.57	<0.03	0.02	No	0.5	No
10	0.74	0.03	<0.03	No	0.5	No
50	3.38	0.16	0.13	No	0.5	No
100	7.22	0.44	0.28	No	0.5	No
HSC-NMP-3						
0	<0.5	<0.03	<0.03	No	0.5	No
100	1.38	0.08	0.05	No	0.5	No
HSC-NMP-4						
0	<0.5	<0.03	<0.03	No	0.5	No
10	1.53	0.06	0.06	No	0.5	No
50	6.60	0.34	0.21	No	0.5	No
100	12.55	0.65	0.46	Yes	0.5	Yes
HSC-NMP-5						
0	1.17	<0.03	0.04	No	0.5	No
10	1.21	0.05	0.04	No	0.5	No
50	4.98	0.27	0.18	No	0.5	No
100	9.81	0.53	0.38	No	0.5	Yes

Α.

Control	Total Ammonia-N, averaged (mg/L)	Initial Un-ionized Ammonia (mg/L)	Final Un-ionized Ammonia (mg/L)	Significant Toxicity?	Un-ionized Ammonia Threshold (mg/L)	Un-ionized Ammonia Threshold Exceeded?
HSC-NMP-6						
0	<0.5	<0.03	<0.03	No	0.5	No
10	1.37	0.05	0.05	No	0.5	No
50	4.82	0.21	0.18	No	0.5	No
100	10.63	0.52	0.42	No	0.5	Yes
HSC-NMP-7						
0	<0.5	<0.03	<0.03	No	0.5	No
10	2.27	0.09	0.06	No	0.5	No
50	9.68	0.49	0.32	No	0.5	No
100	20.65	1.11	0.86	Yes	0.5	Yes
HSC-NMP-8						
0	<0.5	<0.03	<0.03	No	0.5	No
10	1.48	0.05	0.05	No	0.5	No
50	5.42	0.29	0.14	No	0.5	No
100	10.15	0.62	0.29	Yes	0.5	Yes
HSC-NMP-9						
0	<0.5	<0.03	<0.03	No	0.5	No
10	0.97	0.03	0.03	No	0.5	No
50	3.43	0.16	0.12	No	0.5	No
100	7.89	0.44	0.30	No	0.5	No
HSC-NMP-10						
0	<0.5	<0.03	<0.03	No	0.5	No
10	1.31	0.05	0.04	No	0.5	No
50	6.03	0.30	0.19	No	0.5	No
100	11.50	0.62	0.42	No	0.5	Yes
HSC-NMP-11						
0	<0.5	<0.03	<0.03	No	0.5	No
10	1.31	0.05	0.04	No	0.5	No

Control	Total Ammonia-N, averaged (mg/L)	Initial Un-ionized Ammonia (mg/L)	Final Un-ionized Ammonia (mg/L)	Significant Toxicity?	Un-ionized Ammonia Threshold (mg/L)	Un-ionized Ammonia Threshold Exceeded?
50	5.80	0.30	0.20	No	0.5	No
100	11.70	0.65	0.47	No	0.5	Yes

В.

Control	Total Ammonia-N, averaged	Initial Un-ionized Ammonia (mg/L)	Final Un-ionized Ammonia (mg/L)	Significant Toxicity?	Un-ionized Ammonia Threshold (mg/L)	Un-ionized Ammonia Threshold Exceeded?
0	<0.5	<0.03	<0.03			
HSC-NMP-1						
0	<0.5	<0.03	<0.03	No	0.6	No
10	1.76	0.08	0.07	No	0.6	No
50	8.67	0.52	0.46	No	0.6	No
100	16.75	0.92	1.06	Yes	0.6	Yes
HSC-NMP-2						
0	<0.5	<0.03	<0.03	No	0.6	No
10	0.70	0.03	0.03	No	0.6	No
50	3.17	0.19	0.14	No	0.6	No
100	6.81	0.44	0.36	No	0.6	No
HSC-NMP-3						
0	<0.5	<0.03	<0.03	No	0.6	No
100	1.29	0.08	0.04	No	0.6	No
HSC-NMP-4						
0	<0.5	<0.03	<0.03	No	0.6	No
10	1.30	0.06	0.05	No	0.6	No
50	6.45	0.34	0.30	No	0.6	No
100	12.95	0.65	0.80	Yes	0.6	Yes
HSC-NMP-5						
0	<0.5	<0.03	<0.03	No	0.6	No
10	1.00	0.05	0.03	No	0.6	No

Control	Total Ammonia-N, averaged	Initial Un-ionized Ammonia (mg/L)	Final Un-ionized Ammonia (mg/L)	Significant Toxicity?	Un-ionized Ammonia Threshold (mg/L)	Un-ionized Ammonia Threshold Exceeded?
50	4.51	0.28	0.13	No	0.6	No
100	9.42	0.50	0.34	No	0.6	No
HSC-NMP-6						
0	<0.5	<0.03	<0.03	No	0.6	No
10	1.04	0.05	0.04	No	0.6	No
50	4.26	0.21	0.23	No	0.6	No
100	10.48	0.52	0.65	Yes	0.6	Yes
HSC-NMP-7						
0	<0.5	<0.03	<0.03	No	0.6	No
10	1.87	0.09	0.04	No	0.6	No
50	9.13	0.49	0.30	Yes	0.6	No
100	23.50	1.11		Yes	0.6	Yes
HSC-NMP-8						
0	<0.5	<0.03	<0.03	No	0.6	No
10	1.08	0.05	0.03	No	0.6	No
50	5.06	0.29	0.13	No	0.6	No
100	10.62	0.62	0.39	Yes	0.6	Yes
HSC-NMP-9						
0	<0.5	<0.03	<0.03	No	0.6	No
10	0.80	0.03	0.02	No	0.6	No
50	3.16	0.16	0.10	No	0.6	No
100	7.90	0.44	0.28	No	0.6	No
HSC-NMP-10						
0	<0.5	<0.03	<0.03	No	0.6	No
10	1.14	0.05	0.04	No	0.6	No
50	5.52	0.30	0.24	No	0.6	No
100	11.24	0.62	0.65	Yes	0.6	Yes
HSC-NMP-11						

Control	Total Ammonia-N, averaged	Initial Un-ionized Ammonia (mg/L)	Final Un-ionized Ammonia (mg/L)	Significant Toxicity?	Un-ionized Ammonia Threshold (mg/L)	Un-ionized Ammonia Threshold Exceeded?
0	<0.5	<0.03	<0.03	No	0.6	No
10	1.18	0.05	0.03	No	0.6	No
50	5.34	0.30	0.17	No	0.6	No
100	11.31	0.65	0.45	Yes	0.6	Yes

Ammonia values represent the mean between test initiation and termination. Un-ionized ammonia calculated from the measured pH, temperature and salinity in test water.

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5 Appendices

5.1 Appendix A. Sediment Compositing Log

	ERDC Datasheet	Houston Ship Channel Section	103
(.		Sediment Composite Log	103
	Composite 10: HJCNCG - NMP	-03-LD My Fotal Volume Com	posited: 6 g cl
	Technician(s): JDF JB		
	Date: 10-2-18	5- 	Time Started: 6720
÷.	Storage Location: 6017 Cold S	torose	Time Completed: 0800
	Photos Taken? (Y/N)		Bulk Ammonia Sample? (Y/N)
	Discreet Sodiment ID added to Volume		
	Composite Added (gallons)		Sediment Description
	HSCHEL-OFF-OB-18 2	block/red clay:	strong PAH Odat
	" 2013 CtA 2		
	11 30+27 2		
	~ ~ 0		
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Houston Ship Channel Section 103 Sediment Composite Log

echnician(s): JMB					The charles	P:4	0	
Date: 10-9-18					Time Started: <i>C</i> : 40			
itorage Location: 6017	C. 10 110.	2~			Time Completed:			
Photos Taken? (Y/N)			1000		Bulk Ammonia Sa	mple? (Y/N)	/ <u>/</u>	
Discreet Sediment ID added to	Volume							
Composite	Added (gallons)			Se	diment Descripti	on I		
HSCNew- POMP-OTA	2	clay.	with 2	put !	<u>βιαι)ς</u> ν	mild	hydrocr	han som
HSCNOW NMP-07A HHCNEN NMP 07A	2	CLAY	with	Sand	<u> </u>	•••	21	
HHCNEN NMP OTA	2	CAY	w. +h	SAnd	۲	۷.	4	
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Houston Ship Channel Section 103 Sediment Composite Log

Fechnician(s): RB, FB, JDF Date: 10-9-16	Yime Started:
	Time Completed: 18:58
	Bulk Ammonia Sample? (Y/N)
Photos Taken? (Y/N)	
Discreet Sediment ID added to Volume Composite	Sediment Description
I Added (gallons) I	Sediment Description
HSCNCV - NMP-COMP A	red / black ddy, Some Scall: petroleur allor
11 20 FJ ALC Z	
11 3 of Z	
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Houston Ship Channel Section 103 Sediment Composite Log

Composite ID: HSCNEW-1	JMP. 09 Comp		Total Volume (composited:	652/	lonj	
Technician(s): TL, SN							
Date: 19-9-18				Time Star	ted:	0830	
Storage Location: 6°17	Cold room			Time Com	pleted:	9:40	
Photos Taken? (Y/N)	Bulk Amm	nonia Sample	? (Y/N)	\sim			
Discreet Sediment ID added to Composite	Volume						
	Added (gallons)			Sediment D	escription		
fscnew NMP - 09A	2 gallens						
45CNOW - NMP - 094 HSCNOW - NMP - 09C	2 sallon						
HSCNOW-NMP-090	Zynllan						
101							
							<u>2000 - 10000</u>
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Houston Ship Channel Section 103 Sediment Composite Log

Composite ID: HSCNew - N	mp - 10 (om	p Total Volume Composited: 6 gallag
Technician(s): MB, DM, J.	MB, DF	
Date: 10-9-19		Time Started: 0950
Date: 10-9-19 Storage Location: 6017	Cold mon	Time Completed: 094つ
Photos Taken? (Y/N)		Bulk Ammonia Sample? (Y/N) N
Discreet Sediment ID added to	Volume	
Composite	Added (gallons)	Sediment Description
SCALW - NMP-10A+10C	251/1011	
SCNEW-NMP - IDC	2 50/1-75	
HERE - NMP - IOC	2 sallow	
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Houston Ship Channel Section 103 Sediment Composite Log

Composite ID: HSCNcw-	NMP 97 - 01 Ca	Total Volume Composited: 6 Salla~5
Technician(s): MJ, SN, TI		
Date: 10-9-18		Time Started: 10:15
Storage Location: 6°17	C. IJ M.	Time Completed: 10 ! 2 9
Photos Taken? (Y/N)		Bulk Ammonia Sampla? (Y/N)
Discreet Sediment ID added to	Volume	
Composite	Added (gallons)	Sediment Description
HSQNOW -NAP-OIA /	32	black sondy class losa
HENCH, - NMP-61A 4	3 2	u u u u
HSCNEN - NMP- 61A 4 HSCNEN - NMP- 01A-	22	11 <i>21 24 24</i>
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Houston Ship Channel Section 103 Sediment Composite Log

Composite ID: HSCNew-	NAP-050	omp	Tota	I Volume Com	nposited:	6 s.	1110-5		
Techniclan(s):									
Date: 10-9-19					Time Started	I:	0:15		
Storage Location: 601	7 Cold r	22 ~~~	100 marca		Time Completed: 10 ' 45				
Photos Taken? (Y/N)					Bulk Ammor	nia Sample?	(Y/N)		
Discreet Sediment ID added to	Volume								
Composite	Added (gallons)				Sediment Des	cription			
UCON, NMP-050		Sand .	black	clos. A	nd red a	low			
HSCNOW-NMP-05A) HSCNOW-NMP-05A 3 HSCNOW-NMP-05A3	2		ч	<u>ч</u>	4	- , -			
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Houston Ship Channel Section 103 Sediment Composite Log

Composite ID: 1-15C New Technician(s):					
Date: 10-9-13		Time Started: 224	Time Started: 1224		
Storage Location:		Time Completed:			
Photos Taken? (Y/N)		Bulk Ammonia Sample? (Y/N)	Bulk Ammonia Sample? (Y/N)		
Discreet Sediment ID added to Composite	Volume Added (gallons)	Sediment Description			
HSCNOW-NMP - OZA	2 sallons				
HSCNew-NMP OZ C HSCNew-NMP OZA+6	2 sallons				
ASCNEW_ NMP OZAte	2 50/1>				
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Sand

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Houston Ship Channel Section 103 Sediment Composite Log

Composite ID: HSCNew-	NMP. OY Comp	Tol	tal Volume Com	posited: 2MB		
Technician(s):						
Date: /0-9-13				Time Started: 229		
Storage Location: 6017				Time Completed:		
Photos Taken? (Y/N)				Bulk Ammonia Sample? (Y/N)		
Discreet Sediment ID added to Composite	Volume					
Composite	Added (gallons)			Sediment Description		
HSCNW - NMP-04A	2	100				
HSCNOW - NMP-OYA HSCNOW - NMP OYC HSCNOW NMP OYASC	2.					
HSCNUN NIMP OYAXC	X					
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Houston Ship Channel Section 103 Sediment Composite Log

Composite ID: 月S C ル・レー	ALMR DC	Comp Total Volume Composited: 6 50//201
	101-17- 00	Comp Totar Volane composited: 0
Technician(s):		Time Started: 10:46
Date: 10-9-13		
Storage Location: 6017	C.10 ro	Time Completed: : 4
Photos īaken? (Y/N)		Bulk Ammonia Sample? (Y/N)
Discreet Sediment ID added to	Volume	
Composite	Composite Added (gallons) Sediment Description U-NMP-06A Z Yed, black clay; hydrocarbon Smrll U-NNP-06C Z 11 U-NNP-06C Z 11	
HSCNCU- NMP- 06 A	2,	red, black clay; hydrocarbon Smell
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Houston Ship Channel Improvement Sediment Composite Log

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Composite ID: HSCNew- Technician(s): 7L, MJ, TH					
Date: 10-9-13			Time Started: /->: 3 7		
Storage Location: 6 ° 17			Time Completed: 11:09		
Photos Taken? (Y/N)	- F		Bulk Ammonia Sample? (Y/N)		
Discreet Sediment ID added to	Volume				
Composite	Added (gallons)		Sediment Description		
HSCNASSY-NMP- 03A	z	Silly Clay			
HSCNASSI-NMP-038 HSCNew-NMP-03C HSCNew-NMP-036	2	()	8		
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Houston Ship Channel Improvement Sediment Composite Log

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Technician(s): 7~B Date: 10-9-19		Time Started: 10:37
torage Location: 6 = 17	Gld room	Time Completed: // .' 09
hotos Taken? (Y/N)		Bulk Ammonia Sample? (Y/N)
Discreet Sediment ID added to Composite	Volume	
	Added (gallons)	Sediment Description
45CNEW-NMP. 03A	pA Z	which and red along
SCNEW - NMP-03D	pc 2	Sondy with white clay by driver by reall
15 CNew - NMP-03D	pAtc 2	Sandy with white clay by driver ben soull Sandy with white clay by driver ben soull
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Houston Ship Channel Improvement Sediment Composite Log

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Composite ID: HSCNCLA	5-Nmp-04	-Camp Total	Volume Composited: 6 g allun
A -	1-14inp-07	<u> </u>	
	8		Time Started:
Date: $10-5-1$	Cold	(time)	Time Completed: 13:03
	Color		Bulk Ammonia Sample? (V/N)
Photos Taken? (Y/N)	<u></u>	1.00	Buik Ammonia Sampier (1/14)
Discreet Sediment ID added to Composite	Volume Added (gallons)		Sediment Description
BCNCW-NMP-04A	7	Cel day' si	Hy cluy, hydrocator Odol
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Houston Ship Channel Improvement

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Sediment Composite Log

Technician(s): D^F			
Technician(s): DF Date: 10-9-1	8		Time Started:
Storage Location: 6619	5 Cold	forage	Time Completed:
Photos Taken? (Y/N)			Bulk Ammonia Sample? (Y/N)
Discreet Sediment ID added to	Volume		
Composite	Added (gallons)		Sediment Description
HSCNEW - Nmp-02 C	2	red clay; block (Huy/s: H; blue/srey clay
UCNCL-Nmp-02 Atc	2	hydracultor odor	
HSCNEW-Nyp-02-A	2		
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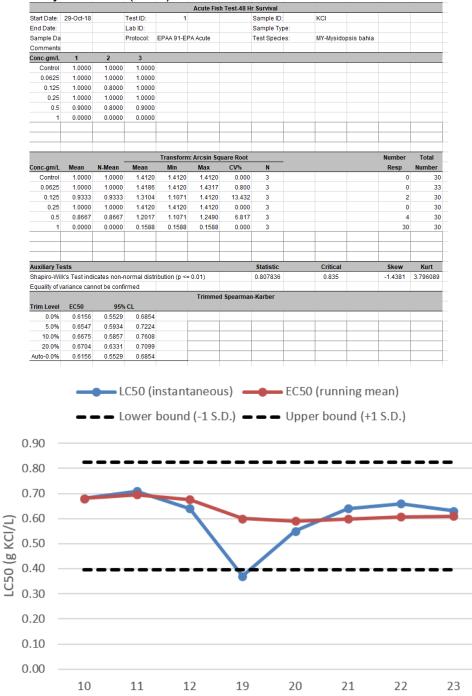
Sample Name	Pan #	Pan Weight (g)	Pan+sediment wet weight (g)	Pan+sediment dry weight (g)	Wet Weight (g)	Dry Weight (g)	% Dry	Dry/Wet Ratio	Mean % Moisture	Mean % Dry	Mean Dry/Wet Ratio
	1	1.32	2.6	1.966	1.28	0.646	50.5%	0.505			
NMP-01	2	1.315	2.419	1.865	1.104	0.55	49.8%	0.498	50.7%	49.3%	0.493
	3	1.316	2.425	1.845	1.109	0.529	47.7%	0.477			
	4	1.315	2.892	2.575	1.577	1.26	79.9%	0.799			
NMP-02	5	1.319	2.362	2.136	1.043	0.817	78.3%	0.783	21.0%	79.0%	0.790
	6	1.32	2.657	2.375	1.337	1.055	78.9%	0.789			
	7	1.317	2.481	2.288	1.164	0.971	83.4%	0.834			
NMP-03	8	1.33	2.581	2.357	1.251	1.027	82.1%	0.821	17.8%	82.2%	0.822
	9	1.323	2.592	2.351	1.269	1.028	81.0%	0.810			
	10	1.317	2.541	2.268	1.224	0.951	77.7%	0.777			
NMP-03-DUP	11	1.323	2.581	2.313	1.258	0.99	78.7%	0.787	22.1%	77.9%	0.779
	12	1.326	2.6	2.31	1.274	0.984	77.2%	0.772			
	13	1.325	2.841	2.276	1.516	0.951	62.7%	0.627			
NMP-04	14	1.327	2.657	2.155	1.33	0.828	62.3%	0.623	36.6%	63.4%	0.634
	15	1.324	2.611	2.164	1.287	0.84	65.3%	0.653			
NMP-05	16	1.319	2.895	2.386	1.576	1.067	67.7%	0.677	41.6%	58.4%	0.584

5.2 Appendix B. Sediment Wet-Dry Ratios

Sample Name	Pan #	Pan Weight (g)	Pan+sediment wet weight (g)	Pan+sediment dry weight (g)	Wet Weight (g)	Dry Weight (g)	% Dry	Dry/Wet Ratio	Mean % Moisture	Mean % Dry	Mean Dry/Wet Ratio
	17	1.318	2.583	1.991	1.265	0.673	53.2%	0.532			
	18	1.323	2.617	2.026	1.294	0.703	54.3%	0.543			
	19	1.323	2.766	2.31	1.443	0.987	68.4%	0.684			
NMP-06	20	1.318	2.838	2.336	1.52	1.018	67.0%	0.670	34.3%	65.7%	0.657
	21	1.329	2.726	2.19	1.397	0.861	61.6%	0.616			
	22	1.317	2.884	2.383	1.567	1.066	68.0%	0.680			
NMP-07	23	1.316	2.835	2.356	1.519	1.04	68.5%	0.685	31.8%	68.2%	0.682
	24	1.32	2.662	2.233	1.342	0.913	68.0%	0.680			
	25	1.323	2.559	2.156	1.236	0.833	67.4%	0.674		68.1%	
NMP-08	26	1.332	2.5	2.137	1.168	0.805	68.9%	0.689	31.9%		0.681
	27	1.325	2.66	2.233	1.335	0.908	68.0%	0.680			
	28	1.323	2.792	2.268	1.469	0.945	64.3%	0.643			
NMP-09	29	1.325	2.515	2.125	1.19	0.8	67.2%	0.672	35.3%	64.7%	0.647
	30	1.322	2.712	2.191	1.39	0.869	62.5%	0.625			
	31	1.322	2.735	2.255	1.413	0.933	66.0%	0.660			
NMP-10	32	1.319	2.865	2.361	1.546	1.042	67.4%	0.674	32.7%	67.3%	0.673
	33	1.316	2.661	2.238	1.345	0.922	68.6%	0.686			

Sample Name	Pan #	Pan Weight (g)	Pan+sediment wet weight (g)	Pan+sediment dry weight (g)	Wet Weight (g)	Dry Weight (g)	% Dry	Dry/Wet Ratio	Mean % Moisture	Mean % Dry	Mean Dry/Wet Ratio
	34	1.316	2.665	2.318	1.349	1.002	74.3%	0.743		75.0%	0.750
NMP-11	35	1.322	2.543	2.25	1.221	0.928	76.0%	0.760	25.0%		
	36	1.314	2.779	2.409	1.465	1.095	74.7%	0.747			

5.3 Appendix C. Reference Toxicity Test Statistics for Elutriate Exposures



5.3.1 Americamysis bahia (96-h)

5.3.2 Menidia beryllina

					Acute Fish	n Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		KCI			
End Date:	11/2/2018		Lab ID:				Sample Ty	pe:				
Sample Da			Protocol:	EPAA 91-E	PA Acute		Test Speci	es:	MB-Menidia	a beryllina		
Comments												
Conc-gm/L	1	2	3									
Control	1.0000	1.0000	1.0000									
0.125	1.0000	1.0000	1.0000									
0.25	1.0000	0.6000	0.9000									
0.5	0.9000	1.0000	1.0000									
1	0.9091	0.8000	1.0000									
2	0.3000	0.1000	0.1000									
Transform: Arcsin Square Root										Number	Total	
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N				Resp	Number
Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	3				0	30
0.125	1.0000	1.0000	1.4145	1.4120	1.4195	0.304	3				0	31
0.25	0.8333	0.8333	1.1824	0.8861	1.4120	22.770	3				5	30
0.5	0.9667	0.9667	1.3577	1.2490	1.4120	6.930	3				1	30
1	0.9030	0.9030	1.2612	1.1071	1.4120	12.088	3				3	31
2	0.1667	0.1667	0.4077	0.3218	0.5796	36.519	3				25	30
Auxiliary T	ests						Statistic		Critical		Skew	Kurt
Shapiro-Wi	IK's Test indi	cates norm	nal distributi	on (p > 0.01)		0.947157		0.858		-0.39923	1.184292
Equality of	variance can	not be conf	irmed									
					Trimmed	Spearmai	1-Karber					
Trim Level	EC50	95%	6 CL									
0.0%												
5.0%												
10.0%												
20.0%	1.4602	1.3427	1.5879									
Auto-16.7%	1.4602	1.3427	1.5879									



5.4 Appendix D. Elutriate bioassay water quality parameters

Table E1. Water quality parameters for 96-hour *Americamysis bahia* bioassay. Means and one standard deviation from the mean are indicated, with the minimum and maximum range of the data provided in parentheses.

Sediment Elutriate	Conc.	Temperature (° C)	Salinity (‰)	рН (SU)	Dissolved oxygen (mg/L)
Control	N/A	20.7 ± 0.2 (20.6 - 21.1)	30.3 ± 0.2 (30.1 - 30.5)	7.80 ± 0.07 (7.73 - 7.91)	6.5 ± 0.5 (6.2 - 7.4)
	0%	20.3 ± 0.6 (19.7 - 21.4)	30.8 ± 0.8 (30.0 - 31.7)	7.86 ± 0.07 (7.75 - 7.95)	6.6 ± 0.7 (5.9 - 7.8)
HSC-NMP-1	10%	20.8 ± 0.5 (20.3 - 21.6)	30.2 ± 0.2 (30.1 - 30.6)	7.86 ± 0.06 (7.78 - 7.94)	6.5 ± 0.7 (6.0 - 7.6)
	50%	20.7 ± 0.4 (20.2 - 21.3)	30.1 ± 0.3 (29.8 - 30.5)	7.99 ± 0.05 (7.91 - 8.02)	6.7 ± 0.6 (6.1 - 7.6)
	100%	20.3 ± 0.7 (19.6 - 21.2)	29.5 ± 0.3 (29.3 - 30.1)	8.05 ± 0.08 (7.93 - 8.13)	6.6 ± 0.7 (6.0 - 7.8)
	0%	20.9 ± 0.9 (19.3 - 21.7)	29.9 ± 0.2 (29.7 - 30.1)	7.92 ± 0.05 (7.84 - 7.98)	6.2 ± 0.9 (5.5 - 7.8)
HSC-NMP-2	10%	21.0 ± 0.4 (20.3 - 21.4)	30.5 ± 0.3 (30.1 - 30.9)	7.87 ± 0.04 (7.83 - 7.93)	6.4 ± 0.7 (6.0 - 7.6)
	50%	20.9 ± 0.5 (20.2 - 21.4)	29.9 ± 0.3 (29.6 - 30.4)	7.93 ± 0.05 (7.90 - 8.02)	$\begin{array}{r} 6.4 \pm 0.7 \\ (5.9 - 7.6) \end{array}$
	100%	20.6 ± 0.6 (19.6 - 21.1)	29.6 ± 0.4 (29.2 - 30.2)	8.01 ± 0.04 (7.97 - 8.08)	6.5 ± 0.7 (6.0 - 7.7)
HSC-NMP-3	0%	20.2 ± 0.5 (19.3 - 20.6)	29.5 ± 0.5 (29.1 - 30.3) 30.4 ± 0.6	7.92 ± 0.07 (7.87 - 8.04)	6.7 ± 0.7 (6.2 - 8.0)
	100%	20.1 ± 0.3 (19.6 - 20.3)	(29.9 - 31.2)	7.97 ± 0.07 (7.92 - 8.10)	$\begin{array}{r} 6.7 \pm 0.6 \\ (6.1 - 7.7) \\ \hline \end{array}$
	0%	20.0 ± 0.3 (19.5 - 20.3)	30.5 ± 0.4 (30.2 - 31.1)	7.93 ± 0.04 (7.88 - 7.99)	6.6 ± 0.6 (6.2 - 7.6)
HSC-NMP-4	10%	20.2 ± 0.2 (20.0 - 20.4)	30.5 ± 0.4 (30.2 - 31.2) 30.2 ± 0.3	7.85 ± 0.07 (7.77 - 7.93)	6.5 ± 0.6 (6.0 - 7.5) 6.6 ± 0.5
	50%	20.0 ± 0.4 (19.6 - 20.4)	(29.8 - 30.6)	7.92 ± 0.04 (7.89 - 7.98)	(6.2 - 7.5)
	100%	19.8 ± 0.4 (19.4 - 20.4)	30.5 ± 0.6 (29.7 - 31.2)	$7.97 \pm 0.03 (7.92 - 8.00) 7.02 \pm 0.02$	6.5 ± 0.3 (6.2 - 7.0)
	0%	19.9 ± 0.6 (19.2 - 20.5)	30.2 ± 0.3 (29.9 - 30.5)	$7.93 \pm 0.03 (7.90 - 7.97) 7.86 \pm 0.04$	6.5 ± 1.0 (5.5 - 8.1)
	10%	20.2 ± 0.5 (19.3 - 20.6) 20.1 ± 0.4	30.6 ± 0.4 (30.2 - 31.1)	$7.86 \pm 0.04 (7.84 - 7.94) 7.05 \pm 0.05$	$\begin{array}{r} 6.6 \pm 0.7 \\ (6.1 - 7.8) \\ \hline \end{array}$
HSC-NMP-5	50%	20.1 ± 0.4 (19.5 - 20.3)	30.3 ± 0.2 (30.1 - 30.7)	7.95 ± 0.05 (7.91 - 8.04)	$\begin{array}{r} 6.6 \pm 0.7 \\ (6.2 - 7.8) \\ \hline \end{array}$
	100%	19.9 ± 0.3 (19.5 - 20.2)	30.3 ± 0.3 (29.9 - 30.6)	7.99 ± 0.04 (7.94 - 8.04)	6.6 ± 0.6 (6.1 - 7.7)

Sediment Elutriate	Conc.	Temperature (° C)	Salinity (‰)	pH (SU)	Dissolved oxygen (mg/L)
	0%	19.9 ± 0.4 (19.4 - 20.4)	30.2 ± 0.3 (29.8 - 30.4)	7.96 ± 0.02 (7.93 - 7.99)	6.8 ± 1 (6.0 - 8.5)
HSC-NMP-6	10%	20.3 ± 0.4 (19.6 - 20.7)	30.6 ± 0.3 (30.3 - 31.2)	7.85 ± 0.05 (7.82 - 7.93)	6.6 ± 0.4 (6.2 - 7.3)
	50%	20.2 ± 0.4 (19.6 - 20.5)	31.9 ± 0.3 (31.5 - 32.3)	7.92 ± 0.03 (7.90 - 7.97)	6.6 ± 0.4 (6.3 - 7.3)
	100%	20 ± 0.4 (19.6 - 20.5)	33.0 ± 0.2 (32.9 - 33.4)	7.97 ± 0.03 (7.92 – 8.00)	6.4 ± 0.7 (5.8 - 7.6)
	0%	19.8 ± 0.5 (19.0 - 20.5)	29.9 ± 0.6 (29.5 - 30.8)	7.95 ± 0.05 (7.87 - 8.01)	6.8 ± 0.8 (6.0 - 8.2)
	10%	19.7 ± 0.5 (19.0 - 20.5)	30.4 ± 0.5 (30.0 - 31.2)	7.89 ± 0.08 (7.82 - 8.02)	6.6 ± 0.6 (6.0 - 7.5)
HSC-NMP-7	50%	19.7 ± 0.5 (19.0 - 20.3)	30.2 ± 0.6 (29.7 - 31.2)	7.95 ± 0.03 (7.93 - 8.00)	6.7 ± 0.5 (6.3 - 7.6)
	100%	19.7 ± 0.5 (19.0 - 20.3)	30.1 ± 0.3 (29.8 - 30.5)	7.98 ± 0.11 (7.79 - 8.05)	6.6 ± 0.6 (6.2 - 7.6)
	0%	19.5 ± 0.3 (19.0 - 19.9)	30.0 ± 0.6 (29.5 - 30.8)	7.95 ± 0.05 (7.91 - 8.04)	6.9 ± 0.9 (6.3 - 8.5)
	10%	19.7 ± 0.5 (19.0 - 20.3)	30.6 ± 0.7 (30.1 - 31.8)	7.83 ± 0.05 (7.79 - 7.92)	6.7 ± 0.5 (6.2 - 7.6)
HSC-NMP-8	50%	19.7 ± 0.4 (19.0 - 20.1)	30.4 ± 0.7 (29.9 - 31.4)	7.90 ± 0.06 (7.85 - 8.00)	6.7 ± 0.5 (6.2 - 7.6)
	100%	19.6 ± 0.3 (19.0 - 19.9)	30.4 ± 0.8 (29.6 - 31.3)	7.96 ± 0.06 (7.89 - 8.06)	6.7 ± 0.5 (6.2 - 7.5)
	0%	20.2 ± 0.4 (19.5 - 20.6)	29.8 ± 0.3 (29.6 - 30.2)	7.96 ± 0.03 (7.93 - 8.00)	6.5 ± 0.8 (5.9 - 7.9)
	10%	20.4 ± 0.3 (20.0 - 20.7)	30.4 ± 0.2 (30.1 - 30.7)	7.85 ± 0.04 (7.82 - 7.91)	6.5 ± 0.6 (6.0 - 7.5)
HSC-NMP-9	50%	20.3 ± 0.2 (19.9 - 20.5)	30.1 ± 0.2 (29.9 - 30.5)	7.91 ± 0.07 (7.81 – 8.00)	6.4 ± 0.8 (5.3 - 7.6)
	100%	19.9 ± 0.3 (19.6 - 20.2)	30.0 ± 0.3 (29.6 - 30.4)	8.00 ± 0.03 (7.97 - 8.05)	6.6 ± 0.7 (6.2 - 7.8)
	0%	19.9 ± 0.3 (19.4 - 20.2)	29.7 ± 0.2 (29.5 - 30.0)	7.95 ± 0.04 (7.92 - 8.02)	6.5 ± 0.9 (5.8 - 7.9)
	10%	20.0 ± 0.4 (19.4 - 20.4)	$\frac{30.5 \pm 0.3}{(30.2 - 30.9)}$	7.86 ± 0.05 (7.81 - 7.93)	6.7 ± 0.5 (6.2 - 7.5)
HSC-NMP-10	50%	20.0 ± 0.4 (19.4 - 20.4)	30.3 ± 0.3 (30.1 - 30.8)	7.91 ± 0.05 (7.87 - 7.99)	6.5 ± 0.7 (6.0 - 7.6)
	100%	19.9 ± 0.3 (19.5 - 20.2)	$\frac{30.2 \pm 0.2}{(30.1 - 30.5)}$	7.98 ± 0.04 (7.95 - 8.04)	6.5 ± 0.8 (5.7 - 7.7)
	0%	$\frac{20.0 \pm 0.5}{(19.3 - 20.5)}$	$\frac{30.3 \pm 0.3}{(30.0 - 30.6)}$	7.93 ± 0.04 (7.90 - 8.01)	6.7 ± 1.1 (6.0 - 8.5)
HSC-NMP-11	10%	$\frac{20.2 \pm 0.4}{(19.6 - 20.6)}$	$\frac{(30.5 \pm 0.6)}{30.5 \pm 0.4}$ (30.1 - 30.9)	7.85 ± 0.05 (7.81 - 7.94)	$\frac{(0.0 - 0.0)}{6.5 \pm 0.5}$ (6.2 - 7.4)

Sediment Elutriate	Conc.	Temperature (° C)	Salinity (‰)	pH (SU)	Dissolved oxygen (mg/L)
	50%	20.3 ± 0.3 (19.7 - 20.6)	30.0 ± 0.6 (29.0 - 30.7)	7.93 ± 0.05 (7.90 - 8.02)	6.4 ± 0.6 (6.0 - 7.5)
	100%	20.1 ± 0.3 (19.7 - 20.4)	30.1 ± 0.4 (29.7 - 30.6)	7.99 ± 0.03 (7.96 - 8.04)	6.6 ± 0.5 (6.2 - 7.4)

Table E3. Water quality parameters for 96-hour *Menidia beryllina* bioassay. Means and one standard deviation from the mean are indicated, with the minimum and maximum range of the data provided in parentheses.

Sediment	Conc.	Temperature	Salinity	pH	Dissolved oxygen
Elutriate		(° C)	(‰)	(SU)	(mg/L)
Control	N/A	20.8 ± 0.1	30.4 ± 0.2	7.77 ± 0.08	6.3 ± 0.7
		(20.7 - 20.9)	(30.2 - 30.7)	(7.71 - 7.90)	(5.7 - 7.5)
	0%	19.7 ± 0.4	30.5 ± 0.5	7.90 ± 0.10	6.7 ± 0.6
	0 /0	(19.2 - 20.2)	(30.0 - 31.2)	(7.82 - 8.05)	(6.2 - 7.8)
	10%	20.0 ± 0.3	30.5 ± 0.4	7.87 ± 0.10	6.6 ± 0.6
HSC-NMP-1		(19.7 - 20.3)	(30.1 – 31.0)	(7.79 - 8.01)	(6.2 - 7.6)
	50%	19.9 ± 0.3	30.1 ± 0.2	8.02 ± 0.10	6.5 ± 0.7
		(19.5 - 20.3)	(29.8 - 30.4)	(7.94 - 8.20)	(6.0 - 7.6)
	100%	19.8 ± 0.3	29.9 ± 0.4	8.07 ± 0.12	6.6 ± 0.7
		(19.5 - 20.2) 20.2 ± 0.5	(29.3 - 30.4) 30.0 ± 0.1	(7.99 - 8.28) 7.94 ± 0.11	(6.1 - 7.8) 6.5 ± 0.7
	0%	(19.3 - 20.7)	(29.9 - 30.2)	(7.85 - 8.10)	(6.0 - 7.8)
		20.4 ± 0.2	30.2 ± 0.5	7.85 ± 0.10	6.5 ± 0.6
	10%	(20.2 - 20.7)	(29.3 - 30.7)	(7.76 - 7.98)	(5.9 - 7.6)
HSC-NMP-2		20.5 ± 0.3	29.9 ± 0.2	7.95 ± 0.10	6.5 ± 0.6
	50%	(20.2 - 20.9)	(29.7 - 30.2)	(7.84 - 8.09)	(6.2 - 7.6)
	100%	20.5 ± 0.6	29.4 ± 0.1	8.02 ± 0.10	6.5 ± 0.7
		(19.6 - 21.1)	(29.2 - 29.5)	(7.93 - 8.18)	(6.0 - 7.7)
	0%	20.1 ± 0.6	29.6 ± 0.3	7.93 ± 0.06	6.5 ± 0.9
HSC-NMP-3	0 /0	(19.3 - 20.6)	(29.1 - 29.8)	(7.89 - 8.04)	(5.8 – 8.0)
	100%	20.2 ± 0.4	30.3 ± 0.3	7.97 ± 0.07	6.4 ± 0.7
		(19.6 - 20.5)	(29.9 - 30.6)	(7.92 - 8.10)	(5.9 - 7.7)
	0%	19.9 ± 0.2	30.3 ± 0.1	7.96 ± 0.10	6.5 ± 0.7
		(19.5 - 20.1)	(30.2 - 30.5)	(7.89 - 8.12)	(6.0 - 7.8)
	10%	20.1 ± 0.3	30.3 ± 0.1	7.90 ± 0.09	6.4 ± 0.6
HSC-NMP-4		(19.8 - 20.4)	(30.2 - 30.4)	(7.80 - 7.98)	(5.9 - 7.5)
	50%	20.1 ± 0.2	30.0 ± 0.7	7.95 ± 0.10	6.4 ± 0.6
		(19.9 - 20.5) 20.1 ± 0.3	(28.8 - 30.5) 29.8 ± 0.1	(7.88 - 8.11) 8.00 ± 0.12	(5.9 - 7.5) 6.1 ± 0.6
	100%	(19.7 - 20.5)	(29.7 – 30.0)	(7.88 - 8.20)	(5.7 – 7.0)
		19.6 ± 0.3	30.5 ± 0.3	7.92 ± 0.03	6.6 ± 0.9
	0%	(19.2 - 19.9)	(30.0 - 30.9)	(7.88 - 7.97)	(5.8 - 8.1)
		19.9 ± 0.4	30.7 ± 0.4	7.82 ± 0.07	6.6 ± 0.7
	10%	(19.4 - 20.5)	(30.2 - 31.1)	(7.77 - 7.94)	(6.0 - 7.8)
HSC-NMP-5		20.0 ± 0.4	30.7 ± 0.4	7.91 ± 0.08	6.5 ± 0.8
	50%	(19.8 - 20.8)	(30.1 – 31.0)	(7.83 - 8.04)	(5.7 - 7.8)
	100%	19.9 ± 0.2	30.2 ± 0.3	7.96 ± 0.04	6.3 ± 0.7
	100 /0	(19.7 - 20.1)	(29.9 - 30.6)	(7.93 - 8.01)	(5.9 - 7.7)
	0%	20.1 ± 0.4	30.0 ± 0.1	7.98 ± 0.10	6.7 ± 1.0
HSC-NMP-6	0 /0	(19.4 - 20.4)	(29.8 - 30.2)	(7.90 - 8.14)	(5.9 - 8.5)
	10%	20.2 ± 0.3	30.6 ± 0.1	7.89 ± 0.08	6.6 ± 0.5
		(19.8 - 20.7)	(30.5 - 30.8)	(7.81 – 8.00)	(6.0 - 7.3)

Sediment Elutriate	Conc.	Temperature (° C)	Salinity (‰)	pH (SU)	Dissolved oxygen (mg/L)
	50%	20.1 ± 0.4	32.1 ± 0.5	7.92 ± 0.14	6.6 ± 0.4
		(19.6 - 20.5)	(31.5 - 32.5)	(7.75 - 8.12)	(6.2 - 7.3)
	100%	20.3 ± 0.4 (19.8 - 20.8)	33.1 ± 0.2 (32.9 - 33.3)	7.97 ± 0.13 (7.83 - 8.18)	6.5 ± 0.6 (6.0 - 7.6)
		(19.8 - 20.8) 19.7 ± 0.3	(32.9 - 33.3) 30.2 ± 0.4	7.90 ± 0.08	6.7 ± 0.8
	0%	(19.3 – 20.0)	(29.5 - 30.5)	(7.77 - 7.98)	(6.1 - 8.2)
		20.1 ± 0.3	$\frac{20.0 \ 00.0}{30.4 \pm 0.1}$	7.85 ± 0.06	6.4 ± 0.7
	10%	(19.7 - 20.5)	(30.2 - 30.6)	(7.80 - 7.92)	(5.9 - 7.5)
HSC-NMP-7	F00/	20.0 ± 0.2	30.2 ± 0.1	7.96 ± 0.04	6.3 ± 0.7
	50%	(19.8 - 20.3)	(30.0 - 30.4)	(7.92 – 8.00)	(6.0 - 7.6)
	100%	20.0 ± 0.3	30.0 ± 0.1	8.00 ± 0.04	6.5 ± 0.7
	100 /0	(19.8 - 20.4)	(29.8 - 30.1)	(7.95 - 8.04)	(5.9 - 7.6)
	0%	19.9 ± 0.4	29.6 ± 0.2	7.93 ± 0.06	6.3 ± 1.2
		(19.4 - 20.3)	(29.5 - 29.9)	(7.89 - 8.04)	(5.5 - 8.5)
	10%	20.1 ± 0.3	30.3 ± 0.2	7.82 ± 0.06	6.4 ± 0.7
HSC-NMP-8		(19.7 - 20.4)	(30.1 - 30.5)	<u>(7.77 - 7.92)</u> 7.91 ± 0.05	(5.9 - 7.6)
	50%	20.1 ± 0.3 (19.7 - 20.4)	30.1 ± 0.1 (29.9 - 30.3)	(7.88 - 8.00)	6.4 ± 0.7 (5.9 - 7.6)
		20.0 ± 0.3	29.7 ± 0.1	(7.88 - 8.00) 7.99 ± 0.04	6.4 ± 0.6
	100%	(19.7 - 20.4)	(29.6 - 29.9)	(7.95 - 8.06)	(6.0 - 7.5)
		19.7 ± 0.2	$\frac{20.0 \pm 20.0}{30.0 \pm 0.3}$	7.94 ± 0.04	6.7 ± 0.8
	0%	(19.5 – 20.0)	(29.6 - 30.2)	(7.9 - 8.00)	(5.8 - 7.9)
	100/	20.1 ± 0.4	30.3 ± 0.2	7.81 ± 0.06	6.4 ± 0.6
HSC-NMP-9	10%	(19.7 - 20.7)	(30.1 - 30.6)	(7.77 - 7.91)	(6.0 - 7.5)
	50%	20.1 ± 0.4	30.1 ± 0.2	7.90 ± 0.06	6.4 ± 0.6
		(19.7 - 20.6)	(29.9 - 30.4)	(7.87 – 8.00)	(6.0 - 7.6)
	100%	19.8 ± 0.2	29.8 ± 0.2	7.98 ± 0.04	6.4 ± 0.8
		(19.6 – 20.0)	(29.6 - 30.1)	(7.95 - 8.05)	(5.8 - 7.8)
	0%	20.0 ± 0.6	30.0 ± 0.4	7.98 ± 0.09 (7.91 - 8.13)	6.5 ± 0.9
		(19.0 - 20.6) 20.3 ± 0.3	(29.5 - 30.4) 30.7 ± 0.3	7.86 ± 0.08	(5.8 - 7.9) 6.5 ± 0.6
	10%	(19.8 - 20.6)	(30.2 - 30.9)	(7.79 - 7.96)	(5.8 - 7.5)
HSC-NMP-10		20.2 ± 0.3	30.7 ± 0.4	7.92 ± 0.10	6.5 ± 0.7
	50%	(19.7 - 20.5)	(30.1 – 31.0)	(7.84 - 8.07)	(5.8 - 7.6)
	4000/	20.1 ± 0.4	30.6 ± 0.3	7.99 ± 0.11	6.6 ± 0.7
	100%	(19.6 - 20.5)	(30.1 - 30.9)	(7.89 - 8.16)	(5.9 - 7.7)
	0%	20.0 ± 0.5	30.4 ± 0.2	7.92 ± 0.06	6.8 ± 1.0
	0 /0	(19.3 - 20.6)	(30.0 - 30.6)	(7.85 - 8.01)	(6.2 - 8.5)
	10%	20.4 ± 0.4	30.3 ± 0.1	7.83 ± 0.07	6.5 ± 0.5
HSC-NMP-11		(19.9 - 20.7)	(30.1 - 30.4)	(7.77 - 7.94)	(6.2 - 7.4)
	50%	20.3 ± 0.3	30.1 ± 0.1	7.91 ± 0.07	6.5 ± 0.6
		(19.9 - 20.7)	(30.0 - 30.3)	(7.84 - 8.02)	(5.9 - 7.5)
	100%	20.3 ± 0.3 (20.0 - 20.6)	29.8 ± 0.1 (29.7 - 30.1)	7.98 ± 0.05 (7.92 - 8.04)	6.4 ± 0.6 (5.9 - 7.4)
		(20.0 - 20.0)	(23.1 - 30.1)	(1.92 - 0.04)	(0.9 - 7.4)

5.5 Appendix E. Statistical Analyses for Elutriate Toxicity Tests

5.5.1 Americamysis bahia (96h)

					Acute Fish	Test-96 H	Ir Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP1			
End Date:	11/2/2018		Lab ID:				Sample Typ	be:				
Sample Dat			Protocol:	EPAA 91-EP	A Acute		Test Specie	es:	MY-Mysido	psis bahia		
Comments:												
Conc-%	1	2	3	4	5							
Control	1.0000	0.8000	1.0000	1.0000	1.0000							
100	0.1000	0.7000	0.3000	0.4000	0.5000							
				Transform:	Arcsin Sau	are Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5					
*100	0.4000	0.4167	0.6725	0.3218	0.9912	36.881	5	5.360	1.860	0.2354		
Auxiliary T	ests						Statistic		Critical		Skew	Kurt
	lk's Test indi	cates norm	al distributio	on (p > 0.01)			0.911669		0.781		-0.491595	
	cates equal v						3.309589		23.1545			
	s Test (1-tai						MSDu	MSDp	MSB	MSE	F-Prob	df
	astic t Test in		nificant diffe	rences			0.145712	0.152982	1.150939	0.040055	6.8E-04	1, 8
TOMOSCEDA												

					Acute Fish	Test-96 H	Ir Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP1			
End Date:	11/2/2018		Lab ID:				Sample Typ	be:				
Sample Dat			Protocol:	EPAA 91-E	PA Acute		Test Specie	es:	MY-Mysidop	osis bahia		
Comments:												
Conc-%	1	2	3	4	5							
Control	1.0000	0.8000	1.0000	1.0000	1.0000							
10	0.9000	0.9000	0.9091	0.9000	1.0000							
50	0.9000	0.9000	0.8000	0.7000	1.0000							
100	0.1000	0.7000	0.3000	0.4000	0.5000							
				Transform	: Arcsin Squ	are Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5					
10	0.9218	0.9602	1.2862	1.2490	1.4195	5.814	5	0.615	2.230	0.2352		
50	0.8600	0.8958	1.2017	0.9912	1.4120	13.288	5	1.416	2.230	0.2352		
*100	0.4000	0.4167	0.6725	0.3218	0.9912	36.881	5	6.434	2.230	0.2352		
uxiliary T	ests						Statistic		Critical		Skew	Kurt
	ests Ik's Test indi	cates norm	al distributio	on (p > 0.01)			Statistic 0.960224		Critical 0.868		Skew -0.363038	Kurt 0.89109
Shapiro-Wi Bartlett's Te	lk's Test indi	equal varia			ChV	TU	0.960224	MSDp	0.868	MSE		
Shapiro-Wi Bartlett's Te	lk's Test indi est indicates s Test (1-ta	equal varia	ances (p = 0	.19)		TU 2	0.960224 4.702851	MSDp 0.152797	0.868 11.34487	MSE 0.0278	-0.363038	0.89109
shapiro-Wi artlett's Te lypothesi	lk's Test indi est indicates s Test (1-ta	equal varia	ances (p = 0 NOEC	.19) LOEC	ChV		0.960224 4.702851 MSDu		0.868 11.34487 MSB		-0.363038 F-Prob	0.89109 df

					Acute Fish	Test-96 Hi	Survival				
Start Date:	10/29/2018		Test ID:	1		:	Sample ID:		NMP1		
End Date:	11/2/2018		Lab ID:			:	Sample Ty	pe:			
Sample Dat			Protocol:	EPAA 91-EF	PA Acute		Test Speci	es:	MY-Mysido	psis bahia	
Comments:											
Conc-%	1	2	3	4	5						
Control	1.0000	0.8000	1.0000	1.0000	1.0000						
10	0.9000	0.9000	0.9091	0.9000	1.0000						
50	0.9000	0.9000	0.8000	0.7000	1.0000						
100	0.1000	0.7000	0.3000	0.4000	0.5000						
											-

					Acute Fish	Test-96 H	lr Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID:	NMP1			
End Date:	11/2/2018		Lab ID:				Sample Type:				
Sample Dat			Protocol:	EPAA 91-EP	A Acute		Test Species:	MY-Mysidop	osis bahia		
Comments:											
Conc-%	1	2	3	4	5						
Control	1.0000	0.8000	1.0000	1.0000	1.0000						
10	0.9000	0.9000	0.9091	0.9000	1.0000						
50	0.9000	0.9000	0.8000	0.7000	1.0000						
100	0.1000	0.7000	0.3000		0.5000						
				Trouchours	Areain Car	ave De et				Number	Total
Conc-%	Mean	N-Mean	Mean	Transform: Min	Max	CV%	N			Resp	Number
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5			2	50
10	0.9218	0.9602	1.2862	1.2490	1.4195	5.814	5			4	52
50	0.8600	0.8958	1.2017	0.9912	1.4120	13.288	5			7	50
100	0.4000	0.4167	0.6725	0.3218	0.9912	36.881	5			30	50
Auxiliary T	ests						Statistic	Critical		Skew	Kurt
Shapiro-Wi	lk's Test indi	cates norm	al distributio	on (p > 0.01)			0.960224	0.868		-0.363038	0.89109
Bartlett's Te	est indicates	equal varia	ances (p = 0	.19)			4.702851	11.34487			
					Trimmed	Spearma	n-Karber				
'rim Level		95%	6 CL								
0.0%											
5.0%											
10.0%											
20.0%											
uto-41.7%	88.644	74.932	104.864								

					Acute Fish	Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP4			
End Date:	11/2/2018		Lab ID:				Sample Typ	e:				
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	S:	MY-Mysidop	osis bahia		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	0.8000	1.0000	1.0000	1.0000							
100	0.8000	0.4000	0.7000	0.6000	0.7000							
				Transform	: Arcsin Squ	are Root		Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Мах	CV%	N	Sum	Critical			
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5					
*100	0.6400	0.6667	0.9321	0.6847	1.1071	17.043	5	15.50	19.00			
Auxiliary T	ests			· ·			Statistic		Critical		Skew	Kurt
Shapiro-Wi	ilk's Test indi	cates non-	normal distr	ibution (p <=	0.01)		0.764059		0.781		-1.17766	0.43893
enaprie m							1.357439		23,1545			
	cates equal v	ariances (p = 0.77)				1.557459		20.1040			
F-Test indi	cates equal v s Test (1-tail,		o = 0.77)				1.337439		20.1040			
F-Test indio		0.05)		nt difference:	s		1.337439		20.1040			

						T 1 00 11	a · .					
					Acute Fish	n Test-96 H						
	10/29/2018		Test ID:	1			Sample ID:		NMP4			
End Date:	11/2/2018		Lab ID:				Sample Typ	be:				
Sample Da			Protocol:	EPAA 91-E	PA Acute		Test Specie	es:	MY-Mysido	psis bahia		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	0.8000	1.0000	1.0000	1.0000							
10	1.0000	1.0000	1.0000	1.0000	0.9000							
50	0.9000	0.9000	0.9000	0.8000	1.0000							
100	0.8000	0.4000	0.7000	0.6000	0.7000							
				Transform	n: Arcsin Sq	uare Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5					
10	0.9800	1.0208	1.3794	1.2490	1,4120	5.284	5	-0.364	2.230	0.1739		
50	0.9000	0.9375	1.2533	1,1071	1.4120	8.613	5	1.254	2.230	0.1739		
*100	0.6400	0.6667	0.9321		1.1071	17.043	5	5.374		0.1739		
Auxiliary To	ests						Statistic		Critical		Skew	Kurt
Shapiro-Wi	ik's Test indi	cates norm	al distributi	on (p > 0.01))		0.87		0.868		-0.97935	0.734932
artiett's Te	est indicates	equal varia	inces (p = 0	.53)			2.203017		11.34487			
lynothoeis	s Test (1-tail,	0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
typoureara												

					Acute Fis	n rest-90 Hr Survivar				
Start Date:	10/29/2018		Test ID:	1		Sample II	D:	NMP7		
End Date:	11/2/2018		Lab ID:			Sample T	ype:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute	Test Spec	cies:	MY-Mysido	psis bahia	
Comments										
Conc-%	1	2	3	4	5					
Control	1.0000	0.8000	1.0000	1.0000	1.0000					
100	0.4000	0.3000	0.2000	0.0000	0.3636					

				Transform	n: Arcsin Sq	uare Root		_	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5					
*100	0.2527	0.2633	0.5068	0.1588	0.6847	41.818	5	7.491	1.860	0.2096		
Auxiliary Te	ests						Statistic		Critical		Skew	Kurt
Shapiro-Wil	k's Test ind	icates norm	al distributio	on (p > 0.01))		0.808395		0.781		-1.37801	1.054302
- -Test indic	ates equal	variances (p) = 0.41)				2.416462		23.1545			
Hypothesis	Test (1-tail	, 0.05)					MSDu	MSDp	MSB	MSE	F-Prob	df
Homosceda	astic t Test i	ndicates sig	nificant diffe	erences			0.125752	0.132026	1.781804	0.031754	7.0E-05	1, 8
		-										

					Acute Fish	Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP7			
End Date:	11/2/2018		Lab ID:				Sample Typ	e:				
Sample Da	1		Protocol:	EPAA 91-E	PA Acute		Test Specie	S:	MY-Mysidop	sis bahia		
Comments	5											
Conc-%	1	2	3	4	5							
Control	1.0000	0.8000	1.0000	1.0000	1.0000							
10	1.0000	1.0000	1.0000	1.0000	1.0000							
50	0.9000	0.9000	1.0000	1.0000	1.0000							
100	0.4000	0.3000	0.2000	0.0000	0.3636							
				Transform	n: Arcsin Squ	are Root		Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical			
COIIC-70	wean											
Control		1.0000	1.3510		1.4120	10.092		oum				
	0.9600	1.0000	1.3510	1.1071			5	34.00				
Control 10	0.9600 1.0000	1.0000 1.0417	1.3510 1.4174	1.1071 1.4120	1.4120 1.4317	10.092 0.606	5 5	34.00	17.00			
Control 10 50	0.9600 1.0000 0.9600	1.0000 1.0417 1.0000	1.3510 1.4174 1.3483	1.1071 1.4120 1.2490	1.4120 1.4317 1.4195	10.092 0.606 6.725	5 5 5	34.00 28.00	17.00 17.00			
Control 10	0.9600 1.0000 0.9600	1.0000 1.0417	1.3510 1.4174	1.1071 1.4120	1.4120 1.4317	10.092 0.606	5 5 5	34.00	17.00 17.00			
Control 10 50	0.9600 1.0000 0.9600	1.0000 1.0417 1.0000	1.3510 1.4174 1.3483	1.1071 1.4120 1.2490	1.4120 1.4317 1.4195	10.092 0.606 6.725	5 5 5	34.00 28.00	17.00 17.00			
Control 10 50	0.9600 1.0000 0.9600	1.0000 1.0417 1.0000	1.3510 1.4174 1.3483	1.1071 1.4120 1.2490	1.4120 1.4317 1.4195	10.092 0.606 6.725	5 5 5	34.00 28.00	17.00 17.00			
Control 10 50	0.9600 1.0000 0.9600	1.0000 1.0417 1.0000	1.3510 1.4174 1.3483	1.1071 1.4120 1.2490	1.4120 1.4317 1.4195	10.092 0.606 6.725	5 5 5	34.00 28.00	17.00 17.00			
Control 10 50	0.9600 1.0000 0.9600	1.0000 1.0417 1.0000	1.3510 1.4174 1.3483	1.1071 1.4120 1.2490	1.4120 1.4317 1.4195	10.092 0.606 6.725	5 5 5	34.00 28.00	17.00 17.00			
Control 10 50 *100	0.9600 1.0000 0.9600 0.2527	1.0000 1.0417 1.0000	1.3510 1.4174 1.3483	1.1071 1.4120 1.2490	1.4120 1.4317 1.4195	10.092 0.606 6.725	5 5 5	34.00 28.00	17.00 17.00 17.00		Skew	Kurt
Control 10 50 *100	0.9600 1.0000 0.9600 0.2527	1.0000 1.0417 1.0000 0.2633	1.3510 1.4174 1.3483 0.5068	1.1071 1.4120 1.2490 0.1588	1.4120 1.4317 1.4195 0.6847	10.092 0.606 6.725	5 5 5 	34.00 28.00	17.00 17.00 17.00 Critical		Skew -1.5143	Kurt 2.764851
Control 10 50 *100 Auxiliary T Shapiro-Wi	0.9600 1.0000 0.9600 0.2527 ests ilk's Test ind	1.0000 1.0417 1.0000 0.2633	1.3510 1.4174 1.3483 0.5068	1.1071 1.4120 1.2490 0.1588	1.4120 1.4317 1.4195 0.6847	10.092 0.606 6.725	5 5 5 	34.00 28.00	17.00 17.00 17.00		Skew -1.5143	
Control 10 50 *100 Auxiliary T Shapiro-Wi Bartlett's Te	0.9600 1.0000 0.9600 0.2527 	1.0000 1.0417 1.0000 0.2633 icates non-i unequal va	1.3510 1.4174 1.3483 0.5068	1.1071 1.4120 1.2490 0.1588	1.4120 1.4317 1.4195 0.6847	10.092 0.606 6.725	5 5 5 	34.00 28.00	17.00 17.00 17.00 Critical			Kurt 2.764851
Control 10 50 *100 Auxiliary T Shapiro-Wi Bartlett's Te Hypothesis	0.9600 1.0000 0.9600 0.2527 ests ilk's Test ind	1.0000 1.0417 1.0000 0.2633 icates non-i unequal va , 0.05)	1.3510 1.4174 1.3483 0.5068 normal distr	1.1071 1.4120 1.2490 0.1588 ibution (p <= 2.39E-04)	1.4120 1.4317 1.4195 0.6847	10.092 0.606 6.725 41.818	5 5 5 	34.00 28.00	17.00 17.00 17.00			

					Acute Fish	Test-96 H	r Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID:	NMP7			
End Date:	11/2/2018		Lab ID:				Sample Type:				
Sample Da			Protocol:	EPAA 91-EP	A Acute		Test Species:	MY-Mysid	opsis bahia		
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	0.8000	1.0000	1.0000	1.0000						
10	1.0000	1.0000	1.0000	1.0000	1.0000						
50	0.9000	0.9000			1.0000						
100	0.4000	0.3000			0.3636						
		0.0000	0.2000	0.0000	0.0000						
				Transform	: Arcsin Squ	aro Poot				Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N			Resp	Number
Control	0.9600	1.0000			1.4120	10.092				2	
10		1.0417			1.4120	0.606				0	54
50		1.0417			1.4317	6.725				2	54
100	0.9600									38	51
100	0.2527	0.2633	0.5068	0.1588	0.6847	41.818	5			38	51
Auxiliary To	ests						Statistic	Critical		Skew	Kurt
Shapiro-Wi	Ik's Test indi	cates non-i	normal distr	ibution (p <=	0.01)		0.849324	0.868		-1.5143	2.764851
	est indicates						19.28577	11.3448	7		
					Trimmed	Spearma	n-Karber				
Frim Level	EC50	95%	6 CL								
0.0%											
5.0%											
10.0%											
10.0% 20.0%											

					Acute Fish	n Test-96 H	r Survival				
start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP8		
nd Date:	11/2/2018		Lab ID:				Sample Typ	be:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	es:	MY-Mysidop	sis bahia	
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	0.8000	1.0000	1.0000	1.0000						
100	0.8000	0.8000	0.6000	0.7000	0.6000						
			1	Transform	: Arcsin Sq	uare Root			1-Tailed	I	
Conc-%	Mean	N-Mean	Mean	Min	Мах	CV%	N	t-Stat	Critical	MSD	
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5				
*100	0.7000	0.7292	0.9955	0.8861	1.1071	11.106	5	4.529	1.860	0.1460	
										1	

Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.837438		0.781		-1.16487	0.538173
F-Test indicates equal variances (p = 0.69)	1.520668		23.1545			
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Hypothesis Test (1-tail, 0.05) Homoscedastic t Test indicates significant differences		MSDp 0.084392				df 1, 8

					Acute Fish	Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP8			
End Date:	11/2/2018		Lab ID:				Sample Typ	pe:				
Sample Da	1		Protocol:	EPAA 91-EF	PA Acute		Test Specie	es:	MY-Mysido	osis bahia		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	0.8000	1.0000	1.0000	1.0000							
10	0.9000	1.0000	1.0000	1.0000	1.0000							
50	1.0000	1.0000	0.9000	0.8000	0.9000							
100	0.8000	0.8000	0.6000	0.7000	0.6000							
				Transform	n: Arcsin Squ	are Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5					
10	0.9800	1.0208	1.3794	1.2490	1.4120	5.284	5	-0.391	2.230	0.1620		
50	0.9200	0.9583	1.2859	1.1071	1.4120	10.026	5	0.898	2.230	0.1620		
*100	0.7000	0.7292	0.9955	0.8861	1.1071	11.106	5	4.895	2.230	0.1620		
									Critical		Skew	Kurt
												KUIT
		iootoo norr	al diatributi	00 (0 > 0.04)			Statistic					
Shapiro-W	ilk's Test ind)		0.907531		0.868		-0.86509	-0.01526
Bartlett's To	ilk's Test ind est indicates	equal varia	ances (p = 0	.69)		TU	0.907531 1.485858	MCDr	0.868 11.34487	MCE	-0.86509	-0.01526
Shapiro-W Bartlett's To	ilk's Test ind est indicates s Test (1-tail	equal varia) ChV 70,71068	TU 2	0.907531	MSDp 0.095794	0.868	MSE 0.013186		

					Acute Fish	Test-96 H	r Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID	:	NMP11		
End Date:	11/2/2018		Lab ID:				Sample Ty	pe:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Speci	es:	MY-Mysido	psis bahia	
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	0.8000	1.0000	1.0000	1.0000						
100	0.8000	1.0000	0.8000	0.8000	0.8000						
				Transform	· Arcsin Sau	are Reet			1.Tailed		

				Transform	: Arcsin Sq	uare Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5					
*100	0.8400	0.8750	1.1681	1.1071	1.4120	11.672	5	2.121	1.860	0.1603		
Auxiliary Te	sts						Statistic		Critical		Skew	Kurt
Shapiro-Wil	k's Test ind	icates norm	al distributio	on (p > 0.01)			0.90066		0.781		0	1.4062
F-Test indic	ates equal v	variances (p	= 1.00)				1		23.1545			
Hypothesis	Test (1-tail	, 0.05)					MSDu	MSDp	MSB	MSE	F-Prob	df
Homosceda	astic t Test i	ndicates sig	nificant diffe	erences			0.090133	0.094629	0.08365	0.018589	0.066688	1, 8
			1		1							

											_
					Acute Fish	h Test-96 H	Ir Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID	c	NMP11		
End Date:	11/2/2018		Lab ID:				Sample Ty	pe:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Speci	es:	MY-Mysidop	osis bahia	
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	0.8000	1.0000	1.0000	1.0000						
10	1.0000	1.0000	1.0000	0.9000	0.9000						
50	1.0000	1.0000	1.0000	1.0000	1.0000						
100	0.8000	1.0000	0.8000	0.8000	0.8000						
											\top
											+
											+
											+
											-
				Transform	: Arcsin Sq	uare Root		Rank	1-Tailed		
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical		
Control	0.9600	1.0000	1.3510	1.1071	1.4120	10.092	5				
10	0.9600	1.0000	1.3468	1.2490	1.4120	6.628	5	26.00	17.00		
50	1.0000	1.0417	1.4120	1.4120	1.4120	0.000	5	30.00	17.00		1
100	0.8400	0.8750	1.1681	1.1071	1.4120	11.672	5	20.00	17.00		+
											+

Statistic

0.907738

Critical

0.868

Skew

-0.06556 2.398115

Kurt

Auxiliary Tests

Shapiro-Wilk's Test indicates normal distribution (p > 0.01)

NOEC

100

LOEC

>100

ChV

TU

1

Equality of variance cannot be confirmed

Hypothesis Test (1-tail, 0.05)

Steel's Many-One Rank Test

5.5.2 Menidia beryllina (96h)

					Acute Fish	1 Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP1			
End Date:	11/2/2018		Lab ID:				Sample Ty	pe:				
Sample Da			Protocol:	EPAA 91-EP	A Acute		Test Specie	es:	MB-Menidia	a beryllina		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
100	0.4000	0.4000	0.1000	0.3000	0.7000							
				Transform	: Arcsin Squ	uare Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Мах	CV%	N	t-Stat	Critical	MSD		
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
*100	0.3800	0.3878	0.6524	0.3218	0.9912	36.873	5	6.468	1.860	0.2090		
Auxiliary T	ests			· · · · ·			Statistic		Critical		Skew	Kurt
Shapiro-Wi	ilk's Test indi	cates norm	nal distributi	on (p > 0.01)			0.838782		0.781		0.009785	2.704292
	cates equal v	ariances (p	o = 0.04)				10.89392		23.1545			
F-Test indi		0.051					MSDu	MSDp	MSB	MSE	F-Prob	df
	s Test (1-tail,	0.05)										

					Acute Fish	Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP1			
End Date:	11/2/2018		Lab ID:				Sample Typ	e:				
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	S:	MB-Menidia	beryllina		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
10	1.0000	0.9091	1.0000	0.9000	1.0000							
50	1.0000	1.0000	1.0000	1.0000	0.8000							
100	0.4000	0.4000	0.1000	0.3000	0.7000							
					• • •							
Conc. N					n: Arcsin Squ			Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV% 5.284	N 5	Sum	Critical			
Control 10		1.0000 0.9814			1.4120 1.4120	5.284		25.50	17.00			
50		0.9814			1.4120	10.092	5	25.50				
50 *100	0.3800	0.3878				36.873	5	27.00				
*100	0.3800	0.3878	0.0524	0.3218	0.9912	30.873	5	15.00	17.00			
Auxiliary T	ests						Statistic		Critical		Skew	Kurt
Shapiro-Wi	ik's Test ind	icates non-	normal distr	ibution (p <=	0.01)		0.837015		0.868		-0.32365	2.473952
Bartlett's Te	est indicates	equal varia	ances (p = 0	.09)			6.43982		11.34487			
lypothesis	s Test (1-tail,	, 0.05)	NOEC	LOEC	ChV	TU						
Steel's Mar	y-One Rank	Test	50	100	70.71068	2						

10/29/2018						Survival					
		Test ID:	1		S	Sample ID:		NMP810			
11/2/2018		Lab ID:			S	Sample Typ	be:				
		Protocol:	EPAA 91-EF	PA Acute	Т	Fest Specie	es:	MB-Menidia	beryllina		
1	2	3	4	5							
1.0000	1.0000	1.0000	1.0000	0.9000							
1.0000	0.9091	1.0000	0.9000	1.0000							
1.0000	1.0000	1.0000	1.0000	0.8000							
0.4000	0.4000	0.1000	0.3000	0.7000							
	1 1.0000 1.0000 1.0000	1 2 1.0000 1.0000 1.0000 0.9091 1.0000 1.0000	1 2 3 1.0000 1.0000 1.0000 1.0000 0.9091 1.0000 1.0000 1.0000 1.0000	1 2 3 4 1.0000 1.0000 1.0000 1.0000 1.0000 0.9091 1.0000 0.9000 1.0000 1.0000 1.0000 1.0000	1 2 3 4 5 1.0000 1.0000 1.0000 0.9000 1.0000 0.9091 1.0000 0.9000 1.0000 1.0000 1.0000 0.8000 1.0000 1.0000 1.0000 0.8000	1 2 3 4 5 1.0000 1.0000 1.0000 0.9000 1.0000 1.0000 0.9091 1.0000 0.9000 1.0000 1.0000 1.0000 1.0000 0.8000 1.0000	1 2 3 4 5 1.0000 1.0000 1.0000 0.9000 1.0000 1.0000 0.9091 1.0000 0.9000 1.0000 1.0000 1.0000 1.0000 0.8000 1.0000	1 2 3 4 5 1.0000 1.0000 1.0000 0.9000 1.0000 1.0000 0.9091 1.0000 0.9000 1.0000 1.0000 1.0000 1.0000 0.8000 1.0000	1 2 3 4 5 1.0000 1.0000 1.0000 0.9000 1.0000 1.0000 0.9091 1.0000 0.9000 1.0000 1.0000 1.0000 1.0000 0.8000 1.0000	1 2 3 4 5 1.0000 1.0000 1.0000 0.9000 1.0000 0.9091 1.0000 0.9000 1.0000 0.9091 1.0000 0.9000 1.0000 1.0000 0.8000	1 2 3 4 5 1.0000 1.0000 1.0000 0.9000 1 1.0000 0.9091 1.0000 0.9000 1 1.0000 1.0000 1.0000 0.9000 1 1.0000 1.0000 0.8000 1 1

		_		Transform	: Arcsin Sq	uare Root			Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N		Resp	Number
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5		1	50
10	0.9618	0.9814	1.3499	1.2490	1.4120	6.312	5		2	51
50	0.9600	0.9796	1.3510	1.1071	1.4120	10.092	5		2	50
100	0.3800	0.3878	0.6524	0.3218	0.9912	36.873	5		31	50
Auxiliary Te	sts						Statistic	Critical	Skew	Kurt
Shapiro-Wil	k's Test ind	icates non-r	normal distri	bution (p <=	0.01)		0.837015	0.868	-0.32365	2.473952
Bartlett's Te	st indicates	equal varia	nces (p = 0.	09)			6.43982	11.34487		
					Trimmed	Spearmar	-Karber			
Trim Level	EC50	95%	CL							
0.0%										
5.0%										
10.0%										
20.0%										
Auto-38.8%	87.682	76.909	99.963							

					Acute Fis	h Test-96 H	r Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID		NMP4		
End Date:	11/2/2018		Lab ID:				Sample Ty	pe:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Speci	es:	MB-Menidi	a beryllina	
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	1.0000	1.0000	1.0000	0.9000						
100	0.3000	0.7000	0.6000	0.6000	0.8000						
			1	Transform	Arcein 6a	wara Doot	1		1 Tailod	1	_

				Transform	n: Arcsin Sq	uare Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
*100	0.6000	0.6122	0.8900	0.5796	1.1071	22.027	5	5.232	1.860	0.1739		
Auxiliary Te	ests						Statistic		Critical		Skew	Kurt
Shapiro-Wil	k's Test ind	icates norm	al distributio	on (p > 0.01)		0.874663		0.781		-1.06083	2.531802
F-Test indic	ates equal	variances (p	(80.0 =				7.23571		23.1545			
Hypothesis	Test (1-tail	, 0.05)					MSDu	MSDp	MSB	MSE	F-Prob	df
Homosceda	astic t Test i	ndicates sig	nificant diffe	erences			0.091442	0.094875	0.598786	0.021873	7.9E-04	1, 8

					Acute Fis	h Test-96 Hr	Survival				
Start Date:	10/29/2018		Test ID:	1		S	ample ID:		NMP4		
End Date:	11/2/2018		Lab ID:			S	ample Typ	be:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute	Т	est Specie	es:	MB-Menidia	a beryllina	
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	1.0000	1.0000	1.0000	0.9000						
10	1.0000	1.0000	1.0000	1.0000	0.9000						
50	1.0000	0.8889	0.8000	1.0000	0.9000						
100	0.3000	0.7000	0.6000	0.6000	0.8000						

					Acute Fish	n Test-96 H	Ir Survival					
start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP4			
End Date:	11/2/2018		Lab ID:				Sample Ty	pe:				
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	es:	MB-Menidia	a beryllina		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
10	1.0000	1.0000	1.0000	1.0000	0.9000							
50	1.0000	0.8889	0.8000	1.0000	0.9000							
100	0.3000	0.7000	0.6000	0.6000	0.8000							
				Transform	n: Arcsin Sq	uare Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
10	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	0.000	2.230	0.1813		
50	0.9178	0.9365	1.2822	1,1071	1.4120	10.174	5	1,196	2.230	0.1813		
*100	0.6000	0.6122	0.8900	0.5796	1,1071	22.027		6.021	2.230	0.1813		
uxiliary T	ests						Statistic		Critical		Skew	Kurt
	lk's Test indi	cates norm	nal distributi	on (p > 0.01)			0.915215		0.868		-0.85373	1.578781
	est indicates						5.053465		11.34487		0.00010	
	Test (1-tail,		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
lynothesis	root (r-tail)	0.00)					0.096376		0.271564		3.8E-05	3, 16
ypothesis) unnett's T	act		50	100	70.71068	2		0.099993				

					Acute Fish	Test-96 H	Ir Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP6			
End Date:	11/2/2018		Lab ID:				Sample Typ	e:				
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	S:	MB-Menidia	beryllina		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
100	0.5000	0.5000	0.4000	0.5000	0.4000							
				Transform	: Arcsin Squ	are Root		Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Мах	CV%	N	Sum	Critical			
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
*100	0.4600	0.4694	0.7451	0.6847	0.7854	7.401	5	15.00	19.00			
Auxiliary To	ests						Statistic		Critical		Skew	Kurt
Shapiro-Wi	lk's Test indi	icates non-	normal distr	ibution (p <=	0.01)		0.697195		0.781		-1.42614	0.854689
-Test indic	ates equal v	/ariances (p	o = 0.60)				1.746821		23.1545			
lypothesis	Test (1-tail,	0.05)		· · · · · ·								
Vilcoxon T	vo-Sample 1	Fest indicat	es significa	nt difference:	S							

					Acute Fish	Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP6			
End Date:	11/2/2018		Lab ID:				Sample Typ	be:				
Sample Da	9		Protocol:	EPAA 91-EF	PA Acute		Test Specie	es:	MB-Menidia	beryllina		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
10	0.9000	1.0000	0.7000	0.9000	1.0000							
50	0.8000	1.0000	0.9000	0.9000	0.9000							
100	0.5000	0.5000	0.4000	0.5000	0.4000							
				Transform	n: Arcsin Squ	iare Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Мах	CV%	N	t-Stat	Critical	MSD		
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
10	0.9000	0.9184	1.2627	0.9912	1.4120	13.643	5	1.657	2.230	0.1572		
50	0.9000	0.9184	1.2533	1.1071	1.4120	8.613	5	1.790	2.230	0.1572		
50 *100		0.9184 0.4694		1.10/1 0.6847	1.4120 0.7854	8.613 7.401	5 5	1.790 8.999	2.230 2.230	0.1572		
							-					
							-					
							-					
							-					
							-					
*100	0.4600						-				Skew	Kurt
*100 Auxiliary T	0.4600	0.4694	0.7451	0.6847	0.7854		5 Statistic 0.908241		2.230 Critical 0.868		Skew -0.8089	Kurt 1.643597
*100 Auxiliary T Shapiro-W	0.4600	0.4694 icates norm	0.7451	0.6847	0.7854		5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		2.230 	0.1572		1.643597
*100 Auxiliary T Shapiro-W Bartlett's Tr	0.4600	0.4694 icates norm equal varia	0.7451	0.6847	0.7854		5 Statistic 0.908241		2.230 Critical 0.868			

					Acute Fish	Test-96 H	Ir Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID:	NMP6			
End Date:	11/2/2018		Lab ID:				Sample Type	:			
Sample Da			Protocol:	EPAA 91-EP	A Acute		Test Species	: MB-M	enidia beryllina		
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	1.0000	1.0000	1.0000	0.9000						
10	0.9000	1.0000	0.7000	0.9000	1.0000						
50	0.8000	1.0000	0.9000	0.9000	0.9000						
100	0.5000	0.5000	0.4000	0.5000	0.4000						
				Transform	Arcsin Squ	iare Root				Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N			Resp	Number
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5			1	50
10	0.9000	0.9184	1.2627	0.9912	1.4120	13.643	5			5	50
50	0.9000	0.9184	1.2533	1.1071	1.4120	8.613	5			5	50
100	0.4600	0.4694	0.7451	0.6847	0.7854	7.401	5			27	50
Auxiliary T	ests						Statistic	Criti	ical	Skew	Kurt
-		cates norm	al distributi	on (p > 0.01)			0.908241	0.8		-0.8089	1.643597
	est indicates						5.250422	11.34			
					Trimmed	Spearma	n-Karber	1			
rim Level	EC50	95%	6 CL								
0.0%											
5.0%											
10.0%											
20.0%											
uto-46.9%	95.384	77.842	116.879								

					Acute Fish	Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP7			
End Date:	11/2/2018		Lab ID:				Sample Typ	e:				
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	S:	MB-Menidia	a beryllina		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
10	1.0000	0.9000	1.0000	1.0000	1.0000							
50	0.8182	0.8000	0.8000	0.9000	0.8000							
100	0.0000	0.0000	0.0000	0.0000	0.0000							
				Transform	n: Arcsin Squ	iare Root		Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical			
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
10	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5	27.50	18.00			
*50	0.8236	0.8404	1.1402	1.1071	1.2490	5.411	5	15.50	18.00			
100	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	5					
			1									
Auxiliary Tr	ests						Statistic		Critical		Skew	Kurt
-	ests Ik's Test indi	cates non-	normal distr	ibution (p <=	= 0.01)		Statistic 0.826411		Critical 0.835		Skew -0.92563	Kurt 0.957313
Shapiro-Wi					= 0.01)							
Bartlett's Te	lk's Test indi	equal varia			= 0.01) ChV	TU	0.826411		0.835			
Shapiro-Wi Bartlett's Te Hypothesis	lk's Test indi est indicates	equal varia 0.05)	ances (p = 0	.94)		TU 10	0.826411		0.835			

					Acute Fish	Test-96 H	Ir Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID:	NMP7			
End Date:	11/2/2018		Lab ID:				Sample Type:				
Sample Da			Protocol:	EPAA 91-EP	A Acute		Test Species:	MB-Menidi	a beryllina		
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	1.0000	1.0000	1.0000	0.9000						
10	1.0000	0.9000	1.0000	1.0000	1.0000						
50	0.8182	0.8000	0.8000	0.9000	0.8000						
100	0.0000	0.0000	0.0000	0.0000	0.0000						
				Transform:	Arcsin Squ	iare Root				Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N			Resp	Number
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5			1	50
10	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5			1	50
50	0.8236	0.8404	1.1402	1.1071	1.2490	5.411	5			9	51
100	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	5			50	50
Auxiliary To	aete						Statistic	Critical		Skew	Kurt
		cates non-	normal distr	ibution (p <=	0.01)		0.826411	0.835		-0.92563	0.957313
	est indicates				0.01)		0.12811	9.21034		-0.52505	0.007010
Janueus re	stinucates	equal valla	nces (p = 0	.54)	Trimmod	Spearma	· · · · · ·	5.21034			
rim Level	EC50	95%	6 CL		minieu	opeanna	n-narber				
0.0%	58.837	52,283	66.213								
5.0%	62.235	54.100	71.593								
10.0%	64.855	53.768	78.228	-							
20.0%	66.204	62.954	69.623								
20.070	58.837	52.283	66.213								

					Acute Fis	n Test-96 H	r Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP8		
End Date:	11/2/2018		Lab ID:				Sample Ty	pe:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Speci	es:	MB-Menidia	a beryllina	
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	1.0000	1.0000	1.0000	0.9000						
100	0.5000	0.4000	0.7000	0.8000	0.6000						

		_		Transform	Arcsin Squ	lare Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
*100	0.6000	0.6122	0.8909	0.6847	1.1071	18.654	5	6.020	1.860	0.1509		
Auxiliary Te	sts						Statistic		Critical		Skew	Kurt
Shapiro-Wil	k's Test indi	cates norma	al distributio	n (p > 0.01)			0.943179		0.781		-0.07033	0.25799
F-Test indic	ates equal v	ariances (p	= 0.14)				5.199646		23.1545			
Hypothesis	Test (1-tail,	0.05)					MSDu	MSDp	MSB	MSE	F-Prob	df
Homosceda	istic t Test ii	ndicates sig	nificant diffe	rences			0.076477	0.079348	0.596635	0.016466	3.2E-04	1, 8

					Acute Fis	h Test-96 Hi	Survival				
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP8		
End Date:	11/2/2018		Lab ID:				Sample Ty	pe:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Speci	es:	MB-Menidia	a beryllina	
Comments											
Conc-%	1	2	3	4	5						
Control	1.0000	1.0000	1.0000	1.0000	0.9000						
10	0.9000	0.9000	0.9000	1.0000	1.0000						
50	1.0000	1.0000	0.9000	1.0000	1.0000						
100	0.5000	0.4000	0.7000	0.8000	0.6000						

					Acute Fish	n Test-96 H	Ir Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP8			
End Date:	11/2/2018		Lab ID:				Sample Ty	be:				
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	es:	MB-Menidia	a beryllina		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
10	0.9000	0.9000	0.9000	1.0000	1.0000							
50	1.0000	1.0000	0.9000	1.0000	1.0000							
100	0.5000	0.4000	0.7000	0.8000	0.6000							
				Transform	n: Arcsin Sq	uare Root			1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
10	0.9400	0.9592	1.3142	1.2490	1.4120	6.792	5	0.958	2.230	0.1518		
50	0.9800	1.0000	1.3809	1.2490	1.4195	5.343	5	-0.022	2.230	0.1518		
*100	0.6000	0.6122	0.8909	0.6847	1.1071	18.654	5	7.176	2.230	0.1518		
Auxiliary Te	ests						Statistic		Critical		Skew	Kurt
Shapiro-Wil	k's Test indi	cates norm	al distributi	on (p > 0.01))		0.945174		0.868		-0.12156	0.298277
Bartlett's Te	st indicates	equal varia	nces (p = 0	.29)			3.770134		11.34487			
	Test (1-tail,	0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
iypotnesis						2		0.079937	0.277781	0.011586	3.7E-06	3, 16

Start Date:	10/29/2018		Test ID:	1		Sample ID		NMP810		
				1				NIVEOTU		
End Date:	11/2/2018		Lab ID:			Sample Ty	pe:			
Sample Da			Protocol:	EPAA 91-EF	PA Acute	Test Speci	es:	MB-Menidia	a beryllina	
Comments										
Conc-%	1	2	3	4	5					
Control	1.0000	1.0000	1.0000	1.0000	0.9000					
100	0.7000	0.8000	0.8000	0.5000	0.7273					

	Transform: Arcsin Square Root								1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
*100	0.7055	0.7199	1.0024	0.7854	1.1071	13.151	5	5.596	1.860	0.1253		
uxiliary Te	sts						Statistic		Critical		Skew	Kurt
hapiro-Will	k's Test indi	cates norm	al distributio	n (p > 0.01)			0.821652		0.781		-1.37129	1.56812
-Test indic	ates equal v	ariances (p	= 0.28)				3.271878		23.1545			
lypothesis	Test (1-tail,	0.05)					MSDu	MSDp	MSB	MSE	F-Prob	df
Iomosceda	astic t Test i	ndicates sig	nificant diffe	rences			0.060779	0.063061	0.355296	0.011346	5.1E-04	1, 8

					Acute Fisl	h Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP10			
End Date:	11/2/2018		Lab ID:				Sample Typ	be:				
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	es:	MB-Menidia	beryllina		
Comments	5											
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
10	0.9000	0.9000	1.0000	1.0000	0.9000							
50	1.0000	1.0000	1.0000	1.0000	1.0000							
100	0.7000	0.8000	0.8000	0.5000	0.7273							
Transform: Arcsin S					n: Arcsin Sq	uare Root		Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Мах	CV%	N	Sum	Critical			
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
10	0.9400	0.9592	1.3142	1.2490	1.4120	6.792	5	22.50	17.00			
50	1.0000	1.0204	1.4103	1.4033	1.4120	0.275	5	28.00	17.00			
*100	0.7055	0.7199	1.0024	0.7854	1.1071	13.151	5	15.00	17.00			
uxiliary T							Statistic		Critical		Skew	Kurt
	ilk's Test ind)		0.902922		0.868		-1.00983	1.64015
	est indicates						20.8151		11.34487			
	s Test (1-tail		NOEC	LOEC	ChV	TU						
Maalla Mar	ny-One Rank	Test	50	100	70.71068	2						
steers war	· · · ·											

					Acute Fish	Test-96 H	Ir Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP810			
End Date:	11/2/2018		Lab ID:				Sample Typ	e:				
Sample Da			Protocol:	EPAA 91-EP	A Acute		Test Specie	S:	MB-Menidia	beryllina		
Comments												
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
100	0.6000	0.4000	0.6000	0.6000	0.5000							
				Tanafam	Annain Cau	and Deat		Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	: Arcsin Squ Max	CV%	N	Sum	Critical			
Control		1.0000	1.3794		1,4120	5.284		oum	ondour			
*100		0.5510	0.8257		0.8861	10.906		15.00	19.00			
100	0.0400	0.0010	0.0207	0.0047	0.0001	10.000	5	10.00	10.00			
Auxiliary T	ests						Statistic		Critical		Skew	Kurt
Shapiro-Wi	lk's Test indi	cates non-	normal dist	ribution (p <=	0.01)		0.744375		0.781		-1.29095	0.143195
-Test indi	cates equal v	ariances (p	o = 0.69)				1.526583		23.1545			
lypothesis	s Test (1-tail,	0.05)										
Vilcoxon T	wo-Sample 1	Fest indicat	es significa	nt differences	;							

					Acute Fish	Test-96 H	r Survival					
Start Date:	10/29/2018		Test ID:	1			Sample ID:		NMP11			
End Date:	11/2/2018		Lab ID:				Sample Typ	e:				
Sample Da			Protocol:	EPAA 91-EF	PA Acute		Test Specie	S:	MB-Menidia	beryllina		
Comments										-		
Conc-%	1	2	3	4	5							
Control	1.0000	1.0000	1.0000	1.0000	0.9000							
10	1.0000	1.0000	1.0000	0.9000	0.8182							
50	1.0000	1.0000	1.0000	1.0000	0.9000							
100	0.6000	0.4000	0.6000	0.6000	0.5000							
				Transform	n: Arcsin Squ	are Root		Rank	1-Tailed			
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical			
Control	0.9800	1.0000	1.3794	1.2490	1.4120	5.284	5					
10	0.9436	0.9629	1.3231	1.1303	1.4120	9.736	5	24.50	17.00			
50	0.9800	1.0000	1.3777	1.2490	1.4120	5.227	5	25.50	17.00			
*100	0.5400	0.5510	0.8257	0.6847	0.8861	10.906	5	15.00	17.00			
Auxiliary Ti	ests						Statistic		Critical		Skew	Kurt
	ests Ik's Test indi	cates non-I	normal distr	ibution (p <=	= 0.01)		Statistic 0.821144		Critical 0.868		Skew -1.07553	
					= 0.01)							
Shapiro-Wi Bartlett's Te	IK's Test indi est indicates	equal varia			= 0.01) ChV	TU	0.821144		0.868			
Shapiro-Wi Bartlett's Te Hypothesis	lk's Test indi	equal varia 0.05)	nces (p = 0	.63)		<u>TU</u> 2	0.821144		0.868			Kurt -0.1082

5.6 Appendix F. Laboratory Photographs



5.6.1 Elutriate preparation

5.6.2 Elutriate bioassays





5.7 Appendix G. Raw Data Sheets for Elutriate Bioassays

SI 556 Calibration Documentation Sheet		
	Serial number 135100686	
Date 10-76-13	Serial humber 1991	
echnician: JmD		
Dissolved Oxygen		
Type of Calibration ZA.V		
Barimetric Pressure 765.Y		
D.O. Gain 0- 921145		
D.O. Local Gain 1.005954		
Acceptable? Y/N		
Conductivity/Salinity		
Type of Calibration 3.0 F		Exp. Date 03 /201
Conductivity Gain 1.413 ms/cm 0. 980 500	Standard Lot # V×/	Exp. Date 03/202
Conductivity Gain 12.88 ms/cm 0.990115	Standard Lot # 9882	Exp. Date 7/3 ka
Conductivity Gain 50.0 ms/cm 1.09561	Standard Lot # 18A(000 85	
Acceptable? Y/N 4		
pH		
Type of Calibration		Exp. Date 10/25/1
pH 7.0 Gain - 5.19371	Standard Lot # 6296-06	Exp. Duce 101-1
pH 7.0 Offset - 202. 556	a. 1.11.14# (200 20	Exp. Date /º/z/
pH 4.01 Gain . J. 1776 5	Standard Lot # 62 92- 20	Lapi Dute 1 4
PH 4.01 Offset - 201.97/	Standard Lot # CC5R03(Exp. Date 5/25/3
pH 10.0 Gain _ 5.23508	Standard Lot # CC3 603	capito de la ferra
pH 10.0 Offset - 197. 613		
Acceptable? Y/N Y		

# 06JZ41846	
<u></u>	
Standard Lot # 1/61	Exp. Date 03/2019
	Exp. Date 63/2021
	Exp. Date 7 /3 /201
Standard Lot # 18A 00005	
	Exp. Date 10.23.
Standard Lot # 6296 - 06	Exp. Date 10.23
	Exp. Date 10.26 .19
Standard Lot # 629220	Exp. Date 10.00
	Exp. Date 5.23. 20
Standard Lot # (C, St 203)	LAP. Date 9-9
	# @(63241846 5tandard Lot # 1/8] Standard Lot # 1882 Standard Lot # 18A ØØØ85 Standard Lot # 6296 - 06 Standard Lot # 6296 - 06 Standard Lot # 6296 - 06 Standard Lot # 6296 - 06

ERDC data sheet

Date: 10-29-18	Technician: 2~ ß
Ammonia Probe Orion 9512	
	00 my/L Lot # WV/ Expiration date: 05/2020
pH Adjusting ISA Solution 951	ENI Lot # URI Expiration date: NA
	M. Il; Q + Tomin Strength & Adjunker
Number of Standards in Curve 3	Concentration of Standards in Curve 1.0 10.0, 102 mg
Slope of Calibration Curve -59	.2 Acceptable? (VN Elstriate fest start with menidia and Mysid
Comments: HSC - NMP	Elitrate test start with menidia and mysid
pH Probe	
Number of Buffers in Curve	
pH Buffer 7.0 Lot #	Expiration Date
pH Buffer 4.01 Lot #	Expiration Date
pH Buffer 10.0 Lot #	Expiration Date
Slope	Acceptable? Y/N
Comments:	
	1

ERDC data sheet

	And the second second	pH/ISE mete	Day	Ludeaus	
Date: 11/2/18		Technician.			
Ammonia Probe Orion 9512		1	110		05/2020
Ammonia Standard Concentration:	100mg/L	Lot #	<u>V1</u>	Expiration date:	112
pH Adjusting ISA Solution 951211		Lot #	21 Charle alle	Expiration date:	10/2
Standard Dilution Water Source	Mille	Q + Ionic	Strength	Adjuster	1
Number of Standards in Curve	3	Concentration of	Standards in C	curve <u>l</u> , le	2, 100 mg/
Slope of Calibration Curve	55.32-56.5	Acceptable 20N			
comments: ₩SC-NMP EIV	triate test	termination) with M	enidia 9 mysi	ds.
pH Probe					
Number of Buffers in Curve					
pH Buffer 7.0 Lot #	Expiratio	on Date			
pH Buffer 4.01 Lot #	Expiratio	on Date			
pH Buffer 10.0 Lot #	Expiratio	on Date			
Slope	Accepta	ble? Y/N			
Comments:					

1300 Blue Spruce Drive, Suite C Fort Collins, Colorado 80524



Toll Free: 800/331-5916 Tel: 970/484-5091 Fax:970/484-2514

ORGANISM HISTORY

DATE:	10/25/2	2018	
SPECIES:	Menid	ia beryllina	
AGE:	8 day		
LIFE STAGE:	Juveni	le	
HATCH DATE:	10/17/	/2018	
BEGAN FEEDING:	Immed		
FOOD: _	Rotife	ers, Artemia sp.	
Water Chemistry Record:		Current	Range
TEMPER	ATURE:	25°C	23-26 °C
SALINITY/CONDUC	TIVITY:	25 ppt**	24-26 ppt
TOTAL HARDNESS (as	CaCO3):		
TOTAL ALKALINITY (as	CaCO ₃):	160 mg/l	160-210 mg/
	pH:	8.19	7.87-8.25
Comments:	** Acclimated	to 27 ppt on 10/25/18.	0
		All	1
		Facility Supervisor	1
		,, <i></i> , <i></i> ,	
\frown			
	tic BioSyst		Research Organisms

1300 Blue Spruce Drive, Suite C Fort Collins, Colorado 80524



Toll Free: 800/331-5916 Tel: 970/484-5091 Fax:970/484-2514

ORGANISM HISTORY

DATE:	10/25/2018
SPECIES:	Americamysis bahia (formerly Mysidopsis)
AGE:	<1 day
LIFE STAGE:	Juvenile
HATCH DATE:	10/25/2018
BEGAN FEEDING:	Immediately
FOOD:	Artemia sp.

Water Chemistry Record:	Mean	Range
TEMPERATURE:	26 °C	21-26 °C
SALINITY/CONDUCTIVITY:	25 ppt**	21-30 ppt
TOTAL HARDNESS (as CaCO3):		
TOTAL ALKALINITY (as CaCO3):	140 mg/l	140-170 mg/l
pH:	8.15	7.77-8.20

Comments:

** Acclimated to 27 ppt on 10/25/18.

hit a

Facility Supervisor

Aquatic BioSystems, Inc • Quality Research Organisms

CTAN A ///			
HSC- NINF	Test Initiation Date: /0-29-/STime: 100		
Test Species: Monduc Doralling Page	/ of /		
4	Environmental chamber temperature: 20'0	5.0	
Dav Date Number Estimated Wate	Estimated Water Change Feeding Temp. Salinity/Cond. Survival (Y/N) (°C) (ppt / uS/cm)	Cond. pH D.O. Initials /cm) (SU) (mg/L)	Comments (mg/L)
2885 Ø	1 ×	Mr Bar	2.2 (5 hish 3-25)
- Q 5857	1 20.2	7.70 10.61 UR	
1	N 4 20.1 30.1	JN 07:1 HE.E	1 - 1 - 5
10/29		11 +521	1257 Initiation

A lint?		ISM RECE		Time 100				
1 MM	Test Initiation Date: / a. 2 5-18	al 101 - 11 21 12		Time: 1100				
2000/100 waysis balance	T	ultin all		. 1100				
		namber temp	perature:	1.02				
Original Number Estimated Number Dead/removed Survival	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Feeding T (Y/N) (Femp. S. (°C) (Salinity/Cond. (ppt / uS/cm)	Hd (US)	-		Comments (mg/L)
	Jutal			282	Y	to	M. Bux	5-4 July 2 2 + 2
1	Z		-	5.62	7.34	10.9		
1885 0 -	Z	7	1.02	24.9	12:4	1.31	111111111	1.1.1
			-			-	TEST INITIALION	11011
			1			+		
			-			-		
			-			-		
			-			_		
						-	_	
						+		
						+		
						_	_	
						-		
						-		
			-			-	_	

iouston. i	MMP		Date:
Site	Start Salinity	Salt added (g)	Final Salinity
1	\$.09	155.6	29.16
1.sw	7.79	160.0g	29.82
2	5.75	184.10	29.08
2 2sw	5.07	185. 205.3 g	29.74
3		205.79	29.73
3 3sw	4.73	117.5	28.91
4	4.13	710.0.	Z9.Z
4 4sw	3.62	215.08 122.0	30.0
45W	3.44	216.5	29.8
5 5sw	2.97	125.9	29.83
	2.03	228,1	32.74
6sw	1.80	131.0	29.65
7	2.31	225.8	29.7
7sw	1.71	131.2	29.2
75W	2.68	207.0	24.38
8sw	2.54	127.0	29.18
9	2.75	206.3	29.37
9 9sw	7.61	127.6	29.34
10	2.47	224.5	29.81
10 10sw	2.24	129.3	79.22
10SW	1.18	235.1	29.51
11 11sw	1.17	134.4	29.69

ERDC Datasheet

Miscellaneous Documentation Sheet HSC North of monpools Point Study: Comment Technician Date Returne Toxicant solution Lop Menda buylling 12-29-19 JMA Meaned 6.0030 p /CEI and dissolved in 29.94 ppt Crystal Sca in a 3L volumetric flaske. poured off 1500 me into produced cylinder and distributed 400 me to each of 3 600 mL backers. Discorded remaining solution in cylinder Retilled volumetric flack with crystal see and much. process until the 3 reps off the following Repeated Above 2, 1, 0.5, 0.25 and 0.125 g/L KCI concutations was prepared .

ERDC Datasheet

HSC Morth of Marsons point. Study: Comment Technician Date Amoricanysis babis test (elutrish) Returnee Toxicoat solution />p. 2~13 10-29-18 KCI . and dissolved in 29.97 ppt Crystal Measured 3.00 ZZ p a 3 L volume tric flaste. Sea in 1500 ml into a sond-ated cylinder and distributed poured off 16 perfects. discorded remaining, in cylinder 400 mL Visto three Ref. 1(ed volumetric flack with anystal sea, mixed and reported Above process to obtain the following concentrations Breases 1.0, 0.5, 0.25, 0.125, 0.0625 016 KCL.

Miscellaneous Documentation Sheet

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	- 1	0.1						NETENEINCE LOAD THE FILST STATE	Toot Initi-	ation Date	0101	10		Time: 14 00	100	
L Page 1 cumulation back, 11/216 Rays 1 cumber tamper	Project: H5C NI	dh							Test Tam	auron Dar		0110		Time: V	100	
Terminomental chamber temperature: $20^{\circ}C$ <th>atory: ERD</th> <th>U-EL</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>Test Tell</th> <th>of 1</th> <th>Date. III</th> <th>0</th> <th></th> <th></th> <th></th> <th></th>	atory: ERD	U-EL							Test Tell	of 1	Date. III	0				
Immber Alive Temp. (°C) Salinity (ppt) pH (SU) D.0. (mgL) $$	species: A. I	pahia							Fage 1	nental cha	umber ten	perature:	20.02			
Rep. Mode Oh ZA Z <thz< th=""><th>ure duration</th><th>un i</th><th></th><th>N</th><th>A rodm</th><th>av.</th><th></th><th>Temn</th><th>(0c)</th><th>Salinit</th><th>v (ppt)</th><th>Hd</th><th>(NS</th><th>D.O. (</th><th>mg/L)</th><th></th></thz<>	ure duration	un i		N	A rodm	av.		Temn	(0c)	Salinit	v (ppt)	Hd	(NS	D.O. (mg/L)	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Repl.	No. Loaded	0 h	24 h	48 h	72 h	96 h	4 O	96 h	0 h	96 h	0 h	96 h	0 h	96 h	Comments
B -	A	1	1	1	1	1	1	1	I	١	١	1	1	1	1	Ammons 50.)
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	Test Indiation Date: $ \mathbf{v} \ge 2s_{\rm P} / \mathbf{v} = 1$ Time: $ \mathbf{u} \mathbf{v} $	Page 1 of 1 Environmental chamber temperature 20°C	Salinity (ppt) pH (SU) D.O. (mg/L) Amnonia (mg/L)	0 h 24 h 48 h 72 h 96 h 0 h 24 h 2012 20 c 23 20 29 8 02 05 293	36.5 S.94 T. 7.95 T. 79.5 S.94 S.94	29.8 7.95	20.3 299 7.46 6.16	3012 30.3 20.3 30.4 30.6 241 7.84 7.87 7.62 7.87 7.46 6.68 6.60 6.14	36.7 7.83	30.7		2041 201 201 201 202 200 202 799 7.81 200 255 618 6138 5.30	20-3 200 201 200 21 1 1 1 1 1 1 1 1 1 1 1 1	30.6 7.91	30.8 7.92	30.4 7.91 7.91	19.2 29.61 20.5 30.1 30.7 8.05 7.97 8.01 7.77 7.99 7.63 6.30 6.58 6.22 6.24 8.74 0.23	6.00	30.2	30.6	UK JC NM NM NM K JC KW NM NM K 31	1227 230 (000 1325 0936 1400		on 29 MgrUg19			
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Λ $(0$ $(2$ g g (M) (20) (2)	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	B [0] C [0] D [0] B [0] B [0] B [0] C [0]	48 h			-	-	-	-	-	24 h	48 h	72 h		0 h	24 h	48 h	72 h	96 h	0 h	24 h	48 h	4	96 h	0 h	96 h
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$\overline{)}$	ELUTRIATE TOXICITY TE Test Initiation Date [0]29 [5] Test Termination Date [1]2 [9] Page [of]	perature:	Salinity (ppt) 24 h 48 h 72 h	20.23						Mm 15/01	0.001		
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st Spec	Test Species: MPN id id	lidia							Page	of 1	-	-				
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Conc.	Repl.	Loaded	0 h	24 h	48 h	72 h	96 h	0 h	96 h	0 h	96 h	0 h	96 h	0 h	96 h	Comments
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12.1	В	10		0	01	0	10		266		31.5		£4.4		6.48	
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			KUNNT	MARIAN ALGUN	Naul					c uo	on 29 March 19	419				
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345										FLUIT	UATE IN	VICITY	ELUTRIATE TOXICITY TEST SHEET	HEET											
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Species. MCDJ Oli O osure duration 90h									Test T	est Termination Date:	n Date:	2 18		Time:	1332										
ssure duration 96h	5								Page	l of l		-													
									Enviro	nmental c	Environmental chamber temperature: $20 \cdot C$	mperature	1.02	1											
		No.	io. Alive				Temp. (°C)	°C)			Sa	Salinity (ppt))t)			pH (SU	SU)				D.O. (mg/L)	(T)		Ammon	Ammonia (mg/L))
Conc. Repl. Load	ied 24 h	h 48 h	h 72 h	h 96 h	0 h	24 h	1 48 h	72 h	96 h	0 h	24 h	48 h	72 h	96 h	0 h 2	24 h 48	48 h 72 h	h 96 h	h 0 h	24 h	48 h	72 h	96 h	0 h	96 h
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Gito, B 10	01	01	0 10	10	0				19.7				M	31.41	-		_	8.06	2				6.55		
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WHILE D 10	01	01 0	0 10	51					12.7				m	30 0			-	8.03	e				6.40		
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v lo	0/	0	0]	01	16.02	3	2 19.8	19	6. 14.9	30.10	30.3	30.4	31.031.0	101	E hbit	78.1 1.85	bet 2		1 7.63	6.21	61.9	6.63	6.25	c1.2	1,42
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A 10	0	0	10		20.15	2.02	3 19.9	19.5	19.9	29.76	30.0 30.0	10.0	30.130	30.28	2 20.8	7.94 7.98	8 7.96	6 8.20	1920	6.00	5.98	6.18	6.51	10.9	6.53
SO' B 10	(0	2	0	01					19.9				3	30.1				Võ	0				6.42		
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Е [0	lo	8	00	14					19.6				3	31.1	_			8,26	20				6.67		
Initials: MB B	MM 6	MIN 1	18	4V	IR	25	LIN	50	10	×	36	NW	51 3	JB 1	VR 3	22 MM	2 2	10	R	36	Lun	36	TB	Buc	JUNE
Date: 10 29	-	15/a1 05 a1	1.11 (1.11	1029		10/30 10/31	10/1	2/11	10/29	10/3 10/31		1/11 1/11	10 2/2	0/ 10/01	10/30/0/21 11/1	1 11 15	2/1 /	10/29		15/07 05/00	111	11/2	62/01	112
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RIMUTUM MIM

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Site ID. 7										Test Ten	Test Termination Date:		218	-	Time 1346	9									
ecies:	Test Species: M PM 1 d 10	0								Page	of	-	<u>.</u>												
re durati	Exposure duration:									Environn	Environmental chamber temperature: $20.U$	mber temp	erature:	7.0-											
		-	~	No Alian		L		Temn (°C)	0			Sali	Salinity (ppt)		_		pH (SU	0			D.0	D.O. (mg/L)		Ammo	Ammonia (mg/L))
	No.	0. 14 h		C	4 96 4	40	440		72 h	96 h	0 h	24 h	48 h 75	ų	96 h 0 h	h 24 h	1 48 h	72 h	96 h	0 h	24 h	48 h 7	_	_	+
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Flaurur Med 29March 19

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conc. Rept. Londed if te B 10 V(1,101 - 100								Environme	Environmental chamber temperature: \mathcal{N}	er tempera	ature: 7	1.0											
Conc. Rept. Loaded i f A 10 i f B 10 i f C 10 i f C 10		No. Alive	ve			Temp. (°C)	0			Salinity (ppt)	((ppt)			-	pH (SU)				D.O. (mg/L)	g/L)		Ammo	Ammonia (mg/L))
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5.8 Appendix H. Sediment Chain of Custody Information

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