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October 31, 2016

VIA U.S. MAIL AND ELECTRONIC MAIL

Ms. Dyan Whyte
Assistant Executive Officer
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, California 94612

Re: *3rd Quarter 2016 Report – June 27, 2013 Amended Water Code section 13267 Order, Order No. R2-2013-1005-A1, Directives 8.f and g . - Chronic Toxicity*

Dear Ms. Whyte:

Enclosed, in accordance with the Regional Water Quality Control Board, San Francisco Bay Region's ("Regional Water Board") June 27, 2013 amended Water Code section 13267 Order, Order No. R2-2013-1005-A1, ("Order"), Lehigh Southwest Cement Company ("Lehigh") provides and encloses the 3rd Quarter ("Q3") 2016 Chronic Toxicity Monitoring Report – TRE Update pursuant to Directives 8.f. and 8.g. of that Order. Sampling locations included Pond 4A, Pond 13, and Pond 14. As part of the toxicity control investigation component of Lehigh's Toxicity Reduction Evaluation ("TRE") for potential sources of toxicity to Pond 4A, testing was also conducted on influent and effluent from the Interim Treatment System ("ITS") and additional piloted treatment train additions.

If you or your staff have any questions regarding the above report or enclosed documents, please do not hesitate to contact me or Greg Knapp/Sam Barket at Lehigh.

Very truly yours,

Nicole E. Granquist

Nicole E. Granquist

Enclosure

Cc: Jack Gregg, Regional Water Quality Control Board, San Francisco Bay Region
Greg Knapp, Director Environmental Region West, Lehigh
Sam Barkett, Area Environmental Manager, Lehigh

ROBERTSON - BRYAN, INC.
Solutions for Progress

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TECHNICAL MEMORANDUM

Date:	October 31, 2016
Prepared for:	Sam Barket and Greg Knapp
Prepared by:	Paul Bedore, M.S.
Reviewed by:	Michael Bryan, Ph.D.; Ben Giudice, Ph.D., P.E.
Project:	Lehigh Southwest Cement Company *Ceriodaphnia dubia* Toxicity Reduction Evaluation
Subject:	3rd Quarter 2016 TRE Update

Overview

The purpose of this memorandum is to summarize the 3rd Quarter ("Q3") 2016 chronic toxicity monitoring for Lehigh Southwest Cement Company ("Lehigh") conducted in accordance with the Regional Water Quality Control Board, San Francisco Bay Region's (Regional Water Board), June 27, 2013 amended Water Code section 13267 Order, Order No. R2-2013-1005-A1, (Order). Sampling locations included Pond 4A, Pond 13, and Pond 14. Consistent with modification of the Order's monitoring requirements (T. Yin, personal communication, to P. Bedore on September 9, 2014), Lehigh has been testing Pond 9 water twice yearly – once during the dry season and once during the wet season. However, Regional Water Board staff agreed that it was unnecessary for Lehigh to conduct Pond 9 testing during the 2016 dry season (T. Yin, personal communication, to P. Bedore on September 23, 2016).

As part of the evaluation of a toxicity control strategy for Lehigh's Toxicity Reduction Evaluation (TRE) for toxicity in Pond 4A, testing was also conducted on samples from a newly configured Pilot Treatment System (PTS) to test possible treatment scenarios for a Final Treatment System (FTS). Next steps in the evaluation of a toxicity control strategy for Lehigh's TRE are also discussed.

Pond 4A, Pond 13, Pond 14 Test Results

Chronic toxicity sampling for Pond 4A, Pond 13, and Pond 14 was conducted September 26–30, 2016. A summary of the results is shown in **Table 1**. At the time samples were collected, discharges into and out of Pond 4A occurred intermittently. There was no inflow from Permanente Creek to Pond 13 and water levels of Pond 13 appeared to have been low for a prolonged period of time, meaning the discharge from Pond 4A had not recently reached Pond 13. Flow was present into and out of Pond 14.

Table 1. Q3 2016 *Ceriodaphnia dubia* chronic toxicity test results for Pond 4A, 13, and 14 samples collected September 26–30, 2016.

Location	TUc – Survival	TUc – Reproduction
Pond 4A	2	1.9
Pond 13	1	1.3
Pond 14	1	1
Notes: TUc = 100/EC25 or 100/IC25		

Chronic toxicity testing in Q3 2016 with *Ceriodaphnia dubia* indicated survival and reproductive toxicity at Pond 4A and reproductive toxicity at Pond 13 (Table 1), while toxicity to *C. dubia* was not observed at Pond 14. As previously reported in updates to Lehigh's TRE (*TRE Progress Update and Future TRE Activities*, dated September 30, 2013), nickel is suspected to be the principal contributor to *C. dubia* toxicity and has been sourced to quarry water discharged to Pond 4A. The update to Lehigh's TRE stated that when survival and reproduction TUc is ≤ 2 (where TUc = 100/EC25 or 100/IC25), no further actions would be taken. Likewise, when survival and reproduction TUc is > 2 and the nickel concentration is ≥ 5.7 µg/L, the cause of toxicity is presumed to be related to nickel, and no further actions beyond the already planned treatment controls would be taken. Because toxicity observed among Pond 4A, Pond 13, and Pond 14 samples was ≤ 2 TUc, no further actions were taken.

Toxicity Control Evaluation Test Results

In Q3 2016, samples were collected from the PTS to test possible treatment scenarios for a FTS. The PTS combined the current biological treatment technology used in the Interim Treatment System (ITS) with an ultra-filtration/reverse osmosis (UF/RO) unit (**Figure 1**). Conceptually, quarry water was fed into the UF/RO creating a *permeate* (water that permeates through the membrane of the UF/RO unit) and a *concentrate* (water rejected from flowing through the UF/RO membrane). Permeate is relatively void of minerals, metals and other compounds that are rejected by the reverse-osmosis membrane, while these constituents are concentrated in the concentrate. The PTS unit was optimized to discharge 75% permeate and 25% concentrate, meaning the mineral and metals content of the concentrate was approximately four times greater than the raw quarry water that is fed into the PTS unit. Concentrate was then treated with a biological treatment system to remove metals and metalloids, including nickel and selenium. Biologically treated concentrate and permeate were discharged separately from the PTS, but under a FTS scenario, they would be recombined prior to discharge. During testing of the PTS, the low volume of biological effluent and permeate discharged from the PTS were directed back to the quarry and not to Pond 4A.

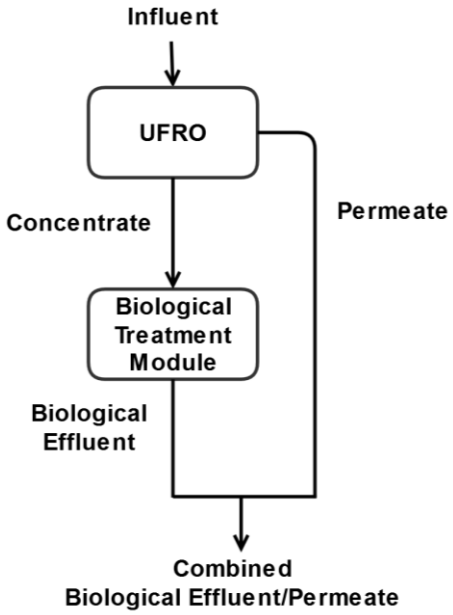


Figure 1. Simplified flow diagram of the Pilot Treatment System (PTS) used to test treatment scenarios for a Final Treatment System (FTS).

Pilot System Test Results

Operational startup and treatment optimization of the PTS occurred in mid-July 2016, and three PTS toxicity sampling events occurred – July 27, September 6, and September 26, 2016. Results for the July 27, 2016 test indicated that the PTS had not been fully optimized at the time samples were collected (e.g., there was good selenium removal, but poor nickel removal through the PTS) and that there were biological agents in the samples that completely covered the test organisms and caused direct mortality. Nickel and selenium removal in the PTS were optimized prior to the subsequent *C. dubia* toxicity tests.

Testing conducted for the second PTS toxicity testing event was completed on samples collected September 6, 2016. Although the PTS was producing 25% biological effluent and 75% permeate, testing was designed to determine whether removing a fraction of the concentrate was necessary to remove toxicity. Practically, this resulted in testing a number of different biological effluent/permeate mixtures for toxicity to *C. dubia*. To screen for the influence of biological agents on the test results, biological effluent/permeate mixtures were filtered – 0.20 µm filtration removes nearly all bacteria and protozoa. Filtration was used under the assumptions that biological agents observed in the PTS may not be present in the FTS effluent (either because biological interferences could be avoided/mitigated, or that Lehigh would be able to add a unit process to the FTS to treat for biological interferences). One treatment (25% biological effluent/75% permeate) was also tested unfiltered.

Results for the September 6, 2016 PTS toxicity tests are shown in **Table 2**. For filtered biological effluent/permeate mixtures, a mixture was considered toxic if survival or reproduction in the treatment differed from the control by 25% or greater and the difference was statistically significant. Toxicity to *C. dubia* reproduction was found across the 12.5–40% biological effluent treatments, but not the 6.25% biological effluent treatment. The theoretical biological effluent/permeate ratio that would be considered "not toxic" based on the test results (i.e., the IC25) was 10.7% biological effluent to 89.3% permeate. Thus, with the water quality produced at the time these samples were collected, approximately 56% of the concentrate produced by the PTS would need to be removed prior to biological treatment for the final combined mixture of filtered biological effluent (11%) and permeate (89%) to not be toxic to *C. dubia*. The proportion of concentrate needing to be removed (56%) corresponds to 14% of the raw influent flow. Toxicity observed in the 12.5–40% biological effluent treatments was not likely related to nickel, as nickel concentrations observed in these mixtures (0–5 µg/L; Table 2) was lower than the empirically derived IC25 for nickel in synthetic Pond 4A water (IC25 = 5.7 µg/L).

Table 2. *Ceriodaphnia dubia* chronic toxicity test results for Pilot Treatment System samples collected September 6, 2016.

Filtration	Treatment[a]	Survival (%)	Reproduction (neonates/ female)	Hardness (mg/L)	Ni[b] (µg/L)
Not Filtered	Lab Water Control	100	24.3	100	0
	25% BE / 75% P	90	3.1*	669	2.9
Filtered	Lab Water Control	100	23.3	100	0
	6.25% BE / 93.75% P	90	22.4	168	0.9
	12.5% BE / 87.5% P	90	16.4*	335	1.5
	18.75% BE / 81.25% P	100	16.8*	502	2.2
	25% BE / 75% P	90	10.3*	669	2.9
	40% BE / 60% P	10	2.2*	1070	4.5

Notes:
*Sample toxic relative to control (i.e., >25% effect relative to control).
[a] BE = Biological Effluent; P = Permeate
[b] Calculated using simple mixing calculations and the concentration of nickel in 100% biological effluent and 100% permeate.

Test results also indicated that the filtered 25% biological effluent treatment was less toxic than the unfiltered treatment (Table 2). Even though the laboratory did not see visible evidence of surface growths on the test organisms in the filtered and unfiltered treatments, the presence of pathogens cannot be ruled out (nor can it be confirmed). The 25% biological effluent treatment was retested (filtered and unfiltered) after 20 days and the toxicity was found to have slightly diminished over the holding time relative to the original test (**Table 3**).

The September 6, 2016 PTS samples were also split between the primary laboratory used to date for Lehigh's TRE (results from the primary lab are shown in Table 2) and a secondary laboratory to help confirm observed toxicity. Results from the secondary laboratory are provided in Attachment 1. Overall, the secondary laboratory showed toxicity in the range of that observed by the primary laboratory, although the dose-response relationship was non-ideal and there was

greater variability between treatments, limiting the utility of results from the secondary laboratory.

Table 3. Original and re-test results for *Ceriodaphnia dubia* chronic toxicity tests of Pilot Treatment System samples collected September 6, 2016.

Filtration	Treatment[a]	Original Test (9/7/16)		Retest (9/27/16)	
		Survival (%)	Reproduction (neonates / female & % Inhibition[b])	Survival (%)	Reproduction (neonates / female & % Inhibition[b])
Not Filtered	Lab Water Control	100	24.3	100	33.8
	25% BE / 75% P	90	3.1* / 87%	90	11.0* / 67%
Filtered	Lab Water Control	100	23.3	100	28.7
	25% BE / 75% P	90	10.3* / 56%	100	16.2* / 43%

Notes:
*Sample toxic relative to control (i.e., >25% effect relative to control).
[a] BE = Biological Effluent; P = Permeate
[b] % Inhibition = difference in reproduction of treatment relative to control.

Biological effluent and permeate were collected from the PTS on September 26, 2016 for another round of chronic toxicity testing with *C. dubia*. The September 26, 2016 samples were used to make filtered and unfiltered 25% biological effluent/75% permeate mixtures. The unfiltered 25% biological effluent/75% permeate sample was *not toxic* relative to the control (i.e., TUc < 1; **Table 4**). In contrast, the filtered 25% biological effluent/75% permeate treatment was toxic relative to the control for the reproduction end-point (i.e., TUc > 1), although the level of inhibition relative to the control was low (28%).

Table 4. *Ceriodaphnia dubia* chronic toxicity test results for Pilot System samples collected September 26, 2016.

Filtered	Treatment[a]	Survival (%)	Reproduction (neonates/ female)	Hardness (mg/L)	Ni[b] (µg/L)
Not Filtered	Lab Water Control	100	34.4	--	--
	25% BE/75% P	100	30.2	623	2.6
Filtered	Lab Water Control	100	33.3	--	--
	25% BE/75% P	100	24.0*	623	2.6

Notes:
*Sample toxic relative to control (i.e., >25% effect relative to control).
[a] BE = Biological Effluent; P = Permeate
[b] Calculated using simple mixing calculations and the concentration of nickel in unfiltered 100% biological effluent and 100% permeate.

The filtered 25% biological effluent/75% permeate mixture using PTS samples from September 26, 2016 was also tested in a dilution series in which this treatment was further diluted using a high hardness water that was made using a synthetic water recipe that corresponds to the mineral content of water from Pond 4A (adjusted to the hardness of the 25% biological effluent/75% permeate mixture). Diluting the filtered 25% biological effluent/75% permeate mixture with the high hardness water allowed for the hardness of each treatment to remain constant over the

dilution series, thereby controlling for the contribution of hardness and mineral balance to observed toxicity. Reproduction results for the filtered 25% biological effluent/75% permeate dilution series show that reproduction was relatively constant across all treatments (**Table 5**), providing evidence that the cause of reproductive impairment in the filtered 25% biological effluent/75% permeate treatment (i.e., the 100% treatment) was caused by high hardness and/or mineral balance.

Table 5. Results for *Ceriodaphnia dubia* chronic toxicity dilution series test of a mixture of 25% Biological Effluent/75% Permeate using high hardness water as the diluent (samples collected from the Pilot System on September 26, 2016).

Treatment	Fraction of 25% BE/75% P Mixture in Treatment[a]	Fraction of High Hardness Water in Treatment[b]	Survival (%)	Reproduction (neonates/female)[c]
Lab Water Control[d]	--	--	100	34.4
High Hardness Water Control[b]	--	--	90	24.1*
6.25% Dilution	6.25%	93.75%	90	25.2
12.5% Dilution	12.5%	87.5%	80	26.7
25% Dilution	25%	75%	80	24.4*
50% Dilution	50%	50%	100	28.1
100% Dilution	100%	0%	100	24.0*

*Sample toxic relative to **lab water control** (i.e., >25% effect relative to control).
[a] BE = Biological Effluent; P = Permeate
[b] High hardness water = synthetic Pond 4A water recipe adjusted to the hardness of the 25% biological effluent+75% permeate mixture.
[c] None of the 6.25–100% dilutions were toxic relative to the high hardness water control.
[d] Bioassay lab's standard lab water control adjusted to moderate hardness (80–100 mg/L).

Conclusions from Pilot System Testing

Testing of the PTS showed that treatment scenarios utilizing a UF/RO/biological treatment system technology have the capability of removing nickel from raw quarry water to levels that are not expected to contribute to chronic toxicity and that such a system is capable of producing non-toxic effluent. However, PTS toxicity testing also showed that there is a potential for toxicants besides nickel to be present in effluent from a UF/RO/biological treatment system, and that a characteristic of these toxicants is that they are at least partially unstable over time. High mineral content could also contribute, in part, to toxicity observed in biological effluent/permeate mixtures, but its effect is not expected to diminish over time, as was observed for the September 6, 2016 samples. However, the slightly diminished toxicity observed in the September 6, 2016 sample that was held and re-tested a week later may simply reflect variability in results among bioassays, and not truly be reflective of diminished toxicity due to a change in the factor causing the toxicity. Due to the difference in test results between the September 6 and September 26, 2016 tests, it is unknown whether toxicants will be present in a FTS utilizing the UF/RO/biological treatment technology.

If such toxicants are present in the FTS, it would be possible to reduce their effect in a final combined effluent of biological effluent/permeate by diverting a fraction of UFRO concentrate from the treatment system. Lehigh intends to design the FTS so that it is capable of diverting

UFRO concentrate from the FTS, as needed, for use in Lehigh's manufacturing process or for being disposed of in a different manner. Overall, the UFRO/biological treatment toxicity control strategy has shown the potential to remove survival-related toxicity caused by nickel in raw quarry water, and has shown the potential to remove *C. dubia* reproductive toxicity as well.

Future TRE Actions

Additional toxicity investigations with PTS samples are not possible at this time because the PTS is not currently available to Lehigh (i.e., the vendor has leased the UF/RO unit for testing out of state). Until Q3 2016, Lehigh had been conducting toxicity control evaluations of the ITS, which is currently treating up to 400 gpm quarry water until the FTS is fully constructed and operational. The FTS is currently on schedule to be fully operational by October 1, 2017. Although ITS testing to date has shown that the ITS removes survival-related toxicity from raw quarry water, in Q1–Q2 2016, the ITS was also shown to contribute reproductive toxicity to the effluent. Continuing toxicological evaluations of the ITS at this time would provide little value in further developing a toxicity control strategy that is centered on the FTS because the testing of treatment scenarios using the PTS shows the potential for the FTS to be an effective toxicity control strategy for Lehigh's discharges. Also, the treatment technology and system engineering of the FTS differs considerably from the ITS, meaning conclusions drawn from further ITS investigations may not provide any utility in understanding sources and characteristics of toxicity that may or may not arise from effluent discharged from the FTS. Thus, toxicity control evaluation testing as part of Lehigh's TRE for potential sources of *C. dubia* toxicity to Pond 4A will continue once the FTS is fully operational.

Near term TRE actions that are planned to continue include quarterly *C. dubia* chronic toxicity testing of Ponds 4A, 13, and 14, in accordance with the quarterly monitoring provisions specified in Lehigh's 2013 TRE update memorandum (*TRE Progress Update and Future TRE Activities*, dated September 30, 2013). Planned quarterly monitoring does not mark a conclusion of efforts to confirm toxicity control. Rather, Lehigh will resume toxicity control evaluations at a time when the FTS is fully operational, which is anticipated to occur by October 1, 2017.

Lehigh seeks Regional Water Board concurrence on the request that was provided in the Q2 2016 Chronic Toxicity Monitoring Results memorandum (Submitted to the Regional Water Board on July 29, 2016) to completely discontinue all monitoring of Pond 9 for *C. dubia* chronic toxicity.

ATTACHMENT 1
Laboratory Reports

Paul Bedore
Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

October 24, 2016

Paul:

I have enclosed our *Supplemental* report "Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Site Water Samples" for the samples collected September 26, 28, and 30, 2016. The 11 test summary for each site in the compliance summary section of the report has been updated to include test data from the March 2016 compliance testing; the revision does not change the conclusions of the testing. A summary of the results of this testing follows (note: TUc = 100/EC_{25} or 100/IC_{25}):

Chronic Effects of Lehigh Pond 4A Site Water on *Ceriodaphnia dubia*

As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 50% site water, resulting in 2.0 TUc. The reproduction IC_{25} was 51.8% site water, resulting in 1.9 TUc (where TUc=100/IC_{25}).

Ceriodaphnia dubia Test Endpoint =	Survival	Reproduction
Survival NOEC or Reproduction IC_{25} =	50% site water	51.8% site water
TUc =	2.0	1.9

Chronic Effects of Lehigh Pond 13 Site Water on *Ceriodaphnia dubia*

As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 100% site water, resulting in <1.0 TUc (where TUc=100/NOEC). The reproduction IC_{25} was 76% site water, resulting in 1.3 TUc (where TUc=100/IC25).

Ceriodaphnia dubia Test Endpoint =	Survival	Reproduction
Survival NOEC or Reproduction IC_{25} =	>100% site water	76% site water
TUc =	<1.0	1.3

Chronic Effects of Lehigh Pond 14 Site Water on *Ceriodaphnia dubia*

As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 100% site water, resulting in <1.0 TUc (where TUc=100/EC_{25}). The reproduction IC_{25} was >100% site water, resulting in <1 TUc (where TUc=100/IC_{25}).

Ceriodaphnia dubia Test Endpoint =	Survival	Reproduction
Survival NOEC or Reproduction IC_{25} =	>100% site water	>100% site water
TUc =	<1.0	<1

If you have any questions regarding the performance and interpretation of these tests, feel free to contact my colleague Chris Dudenhoeffer or myself at (707) 207-7760.

Regards,

Stephen L. Clark
Vice President & Special Projects Director

Pacific EcoRisk is accredited in accordance with NELAP (ORELAP ID 4043). Pacific EcoRisk certifies that the test results reported herein conform to the most current NELAP requirements for parameters for which accreditation is required and available. Any exceptions to NELAP requirements are noted, where applicable, in the body of the report. This report shall not be reproduced, except in full, without the written consent of Pacific EcoRisk. This testing was performed under Lab Order 26327.

NPDES Compliance Summary

Lehigh Southwest Cement Company
Permanente Facility
Chronic Toxicity for SFBRWQCB Reporting

Testing Facility: Pacific EcoRisk
2250 Cordelia Rd.
Fairfield, CA 94534

Lehigh Pond 4A	Chronic Toxicity Test Species:	*Ceriodaphnia dubia*
	Test Protocol:	EPA-821-R-02-013
Sampling Dates: September 26, 28 and 30, 2016	Dilution Series:	6.25, 12.5, 25, 50, 100%
Test Dates: September 27-October 3, 2016	Test Endpoint:	Survival, Reproduction

Current Pond 4A Site Water Test Data.

Site Water Concentration	% Survival	Mean Reproduction (# neonates /female)
Hardness Blank	90	**24.1***
Lab Control	100	32.0
6.25%	100	31.8
12.5%	90	33.3
25%	100	29.6
50%	100	**25.1***
100%	**20***	1.6

Current Pond 4A Site Water Test Endpoints.

Endpoint	NOEC	EC_{15}-IC_{15}	EC_{25}-IC_{25}	EC_{40}-IC_{40}	EC_{50}-IC_{50}	TUc	TUc Method
Survival	50%	N/A**	N/A**	N/A**	76.2%	2.0	NOEC
Reproduction	25%	36.6%	51.8%	62.1%	69.0%	1.9	100/IC_{25}

Lab Control Survival (after ~96 hrs)	100%
100% Site Water Survival (after ~96 hrs)	20%

* The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).
** Due to the absence of significant mortalities at multiple concentrations, the EC_{25} point estimates could not be calculated.

Summary of 11 Test Window for *Ceriodaphnia dubia*: Pond 4A

Test #	Sample Dates	NOEC (%)	EC_{25} or IC_{25}	TUc	96-hr Survival	Comments
1	Dec 9, 11, & 13, 2013	100% (repro)	>100% (repro)	<1	100%	
2	Mar 10, 12, & 14, 2014	25% (repro)	4.81% (repro)	20.8	0%	
3	Apr 7, 9, & 11, 2014	6.25% (repro)	8.4% (repro)	11.9	0%	
4	Sept 22, 24, & 26, 2014	50% (repro)	>100% (repro)	<1	100%	
5	Nov 10, 12, & 14, 2014	100% (repro)	>100% (repro)	<1	100%	
6	Jan 19, 21, & 23, 2015	25% (repro)	40.1% (repro)	2.5	100%	
7	Apr 13, 15, & 17, 2015	50% (repro)	64.2% (repro)	1.6	100%	
8	Sept 14, 16, & 18, 2015	25% (repro)	28.5% (repro)	3.5	80%	
9	Nov 30, Dec 2, & 4, 2015	12.5% (repro)	21.8% (repro)	4.6	30%	
10	Mar 21, 23, & 25, 2016	25% (repro)	36.2% (repro)	2.8	100%	
11	Sept 26, 28, & 30, 2016	25% (repro)	51.8% (repro)	1.9	10%	

NPDES Compliance Summary

Lehigh Southwest Cement Company
Permanente Facility
Chronic Toxicity for SFBRWQCB Reporting

Testing Facility: Pacific EcoRisk
2250 Cordelia Rd.
Fairfield, CA 94534

Lehigh Pond 13	Chronic Toxicity Test Species:	*Ceriodaphnia dubia*
	Test Protocol:	EPA-821-R-02-013
Sampling Dates: September 26, 28, and 30, 2016	Dilution Series:	6.25, 12.5, 25, 50, 100%
Test Dates: September 27- October 3, 2016	Test Endpoint:	Survival, Reproduction

Current Pond 13 Site Water Test Data.

Site Water Concentration	% Survival	Mean Reproduction (# neonates /female)
Hardness Blank	90	**24.1***
Lab Control	90	31.3
6.25%	100	33.6
12.5%	90	32.2
25%	100	29.7
50%	100	27.1
100%	80	22.1

Current Pond 13 Site Water Test Endpoints.

Endpoint	NOEC	EC_{15}-IC_{15}	EC_{25}-IC_{25}	EC_{40}-IC_{40}	EC_{50}-IC_{50}	TUc	TUc Method
Survival	100%	>100%	>100%	>100%	>100%	<1	100/EC_{25}
Reproduction	100%	45.2%	77.5%	>100%	>100%	1.3	100/IC_{25}

Lab Control Survival (after ~96 hrs)	90%
100% Site Water Survival (after ~96 hrs)	90%

* The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).

Summary of 11 Test Window for *Ceriodaphnia dubia*: Pond 13

Test #	Sample Dates	NOEC (%)	EC_{25} or IC_{25}	TUc	96-hr Survival	Comments
1	Mar 25, 27, & 29, 2013	<6.25% (repro)	3.7% (repro)	27.3	30%	
2	May 6, 8, & 10, 2013	50% (repro)	6.1% (repro)	16.4	100%	
3	Dec 9, 11, & 13, 2013	100% (repro)	>100% (repro)	<1	100%	
4	Mar 14 & 18, 2014	50% (repro)	48% (repro)	2.1	100%	
5	Dec 8, 10, & 12, 2014	100% (repro)	43.9% (repro)	2.3	100%	
6	Jan 19, 21, & 23, 2015	100% (repro)	>100% (repro)	<1	100%	
7	Apr 13, 15, & 17, 2015	25% (repro)	29.5% (repro)	3.4	100%	
8	Nov 30, Dec 1, & 2, 2015	50 (repro)	76% (repro)	1.3	100%	
9	Mar 21, 23, & 25, 2016	100% (repro)	>100% (repro)	<1	100%	
10	Sept 26, 28, & 30 2016	100% (repro)	77.5% (repro)	1.3	90%	
11						

NPDES Compliance Summary

Lehigh Southwest Cement Company
Permanente Facility
Chronic Toxicity for SFBRWQCB Reporting

Testing Facility: Pacific EcoRisk
2250 Cordelia Rd.
Fairfield, CA 94534

Lehigh Pond 14	Chronic Toxicity Test Species:	*Ceriodaphnia dubia*
	Test Protocol:	EPA-821-R-02-013
Sampling Dates: September 26, 28, and 30, 2016	Dilution Series:	6.25, 12.5, 25, 50, 100%
Test Dates: September 27- October 3, 2016	Test Endpoint:	Survival, Reproduction

Current Pond 14 Site Water Test Data.

Site Water Concentration	% Survival	Mean Reproduction (# neonates /female)
Hardness Blank	90	**24.1***
Lab Control	100	30.3
6.25%	80	20.9
12.5%	100	31.2
25%	90	30.3
50%	100	29.3
100%	100	25.8

Current Pond 14 Site Water Test Endpoints.

Endpoint	NOEC	EC_{15}-IC_{15}	EC_{25}-IC_{25}	EC_{40}-IC_{40}	EC_{50}-IC_{50}	TUc	TUc Method
Survival	100%	>100%	>100%	>100%	>100%	<1	100/EC_{25}
Reproduction	100%	>100%	>100%	>100%	>100%	<1	100/IC_{25}

Lab Control Survival (after ~96 hrs)	100%
100% Site Water Survival (after ~96 hrs)	100%

* The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).

Summary of 11 Test Window for *Ceriodaphnia dubia*: Pond 14

Test #	Sample Dates	NOEC (%)	EC_{25} or IC_{25}	TUc	96-hr Survival	Comments
1	May 6, 8, & 10, 2013	100%	87.1% (repro)	1.1	100%	
2	Dec 9, 11, & 13, 2013	100% (repro)	>100% (repro)	<1	100%	
3	Mar 14 & 18, 2014	100% (repro)	>100% (repro)	<1	100%	
4	Apr 7, 9, & 11, 2014	100% (repro)	>100% (repro)	<1	100%	
5	Sept 22, 24, & 26, 2014	100% (repro)	>100% (repro)	<1	100%	
6	Nov 10, 12, & 14, 2014	100% (repro)	>100% (repro)	<1	100%	
7	Jan 19, 21, & 23, 2015	100% (repro)	>100% (repro)	<1	100%	
8	Apr 13, 15, & 17, 2015	50% (repro)	66.7% (repro)	1.5	100%	
9	Nov 30, Dec 1, & 2, 2015	50% (repro)	>100% (repro)	<1	100%	
10	Mar 21, 23, & 25, 2016	100% (repro)	>100% (repro)	<1	100%	
11	Sept 26, 28, and 30, 2016	100% (repro)	>100% (repro)	<1	100%	

Supplemental Report

Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Site Water Samples

Samples collected September 26, 28, and 30, 2016

Prepared For

Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

Prepared By

Pacific EcoRisk, Inc.
2250 Cordelia Rd.
Fairfield, CA 94534

Original Report Submitted October 24, 2016
Revised Report Submitted October 24, 2016

PACIFIC ECORISK
ENVIRONMENTAL CONSULTING & TESTING

Supplemental Report

Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Site Water Samples

Samples collected September 26, 28, and 30, 2016

Table of Contents

Appendices

1. INTRODUCTION

Under contract to the Robertson-Bryan, Pacific EcoRisk (PER) conducted an evaluation of the chronic toxicity of Lehigh Southwest Cement Company Permanente Facility (Lehigh) water samples from three sites, designated Pond 4A, Pond 13, and Pond 14. This evaluation consisted of performing the US EPA short-term chronic 3-brood (6-8 day) survival and reproduction test with the crustacean *Ceriodaphnia dubia*. These toxicity tests were conducted on samples collected on September 26, 28, and 30, 2016. In order to assess the sensitivity of the organisms to chemical stress, a reference toxicant test was performed. This report describes the performance and results of these tests.

2. CHRONIC TOXICITY TEST PROCEDURES

The method used in conducting the chronic toxicity tests followed the guidance established by the EPA manual "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition" (EPA-821-R-02-013).

2.1 Sample Receipt and Handling

On September 26, 28, and 30, three Lehigh water samples (designated Pond 4A, Pond 13, Pond 14), were collected into appropriately cleaned sample containers. These samples were transported on the day of collection, on ice and under chain-of-custody, to the PER testing laboratory in Fairfield, CA. Upon receipt at the testing laboratory, aliquots of each water sample were collected for analysis of initial water quality characteristics (Table 1), with the remainder of each sample being stored at 0-6˚C except when being used to prepare test solutions. The chain-of-custody records for the collection and delivery of the samples are presented in Appendix A.

Table 1. Initial water quality characteristics of the Lehigh site water samples.

Sample ID	Sample Receipt Date	Temp. (˚C)	pH	D.O. (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)	Conductivity (μS/cm)	Total Ammonia (mg/L N)	Sulfide (mg/L)
Pond 4A	9/26/16	7.2*	7.75	7.2	180	672	1359	<1.0	0.022
	9/28/16	4.4	7.69	7.4	176	705	1342	<1.0	0.004
	9/30/16	1.2	7.47	7.9	187	690	1311	<1.0	0.000
Pond 13	9/26/16	2.1	7.71	9.9	184	722	1432	<1.0	0.004
	9/28/16	2.5	7.62	10.2	178	725	1424	<1.0	0.004
	9/30/16	2.5	7.30	8.6	368	725	1403	<1.0	0.000
Pond 14	9/26/16	2.1	7.70	7.3	234	695	1554	<1.0	0.008
	9/28/16	3.1	7.60	7.0	242	765	1594	<1.0	0.001
	9/30/16	6.5*	7.37	6.7	241	770	1568	<1.0	0.000

* Sample was received on ice the day of sample collection; the temperature of the temperature blank was <6ºC.

2.2 Survival and Reproduction Toxicity Testing with *Ceriodaphnia dubia*

The short-term chronic *C. dubia* test consists of exposing individual females to a series of sample dilutions for the length of time it takes for the Control treatment females to produce 3 broods (typically 6-8 days), after which effects on survival and reproduction are evaluated. The specific procedures used in this testing are described below.

The Lab Water Control medium for this testing consisted of a synthetic reconstituted freshwater (SRW adjusted to EPA "moderately-hard" hardness), prepared by addition of reagent grade chemicals to Type 1 lab water. The Lab Water Control medium and the samples were used to prepare test solutions at test treatment concentrations of 6.25%, 12.5%, 25%, 50%, and 100% sample for each sample. At the request of the client, an additional Hardness Blank (consisting Type 1 water [reverse-osmosis, de-ionized water] amended with reagent-grade chemicals to a match the hardness of Pond 4A) was prepared and tested; prior to use, the Hardness Blank was filtered to remove any insoluble particulate material. For each test treatment, the test solution was amended with the alga *Selenastrum capricornutum* and Yeast-Cerophyll®-Trout (YCT) food to provide food for the test organisms. "New" water quality characteristics (pH, dissolved oxygen [D.O.], and conductivity) were measured on these food-amended test solutions prior to use in these tests.

There were 10 replicates for each test treatment, each replicate consisting of 15 mL of test solution in a 30-mL plastic cup. These "3-brood" tests were initiated by allocating one neonate (<24 hrs old, and within 8 hrs of age) *C. dubia*, obtained from in-house laboratory cultures, into each replicate cup. The test replicate cups were placed into a temperature-controlled room at 25˚C, under cool white fluorescent lighting on a 16L:8D photoperiod.

Each day of the tests, fresh test solutions were prepared and characterized as before, and a "new" set of replicate cups was prepared. The original test replicate cups were examined, with surviving "original" individual organisms being transferred to the corresponding new cup. The contents of each of the remaining "old" replicate cups was carefully examined and the number of neonate offspring produced by each original organism was determined, after which the "old" water quality characteristics (pH, D.O., and conductivity) were measured for the old media from one randomly-selected replicate at each treatment.

After it was determined that ≥60% of the *C. dubia* in a Lab Water Control treatment had produced their third brood of offspring, the corresponding site water test was terminated. The resulting survival and reproduction (number of offspring) data were analyzed to evaluate any impairment caused by the samples; all statistical analyses were performed using the CETIS® statistical software (TidePool Scientific, McKinleyville, CA).

2.2.1 Reference Toxicant Testing of the *Ceriodaphnia dubia*

In order to assess the sensitivity of the test organisms to toxic stress, a monthly reference toxicant test was performed concurrently with the site water tests. The reference toxicant test was performed similarly to the site water tests except that test solutions consisted of Lab Water Control medium spiked with NaCl at test concentrations of 500, 1000, 1500, 2000, and 2500 mg/L. The resulting test response data were statistically analyzed to determine key dose-response point estimates (e.g., EC_{50}); all statistical analyses were made using the CETIS® software. These response endpoints were then compared to the 'typical response' ranges established by the mean ± 2 SD of the point estimates generated by the most recent previous reference toxicant tests performed by this lab.

3. RESULTS

3.1 Effects of Lehigh Pond 4A Site Water on *Ceriodaphnia dubia*

The results of this test are summarized below in Table 2. As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 50% site water, resulting in 2.0 TUc. The reproduction IC_{25} was 51.8% site water, resulting in 1.9 TUc (where TUc= IC25).

The test data and summary of statistical analyses for this test excluding the outliers are presented in Appendix B; the statistical analyses for this test including the outlier are presented in Appendix C.

Table 2. Effects of Lehigh Pond 4A site water on *Ceriodaphnia dubia* survival and reproduction.

Site Water Treatment	Mean % Survival	Mean Reproduction (# neonates /female)
Hardness Blank	90	**24.1*[b]**
Lab Water Control	100	32.0
6.25%	100	31.8
12.5%	90	33.3[b]
25%	100	29.6
50%	100	**25.1*[b]**
100%	**20***	1.6
Summary of Key Statistics		
NOEC =	50% site water	25% site water
TUc (TUc = 100/NOEC) =	2.0	4.0
Survival EC_{25} or Reproduction IC_{25} =	>100% site water[a]	51.8% site water
TUc (TUc = 100/EC_{25} or 100/IC_{25}) =	N/A	1.9
Survival EC_{50} or Reproduction IC_{50} =	76.2 % site water	69.0% site water
TUc (TUc = 100/EC_{50} or 100/IC_{50}) =	1.3	1.5

* - The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).

a - Due to the absence of significant mortalities at multiple concentrations, the EC25 point estimates could not be calculated.

b - There was an outlier replicate in the 12.5%, 50%, and Hardness Blank treatments. The results presented here are those with the outlier excluded. Per EPA guidance, the data are presented both excluding and including the outlier are presented in Appendix B and C, respectively.

3.2 Effects of Lehigh Pond 13 Site Water on *Ceriodaphnia dubia*

The results of this test are summarized below in Table 3. As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 100% site water, resulting in <1.0 TUc (where TUc=100/NOEC). The reproduction IC_{25} was 77.5% site water, resulting in 1.3 TUc (where TUc=100/IC_{25}).

The test data and summary of statistical analyses for this test excluding the outlier are presented in Appendix D; the statistical analyses for this test including the outlier are presented in Appendix E.

Table 3. Effects of Lehigh Pond 13 site water on *Ceriodaphnia dubia* survival and reproduction.

Site Water Treatment	Mean % Survival	Mean Reproduction (# neonates /female)
Hardness Blank	90	**24.1*[b]**
Lab Control	90	31.3[b]
6.25%	100	33.6
12.5%	90	32.2[b]
25%	100	29.7
50%	100	27.1
100%	80	22.1
Summary of Key Statistics		
NOEC =	100% site water	100% site water
TUc (TUc = 100/NOEC) =	1.0	1.0
Survival EC_{25} or Reproduction IC_{25} =	>100% site water[a]	77.5% site water
TUc (TUc = 100/EC_{25} or 100/IC_{25}) =	<1.0	1.3
Survival EC_{50} or Reproduction IC_{50} =	>100% site water[a]	>100% site water[a]
TUc (TUc = 100/EC_{50} or 100/IC_{50}) =	<1.0	<1.0

* - The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).

a - Due to the absence of significant mortalities, the EC point estimates could not be calculated, but can be determined by inspection to be >100% site water.

b - There was an outlier replicate in the Ctrl-C, 12.5-A%, and Hardness Blank-G treatments. The results presented here are those with the outlier excluded. Per EPA guidance, the data are presented both excluding and including the outlier in Appendix D and E, respectively.

3.3 Effects of Lehigh Pond 14 Site Water on *Ceriodaphnia dubia*

The results of this test are summarized below in Table 4. As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 100% site water, resulting in <1.0 TUc (where TUc=100/EC25). The reproduction IC_{25} was >100% site water, resulting in <1 TUc (where TUc=100/IC25).

The test data and summary of statistical analyses for this test excluding the outlier are presented in Appendix F; the statistical analyses for this test including the outlier are presented in Appendix G.

Table 4. Effects of Lehigh Pond 14 site water on *Ceriodaphnia dubia* survival and reproduction.

Site Water Treatment	Mean % Survival	Mean Reproduction (# neonates /female)
Hardness Blank	90	**24.1*[b]**
Lab Control	100	30.3
6.25%	80	20.9
12.5%	100	31.2
25%	90	30.3[b]
50%	100	29.3
100%	100	25.8
Summary of Key Statistics		
NOEC =	100% site water	100% site water
TUc (TUc = 100/NOEC) =	1.0	1.0
Survival EC_{25} or Reproduction IC_{25} =	>100% site water[a]	>100% site water
TUc (TUc = 100/EC_{25} or 100/IC_{25}) =	<1.0	<1
Survival EC_{50} or Reproduction IC_{50} =	>100% site water[a]	>100% site water
TUc (TUc = 100/EC_{50} or 100/IC_{50}) =	<1.0	<1

* - The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).

a - Due to the absence of significant mortalities, the EC point estimates could not be calculated, but can be determined by inspection to be >100% site water.

b - There was an outlier replicate in the 25-D% and Hardness Blank-G treatments. The results presented here are those with the outlier excluded. Per EPA guidance, the data are presented both excluding and including the outlier in Appendix F and G, respectively.

4. AQUATIC TOXICITY DATA QUALITY CONTROL

Four QC measures were assessed during the toxicity testing:

- Maintenance of acceptable test conditions;
- Negative Control testing;
- Assessment of concentration response relationship; and
- Positive Control (reference toxicant) testing.

Maintenance of Acceptable Test Conditions
All test conditions (pH, D.O., temperature, etc.) were within acceptable limits for these tests. All analyses were performed according to laboratory Standard Operating Procedures.

Negative Control Testing
The responses at the Lab Control treatments were acceptable.

Concentration Response Relationships
There were valid concentration-response relationships for the site water and reference toxicant tests (EPA-821-B-00-004).

Positive Control Testing - Reference Toxicant Toxicity
The results of this test are summarized below in Table 6. The survival EC_{50} and reproduction IC_{50} for these tests were consistent with the "typical response" ranges established by the reference toxicant test database for this species, indicating that these test organisms were responding to toxicant stress in a typical and consistent fashion.

The test data and summary of statistical analyses for this test are presented in Appendix H.

Table 6. Reference toxicant testing: effects of NaCl on *Ceriodaphnia dubia*.

NaCl Treatment (mg/L)	Mean % Survival	Mean Reproduction (# neonates/female)
Lab Control	100	33.5
500	100	31.0
1000	66.7	**20.3***
1500	100	**20.7***
2000	60	**5.3***
2500	**0***	-
Summary of Statistics		
Survival EC_{50} or Reproduction IC_{50} =	1740 mg/L NaCl	1620 mg/L NaCl
"Typical Response" =	728 - 2715 mg/L NaCl	598 - 2054 mg/L NaCl

* The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).

5. SUMMARY AND CONCLUSIONS

Chronic Effects of Lehigh Pond 4A Site Water on *Ceriodaphnia dubia*

As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 50% site water, resulting in 2.0 TUc. The reproduction IC_{25} was 51.8% site water, resulting in 1.9 TUc (where TUc=100/IC_{25}).

Ceriodaphnia dubia Test Endpoint =	Survival	Reproduction
Survival NOEC or Reproduction IC_{25} =	50% site water	51.8% site water
TUc =	2.0	1.9

Chronic Effects of Lehigh Pond 13 Site Water on *Ceriodaphnia dubia*

As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 100% site water, resulting in <1.0 TUc (where TUc=100/NOEC). The reproduction IC_{25} was 76% site water, resulting in 1.3 TUc (where TUc=100/IC_{25}).

Ceriodaphnia dubia Test Endpoint =	Survival	Reproduction
Survival NOEC or Reproduction IC_{25} =	>100% site water	76% site water
TUc =	<1.0	1.3

Chronic Effects of Lehigh Pond 14 Site Water on *Ceriodaphnia dubia*

As the survival EC_{25} could not be calculated, the survival toxic units were calculated using the NOEC. The survival NOEC was 100% site water, resulting in <1.0 TUc (where TUc=100/NOEC). The reproduction IC_{25} was >100% site water, resulting in <1 TUc (where TUc=100/IC_{25}).

Ceriodaphnia dubia Test Endpoint =	Survival	Reproduction
Survival NOEC or Reproduction IC_{25} =	>100% site water	>100% site water
TUc =	<1.0	<1

Appendix A

Chain-of-Custody Records for the Collection and Delivery of the Lehigh Samples

Pacific EcoRisk
2250 Cordelia Rd., Fairfield, CA 94534
(707) 207-7760 FAX (707) 207-7916

CHAIN-OF-CUSTODY RECORD

Results To:	Robertson-Bryan, Inc	**Invoice To:**	Same
Address:	9888 Kent Street	**Address:**	
	Elk Grove, CA 95624		
Phone:	(916) 405-8918	**Phone:**	
Attn:	Paul Bedore	**Attn:**	
E-mail:	paul@robertson-bryan.com	**E-mail:**	
Project Name:	Lehigh Toxicity and TRE Testing		
P.O.#/Ref:			

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Grab/ Comp	Container Number	Container Type	*Ceriodaphnia dubia* Surival and Reproduction, EPA 1002.0
1	Pond 4A	9/26/16	10:00am	FW	Comp	1	2.5-gal LDPE Cube	x
2	~~Pond 9~~			~~FW~~	~~Comp~~	~~1~~	~~2.5-gal LDPE Cube~~	~~x~~
3	Pond 13		10:00am	FW	Comp	1	2.5-gal LDPE Cube	x
4	Pond 14		10:33am	FW	Comp	1	2.5-gal LDPE Cube	x
5								
6								
7								
8								
9								
10								

REQUESTED ANALYSIS

Samples collected by:

Comments/Special Instruction:

Statndard dilution series on all samples (6.25, 12.5, 25, 50, 100%)

Concurrent reference toxicant test

Concurrent hardness control from Pilot System test

RELIQUINSHED BY:		**RECEIVED BY:**	
Signature:		**Signature:**	
Print:	Cyle Moon	**Print:**	A. Khadizeva
Organization:	RBI	**Organization:**	PER
Date:	9/26/16 **Time:** 2:15pm	**Date:**	9-26-16 **Time:** 1415
RELIQUINSHED BY:		**RECEIVED BY:**	
Signature:		**Signature:**	
Print:		**Print:**	
Organization:		**Organization:**	
Date:	**Time:**	**Date:**	**Time:**

***Example Matrix Codes:** (**EFF** - Effluent) (**FW** = Freshwater); (**SW** = Saltwater); (**WW** = Wastewater); (**STRMW** = Stormwater); (**SED** = Sediment); or other

Pacific EcoRisk
2250 Cordelia Rd., Fairfield, CA 94534
(707) 207-7760 FAX (707) 207-7916

CHAIN-OF-CUSTODY RECORD

Results To:	Robertson-Bryan, Inc	**Invoice To:**	Same
Address:	9888 Kent Street	**Address:**	
	Elk Grove, CA 95624		
Phone:	(916) 405-8918	**Phone:**	
Attn:	Paul Bedore	**Attn:**	
E-mail:	paul@robertson-bryan.com	**E-mail:**	
Project Name:	Lehigh Toxicity and TRE Testing		
P.O.#/Ref:			

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Grab/ Comp	Container Number	Container Type	REQUESTED ANALYSIS: *Ceriodaphnia dubia* Surival and Reproduction, EPA 1002.0
1	Pond 4A	9/28/16	8:00	FW	Comp	1	2.5-gal LDPE Cube	x
2	Pond 9			FW	Comp	1	2.5-gal LDPE Cube	x
3	Pond 13	9/28/16	10:50	FW	Comp	1	2.5-gal LDPE Cube	x
4	Pond 14	9/28/16	11:15	FW	Comp	1	2.5-gal LDPE Cube	x
5								
6								
7								
8								
9								
10								

Samples collected by: P Bedore

Comments/Special Instruction:

Statndard dilution series on all samples (6.25, 12.5, 25, 50, 100%)

Concurrent reference toxicant test

Concurrent hardness control from Pilot System test

RELIQUINSHED BY:	RECEIVED BY:
Signature: Paul Bedore	Signature: Julia Stansberry
Print: Paul Bedore	Print: Julia Stansberry (PE)
Organization: RBI	Organization: Pacific EcoRisk
Date: 9/28/16 Time: 12:55	Date: 9/28/16 Time: 1255
RELIQUINSHED BY:	**RECEIVED BY:**
Signature:	Signature:
Print:	Print:
Organization:	Organization:
Date: Time:	Date: Time:

***Example Matrix Codes**: (**EFF** - Effluent) (**FW** = Freshwater); (**SW** = Saltwater); (**WW** = Wastewater); (**STRMW** = Stormwater); (**SED** = Sediment); or other

Pacific EcoRisk
2250 Cordelia Rd., Fairfield, CA 94534
(707) 207-7760 FAX (707) 207-7916

CHAIN-OF-CUSTODY RECORD

Results To:	Robertson-Bryan, Inc	**Invoice To:**	Same
Address:	9888 Kent Street Elk Grove, CA 95624	**Address:**	
Phone:	(916) 405-8918	**Phone:**	
Attn:	Paul Bedore	**Attn:**	
E-mail:	paul@robertson-bryan.com	**E-mail:**	
Project Name:	Lehigh Toxicity and TRE Testing		
P.O.#/Ref:			

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Grab/ Comp	Container Number	Container Type	REQUESTED ANALYSIS: *Ceriodaphnia dubia* Surival and Reproduction, EPA 1002.0
1	Pond 4A	9/30/16	800	FW	Comp	1	2.5-gal LDPE Cube	x
2	~~Pond 9~~ PDB			FW	~~Comp~~	1	2.5-gal LDPE Cube	x
3	Pond 13	9/30/16	850	FW	~~Comp~~ Grab	1	2.5-gal LDPE Cube	x
4	Pond 14	9/30/16	920	FW	~~Comp~~ Grab	1	2.5-gal LDPE Cube	x
5					PDB			
6								
7								
8								
9								
10								

Samples collected by: PBedore

Comments/Special Instruction:

Statndard dilution series on all samples (6.25, 12.5, 25, 50, 100%)

Concurrent reference toxicant test

Concurrent hardness control from Pilot System test

RELIQUINSHED BY:	RECEIVED BY:
Signature: Paul Bedore	Signature:
Print: Paul Bedore	Print: Y. Khadizeva
Organization: RBI	Organization: PER
Date: 9/30/16 Time: 11:25	Date: 9-30-16 Time: 1125
RELIQUINSHED BY:	**RECEIVED BY:**
Signature:	Signature:
Print:	Print:
Organization:	Organization:
Date: Time:	Date: Time:

***Example Matrix Codes:** (**EFF** - Effluent) (**FW** = Freshwater); (**SW** = Saltwater); (**WW** = Wastewater); (**STRMW** = Stormwater); (**SED** = Sediment); or other

Appendix B

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of Lehigh Pond 4A Site Water to *Ceriodaphnia dubia*: Analysis Excluding Outlier Data

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Batch ID:	09-8172-5943	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	27 Sep-16 12:15	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	03 Oct-16 15:00	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 3h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	00-2037-7482	**Code:**	Pond 4A	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 10:00	**Material:**	Influent	**Project:**	26327
Receive Date:	26 Sep-16 14:15	**Source:**	Lehigh Permanente		
Sample Age:	26h (7.2 °C)	**Station:**	Pond 4A		

Batch Note: Excludes Outliers 12.5 C, 50 D, Hardness Ctl G

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
19-9455-4016	Reproduction	<0	0		8.15%		Equal Variance t Two-Sample Test
08-8229-0606	Reproduction	25	50	35.36	12.6%	4	Bonferroni Adj t Test
05-6705-7130	Survival	0	>0		NA		Fisher Exact Test
01-4014-3952	Survival	50	100	70.71	NA	2	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
09-1564-2473	Reproduction	IC5	19.8	9.63	27.7	5.054	Linear Interpolation (ICPIN)
		IC10	27.6	19.4	35.3	3.628	
		IC15	36.6	24.7	45.9	2.734	
		IC20	45.6	35.7	52.3	2.193	
		IC25	51.8	42.8	55.4	1.932	
		IC40	62.1	57.7	65.4	1.611	
		IC50	69	65.5	72.3	1.45	
21-1721-2635	Survival	EC50	76.2	66	88.1	1.312	Trimmed Spearman-Kärber

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	32	29.5	34.5	27	39	1.12	3.53	11.0%	0.0%
0	Hardness Contr	9	24.1	21.9	26.4	20	29	0.978	2.93	12.2%	24.7%
6.25		10	31.8	28.3	35.3	23	40	1.54	4.87	15.3%	0.63%
12.5		9	33.3	30.4	36.3	25	38	1.28	3.84	11.5%	-4.17%
25		10	29.6	27.6	31.6	24	34	0.884	2.8	9.45%	7.5%
50		9	25.1	22.4	27.8	18	30	1.17	3.52	14.0%	21.5%
100		10	1.6	-1.02	4.22	0	11	1.16	3.66	229.0%	95.0%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Hardness Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
6.25		10	1	1	1	1	1	0	0	0.0%	0.0%
12.5		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
25		10	1	1	1	1	1	0	0	0.0%	0.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	0.2	0	0.502	0	1	0.133	0.422	211.0%	80.0%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	30	27	32	39	36	28	32	32	31	33
0	Hardness Contr	26	25	29	21	23	24		27	20	22
6.25		33	31	32	40	23	30	37	27	35	30
12.5		37	38		34	25	35	35	31	32	33
25		28	32	28	29	34	31	24	28	31	31
50		27	24	30		18	27	27	27	23	23
100		0	0	0	0	0	0	0	11	5	0

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Hardness Contr	1	1	1	1	1	1	0	1	1	1
6.25		1	1	1	1	1	1	1	1	1	1
12.5		1	1	0	1	1	1	1	1	1	1
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
100		0	0	1	0	0	0	0	1	0	0

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Hardness Contr	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		0/1	0/1	1/1	0/1	0/1	0/1	0/1	1/1	0/1	0/1

CETIS Analytical Report

Test Code: 69786 | 01-3299-7615

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	05-6705-7130	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Oct-16 14:16	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

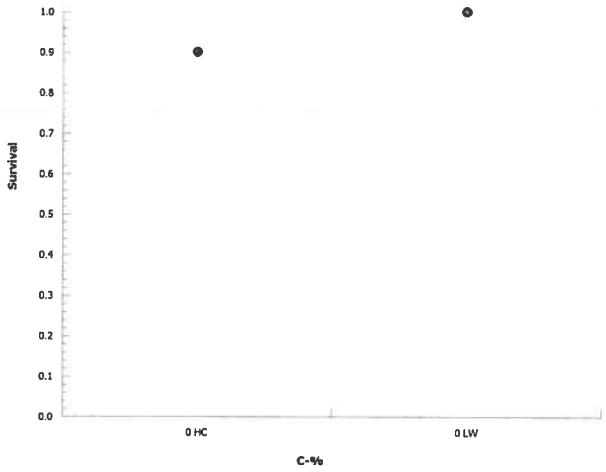
Fisher Exact Test

Control	vs	Control	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Hardness Control	0.5	0.5000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
0	Hardness Contr	9	1	10	0.9	0.1	10.0%

Graphics



CETIS Analytical Report

Report Date: 12 Oct-16 14:31 (p 1 of 1)
Test Code: 69786 | 01-3299-7615

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID: 19-9455-4016 Endpoint: Reproduction CETIS Version: CETISv1.8.7
Analyzed: 12 Oct-16 14:30 Analysis: Parametric-Two Sample Official Results: Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.15%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Hardness Control	5.26	1.74	2.61	17	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	294.7953	294.7953	1	27.7	<0.0001	Significant Effect
Error	180.8889	10.64052	17			
Total	475.6842		18			

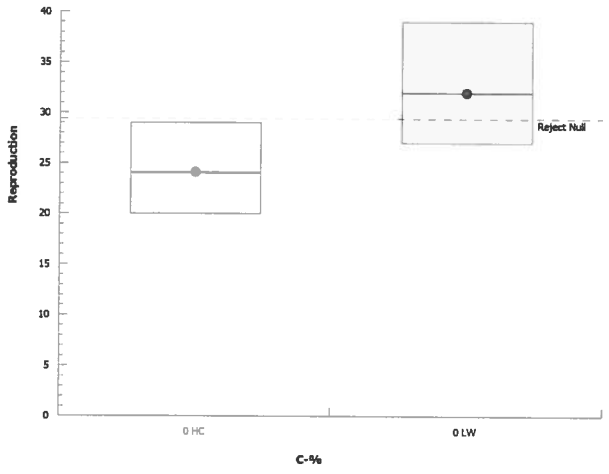
Distributional Tests

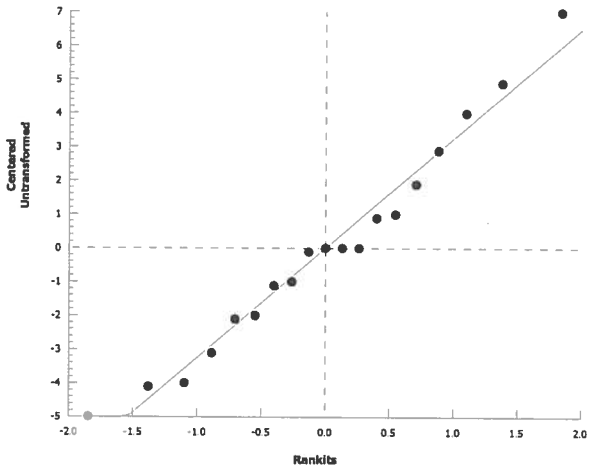
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.45	7.34	0.6147	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.97	0.861	0.7864	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	32	29.5	34.5	32	27	39	1.12	11.0%	0.0%
0	Hardness Contr	9	24.1	21.9	26.4	24	20	29	0.978	12.2%	24.7%

Graphics





Analyst: R6 QA: SD

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: ~~25%,75% 0.2 um Filt. Biological Effluent/ Permeate~~ Hardness Control CSD 10/24 Test Date: 9/27/16

Project #: CSD ~~26377~~ 26327 10/24 Test ID: CSD 10/24 ~~69875~~ 69786 Randomization: 10.7.3/10.2.5 Control Water: Hardness Control

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
Hardness Control	0	7.51		8.1		1712	25.1	0	0	0	0	0	0	0	0	0	0	Date: 9/27/16 New WQ: JV Test Init.: DM Sol'n Prep: DM Time: 1720
	1	7.39	7.76	8.3	7.0	1720	25.0	0	0	0	0	0	0	0	0	0	0	Date: 9/28/16 New WQ: JV Counts: DM Sol'n Prep: DM Old WQ: JV Time: 1235
	2	7.71	7.82	9.5	7.4	1729	25.3	0	0	0	0	0	0	0	0	0	0	Date: 9/29/16 New WQ: JV Counts: TK Sol'n Prep: TV Old WQ: SF Time: 1500
	3	7.50	7.68	8.9	7.1	1688	25.4	5	4	0	0	0	0	3	0	0	0	Date: 9/30/16 New WQ: RB Counts: DM Sol'n Prep: DM Old WQ: RB Time: 1215
	4	7.33	8.00	10.5	6.9	1732	25.2	0	0	5	2	4	3	6	5	4	3	Date: 10/1/16 New WQ: DM Counts: DH Sol'n Prep: DM Old WQ: DJ Time: 1215
	5	7.86	7.62	9.1	8.9	1720	25.4	9	8	8	5	7	7	X/0	8	7	8	Date: 10/2/16 New WQ: DJ Counts: TK Sol'n Prep: TK Old WQ: SH Time: 1415
	6	—	7.24	—	7.5	1786	25.4	12	17	16	14	12	14	—	14	9	11	Date: 10/3/16 New WQ: — Counts: ~~ALL~~ Sol'n Prep: — Old WQ: NC Time: 1515
	7													—				Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
	8													—				Date: New WQ: Counts: Sol'n Prep Old WQ Time:
							Total=	26	25	29	21	23	24	X/9	27	20	22	Mean Neonates/Female = 22.6

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	15-5954-6677	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 10:35	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	50	100	70.71	2

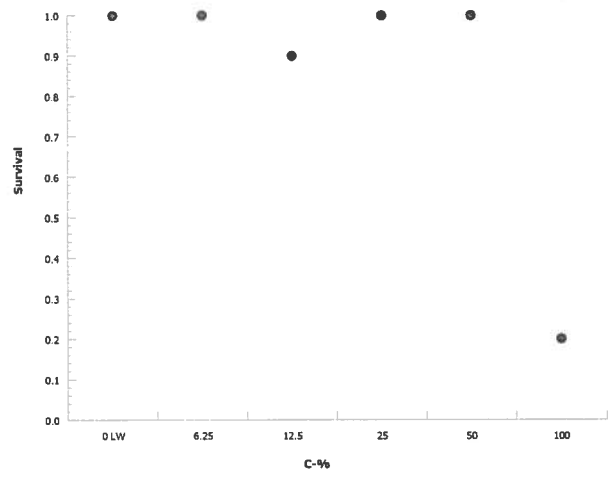
Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	1	1.0000	Exact	Non-Significant Effect
		12.5	0.5	1.0000	Exact	Non-Significant Effect
		25	1	1.0000	Exact	Non-Significant Effect
		50	1	1.0000	Exact	Non-Significant Effect
		100	0.000357	0.0018	Exact	Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
6.25		10	0	10	1	0	0.0%
12.5		9	1	10	0.9	0.1	10.0%
25		10	0	10	1	0	0.0%
50		10	0	10	1	0	0.0%
100		2	8	10	0.2	0.8	80.0%

Graphics



CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	07-4976-2263	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 10:35	**Analysis:**	Trimmed Spearman-Kärber	**Official Results:**	Yes

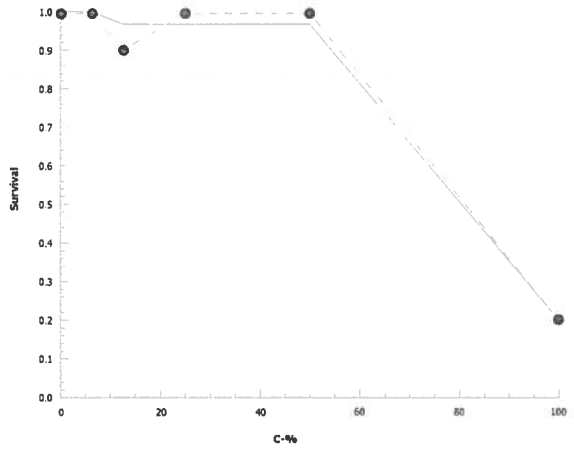
Trimmed Spearman-Kärber Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0	20.00%	1.88	0.0315	76.2	66	88.1

Survival Summary

			Calculated Variate(A/B)								
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Water Contr	10	1	1	1	0	0	0.0%	0.0%	10	10
6.25		10	1	1	1	0	0	0.0%	0.0%	10	10
12.5		10	0.9	0	1	0.1	0.316	35.1%	10.0%	9	10
25		10	1	1	1	0	0	0.0%	0.0%	10	10
50		10	1	1	1	0	0	0.0%	0.0%	10	10
100		10	0.2	0	1	0.133	0.422	211.0%	80.0%	2	10

Graphics



CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID: 08-8229-0606 **Endpoint:** Reproduction **CETIS Version:** CETISv1.8.7
Analyzed: 04 Oct-16 10:39 **Analysis:** Parametric-Multiple Comparison **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	12.6%	25	50	35.36	4

Bonferroni Adj t Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	0.118	2.32	3.92	18	1.0000	CDF	Non-Significant Effect
		12.5	-0.769	2.32	4.03	17	1.0000	CDF	Non-Significant Effect
		25	1.42	2.32	3.92	18	0.3248	CDF	Non-Significant Effect
		50*	3.97	2.32	4.03	17	0.0005	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	380.7778	95.19444	4	6.68	0.0003	Significant Effect
Error	612.8889	14.25323	43			
Total	993.6667		47			

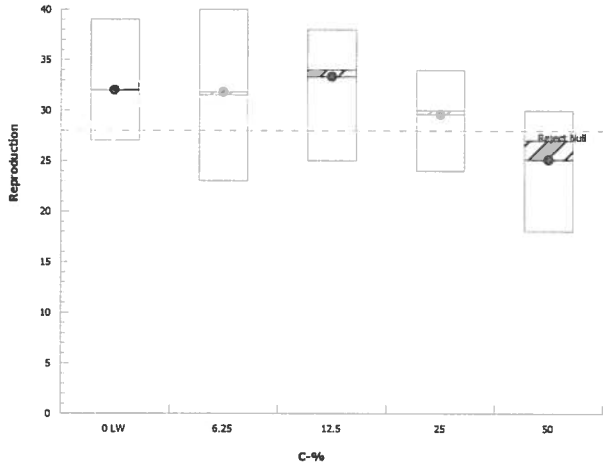
Distributional Tests

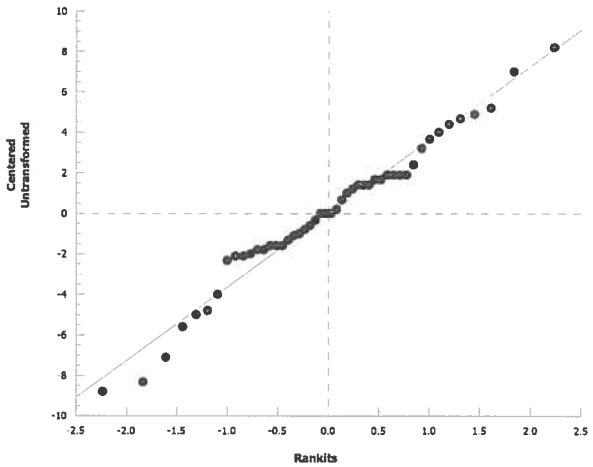
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.77	13.3	0.5973	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.977	0.934	0.4704	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	32	29.5	34.5	32	27	39	1.12	11.0%	0.0%
6.25		10	31.8	28.3	35.3	31.5	23	40	1.54	15.3%	0.63%
12.5		9	33.3	30.4	36.3	34	25	38	1.28	11.5%	-4.17%
25		10	29.6	27.6	31.6	30	24	34	0.884	9.45%	7.5%
50		9	25.1	22.4	27.8	27	18	30	1.17	14.0%	21.5%

Graphics





CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	09-1564-2473	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 10:39	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1800141	200	Yes	Two-Point Interpolation

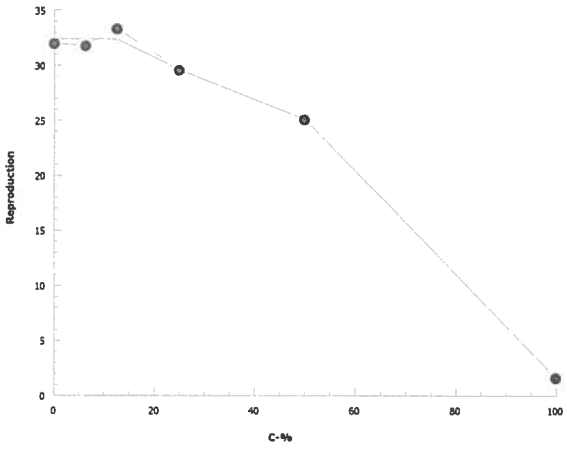
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	19.8	9.63	27.7	5.054	3.614	10.39
IC10	27.6	19.4	35.3	3.628	2.829	5.147
IC15	36.6	24.7	45.9	2.734	2.176	4.043
IC20	45.6	35.7	52.3	2.193	1.911	2.8
IC25	51.8	42.8	55.4	1.932	1.804	2.335
IC40	62.1	57.7	65.4	1.611	1.529	1.735
IC50	69	65.5	72.3	1.45	1.383	1.527

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	32	27	39	1.12	3.53	11.0%	0.0%
6.25		10	31.8	23	40	1.54	4.87	15.3%	0.63%
12.5		9	33.3	25	38	1.28	3.84	11.5%	-4.17%
25		10	29.6	24	34	0.884	2.8	9.45%	7.5%
50		9	25.1	18	30	1.17	3.52	14.0%	21.5%
100		10	1.6	0	11	1.16	3.66	229.0%	95.0%

Graphics



Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 4A** Test Date: 9/27/16

Project #: 26327 Test ID: 69786 Randomization: 10.7.7 Control Water: SRW

Lab Water Control

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	8.01		8.1		322	25.1	0	0	0	0	0	0	0	0	0	0
1	7.86	7.84	7.6	7.0	342	25.4	0	0	0	0	0	0	0	0	0	0
2	7.86	7.79	8.4	8.0	316	25.1	0	0	0	0	0	0	0	0	0	0
3	7.99	7.88	8.7	7.0	315	25.2	4	5	4	0	0	4	6	7	3	5
4	7.81	8.00	8.2	7.8	331	25.4	0	10	10	8	6	9	0	8	0	0
5	7.90	8.25	8.2	6.7	314	25.0	12	0	1	13	13	0	12	0	13	14
6	–	8.04	–	6.5	331	25.4	14	12	17	18	17	15	14	17	15	14
7																
8																
						Total=	30	27	32	39	36	28	32	32	31	33

SIGN-OFF

Date: 9/27/16 Sol'n Prep: SO	New WQ: EP	Test Init: SE	Time: 1215
Date: 9/28/16 Sol'n Prep: DM	New WQ: SJ Old WQ: SJ	Counts: AV	Time: 1021
Date: 9/29/16 Sol'n Prep: TK	New WQ: RB Old WQ: SJ	Counts: AV	Time: 1115
Date: 9/30/16 Sol'n Prep: DM	New WQ: TA Old WQ: RB	Counts: DM	Time: 1250
Date: 10/1/16 Sol'n Prep: DM	New WQ: TA Old WQ: DS	Counts: DM	Time: 1335
Date: 10/2/16 Sol'n Prep: TK	New WQ: DT Old WQ: HR	Counts: SH	Time: 1315
Date: 10/3/16 Sol'n Prep: –	New WQ: – Old WQ: JBL	Counts: JBL	Time: 1500
Date: Sol'n Prep:	New WQ: Old WQ:	Counts:	Time:
Date:	Old WQ:	Counts:	Time:

Mean Neonates/Female = 32.0

6.25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	Sample ID
0	7.92		8.2		399	0	0	0	0	0	0	0	0	0	0	44182
1	7.72	7.63	7.8	7.2	413	0	0	0	0	0	0	0	0	0	0	44182
2	7.79	7.63	8.2	7.4	398	0	0	0	0	0	0	0	0	0	0	44192
3	7.92	7.79	8.8	6.7	397	6	4	6	6	5	5	6	5	6	5	44192
4	7.76	7.87	8.6	7.5	404	0	0	0	0	0	10	13	0	0	0	44197
5	7.71	8.12	8.1	6.1	390	13	13	12	17	11	0 (18 10/3/16)	18	12	14	12	44197
6	–	7.94	–	6.9	442	14	14	14	17	7	15	0	10	15	13	
7																
8																
						Total= 33	31	32	40	23	30	37	27	35	30	

Mean Neonates/Female = 31.8

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 4A** Test Date: 9127116

Project #: 26327 Test ID: 69786 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
12.5%	0	7.85		8.3		475		0	0	0	0	0	0	0	0	0	0	
	1	7.66	7.55	8.0	6.7	506		0	0	0	0	0	0	0	0	0	0	
	2	7.74	7.57	8.3	7.6	475		0	0	0	0	0	0	0	0	0	0	
	3	7.88	7.76	8.8	6.8	468		0	6	x/o	7	4	6	5	5	7	6	
	4	7.71	7.83	8.4	7.4	468		7	0	-	0	9	12	14	11	9	0	
	5	7.64	8.06	8.2	6.8	464		15	16	-	15	0	16	16	15	16	13	
	6	—	7.8	—	6.4	498		15	16	-	12	12	17	0	0	0	14	
	7									-								
	8									-								
							Total=	37	38	x/o	34	25	35	35	31	32	33	Mean Neonates/Female = 30.0

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)		Survival / Reproduction A	B	C	D	E	F	G	H	I	J	
25%	0	7.78		8.4		617		0	0	0	0	0	0	0	0	0	0	
	1	7.61	7.49	7.8	7.7	618		0	0	0	0	0	0	0	0	0	0	
	2	7.67	7.53	8.3	7.8	612		0	0	0	0	0	0	0	0	0	0	
	3	7.82	7.69	8.7	6.3	599		4	6	4	5	5	5	3	5	4	3	
	4	7.67	7.76	8.4	7.5	598		0	9	10	0	14	0	7	8	0	0	
	5	7.56	8.00	8.3	6.6	585		13	0	14	12	0	13	14	15	12	14	
	6	—	7.82	—	6.7	628		11	17	0	12	15	13	0	0	15	14	
	7																	
	8																	
							Total=	28	32	28	29	34	31	24	28	31	31	Mean Neonates/Female = 29.6

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 4A** Test Date: 9/27/16

Project #: 26327 Test ID: 69786 Control Water: SRW

50%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	7.70		8.5		874		0	0	0	0	0	0	0	0	0	0	
1	7.55	7.41	8.1	7.2	867		0	0	0	0	0	0	0	0	0	0	
2	7.60	7.46	8.3	7.9	846		0	0	0	0	0	0	0	0	0	0	
3	7.75	7.79	8.9	7.2	849		5	5	5	3	3	4	5	4	2	5	
4	7.62	7.72	8.6	7.7	846		0	0	0	0	0	0	8	10	8	3	
5	7.48	7.92	8.3	7.0	836		12	10	13	0	12	13	0	0	0	3	
6	–	7.74	–	6.5	947		10	9	12	2	3	10	14	13	13	12	
7																	
8																	
						Total=	27	24	30	5	18	27	27	27	23	23	Mean Neonates/Female = 23.1

100%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	7.65		8.3		1342	0	0	0	0	0	0	0	0	0	0	
1	7.49	7.55	8.2	6.6	1332	0	0	0	0	X/0	X/0	0	0	0	0	
2	7.53	7.71	8.1	7.8	1305	X/0	0	0	0	—	—	0	0	0	0	
3	7.67	7.88	8.8	7.0	1303	–	0	0	X/0	—	–	X/0	4	5	0	
4	7.56	7.68	8.8	7.8	1298	–	X/0	0	–	—	—	–	7	X/0	X/0	
5	7.38	7.90	8.3	6.7	1302	–	–	0	–	—	—	–	0	–	–	
6	–	7.78	–	6.2	1346	–	–	0	–	—	–	–	0	–	–	
7						–	–		–	—	—	–		–	–	
8							–		–	—	—	–		–	–	
					Total=	X/0	X/0	0	X/0	X/0	X/0	X/0	~~10~~ 11	X/5	X/0	Mean Neonates/Female = ~~0~~ 1.6

JBL 10/3/16

RC 10/4/16

Appendix C

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of Lehigh Pond 4A Site Water to *Ceriodaphnia dubia*: Analysis Including Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	09-8172-5943	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	27 Sep-16 12:15	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	03 Oct-16 15:00	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 3h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	00-2037-7482	**Code:**	Pond 4A	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 10:00	**Material:**	Influent	**Project:**	26327
Receive Date:	26 Sep-16 14:15	**Source:**	Lehigh Permanente		
Sample Age:	26h (7.2 °C)	**Station:**	Pond 4A		

Batch Note: Includes Outliers 12.5 C, 50 D, Hardness Ctl G

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
08-0467-8126	Reproduction	<0	0		11.2%		Equal Variance t Two-Sample Test
14-4710-9233	Reproduction	25	50	35.36	20.6%	4	Steel Many-One Rank Sum Test
05-6705-7130	Survival	0	>0		NA		Fisher Exact Test
15-5954-6677	Survival	50	100	70.71	NA	2	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
19-6811-3164	Reproduction	IC5	11.1	3.52	28	9	Linear Interpolation (ICPIN)
		IC10	28.1	7.52	34.4	3.562	
		IC15	34.2	10.3	42	2.921	
		IC20	40.4	12.4	51.4	2.476	
		IC25	46.5	34.4	54.6	2.149	
		IC40	59.1	47.8	64.5	1.693	
		IC50	66.5	56.4	71.4	1.503	
07-4976-2263	Survival	EC50	76.2	66	88.1	1.312	Trimmed Spearman-Kärber

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	32	29.5	34.5	27	39	1.12	3.53	11.0%	0.0%
0	Hardness Contr	10	22.6	18.7	26.5	9	29	1.75	5.52	24.4%	29.4%
6.25		10	31.8	28.3	35.3	23	40	1.54	4.87	15.3%	0.63%
12.5		10	30	22	38	0	38	3.52	11.1	37.2%	6.25%
25		10	29.6	27.6	31.6	24	34	0.884	2.8	9.45%	7.5%
50		10	23.1	18	28.2	5	30	2.27	7.17	31.0%	27.8%
100		10	1.6	-1.02	4.22	0	11	1.16	3.66	229.0%	95.0%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Hardness Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
6.25		10	1	1	1	1	1	0	0	0.0%	0.0%
12.5		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
25		10	1	1	1	1	1	0	0	0.0%	0.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	0.2	0	0.502	0	1	0.133	0.422	211.0%	80.0%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	30	27	32	39	36	28	32	32	31	33
0	Hardness Contr	26	25	29	21	23	24	9	27	20	22
6.25		33	31	32	40	23	30	37	27	35	30
12.5		37	38	0	34	25	35	35	31	32	33
25		28	32	28	29	34	31	24	28	31	31
50		27	24	30	5	18	27	27	27	23	23
100		0	0	0	0	0	0	0	11	5	0

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Hardness Contr	1	1	1	1	1	1	0	1	1	1
6.25		1	1	1	1	1	1	1	1	1	1
12.5		1	1	0	1	1	1	1	1	1	1
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
100		0	0	1	0	0	0	0	1	0	0

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Hardness Contr	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		0/1	0/1	1/1	0/1	0/1	0/1	0/1	1/1	0/1	0/1

CETIS Analytical Report

Report Date: 12 Oct-16 14:19 (p 1 of 1)
Test Code: 69786 | 01-3299-7615

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID: 08-0467-8126 Endpoint: Reproduction CETIS Version: CETISv1.8.7
Analyzed: 12 Oct-16 14:18 Analysis: Parametric-Two Sample Official Results: Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	11.2%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Hardness Control	4.54	1.73	3.59	18	0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	441.8	441.8	1	20.6	0.0003	Significant Effect
Error	386.4	21.46667	18			
Total	828.2		19			

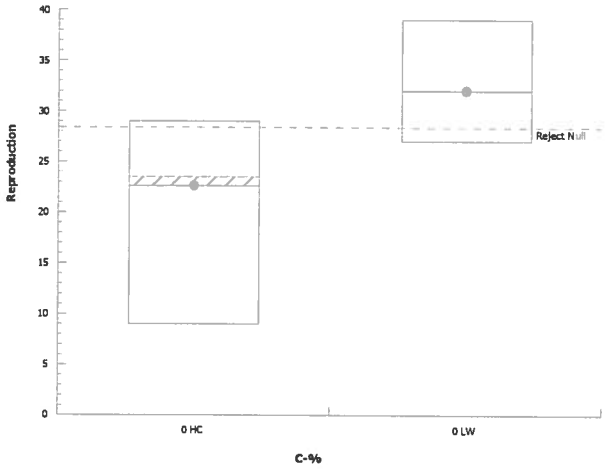
Distributional Tests

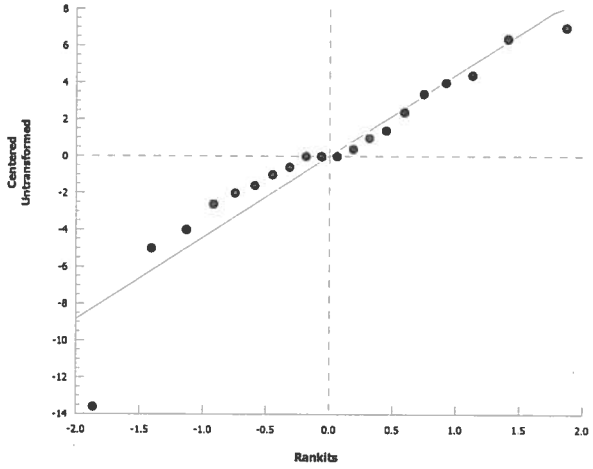
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.45	6.54	0.1981	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.911	0.866	0.0664	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	32	29.5	34.5	32	27	39	1.12	11.0%	0.0%
0	Hardness Contr	10	22.6	18.7	26.5	23.5	9	29	1.75	24.4%	29.4%

Graphics





CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	14-4710-9233	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 10:35	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	20.6%	25	50	35.36	4

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	104	76	5	18	0.7742	Asymp	Non-Significant Effect
		12.5	114	76	3	18	0.9452	Asymp	Non-Significant Effect
		25	85.5	76	3	18	0.1929	Asymp	Non-Significant Effect
		50*	59.5	76	2	18	0.0011	Asymp	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	525.6	131.4	4	2.99	0.0284	Significant Effect
Error	1976.9	43.93111	45			
Total	2502.5		49			

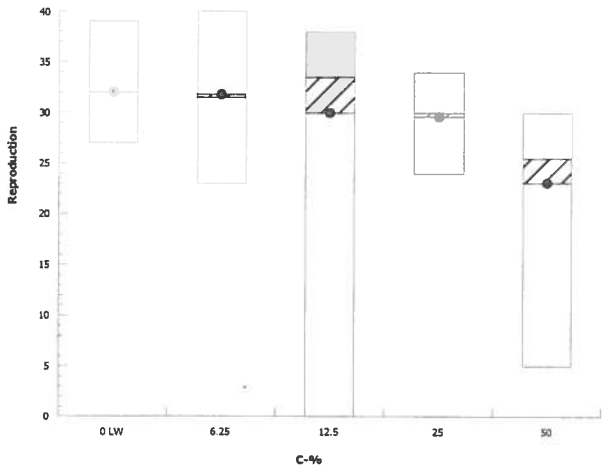
Distributional Tests

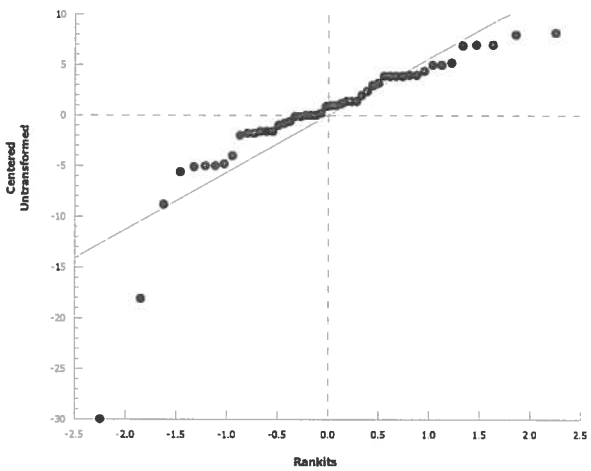
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	20.7	13.3	0.0004	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.776	0.937	<0.0001	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	32	29.5	34.5	32	27	39	1.12	11.0%	0.0%
6.25		10	31.8	28.3	35.3	31.5	23	40	1.54	15.3%	0.63%
12.5		10	30	22	38	33.5	0	38	3.52	37.2%	6.25%
25		10	29.6	27.6	31.6	30	24	34	0.884	9.45%	7.5%
50		10	23.1	18	28.2	25.5	5	30	2.27	31.0%	27.8%

Graphics





CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	19-6811-3164	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 10:35	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1551765	200	Yes	Two-Point Interpolation

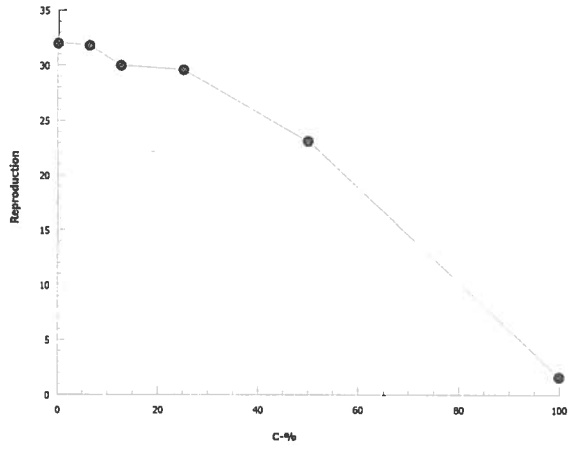
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	11.1	3.52	28	9	3.576	28.4
IC10	28.1	7.52	34.4	3.562	2.911	13.3
IC15	34.2	10.3	42	2.921	2.383	9.669
IC20	40.4	12.4	51.4	2.476	1.946	8.051
IC25	46.5	34.4	54.6	2.149	1.831	2.903
IC40	59.1	47.8	64.5	1.693	1.55	2.093
IC50	66.5	56.4	71.4	1.503	1.401	1.773

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	32	27	39	1.12	3.53	11.0%	0.0%
6.25		10	31.8	23	40	1.54	4.87	15.3%	0.63%
12.5		10	30	0	38	3.52	11.1	37.2%	6.25%
25		10	29.6	24	34	0.884	2.8	9.45%	7.5%
50		10	23.1	5	30	2.27	7.17	31.0%	27.8%
100		10	1.6	0	11	1.16	3.66	229.0%	95.0%

Graphics



Appendix D

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of Lehigh Pond 13 Site Water to *Ceriodaphnia dubia*: Analysis Excluding Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	10-2017-0884	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	27 Sep-16 11:45	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	03 Oct-16 15:05	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 3h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	12-5390-1120	**Code:**	Pond 13	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 10:00	**Material:**	Influent	**Project:**	26327
Receive Date:	26 Sep-16 14:15	**Source:**	Lehigh Permanente		
Sample Age:	26h (2.1 °C)	**Station:**	Pond 13		

Batch Note: Excludes Outliers Ctrl C, 12.5 A

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
21-0040-5233	Reproduction	100	>100	NA	20.8%	1	Wilcoxon/Bonferroni Adj Test
05-8827-9943	Survival	100	>100	NA	NA	1	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
10-4014-0713	Reproduction	IC5	19.3	10.3	34.4	5.172	Linear Interpolation (ICPIN)
		IC10	29.6	17.4	58.5	3.377	
		IC15	45.2	22.6	69.5	2.211	
		IC20	61.3	37.5	N/A	1.632	
		IC25	77.5	48.6	N/A	1.29	
		IC40	>100	N/A	N/A	<1	
		IC50	>100	N/A	N/A	<1	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	9	31.3	28.7	33.9	26	38	1.13	3.39	10.8%	0.0%
6.25		10	33.6	30.7	36.5	28	42	1.3	4.12	12.2%	-7.23%
12.5		9	32.2	29.8	34.6	27	37	1.05	3.15	9.79%	-2.84%
25		10	29.7	26	33.4	23	36	1.65	5.21	17.5%	5.21%
50		10	27.1	23	31.2	19	37	1.8	5.7	21.1%	13.5%
100		10	22.1	14.7	29.5	4	33	3.25	10.3	46.6%	29.5%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	0.0%
6.25		10	1	1	1	1	1	0	0	0.0%	-11.1%
12.5		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	0.0%
25		10	1	1	1	1	1	0	0	0.0%	-11.1%
50		10	1	1	1	1	1	0	0	0.0%	-11.1%
100		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	11.1%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	29	26		30	31	31	33	34	38	30
6.25		42	30	28	39	32	33	34	32	34	32
12.5			34	29	32	32	27	30	37	35	34
25		23	25	36	30	26	30	35	33	36	23
50		19	22	28	33	28	26	25	37	32	21
100		23	24	4	33	31	5	30	21	30	20

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	0	1	1	1	1	1	1	1
6.25		1	1	1	1	1	1	1	1	1	1
12.5		0	1	1	1	1	1	1	1	1	1
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
100		1	1	0	1	1	0	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	0/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	10-1075-1526	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 11:11	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	100	>100	NA	1

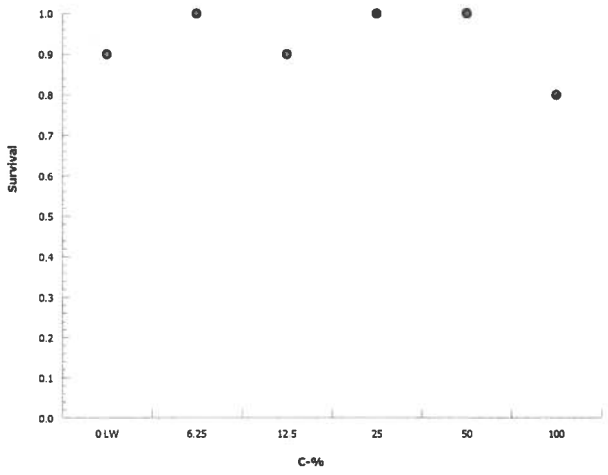
Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	1	1.0000	Exact	Non-Significant Effect
		12.5	0.763	1.0000	Exact	Non-Significant Effect
		25	1	1.0000	Exact	Non-Significant Effect
		50	1	1.0000	Exact	Non-Significant Effect
		100	0.5	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	9	1	10	0.9	0.1	0.0%
6.25		10	0	10	1	0	-11.1%
12.5		9	1	10	0.9	0.1	0.0%
25		10	0	10	1	0	-11.1%
50		10	0	10	1	0	-11.1%
100		8	2	10	0.8	0.2	11.1%

Graphics



CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	21-0040-5233	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 11:15	**Analysis:**	Nonparametric-Multiple Comparison	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	20.8%	100	>100	NA	1

Wilcoxon/Bonferroni Adj Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	117	NA	3	17	1.0000	Exact	Non-Significant Effect
		12.5	93.5	NA	3	16	1.0000	Exact	Non-Significant Effect
		25	92	NA	3	17	1.0000	Exact	Non-Significant Effect
		50	78	NA	2	17	0.1885	Exact	Non-Significant Effect
		100	72.5	NA	3	17	0.0561	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	867.2651	173.453	5	4.97	0.0009	Significant Effect
Error	1813.856	34.88184	52			
Total	2681.121		57			

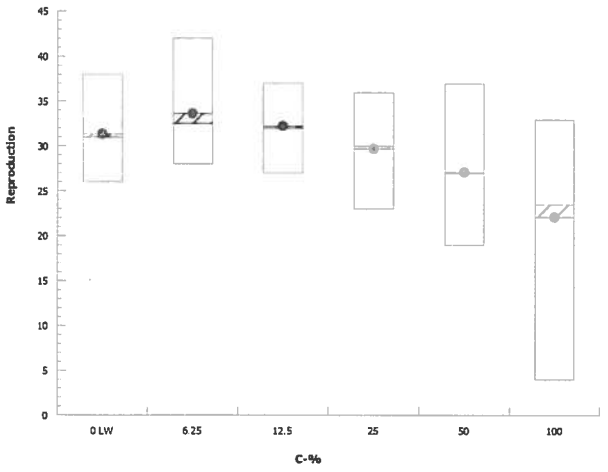
Distributional Tests

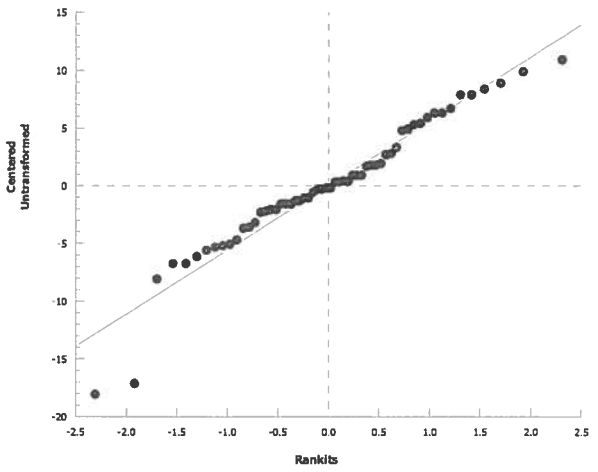
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	17.5	15.1	0.0036	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.948	0.944	0.0146	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	9	31.3	28.7	33.9	31	26	38	1.13	10.8%	0.0%
6.25		10	33.6	30.7	36.5	32.5	28	42	1.3	12.2%	-7.23%
12.5		9	32.2	29.8	34.6	32	27	37	1.05	9.79%	-2.84%
25		10	29.7	26	33.4	30	23	36	1.65	17.5%	5.21%
50		10	27.1	23	31.2	27	19	37	1.8	21.1%	13.5%
100		10	22.1	14.7	29.5	23.5	4	33	3.25	46.6%	29.5%

Graphics





CETIS Analytical Report

Test Code: 69788 | 17-2117-9824

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	10-4014-0713	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 11:15	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	515011	200	Yes	Two-Point Interpolation

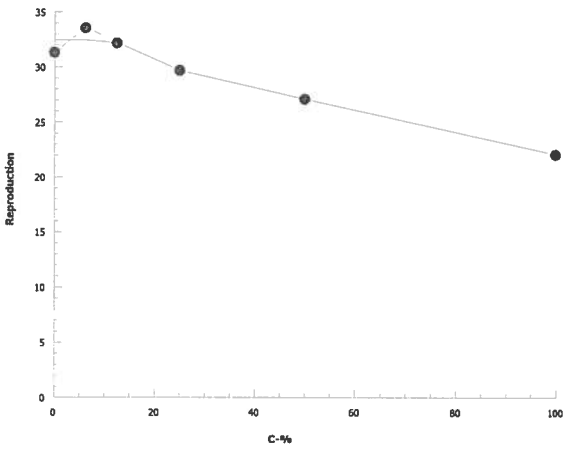
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	19.3	10.3	34.4	5.172	2.905	9.724
IC10	29.6	17.4	58.5	3.377	1.709	5.745
IC15	45.2	22.6	69.5	2.211	1.438	4.422
IC20	61.3	37.5	N/A	1.632	NA	2.668
IC25	77.5	48.6	N/A	1.29	NA	2.057
IC40	>100	N/A	N/A	<1	NA	NA
IC50	>100	N/A	N/A	<1	NA	NA

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	9	31.3	26	38	1.13	3.39	10.8%	0.0%
6.25		10	33.6	28	42	1.3	4.12	12.2%	-7.23%
12.5		9	32.2	27	37	1.05	3.15	9.79%	-2.84%
25		10	29.7	23	36	1.65	5.21	17.5%	5.21%
50		10	27.1	19	37	1.8	5.7	21.1%	13.5%
100		10	22.1	4	33	3.25	10.3	46.6%	29.5%

Graphics



 Analyst: RL QA: SD

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 13** Test Date: 9/27/16

Project #: 26327 Test ID: 69788 Randomization: 10.7.5 Control Water: SRW

Lab Water Control

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.89		7.4		330	25.3	0	0	0	0	0	0	0	0	0	0
1	8.03	8.09	7.7	6.3	319	25.0	0	0	0	0	0	0	0	0	0	0
2	7.68	7.71	8.2	7.5	317	25.3	0	0	0	0	0	0	0	0	0	0
3	7.90	8.22	8.5	7.9	333	25.6	4	4	0	5	5	5	4	6	7	5
4	7.89	7.96	8.0	7.7	363	25.4	9	8	x/0	0	10	9	0	8	0	0
5	7.67	8.16	7.8	6.5	307	25.1	0	0	-	10	0	0	13	0	14	10
6	—	8.08	—	6.9	325	25.4	16	14	-	15	16	17	16	20	17	15
7									-							
8									-							
						Total=	29	26	x/0	30	31	31	33	34	38	30

SIGN-OFF

Date: 9/27/16 New WQ: JL Test Init: DM
Sol'n Prep: JO Time: 1145

Date: 9/28/16 New WQ: JJ Counts: WC
Sol'n Prep: DM Old WQ: JJ Time: 1250

Date: 9/29/16 New WQ: RB Counts: WC
Sol'n Prep: TK Old WQ: JJ Time: 1115

Date: 9/30/16 New WQ: TA Counts: JO
Sol'n Prep: DM Old WQ: RB Time: 1245

Date: ~~9/30/16~~ 10/1/16 New WQ: TA Counts: DM
Sol'n Prep: DM Old WQ: DJ Time: 1300

Date: 10/2/16 New WQ: JJ Counts: WC
Sol'n Prep: TK Old WQ: RB Time: 1330

Date: 9/3/16 New WQ: — Counts: WC
Sol'n Prep: ~~JBL~~ Old WQ: JBL Time: 1505

Date: New WQ: Counts:
Sol'n Prep: Old WQ: Time:

Date: Old WQ: Counts:
Time:

Mean Neonates/Female = 28.2

6.25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.74		7.8		401	0	0	0	0	0	0	0	0	0	0
1	7.86	7.95	7.8	7.0	411	0	0	0	0	0	0	0	0	0	0
2	7.62	7.56	8.2	7.8	402	0	0	0	0	0	0	0	0	0	0
3	7.80	8.03	8.6	7.6	403	7	7	3	5	5	4	6	5	6	5
4	7.76	7.91	8.2	7.7	415	0	10	0	0	0	12	11	0	0	10
5	7.56	7.99	7.9	6.6	401	14	0	11	15	10	0	0	13	13	0
6	—	8.01	—	7.0	416	21	13	14	19	17	17	17	14	15	17
7															
8															
						Total= 42	30	28	34	32	33	34	32	34	32

Sample ID

44180
44180
44190
44190
44195
44195
—

Mean Neonates/Female = 33.6

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 13** Test Date: 9/27/16

Project #: 26327 Test ID: 69788 Control Water: SRW

12.5%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	7.68		8.1		481		0	0	0	0	0	0	0	0	0	0	
1	7.79	7.88	7.9	7.0	500		0	0	0	0	0	0	0	0	0	0	
2	7.60	7.50	8.4	7.9	484		0	0	0	0	0	0	0	0	0	0	
3	7.74	7.98	8.8	7.7	482		X/2	4	5	5	4	5	5	5	6	7	
4	7.69	7.86	8.6	7.8	485		—	0	0	6	11	8	0	0	0	0	
5	7.51	7.96	8.0	6.8	481		—	15	11	4	0	0	11	15	11	14	
6	—	7.95	—	7.0	497		—	15	13	17	17	14	14	17	18	13	
7							—										
8							—										
						Total=	X/2	34	29	32	32	27	30	37	35	34	Mean Neonates/Female = 29.2

25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.62		8.3		625	0	0	0	0	0	0	0	0	0	0
1	7.72	7.80	8.1	6.8	634	0	0	0	0	0	0	0	0	0	0
2	7.56	7.44	8.5	7.9	618	0	0	0	0	0	0	0	0	0	0
3	7.68	7.94	8.8	7.6	619	4	5	6	6	5	4	6	6	5	4
4	7.62	7.81	8.5	7.7	619	6	7	0	9	5	8	0	0	0	5
5	7.46	7.89	9.0	7.0	623	0	0	14	0	0	0	13	12	13	0
6	—	7.88	—	7.1	648	13	13	16	15	16	18	16	15	18	14
7															
8															
						Total=	23	25	36	30	26	30	35	33	36	23	Mean Neonates/Female = 29.7

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 13** Test Date: 9/27/16

Project #: 26327 Test ID: 69788 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
50%	0	7.55		8.8		898		0	0	0	0	0	0	0	0	0	0	
	1	7.64	7.72	8.4	7.0	928		0	0	0	0	0	0	0	0	0	0	
	2	7.48	7.41	8.9	7.9	892		0	0	0	0	0	0	0	0	0	0	
	3	7.61	7.90	9.3	7.5	894		6	4	4	5	5	4	3	7	4	5	
	4	7.55	7.75	8.9	7.8	898		0	5	0	0	8	10	0	0	0	6	
	5	7.40	7.84	8.1	6.9	873		13	0	13	15	0	0	11	13	13	0	
	6	—	7.81	—	7.2	912		0	13	11	13	15	12	11	17	15	10	
	7																	
	8																	
							Total=	19	22	28	33	28	26	25	37	32	21	Mean Neonates/Female = 27.1

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	
100%	0	7.53		9.7		1377	0	0	0	0	0	0	0	0	0	0	
	1	7.63	7.96	8.9	7.3	1481	0	0	0	0	0	0	0	0	0	0	
	2	7.45	7.65	9.8	7.6	1382	0	0	0	0	0	0	0	0	0	0	
	3	7.56	8.12	10.0	7.6	1380	5	3	4	6	4	5	5	4	3	3	
	4	7.48	7.72	8.8	7.9	1393	6	7	x/0	0	0	0	0	5	0	8	
	5	7.33	7.93	8.2	7.1	1410	0	0	-	13	11	x/0	11	1	13	0	
	6	—	7.82	—	7.0	1453	12	14	-	14	16	-	14	11	14	9	
	7								-			-					
	8								-			-					
							Total=	23	24	x/4	33	31	x/5	30	21	30	20	Mean Neonates/Female = 22.1

Appendix E

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of Lehigh Pond 13 Site Water to *Ceriodaphnia dubia*: Analysis Including Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	10-2017-0884	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	27 Sep-16 11:45	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	03 Oct-16 15:05	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 3h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	12-5390-1120	**Code:**	Pond 13	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 10:00	**Material:**	Influent	**Project:**	26327
Receive Date:	26 Sep-16 14:15	**Source:**	Lehigh Permanente		
Sample Age:	26h (2.1 °C)	**Station:**	Pond 13		

Batch Note: Includes Outliers Ctrl C, 12.5 A

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
06-7593-3888	Reproduction	100	>100	NA	29.3%	1	Steel Many-One Rank Sum Test
10-1075-1526	Survival	100	>100	NA	NA	1	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
12-4850-9209	Reproduction	IC5	26	7.76	57.8	3.845	Linear Interpolation (ICPIN)
		IC10	42.4	9.4	86.1	2.356	
		IC15	58.3	11	N/A	1.714	
		IC20	73.8	32.8	N/A	1.355	
		IC25	89.3	48.2	N/A	1.12	
		IC40	>100	N/A	N/A	<1	
		IC50	>100	N/A	N/A	<1	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	28.2	20.8	35.6	0	38	3.29	10.4	36.9%	0.0%
6.25		10	33.6	30.7	36.5	28	42	1.3	4.12	12.2%	-19.1%
12.5		10	29.2	22	36.4	2	37	3.17	10	34.3%	-3.55%
25		10	29.7	26	33.4	23	36	1.65	5.21	17.5%	-5.32%
50		10	27.1	23	31.2	19	37	1.8	5.7	21.1%	3.9%
100		10	22.1	14.7	29.5	4	33	3.25	10.3	46.6%	21.6%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	0.0%
6.25		10	1	1	1	1	1	0	0	0.0%	-11.1%
12.5		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	0.0%
25		10	1	1	1	1	1	0	0	0.0%	-11.1%
50		10	1	1	1	1	1	0	0	0.0%	-11.1%
100		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	11.1%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	29	26	0	30	31	31	33	34	38	30
6.25		42	30	28	39	32	33	34	32	34	32
12.5		2	34	29	32	32	27	30	37	35	34
25		23	25	36	30	26	30	35	33	36	23
50		19	22	28	33	28	26	25	37	32	21
100		23	24	4	33	31	5	30	21	30	20

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	0	1	1	1	1	1	1	1
6.25		1	1	1	1	1	1	1	1	1	1
12.5		0	1	1	1	1	1	1	1	1	1
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
100		1	1	0	1	1	0	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	0/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Test Code: 69788 | 17-2117-9824

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID: 06-7593-3888 Endpoint: Reproduction CETIS Version: CETISv1.8.7
Analyzed: 04 Oct-16 11:12 Analysis: Nonparametric-Control vs Treatments Official Results: Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	29.3%	100	>100	NA	1

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	127	75	3	18	0.9983	Asymp	Non-Significant Effect
		12.5	114	75	3	18	0.9590	Asymp	Non-Significant Effect
		25	102	75	3	18	0.7570	Asymp	Non-Significant Effect
		50	88	75	2	18	0.2908	Asymp	Non-Significant Effect
		100	82.5	75	3	18	0.1507	Asymp	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	707.4833	141.4967	5	2.17	0.0709	Non-Significant Effect
Error	3519.5	65.17593	54			
Total	4226.983		59			

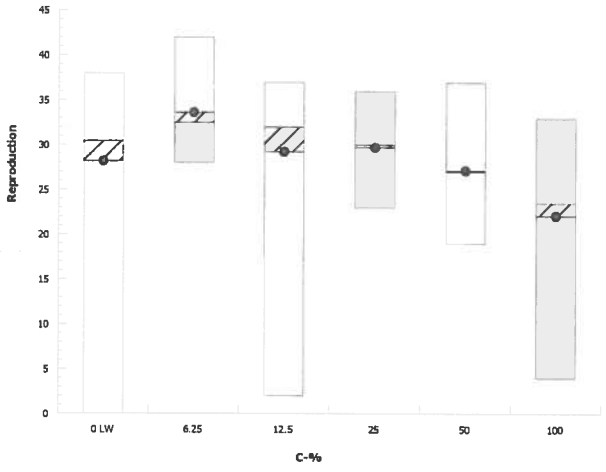
Distributional Tests

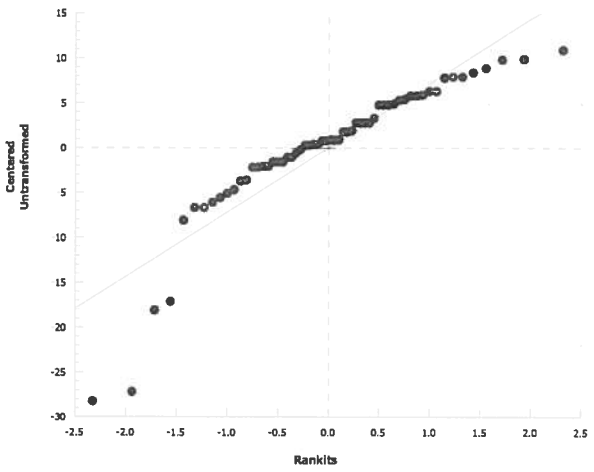
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	12.9	15.1	0.0243	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.844	0.946	<0.0001	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	28.2	20.8	35.6	30.5	0	38	3.29	36.9%	0.0%
6.25		10	33.6	30.7	36.5	32.5	28	42	1.3	12.2%	-19.1%
12.5		10	29.2	22	36.4	32	2	37	3.17	34.3%	-3.55%
25		10	29.7	26	33.4	30	23	36	1.65	17.5%	-5.32%
50		10	27.1	23	31.2	27	19	37	1.8	21.1%	3.9%
100		10	22.1	14.7	29.5	23.5	4	33	3.25	46.6%	21.6%

Graphics





CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	12-4850-9209	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 11:12	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1543623	200	Yes	Two-Point Interpolation

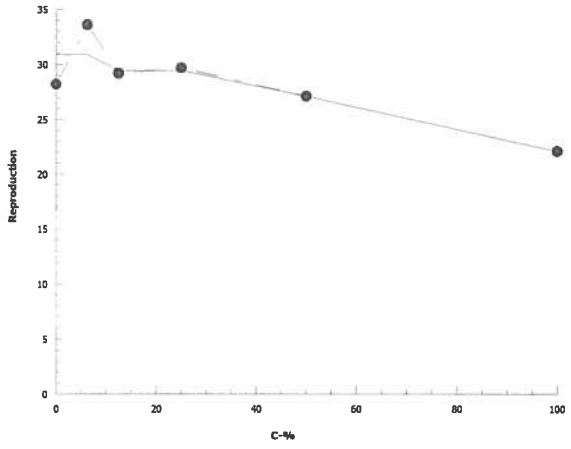
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	26	7.76	57.8	3.845	1.73	12.88
IC10	42.4	9.4	86.1	2.356	1.161	10.63
IC15	58.3	11	N/A	1.714	NA	9.107
IC20	73.8	32.8	N/A	1.355	NA	3.045
IC25	89.3	48.2	N/A	1.12	NA	2.076
IC40	>100	N/A	N/A	<1	NA	NA
IC50	>100	N/A	N/A	<1	NA	NA

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	28.2	0	38	3.29	10.4	36.9%	0.0%
6.25		10	33.6	28	42	1.3	4.12	12.2%	-19.1%
12.5		10	29.2	2	37	3.17	10	34.3%	-3.55%
25		10	29.7	23	36	1.65	5.21	17.5%	-5.32%
50		10	27.1	19	37	1.8	5.7	21.1%	3.9%
100		10	22.1	4	33	3.25	10.3	46.6%	21.6%

Graphics



Appendix F

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of Lehigh Pond 14 Site Water to *Ceriodaphnia dubia*: Analysis Excluding Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	07-2617-3516	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	27 Sep-16 11:30	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	03 Oct-16 15:02	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 4h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	06-9986-9661	**Code:**	Pond 14	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 10:33	**Material:**	Influent	**Project:**	26327
Receive Date:	26 Sep-16 14:15	**Source:**	Lehigh Permanente		
Sample Age:	25h (2.1 °C)	**Station:**	Pond 14		

Batch Note: Excludes Outlier 25 D

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-3930-3964	Reproduction	100	>100	NA	28.2%	1	Steel Many-One Rank Sum Test
02-0030-7518	Survival	100	>100	NA	NA	1	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
15-7433-3217	Reproduction	IC5	3.03	1.67	89	33	Linear Interpolation (ICPIN)
		IC10	6.06	3.35	N/A	16.5	
		IC15	>100	N/A	N/A	<1	
		IC20	>100	N/A	N/A	<1	
		IC25	>100	N/A	N/A	<1	
		IC40	>100	N/A	N/A	<1	
		IC50	>100	N/A	N/A	<1	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	30.3	27.5	33.1	24	36	1.23	3.89	12.8%	0.0%
6.25		10	20.9	11.2	30.6	0	32	4.27	13.5	64.6%	31.0%
12.5		10	31.2	27.5	34.9	25	39	1.65	5.2	16.7%	-2.97%
25		9	30.3	27.1	33.5	25	37	1.39	4.18	13.8%	-0.11%
50		10	29.3	26.5	32.1	22	36	1.25	3.95	13.5%	3.3%
100		10	25.8	19.7	31.9	13	40	2.68	8.47	32.8%	14.9%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
6.25		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
12.5		10	1	1	1	1	1	0	0	0.0%	0.0%
25		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	36	36	31	27	33	28	24	31	28	29
6.25		0	0	5	29	32	30	30	30	24	29
12.5		37	39	33	32	27	30	26	37	26	25
25		37	33	33		26	32	25	33	28	26
50		30	36	29	32	32	29	25	31	22	27
100		40	30	29	26	31	19	28	13	29	13

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
6.25		0	0	1	1	1	1	1	1	1	1
12.5		1	1	1	1	1	1	1	1	1	1
25		1	1	1	0	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6.25		0/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Test Code: 69789 | 19-2079-7963

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID: 02-0030-7518 Endpoint: Survival CETIS Version: CETISv1.8.7
Analyzed: 04 Oct-16 12:58 Analysis: STP 2x2 Contingency Tables Official Results: Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	100	>100	NA	1

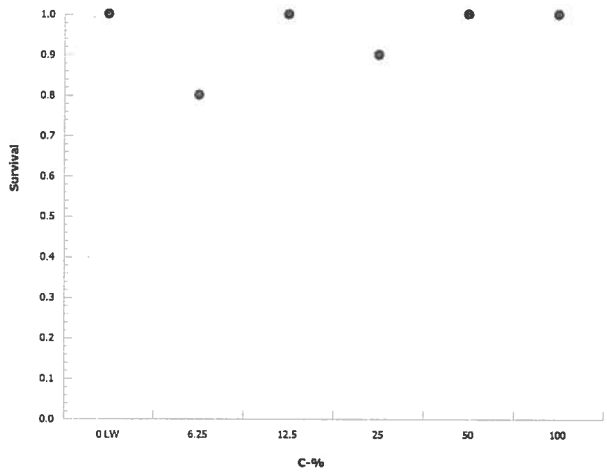
Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	0.237	1.0000	Exact	Non-Significant Effect
		12.5	1	1.0000	Exact	Non-Significant Effect
		25	0.5	1.0000	Exact	Non-Significant Effect
		50	1	1.0000	Exact	Non-Significant Effect
		100	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
6.25		8	2	10	0.8	0.2	20.0%
12.5		10	0	10	1	0	0.0%
25		9	1	10	0.9	0.1	10.0%
50		10	0	10	1	0	0.0%
100		10	0	10	1	0	0.0%

Graphics



Analyst: R6 QA: SD

CETIS Analytical Report

Report Date: 04 Oct-16 13:04 (p 1 of 1)
Test Code: 69789 | 19-2079-7963

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	01-3930-3964	Endpoint:	Reproduction	CETIS Version:	CETISv1.8.7
Analyzed:	04 Oct-16 12:58	Analysis:	Nonparametric-Control vs Treatments	Official Results:	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	28.2%	100	>100	NA	1

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	86.5	75	2	18	0.2473	Asymp	Non-Significant Effect
		12.5	109	75	2	18	0.9082	Asymp	Non-Significant Effect
		25	101	75	2	18	0.7129	Asymp	Non-Significant Effect
		50	101	75	5	18	0.7129	Asymp	Non-Significant Effect
		100	89	75	3	18	0.3218	Asymp	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	712.5333	142.5067	5	2.04	0.0875	Non-Significant Effect
Error	3772.4	69.85926	54			
Total	4484.933		59			

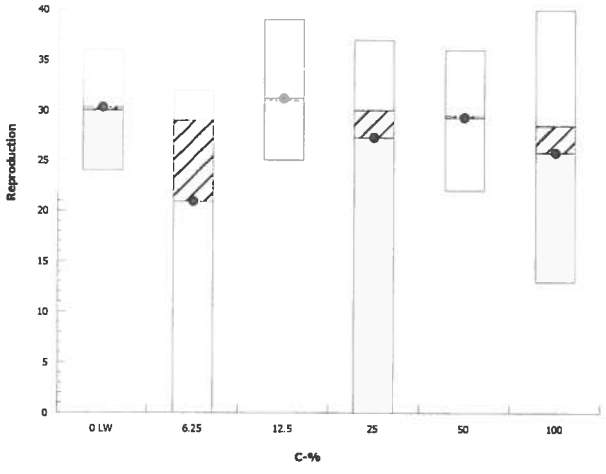
Distributional Tests

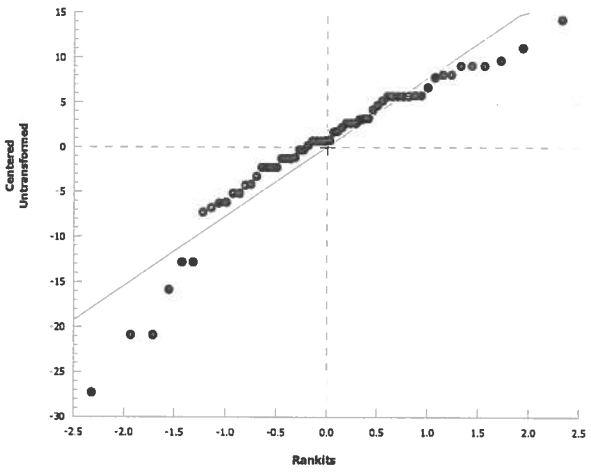
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	22.1	15.1	0.0005	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.909	0.946	0.0003	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	30.3	27.5	33.1	30	24	36	1.23	12.8%	0.0%
6.25		10	20.9	11.2	30.6	29	0	32	4.27	64.6%	31.0%
12.5		10	31.2	27.5	34.9	31	25	39	1.65	16.7%	-2.97%
25		10	27.3	19.9	34.7	30	0	37	3.28	38.0%	9.9%
50		10	29.3	26.5	32.1	29.5	22	36	1.25	13.5%	3.3%
100		10	25.8	19.7	31.9	28.5	13	40	2.68	32.8%	14.9%

Graphics





CETIS Analytical Report

Test Code: 69789 | 19-2079-7963

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	15-7433-3217	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 12:59	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	651813	200	Yes	Two-Point Interpolation

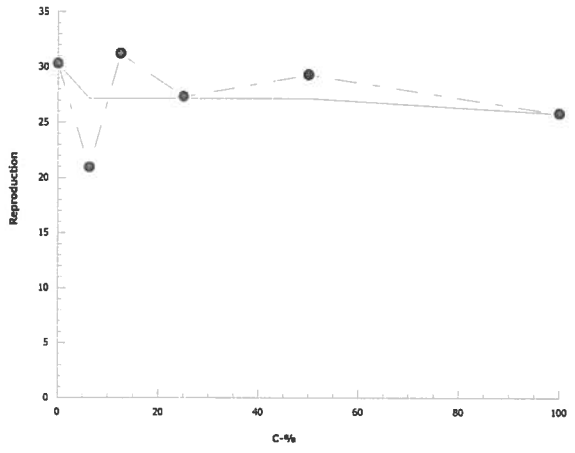
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	3.03	1.67	89	33	1.123	59.78
IC10	6.06	3.35	N/A	16.5	NA	29.89
IC15	>100	N/A	N/A	<1	NA	NA
IC20	>100	N/A	N/A	<1	NA	NA
IC25	>100	N/A	N/A	<1	NA	NA
IC40	>100	N/A	N/A	<1	NA	NA
IC50	>100	N/A	N/A	<1	NA	NA

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	30.3	24	36	1.23	3.89	12.8%	0.0%
6.25		10	20.9	0	32	4.27	13.5	64.6%	31.0%
12.5		10	31.2	25	39	1.65	5.2	16.7%	-2.97%
25		10	27.3	0	37	3.28	10.4	38.0%	9.9%
50		10	29.3	22	36	1.25	3.95	13.5%	3.3%
100		10	25.8	13	40	2.68	8.47	32.8%	14.9%

Graphics



Analyst: RG QA: SD

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 14** Test Date: 9/27/16

Project #: 26327 Test ID: 69789 Randomization: 10.7.2 Control Water: SRW

Lab Water Control

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	7.89		7.3		313	25.3	0	0	0	0	0	0	0	0	0	0	Date: 9/27/16 New WQ: Test Init.: JO Sol'n Prep: JO JL Time: 1130
1	8.06	7.89	7.7	6.0	~~388~~ 329	25.3	0	0	0	0	0	0	0	0	0	0	Date: 9/28/16 New WQ: JJ Counts: RG Sol'n Prep: DM Old WQ: JJ Time: 1115
2	7.62	7.93	8.1	7.8	313	25.1	0	0	0	0	0	0	0	0	0	0	Date: 9/29/16 New WQ: RB Counts: JAV Sol'n Prep: TK Old WQ: TC Time: 1410
3	8.05	8.06	8.6	7.7	305	25.2	0	0	5	3	0	4	3	6	4	0	Date: 9/30/16 New WQ: TA Counts: DM Sol'n Prep: DM Old WQ: TK Time: 1325
4	8.18	7.89	8.3	7.1	324	25.3	6	7	0	0	6	0	8	0	0	5	Date: 10/1/16 New WQ: DM Counts: DM Sol'n Prep: DM Old WQ: DC Time: 1400
5	7.65	7.70	7.2	7.0	305	25.0	12	12	11	9	11	10	0	11	11	11	Date: 10/2/16 New WQ: JJ Counts: SH Sol'n Prep: TK Old WQ: AR Time: 1230
6	—	7.79	—	5.7	329	24.9	18	17	15	15	16	14	13	14	13	13	Date: 10/3/16 New WQ: — Counts: EP Sol'n Prep: — Old WQ: SH Time: 1502
7																	Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
8																	Date: Old WQ: Counts: Time:
						Total=	36	36	31	27	33	28	24	31	28	29	Mean Neonates/Female = 30.3

6.25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	Sample ID
0	7.78		7.7		409	0	0	0	0	0	0	0	0	0	0	44181
1	7.94	7.65	7.8	5.6	420	0	0	0	0	0	0	0	0	0	0	44181
2	7.55	7.83	8.2	7.8	414	X/0	X/0	0	0	0	0	0	0	0	0	44191
3	7.97	7.93	8.8	7.7	412	-	-	0	4	3	5	3	5	4	4	44191
4	8.08	7.76	8.1	6.9	430	-	-	0	0	0	9	0	0	5	0	44196
5	7.54	7.65	7.2	6.9	408	-	-	5	10	10	0	10	11	0	11	44196
6	—	7.55	—	6.4	461	-	-	0	15	19	16	17	14	15	14	—
7						-	-									
8																
						Total= X/0	X/0	5	29	32	30	30	30	24	29	Mean Neonates/Female = 20.9

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 14** Test Date: 9/27/16

Project #: 26327 Test ID: 69789 Control Water: SRW

12.5%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	7.72		7.8		496		0	0	0	0	0	0	0	0	0	0	
1	7.85	7.59	7.9	5.5	524		0	0	0	0	0	0	0	0	0	0	
2	752	775	8.3	7.4	502		0	0	0	0	0	0	0	0	0	0	
3	7.92	7.72	8.8	7.4	500		0	7	3	0	6	0	3	0	0	2	
4	7.92	7.69	8.1	7.1	515		6	0	0	6	8	4	9	6	5	0	
5	7.46	7.61	7.3	6.0	518		12	11	11	10	0	12	0	13	9	9	
6	—	7.72	—	6.7	584		19	21	19	16	13	14/16	14/N EP 10/3/16	13/15	12/15	14/16	
7																	
8																	
						Total=	37	39	33	32	27	30	26	37	26	25	Mean Neonates/Female = 31.2

25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)		Survival / Reproduction A	B	C	D	E	F	G	H	I	J	
0	7.65		8.0		669		0	0	0	0	0	0	0	0	0	0	
1	7.77	7.55	7.9	5.5	699		0	0	0	0	0	0	0	0	0	0	
2	7.47	7.74	8.2	7.5	675		0	0	0	x/0	0	0	0	0	0	0	
3	7.84	7.66	8.7	7.4	665		6	0	5	—	6	5	0	7	7	5	
4	7.82	7.64	8.1	7.2	688		0	5	0	—	6	0	6	0	5	5	
5	7.44	7.58	7.9	6.6	634		13	11	13	—	0	11	8	11	1	0	
6	—	6.95	—	6.5	705		18	17	15	—	14	16	11	15	15	16	
7										—							
8																	
						Total=	37	33	33	x/0	26	32	25	33	28	26	Mean Neonates/Female = 27.3

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Pond 14** Test Date: 9/27/16

Project #: 26327 Test ID: 69789 Control Water: SRW

50%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	7.58		8.0		972		0	0	0	0	0	0	0	0	0	0	
1	7.68	7.74	8.0	5.7	1008		0	0	0	0	0	0	0	0	0	0	
2	7.43	7.75	8.1	7.5	985		0	0	0	0	0	0	0	0	0	0	
3	7.76	7.65	8.8	7.5	984		6	5	0	6	6	5	4	4	0	0	
4	7.70	7.74	8.0	6.8	1014		0	0	6	8	10	9	6	0	4	5	
5	7.40	7.68	7.9	5.7	978		8	12	10	0	0	0	0	12	8	8	
6	—	6.68	-	6.7	1045		16	19	13	18	16	15	15	15	10	14	
7																	
8																	
						Total=	30	36	29	32	32	29	25	31	22	27	Mean Neonates/Female = 29.3

100%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)		Survival / Reproduction A	B	C	D	E	F	G	H	I	J	
0	7.51		7.5		1504		0	0	0	0	0	0	0	0	0	0	
1	7.62	7.87	8.1	6.0	1557		0	0	0	0	0	0	0	0	0	0	
2	7.66	7.75	8.0	7.4	1557		0	0	0	0	0	0	0	0	0	0	
3	7.67	7.59	8.7	7.5	1541		4	5	3	4	5	4	5	4	0	0	
4	7.58	7.70	7.2	7.5	1601		0	0	0	8	0	0	7	0	6	3	
5	7.34	7.78	7.8	6.5	1597		12	11	11	0	11	10	0	9	11	10	
6	—	6.52	—	6.8	1601		24	14	15	14	15	5	16	0	12	0	
7																	
8																	
						Total=	40	30	29	26	31	19	28	13	29	13	Mean Neonates/Female = 25.8

Appendix G

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of Lehigh Pond 14 Site Water to *Ceriodaphnia dubia*: Analysis Including Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	07-2617-3516	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	27 Sep-16 11:30	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	03 Oct-16 15:02	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 4h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	06-9986-9661	**Code:**	Pond 14	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 10:33	**Material:**	Influent	**Project:**	26327
Receive Date:	26 Sep-16 14:15	**Source:**	Lehigh Permanente		
Sample Age:	25h (2.1 °C)	**Station:**	Pond 14		

Batch Note: Includes Outlier 25 D

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-3930-3964	Reproduction	100	>100	NA	28.2%	1	Steel Many-One Rank Sum Test
02-0030-7518	Survival	100	>100	NA	NA	1	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
15-7433-3217	Reproduction	IC5	3.03	1.67	89	33	Linear Interpolation (ICPIN)
		IC10	6.06	3.35	N/A	16.5	
		IC15	>100	N/A	N/A	<1	
		IC20	>100	N/A	N/A	<1	
		IC25	>100	N/A	N/A	<1	
		IC40	>100	N/A	N/A	<1	
		IC50	>100	N/A	N/A	<1	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	30.3	27.5	33.1	24	36	1.23	3.89	12.8%	0.0%
6.25		10	20.9	11.2	30.6	0	32	4.27	13.5	64.6%	31.0%
12.5		10	31.2	27.5	34.9	25	39	1.65	5.2	16.7%	-2.97%
25		10	27.3	19.9	34.7	0	37	3.28	10.4	38.0%	9.9%
50		10	29.3	26.5	32.1	22	36	1.25	3.95	13.5%	3.3%
100		10	25.8	19.7	31.9	13	40	2.68	8.47	32.8%	14.9%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
6.25		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
12.5		10	1	1	1	1	1	0	0	0.0%	0.0%
25		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	36	36	31	27	33	28	24	31	28	29
6.25		0	0	5	29	32	30	30	30	24	29
12.5		37	39	33	32	27	30	26	37	26	25
25		37	33	33	0	26	32	25	33	28	26
50		30	36	29	32	32	29	25	31	22	27
100		40	30	29	26	31	19	28	13	29	13

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
6.25		0	0	1	1	1	1	1	1	1	1
12.5		1	1	1	1	1	1	1	1	1	1
25		1	1	1	0	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6.25		0/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Test Code: 69789 | 19-2079-7963

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	01-3930-3964	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 12:58	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	28.2%	100	>100	NA	1

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	86.5	75	2	18	0.2473	Asymp	Non-Significant Effect
		12.5	109	75	2	18	0.9082	Asymp	Non-Significant Effect
		25	101	75	2	18	0.7129	Asymp	Non-Significant Effect
		50	101	75	5	18	0.7129	Asymp	Non-Significant Effect
		100	89	75	3	18	0.3218	Asymp	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	712.5333	142.5067	5	2.04	0.0875	Non-Significant Effect
Error	3772.4	69.85926	54			
Total	4484.933		59			

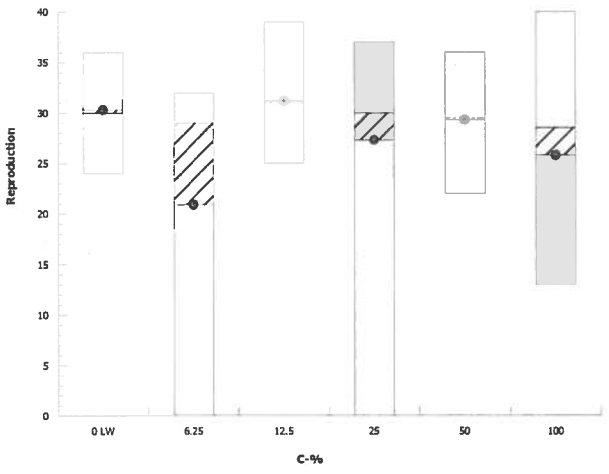
Distributional Tests

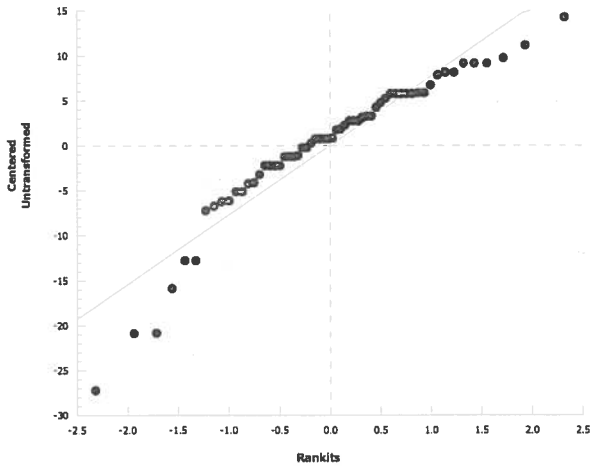
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	22.1	15.1	0.0005	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.909	0.946	0.0003	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	30.3	27.5	33.1	30	24	36	1.23	12.8%	0.0%
6.25		10	20.9	11.2	30.6	29	0	32	4.27	64.6%	31.0%
12.5		10	31.2	27.5	34.9	31	25	39	1.65	16.7%	-2.97%
25		10	27.3	19.9	34.7	30	0	37	3.28	38.0%	9.9%
50		10	29.3	26.5	32.1	29.5	22	36	1.25	13.5%	3.3%
100		10	25.8	19.7	31.9	28.5	13	40	2.68	32.8%	14.9%

Graphics





Analyst: R6 QA: SD

CETIS Analytical Report

Test Code: 69789 | 19-2079-7963

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	15-7433-3217	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 12:59	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	651813	200	Yes	Two-Point Interpolation

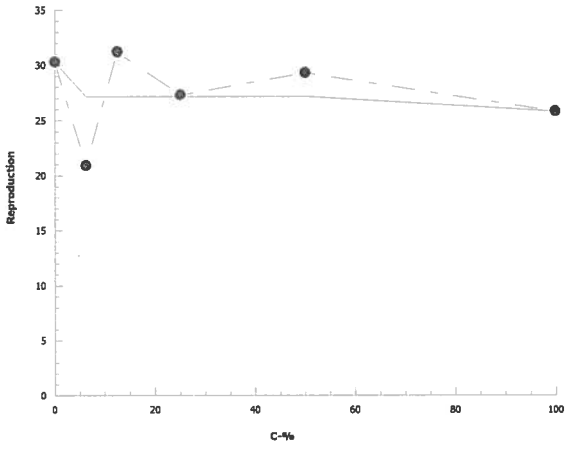
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	3.03	1.67	89	33	1.123	59.78
IC10	6.06	3.35	N/A	16.5	NA	29.89
IC15	>100	N/A	N/A	<1	NA	NA
IC20	>100	N/A	N/A	<1	NA	NA
IC25	>100	N/A	N/A	<1	NA	NA
IC40	>100	N/A	N/A	<1	NA	NA
IC50	>100	N/A	N/A	<1	NA	NA

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	30.3	24	36	1.23	3.89	12.8%	0.0%
6.25		10	20.9	0	32	4.27	13.5	64.6%	31.0%
12.5		10	31.2	25	39	1.65	5.2	16.7%	-2.97%
25		10	27.3	0	37	3.28	10.4	38.0%	9.9%
50		10	29.3	22	36	1.25	3.95	13.5%	3.3%
100		10	25.8	13	40	2.68	8.47	32.8%	14.9%

Graphics



Appendix H

Test Data and Summary of Statistics for the Reference Toxicant Evaluation of the *Ceriodaphnia dubia*

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Batch ID:	15-1022-7721	Test Type:	Reproduction-Survival (7d)	Analyst:	Robert Gee
Start Date:	27 Sep-16 12:50	Protocol:	EPA-821-R-02-013 (2002)	Diluent:	Laboratory Water
Ending Date:	03 Oct-16 14:05	Species:	Ceriodaphnia dubia	Brine:	Not Applicable
Duration:	6d 1h	Source:	In-House Culture	Age:	1

Sample ID:	04-5687-9373	Code:	NaCl	Client:	Reference Toxicant
Sample Date:	27 Sep-16 12:50	Material:	Sodium chloride	Project:	26308
Receive Date:	27 Sep-16 12:50	Source:	Reference Toxicant		
Sample Age:	NA (25.6 °C)	Station:	In House		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
16-6965-0530	Reproduction	500	1000	707.1	22.5%		Wilcoxon/Bonferroni Adj Test
05-1926-9841	Survival	2000	2500	2236	NA		Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
01-8681-6691	Reproduction	IC5	335	177	574		Linear Interpolation (ICPIN)
		IC10	541	353	882		
		IC15	620	523	1080		
		IC20	700	606	1140		
		IC25	780	678	1270		
		IC40	1510	849	1580		
		IC50	1620	959	1680		
03-6116-4434	Survival	EC50	1740	1460	2080		Spearman-Kärber

Reproduction Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	33.5	31.7	35.3	30	38	0.778	2.46	7.35%	0.0%
500		10	31	28.5	33.5	26	38	1.09	3.43	11.1%	7.46%
1000		9	20.3	9.21	31.5	0	33	4.82	14.5	71.1%	39.3%
1500		10	20.7	17.5	23.9	9	24	1.43	4.52	21.8%	38.2%
2000		10	5.3	1.16	9.44	0	18	1.83	5.79	109.0%	84.2%
2500		10	0	0	0	0	0	0	0		100.0%

Survival Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
500		10	1	1	1	1	1	0	0	0.0%	0.0%
1000		9	0.667	0.282	1	0	1	0.167	0.5	75.0%	33.3%
1500		10	1	1	1	1	1	0	0	0.0%	0.0%
2000		10	0.6	0.231	0.969	0	1	0.163	0.516	86.1%	40.0%
2500		10	0	0	0	0	0	0	0		100.0%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	34	31	31	38	30	36	34	35	33	33
500		33	38	28	32	26	32	27	31	32	31
1000		32	33	31	30	0	27	4	26	0	
1500		24	24	21	24	9	23	23	20	20	19
2000		0	0	0	7	9	4	18	8	0	7
2500		0	0	0	0	0	0	0	0	0	0

Survival Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
500		1	1	1	1	1	1	1	1	1	1
1000		1	1	1	1	0	1	0	1	0	
1500		1	1	1	1	1	1	1	1	1	1
2000		0	0	0	1	1	1	1	1	0	1
2500		0	0	0	0	0	0	0	0	0	0

Survival Binomials

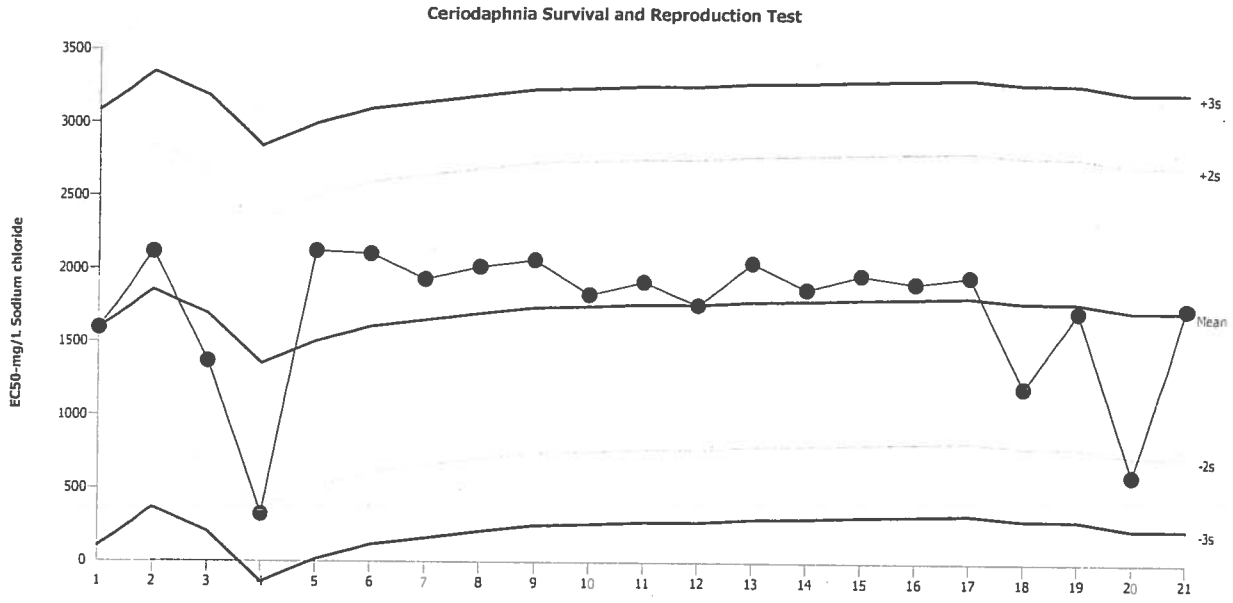
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
500		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1000		1/1	1/1	1/1	1/1	0/1	1/1	0/1	1/1	0/1	
1500		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
2000		0/1	0/1	0/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
2500		0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1

CETIS QC Plot

Report Date: 04 Oct-16 09:50 (1 of 1)

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Test Type:	Reproduction-Survival (7d)	**Organism:**	Ceriodaphnia dubia (Water Flea)	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-013 (2002)	**Endpoint:**	Survival	**Source:**	Reference Toxicant-REF



Mean:	1721	**Count:**	20	**-2s Warning Limit:**	727.8	**-3s Action Limit:**	231
Sigma:	496.8	**CV:**	28.90%	**+2s Warning Limit:**	2715	**+3s Action Limit:**	3212

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	May	10	14:15	1594	-127.2	-0.2561			04-1900-2071	02-7180-6176
2			17	16:30	2117	396	0.7971			02-0217-2091	01-8095-6167
3			24	14:40	1369	-352	-0.7085			12-4725-4616	17-8748-4211
4		Jun	14	12:15	321.4	-1400	-2.817	(-)		06-1840-5245	14-8979-7423
5			23	10:40	2125	403.7	0.8126			16-6250-9087	17-5652-1508
6			23	13:25	2105	384.4	0.7738			07-7424-9431	12-9537-7598
7			28	13:00	1933	212	0.4267			09-5722-1456	07-9253-0885
8		Jul	6	13:00	2019	297.9	0.5996			09-9739-4449	17-8269-3326
9			7	10:20	2064	343.2	0.6909			07-3590-7818	09-8307-4510
10			12	13:45	1831	109.6	0.2207			19-4280-6480	04-6439-4868
11		Aug	9	14:15	1918	197.4	0.3973			01-7078-3993	16-1640-2231
12			11	15:25	1759	38.26	0.07701			05-4282-8788	09-4783-9953
13			18	13:30	2050	328.9	0.662			09-3523-7380	14-1088-4073
14			23	14:15	1870	149	0.2999			20-3175-3833	16-0364-9515
15			25	14:35	1968	247	0.4972			08-0124-0684	18-2643-7985
16			30	16:05	1913	191.7	0.3859			02-5260-5089	09-5069-0405
17		Sep	8	13:40	1957	236.4	0.4759			18-2267-1225	05-8688-6279
18			13	10:20	1198	-523	-1.053			15-9643-7614	12-2668-1557
19			15	14:20	1718	-3.382	-0.00681			16-2243-5631	01-5480-0827
20			20	15:00	597.9	-1123	-2.261	(-)		18-2996-3053	17-7702-4069
21			27	12:50	1739	17.88	0.03599			02-6694-9084	03-6116-4434

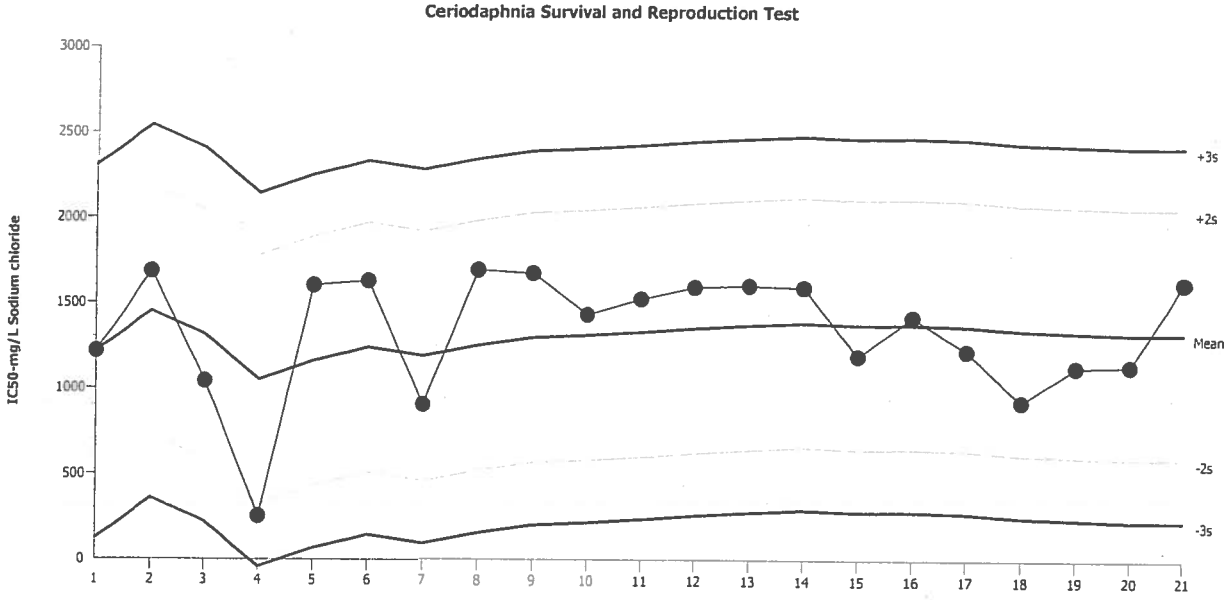
Analyst: RG QA: SD

CETIS QC Plot

Report Date: 04 Oct-16 09:51 (1 of 1)

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Test Type:	Reproduction-Survival (7d)	**Organism:**	Ceriodaphnia dubia (Water Flea)	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-013 (2002)	**Endpoint:**	Reproduction	**Source:**	Reference Toxicant-REF



Mean:	1326	**Count:**	20	**-2s Warning Limit:**	598.4	**-3s Action Limit:**	234.4
Sigma:	364	**CV:**	27.50%	**+2s Warning Limit:**	2054	**+3s Action Limit:**	2418

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	May	10	14:15	1216	-110	-0.3021			04-1900-2071	20-3182-9235
2			17	16:30	1684	358.4	0.9847			02-0217-2091	07-3645-9270
3			24	14:40	1042	-284.3	-0.7811			12-4725-4616	17-2108-7232
4		Jun	14	12:15	255	-1071	-2.942	(-)		06-1840-5245	10-0782-9712
5			23	10:40	1603	277.2	0.7616			16-6250-9087	07-8286-1737
6			23	13:25	1628	302.2	0.8303			07-7424-9431	14-5397-9899
7			28	13:00	908.1	-417.9	-1.148			09-5722-1456	07-0717-9325
8		Jul	6	13:00	1696	370.1	1.017			09-9739-4449	05-4282-8277
9			7	10:20	1679	353	0.9699			07-3590-7818	02-2720-1850
10			12	13:45	1435	109	0.2995			19-4280-6480	01-6291-6561
11		Aug	9	14:15	1528	202.3	0.5558			01-7078-3993	16-5522-9106
12			11	15:25	1598	271.5	0.746			05-4282-8788	20-6991-7970
13			18	13:30	1607	281.3	0.7727			09-3523-7380	12-7959-5180
14			23	14:15	1598	271.9	0.7469			20-3175-3833	12-9031-4120
15			25	14:35	1196	-130.1	-0.3574			08-0124-0684	03-1672-5825
16			30	16:05	1425	99	0.272			02-5260-5089	20-2491-5546
17		Sep	8	13:40	1226	-100.1	-0.2749			18-2267-1225	12-1761-7946
18			13	10:20	930.9	-395.1	-1.086			15-9643-7614	16-7658-0121
19			15	14:20	1132	-193.7	-0.5323			16-2243-5631	01-2656-4408
20			20	15:00	1140	-186.3	-0.5118			18-2996-3053	19-4443-0639
21			27	12:50	1624	297.8	0.818			02-6694-9084	01-8681-6691

Analyst: RC QA: SD

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/16

Project #: 26308 Test ID: 69790 Randomization: 10.6.1 Control Water: SRW

Lab Water Control

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	8.01		8.6		321		25.6	0	0	0	0	0	0	0	0	0	0
1	8.53	8.17	8.0	7.1	324	334	25.0	0	0	0	0	0	0	0	0	0	0
2	8.30	7.92	9.0	7.2	328	375	25.1	0	0	0	0	0	0	0	0	~~0~~	0
3	7.92	8.30	8.3	6.1	328	335	25.3	6	5	5	6	6	6	6	0	5	0
4	7.86	7.92	8.2	7.3	329	~~324~~ 369	25.4	0	0	0	0	0	0	0	7	0	6
5	7.75	8.00	7.9	6.3	309	343	25.1	12	14	13	14	11	13	12	13	12	13
6	—	7.59	—	7.4	—	339	24.9	16	12	13	18	13	17	16	15	16	14
7																	
8																	
							Total=	34	31	31	38	30	36	34	35	33	33

SIGN-OFF

- Date: 9/27/16 New WQ: Test Init: WC
  Sol'n Prep: WC Old WQ: Time: 1250
- Date: 9/28/16 New WQ: Counts: WSM
  Sol'n Prep: WC Old WQ: JZ Time: 1310
- Date: 9/29/16 New WQ: Counts: ~~1137~~ 1137 (JZ)
  Sol'n Prep: JZ Old WQ: JZ Time: 1137
- Date: 9/30/16 New WQ: RB Counts: TK
  Sol'n Prep: TK Old WQ: RB Time: 1255
- Date: 10/1/16 New WQ: TK Counts: TK
  Sol'n Prep: TK Old WQ: DT Time: 1400
- Date: 10/2/16 New WQ: JZ Counts: SH
  Sol'n Prep: SH Old WQ: BR Time: 1405
- Date: 10/3/16 New WQ: — Counts: JL
  Sol'n Prep: — Old WQ: TK Time: 1405
- Date: New WQ: Counts:
  Sol'n Prep: Old WQ: Time:
- Date: Old WQ: Counts:
  Time:

Mean Neonates/Female = 33.5

500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.82		8.0		1310		0	0	0	0	0	0	0	0	0	0
1	7.56	8.04	8.3	7.0	1346	1391	0	0	0	0	0	0	0	0	0	0
2	8.10	7.74	9.0	8.0	1337	1453	0	0	0	0	0	0	0	0	0	0
3	7.87	8.19	8.5	6.5	1270	1427	5	5	4	6	4	5	5	0	0	0
4	7.73	7.83	8.3	7.4	1333	1447	0	0	0	0	0	13	0	6	5	6
5	7.67	~~7.87~~	8.0	6.7	1355	1445	12	15	11	12	9	0	14	8	12	13
6	—	7.55	—	6.8	—	1459	16	18	13	14	13	14	8	17	15	12
7																
8																
						Total=	33	38	28	32	26	32	27	31	32	31

RT BATCH NUMBER

- 230
- 230
- 230
- 230
- 230
- 230
- —
-
-

Mean Neonates/Female = 31.0

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/6

Project #: 26308 Test ID: 69790 Control Water: SRW

1000 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.81		8.1		2208			0	0	0	0	0	0	0	0	0	0
1	7.47	7.99	8.5	7.6	2196	2358		0	0	0	0	0	0	0	0	0	0
2	7.62	7.70	8.7	7.9	2274	2335		0	0	0	0	0	0	0	0	0	0
3	7.86	8.16	8.8	6.8	2184	2570		0	6	0	5	X/0	0	4	0	X/0	0
4	7.69	7.86	8.6	7.4	2157	2624		6	0	6	0	-	5	0	5	-	7
5	7.60	7.87	8.1	6.6	2186	2350		13	13	12	12	-	9	X/0	9	-	-/12
6	—	7.55	—	7.3	~	2512		13	14	13	13	-	13	-	12	-	-
7												-		-		-	-
8												-		-		-	-
							Total=	32	33	31	30	X/0	27	X/4	26	X/6	-/19

Mean Neonates/Female = 20.3

1500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.81		8.6		2965			0	0	0	0	0	0	0	0	0	0
1	7.50	7.97	8.8	7.8	3130	3280		0	0	0	0	0	0	0	0	0	0
2	7.61	7.70	8.9	8.0	3289	3400		0	0	0	0	0	0	0	0	0	0
3	7.85	8.13	9.1	6.6	3050	3410		0	0	0	5	0	5	4	4	0	0
4	7.65	7.88	8.7	7.3	3020	3410		4	5	4	0	TF 4/23	0	0	0	4	4
5	7.61	7.87	8.3	4.7	3073	3420		9	10	11	9	0	10	7	8	9	7
6	—	7.55	—	7.1	—	3460		11	9	6	10	6	8	12	8	7	8
7																	
8																	
							Total=	24	24	21	24	9	23	23	20	20	19

Mean Neonates/Female = 20.7

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/16

Project #: 26308 Test ID: 69790 Control Water: SRW

2000 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.80		8.6		3910			0	0	0	0	0	0	0	0	0	0
1	7.50	7.97	9.0	7.7	4000	4120		C	0	0	0	0	0	0	0	0	0
2	7.64	7.71	9.1	8.5	3972	3901		+/0	+/0	+/0	0	0	0	0	0	+/0	0
3	7.84	8.12	9.0	6.9	3920	4300		–	–	–	0	0	0	0	0	–	0
4	7.65	7.85	9.0	7.5	4070	4360		–	–	–	2	0	0	2	0	–	0
5	7.62	7.83	8.5	6.6	3938	4470		–	–	–	5	3	0	6	3	–	4
6								–	–	–	0	6	4	10	5	–	3
7								–	–	–						–	
8								–	–	–						–	NR in MH
							Total=	+/0	+/0	+/0	7	9	4	18	8	+/0	~~47~~

Mean Neonates/Female = ~~5.0~~ 5.3 NR 10/19/16

2500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.77		9.1		4800		0	0	0	0	0	0	0	0	0	0
1	7.52	7.95	9.3	7.7	4850	5060	0	0	0	0	0	0	0	0	0	0
2	7.61	7.67	9.5	8.7	4837	5091	+/0	+/0	+/0	+/0	+/0	+/0	+/0	+/0	+/0	+/0
3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
8		–		–		–	–	–	–	–	–	–	–	–	–	–
						Total=	+/0	+/0	+/0	+/0	+/0	+/0	+/0	+/0	+/0	+/0

Mean Neonates/Female = 0

Paul Bedore
Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

October 19, 2016

Paul:

I have enclosed our report "An Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples to *Ceriodaphnia dubia*" for the Biological Effluent and Permeate samples collected September 6, 2016.

Chronic Effects of Biological Effluent and Permeate on *Ceriodaphnia dubia*
There was a significant reduction in survival in the 40% effluent blend treatment; the survival EC_{25} was 29% effluent blend resulting in 3.4 TUc. There were significant reductions in reproduction down through the 12.5% effluent blend treatment; the reproduction IC_{25} was 10.7% effluent blend, resulting in 9.3 TUc.

There was no significant reduction to survival observed in the unfiltered 25% treatment; however, a significant reduction in reproduction was observed when compared to the Lab Water Control.

If you have any questions regarding the performance and interpretation of these tests, feel free to contact my colleague Chris Dudenhoeffer or myself at (707) 207-7760.

Regards,

Stephen L. Clark
Vice President & Special Projects Director

An Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples to *Ceriodaphnia dubia*

Samples collected September 6, 2016

Prepared For:

Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

Prepared By:

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534

October 2016

PACIFIC ECORISK
ENVIRONMENTAL CONSULTING & TESTING

An Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples to *Ceriodaphnia dubia*

Samples collected September 6, 2016

Table of Contents

Appendices

1. INTRODUCTION

Under contract to the Robertson-Bryan, Pacific EcoRisk (PER) conducted an evaluation of the chronic toxicity of Lehigh Permanente Southwest Cement Company Reverse-Osmosis (RO) Biological Effluent and Permeate water samples. This evaluation consisted of performing the US EPA chronic 3-brood survival and reproduction test with the crustacean *Ceriodaphnia dubia*. This test was conducted on samples collected on September 6, 2016. In order to assess the sensitivity of the organisms to chemical stress, a monthly reference toxicant test was performed. This report describes the performance and results of these tests.

2. CHRONIC TOXICITY TEST PROCEDURES

This testing followed established guidelines in "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition (EPA-821-R-02-013)".

2.1 Receipt and Handling of the Biological Effluent and Permeate Samples

On September 6th, samples of Lehigh Biological Effluent and Permeate were collected into appropriately cleaned sample containers. These samples were transported the day of collection, on ice and under chain-of-custody, to the PER laboratory in Fairfield, CA. Aliquots of each water sample were collected for analysis of initial water quality characteristics (Table 1) with the remainder of each sample being stored at 0-6˚C except when being used to prepare test solutions. Based on client guidance, the Biological Effluent and Permeate samples were areared for 15 minutes upon receipt to address concerns about D.O. and sulfide concentrations. The post-aeration sulfide concentrations were 0.090 mg/L and 0.001 mg/L for the Biological Effluent and Permeate samples, respectively. The chain-of-custody records for the collection and delivery of the samples are presented in Appendix A.

Table 1. Initial water quality characteristics of the Biological Effluent and Permeate Samples.

Sample Receipt Date	Sample ID	Temp (°C)	pH	D.O. (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)	Conductivity (μS/cm)	Residual Chlorine (mg/L)	Total Ammonia (mg/L N)	Sulfide (mg/L)
9/6/16	Biological Effluent	7.1*	7.63	6.4	794	2570	3960	0.54	<1.00	0.80
9/6/16	Permeate	8.1*	7.79	8.5	3.7	1.2	19	0	<1.00	0.002

***** The samples were received on ice the day of sample collection; the temperature of the temperature blank was <6ºC.

2.2 Survival and Reproduction Toxicity Testing with *Ceriodaphnia dubia*

The chronic toxicity test with *C. dubia* consists of exposing individual females to several Biological Effluent/Permeate mixtures for the length of time it takes for the Lab Control treatment females to produce three broods (typically 6-8 days), after which effects on survival and reproduction are evaluated. The specific procedures used in this testing are described below.

The Lab Water Control medium for this test consisted of a synthetic reconstituted freshwater (SRW adjusted to EPA "moderately-hard" hardness), prepared by addition of reagent grade chemicals to Type 1 lab water. The Biological Effluent and Permeate samples were used to prepare daily test mixtures at concentrations of 6.25%, 12.5%, 18.75%, 25% and 40% Biological Effluent. Before sample preparation, both the Biological Effluent and Permeate samples were filtered using a 0.2µm filter. A separate unfiltered 25% Biological Effluent treatment was tested in addition to the filtered dilution series; a filtration blank consisting of 0.2 μm-filtered control water was also tested. For each test treatment, 200 mL aliquots of test solution were amended with the alga *Selenastrum capricornutum* and Yeast-Cerophyll®-Trout Food (YCT) to provide food for the test organisms. "New" water quality characteristics (pH, D.O., and conductivity) were measured on these food-amended test solutions prior to use in this testing.

There were 10 replicates for each test treatment, each replicate consisting of 15 mL of test solution in a 30-mL plastic cup. This "3-brood" test was initiated by allocating one neonate (<24 hrs old and within 8 hrs of age) *Ceriodaphnia*, obtained from in-house laboratory cultures, into each replicate cup. The test replicate cups were placed into a temperature-controlled room at 25°C, under cool white fluorescent lighting on a 16L:8D photoperiod.

Each day of the test, fresh test solutions were prepared and characterized as before, and a "new" set of replicate cups was prepared. The test replicate cups containing the test organisms were examined, with surviving organisms being transferred to the corresponding new cup. The contents of each of the remaining "old" replicate cups was carefully examined and the number of neonate offspring produced by each parent organism was determined, after which the "old" water quality characteristics (pH, D.O., and conductivity) were measured for the old solution from one randomly-selected replicate at each treatment.

After it was determined that ≥60% of the females in the Lab Water Control treatment had produced their third brood of offspring, the test was terminated. The resulting survival and reproduction (# of offspring) data were analyzed to evaluate any impairment(s) caused by the Biological Effluent/Permeate mixtures; all statistical analyses were performed using the CETIS® statistical software.

2.2.1 Reference Toxicant Testing of the *Ceriodaphnia dubia*

In order to assess the sensitivity of the test organisms to toxic stress, a monthly reference toxicant test was performed. The reference toxicant test was performed similarly to the effluent/permeate test except that test solutions consisted of modified Lab Control Water

medium spiked with NaCl at test concentrations of 500, 1000, 1500, 2000, and 2500 mg/L. The resulting test response data were statistically analyzed to determine key dose-response point estimates (e.g., EC_{50}); all statistical analyses were made using the CETIS® software. These response endpoints were then compared to the "typical response" ranges established by the mean ± 2 SD of the point estimates generated by the most recent previous reference toxicant tests performed by this lab.

3. RESULTS

3.1 Effects of Biological Effluent/Permeate on *Ceriodaphnia dubia*

The results of this test are summarized below in Table 2. There was a significant reduction in survival in the 40% effluent blend treatment; the survival EC_{25} was 29% effluent blend, resulting in 3.4 TUc. There were significant reductions in reproduction down through the 12.5% effluent blend treatment; the reproduction IC_{25} was 10.7% effluent blend, resulting in 9.3 TUc.

There were no significant reductions to survival observed in the unfiltered 25% treatment; however, a significant reduction in reproduction was observed when compared to the Lab Water Control.

As some of the replicates did not produce a third brood upon test termination on Day 6, the test was evaluated the following day. There were only minor differences in the outcome of the Day 7 test when compared to the Day 6 data.

The test data and summary of statistical analyses for this test through Day 6 are presented in Appendix B. The test data and summary of statistical analyses for this test through Day 7 are presented in Appendix C.

Table 2. Effects of Biological Effluent/Permeate blends on *Ceriodaphnia dubia*.

Test Treatment	% Survival	Reproduction (mean # of offspring)
Lab Water Control	100	24.3
Filtered Lab Water Control	100	23.3
6.25% Filtered Effluent Blend	90	22.4
12.5% Filtered Effluent Blend	90	**16.4***
18.75% Filtered Effluent Blend	100	**16.8***
25% Filtered Effluent Blend	90	**10.3***
40% Filtered Effluent Blend	**10***	2.2
25% Unfiltered Effluent Blend	90	**3.1***
Summary of Statistics		
NOEC =	25% Effluent Blend	6.25% Effluent Blend
TUc (where TUc = 100/NOEC)	4 TUc	16 TUc
Survival EC25 or Reproduction IC25 =	29.2% Effluent Blend	10.7% Effluent Blend
TUc (where TUc = 100/EC25 or 100/IC25) =	3.4 TUc	9.3 TUc
Survival EC50 or Reproduction IC50 =	32.6% Effluent Blend	23.2% Effluent Blend
TUc (where TUc = 100/EC50 or 100/IC50) =	3.1 TUc	4.3 TUc
Test PMSD	N/A	25.8%

* The response at this test treatment was significantly less than the Lab Water Control response at $p < 0.05$.

3.1.1 Reference Toxicant Toxicity to *Ceriodaphnia dubia*

The results of this test are summarized below in Table 3. The survival EC_{50} and reproduction IC_{50} for this test were consistent with the "typical response" ranges established by the reference toxicant test database for this species, indicating that these test organisms were responding to toxicant stress in a typical and consistent fashion. The test data and summary of statistical analyses for this test are presented in Appendix D.

Table 3. Reference toxicant testing: Effects of NaCl on *Ceriodaphnia dubia*.

NaCl Treatment (mg/L)	% Survival	Reproduction (# neonates/female)
Lab Water Control	100	25.6
500	100	**20.9***
1000	60	**11.5***
1500	**20***	2.2
2000	**30***	0.8
2500	**0***	**-**
Summary of Statistics		
Survival EC_{50} or Reproduction IC_{50} =	1200	931

* The response at this test treatment was significantly less than the Lab Control treatment response at $p < 0.05$.

4. SUMMARY & CONCLUSIONS

An chronic toxicity evaluation was performed on the Lehigh Permanente Cement Plant biological effluent and permeate water samples using *Ceriodaphnia dubia*. The results of this testing follow:

Effects of Biological Effluent/Permeate on *Ceriodaphnia dubia*
There was a significant reduction in survival in the 40% effluent blend treatment; the survival EC_{25} was 29% effluent blend, resulting in 3.4 TUc. There were significant reductions in reproduction down through the 12.5% effluent blend treatment; the reproduction IC_{25} was 10.7% effluent blend, resulting in 9.3 TUc.

There was no significant reduction to survival observed in the unfiltered 25% treatment; however, a significant reduction in reproduction was observed when compared to the Lab Water Control.

4.1 QA/QC Summary

Test Conditions – All test conditions (pH, D.O., temperature, etc.) were within acceptable limits for these tests. All test analyses were performed according to laboratory Standard Operating Procedures.

Negative Control – The biological responses for the test organisms at the Lab Control treatments were within acceptable limits.

Positive Control – The reference toxicant test survival EC_{50} and reproduction IC_{50} were both consistent with the "typical response" ranges established by the reference toxicant test database for this species, indicating that these test organisms were responding to toxicant stress in a typical and consistent fashion.

Concentration Response Relationships – The concentration-response relationships for these tests were evaluated as per EPA guidelines (EPA-821-B-00-004), and were determined to be acceptable for this testing.

Appendix A

Chain-of-Custody Record for the Collection and Delivery of the Lehigh Permanente Cement Plant Biological Effluent and Permeate Samples

Pacific EcoRisk
2250 Cordelia Rd., Fairfield, CA 94534
(707) 207-7760 FAX (707) 207-7916

CHAIN-OF-CUSTODY RECORD

Results To:	Robertson-Bryan, Inc	**Invoice To:**	Same
Address:	9888 Kent Street Elk Grove, CA 95624	**Address:**	
Phone:	(916) 405-8918	**Phone:**	
Attn:	Paul Bedore	**Attn:**	Sam Barket
E-mail:	paul@robertson-bryan.com	**E-mail:**	sam.Barket@lehighhanson.com
Project Name:	Lehigh TRE Testing		
P.O.#/Ref:			

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Grab/ Comp	Container Number	Container Type	REQUESTED ANALYSIS: *Ceriodapnia dubia* Survival and Reproduction, EPA 1002.0
1	Biological Effluent	9/6/16	9:40AM	FW	Grab	2	2.5-gal LDPE Cube	x
2	Permeate	9/6/16	9:50AM	FW	Grab	2	2.5-gal LDPE Cube	x
3								
4								
5								
6								
7								
8								
9								
10								

Samples collected by:

Comments/Special Instruction:

Test mixtures of permeate and biological effluent specified in Sept. 2016 test plan provided to PER by P Bedore against shared lab water control.

RELIQUINSHED BY: Courtney Perry	**RECEIVED BY:**
Signature: Courtney Perry	**Signature:**
Print:	**Print:** Lindsey Freeman
Organization: Lehigh	**Organization:** PER
Date: 9/6/16 **Time:**	**Date:** 9/6/16 **Time:** 1100
RELIQUINSHED BY:	**RECEIVED BY:**
Signature:	**Signature:**
Print:	**Print:**
Organization:	**Organization:**
Date: **Time:**	**Date:** **Time:**

***Example Matrix Codes**: (EFF - Effluent) (FW = Freshwater); (SW = Saltwater); (WW = Wastewater); (STRMW = Stormwater); (SED = Sediment); or other

Appendix B

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of the Lehigh Permanente Cement Plant Biological Effluent and Permeate Samples to *Ceriodaphnia dubia* - Day 6

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Batch ID:	11-3483-0410	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Chris Dudenhoeffer
Start Date:	07 Sep-16 16:40	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	UFRO Permeate
Ending Date:	13 Sep-16 16:00	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	5d 23h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	03-2813-4514	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	06 Sep-16 09:40	**Material:**	Effluent	**Project:**	26261
Receive Date:	06 Sep-16 11:00	**Source:**	Lehigh Permanente		
Sample Age:	31h (7.1 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include Day 6 Filtered Sample

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
06-8061-9818	Reproduction	0	>0		21.2%		Equal Variance t Two-Sample Test
05-4862-5344	Reproduction	6.25	12.5	8.839	25.8%	16	Steel Many-One Rank Sum Test
07-6351-7444	Survival	0	>0		NA		Fisher Exact Test
18-3405-8270	Survival	25	40	31.62	NA	4	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
06-6135-9619	Reproduction	IC5	4	1.06	8.57	25.02	Linear Interpolation (ICPIN)
		IC10	6.82	2.12	11.2	14.66	
		IC15	8.13	3.18	14.5	12.3	
		IC20	9.44	4.24	19	10.59	
		IC25	10.7	5.3	20.1	9.303	
		IC40	20.8	11.5	23.1	4.818	
		IC50	23.2	20.3	25.9	4.317	
05-8943-1489	Survival	EC5	25	6.76	30.5	4.004	Linear Regression (MLE)
		EC10	26.5	8.73	31.8	3.774	
		EC15	27.6	10.4	32.7	3.627	
		EC20	28.5	11.9	33.5	3.514	
		EC25	29.2	13.3	34.3	3.42	
		EC40	31.3	17.6	36.6	3.194	
		EC50	32.6	20.6	38.4	3.065	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	24.3	19.2	29.4	14	32	2.26	7.15	29.4%	0.0%
0	Filtration Blank	10	23.3	18.9	27.7	14	31	1.93	6.09	26.1%	4.12%
6.25		10	22.4	16.3	28.5	3	34	2.72	8.59	38.4%	7.82%
12.5		10	16.4	10.5	22.3	0	29	2.6	8.21	50.1%	32.5%
18.75		10	16.8	14.1	19.5	13	23	1.2	3.79	22.6%	30.9%
25		10	9.9	7.95	11.9	5	14	0.862	2.73	27.5%	59.3%
40		10	2.2	-0.0571	4.46	0	10	0.998	3.16	143.0%	90.9%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Filtration Blank	10	1	1	1	1	1	0	0	0.0%	0.0%
6.25		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
12.5		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
18.75		10	1	1	1	1	1	0	0	0.0%	0.0%
25		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
40		10	0.1	0	0.326	0	1	0.1	0.316	316.0%	90.0%

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	16	18	26	29	32	32	26	32	14	18
0	Filtration Blank	18	17	17	27	27	27	29	14	31	26
6.25		21	3	26	25	34	18	29	25	27	16
12.5		14	16	13	0	29	17	23	12	26	14
18.75		17	13	21	13	21	14	15	18	23	13
25		7	11	13	9	12	14	9	10	9	5
40		2	0	2	0	2	10	0	5	1	0

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Filtration Blank	1	1	1	1	1	1	1	1	1	1
6.25		1	0	1	1	1	1	1	1	1	1
12.5		1	1	1	0	1	1	1	1	1	1
18.75		1	1	1	1	1	1	1	1	1	1
25		1	1	1	1	1	1	1	1	1	0
40		0	0	0	0	0	1	0	0	0	0

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Filtration Blank	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6.25		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
18.75		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
40		0/1	0/1	0/1	0/1	0/1	1/1	0/1	0/1	0/1	0/1

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	07-6351-7444	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Sep-16 10:41	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

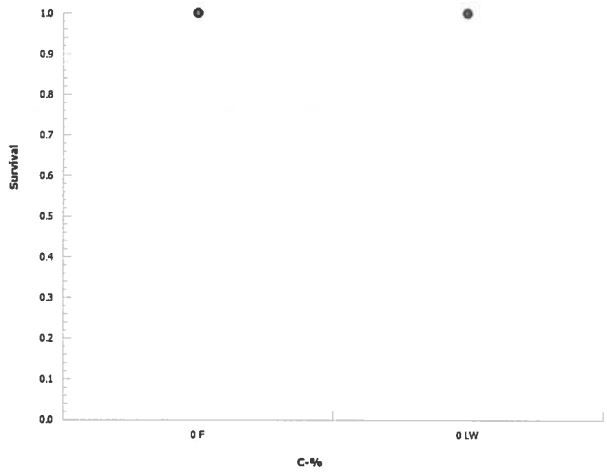
Fisher Exact Test

Control	vs	Control	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Filtration Blank	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
0	Filtration Blank	10	0	10	1	0	0.0%

Graphics



Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	06-8061-9818	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Sep-16 10:42	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	21.2%	Passes reproduction

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Filtration Blank	0.337	1.73	5.15	18	0.3701	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	5	5	1	0.113	0.7403	Non-Significant Effect
Error	794.2	44.12222	18			
Total	799.2		19			

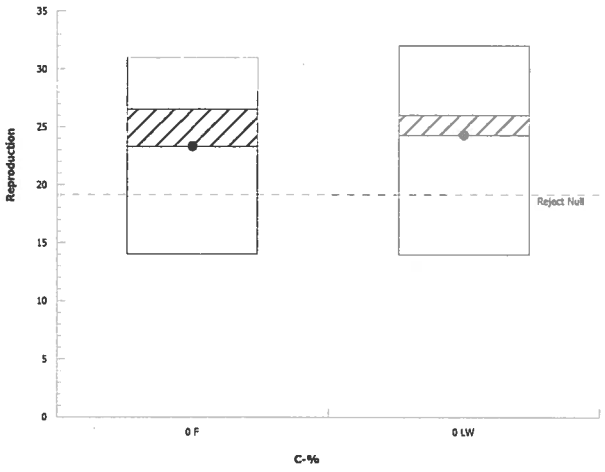
Distributional Tests

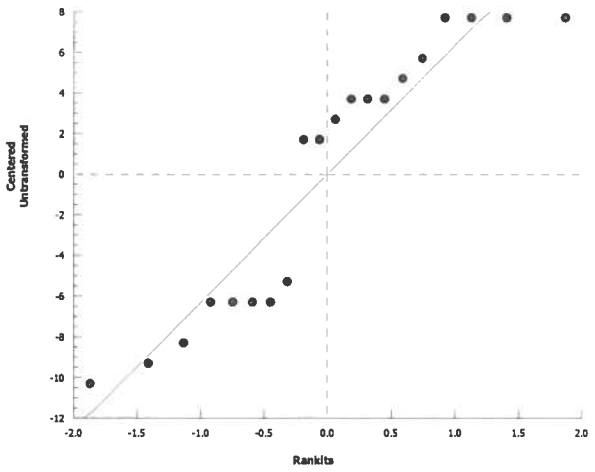
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.38	6.54	0.6413	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.867	0.866	0.0105	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	24.3	19.2	29.4	26	14	32	2.26	29.4%	0.0%
0	Filtration Blank	10	23.3	18.9	27.7	26.5	14	31	1.93	26.1%	4.12%

Graphics





Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Randomization: ~~10.7.1/10.1.1~~ 10.6.1/10.2.1 WC 9/7/16 Control Water: SRW 0.2µm Filt.

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
Filtered Control	0	7.87		7.5		330		0	0	0	0	0	0	0	0	0	0	Date: 9/7/16 New WQ: WC Test Init.: SH Sol'n Prep: BV Time: 1640
	1	8.10	8.37	8.6	7.8	~~362~~ 322 BV 9/8/16		0	0	0	0	0	0	0	0	0	0	Date: 9/8/16 New WQ: RB Counts: BV Sol'n Prep: BV Old WQ: MM Time: 1030
	2	8.66	8.68	9.4	7.7	315		0	0	0	0	0	0	0	0	0	0	Date: 9/9/16 New WQ: JL Counts: BV Sol'n Prep: BV Old WQ: JL Time: 1125
	3	8.78	8.39	9.0	7.0	314		0	0	0	0	0	0	0	0	0	0	Date: 9/10/16 New WQ: JO Counts: JO Sol'n Prep: JO Old WQ: DM Time: 1430
	4	8.32	8.44	10.5	6.8	300		6	6	6	5	6	6	6	0	6	5	Date: 9/11/16 New WQ: JO Counts: SH Sol'n Prep: SH Old WQ: TA Time: 1215
	5	8.04	8.39	9.9	6.9	306		12	11	10	10	11	10	11	5	12	12	Date: 9/12/16 New WQ: HR Counts: SH Sol'n Prep: SH Old WQ: HR Time: 1320
	6	7.80	8.08	9.2	7.6	317		0	0	1	12	10	11	12	9	13	9	Date: 9/13/16 New WQ: JL Counts: JO Sol'n Prep: JO Old WQ: DM Time: 1600
	7																	Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
	8																	Date: Old WQ: Counts: Time:
							Total=	18	17	17	27	27	27	29	14	31	26	Mean Neonates/Female = 23.3

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	18-3405-8270	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Sep-16 10:42	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	25	40	31.62	4

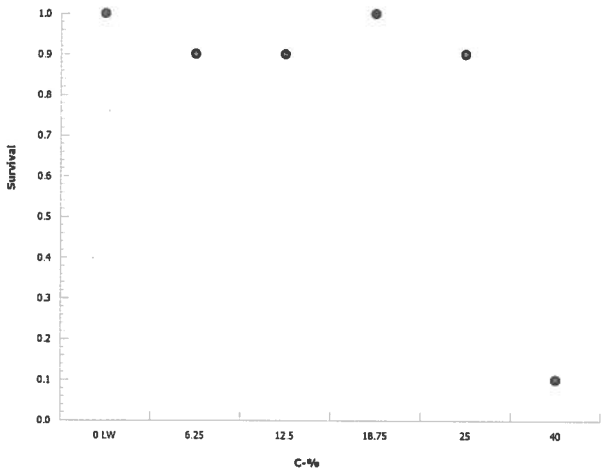
Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	0.5	1.0000	Exact	Non-Significant Effect
		12.5	0.5	1.0000	Exact	Non-Significant Effect
		18.75	1	1.0000	Exact	Non-Significant Effect
		25	0.5	1.0000	Exact	Non-Significant Effect
		40	5.95E-05	0.0003	Exact	Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
6.25		9	1	10	0.9	0.1	10.0%
12.5		9	1	10	0.9	0.1	10.0%
18.75		10	0	10	1	0	0.0%
25		9	1	10	0.9	0.1	10.0%
40		1	9	10	0.1	0.9	90.0%

Graphics



Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	05-8943-1489	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Sep-16 10:42	**Analysis:**	Linear Regression (MLE)	**Official Results:**	Yes

Linear Regression Options

Model Function	Threshold Option	Threshold	Optimized	Pooled	Het Corr	Weighted
Log-Normal [NED=A+B*log(X)]	Control Threshold	1E-07	Yes	Yes	No	Yes

Regression Summary

Iters	LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision(α:5%)
14	-14.4	46.9	34.3	1.51	0.0706	0.907				Lack of Fit Not Tested

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC5	25	6.76	30.5	4.004	3.276	14.8
EC10	26.5	8.73	31.8	3.774	3.146	11.45
EC15	27.6	10.4	32.7	3.627	3.056	9.649
EC20	28.5	11.9	33.5	3.514	2.983	8.432
EC25	29.2	13.3	34.3	3.42	2.917	7.521
EC40	31.3	17.6	36.6	3.194	2.735	5.686
EC50	32.6	20.6	38.4	3.065	2.606	4.853

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(α:5%)
Threshold	0.0502	0.0347	-0.0178	0.118	1.45	0.2438	Non-Significant Parameter
Slope	14.2	5.61	3.17	25.2	2.53	0.0858	Non-Significant Parameter
Intercept	-21.5	8.72	-38.5	-4.37	-2.46	0.0908	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	35.39943	35.39943	1	50.6	0.0057	Significant
Residual	2.100573	0.700191	3			

Residual Analysis

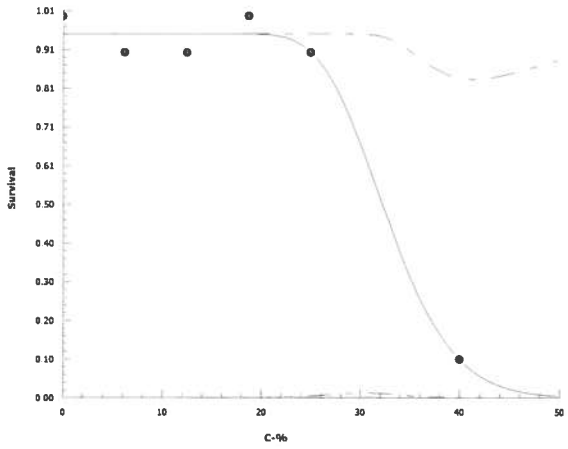
Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Goodness-of-Fit	Pearson Chi-Sq GOF	2.1	7.81	0.5518	Non-Significant Heterogenity
	Likelihood Ratio GOF	2.88	7.81	0.4097	Non-Significant Heterogenity
Distribution	Shapiro-Wilk W Normality	0.856	0.513	0.1761	Normal Distribution

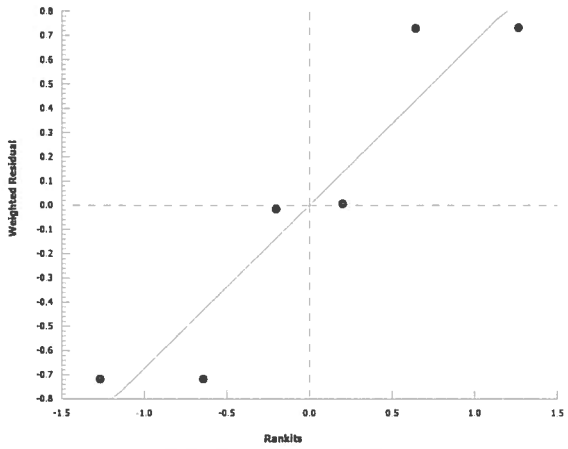
Survival Summary

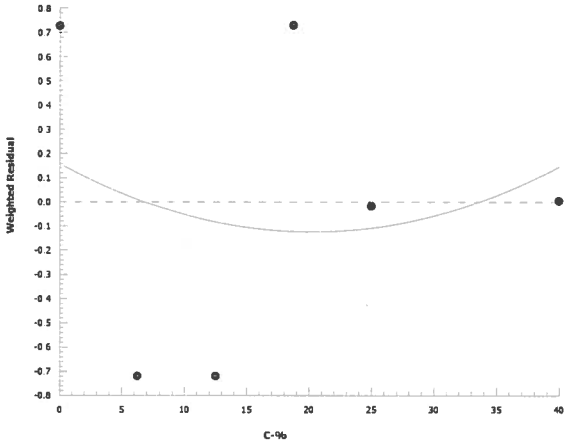
			Calculated Variate(A/B)								
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Water Contr	10	1	1	1	0	0	0.0%	0.0%	10	10
6.25		10	0.9	0	1	0.1	0.316	35.1%	10.0%	9	10
12.5		10	0.9	0	1	0.1	0.316	35.1%	10.0%	9	10
18.75		10	1	1	1	0	0	0.0%	0.0%	10	10
25		10	0.9	0	1	0.1	0.316	35.1%	10.0%	9	10
40		10	0.1	0	1	0.1	0.316	316.0%	90.0%	1	10

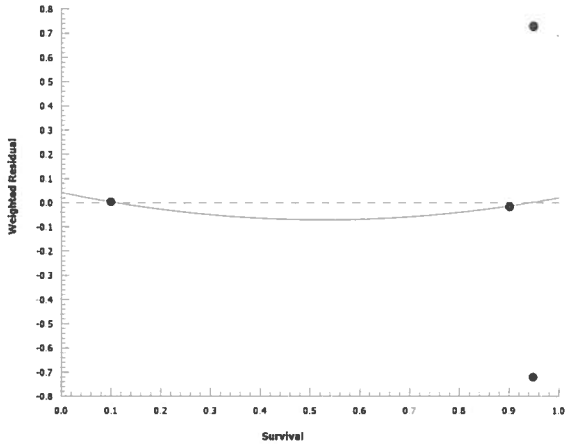
Ceriodaphnia Survival and Reproduction Test					Pacific EcoRisk
Analysis ID:	05-8943-1489	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Sep-16 10:42	**Analysis:**	Linear Regression (MLE)	**Official Results:**	Yes

Graphics Log-Normal [NED=A+B*log(X)]









Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	05-4862-5344	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Sep-16 10:42	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	25.8%	6.25	12.5	8.839	16

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	99	75	4	18	0.6654	Asymp	Non-Significant Effect
		12.5*	75	75	4	18	0.0461	Asymp	Significant Effect
		18.75*	73.5	75	2	18	0.0350	Asymp	Significant Effect
		25*	55.5	75	1	18	0.0004	Asymp	Significant Effect
		40*	55	75	0	18	0.0004	Asymp	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	3314.2	662.84	5	17.7	<0.0001	Significant Effect
Error	2024.2	37.48518	54			
Total	5338.4		59			

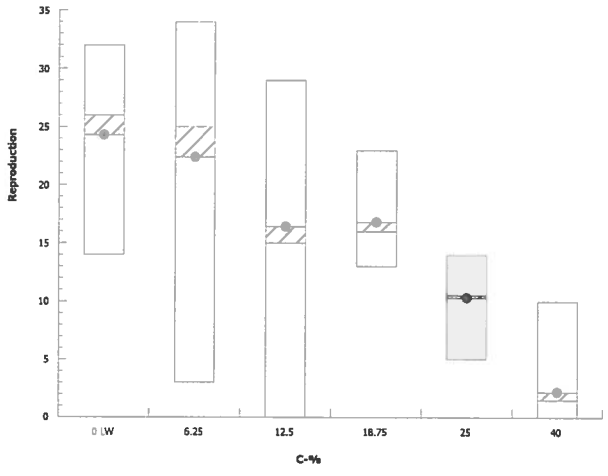
Distributional Tests

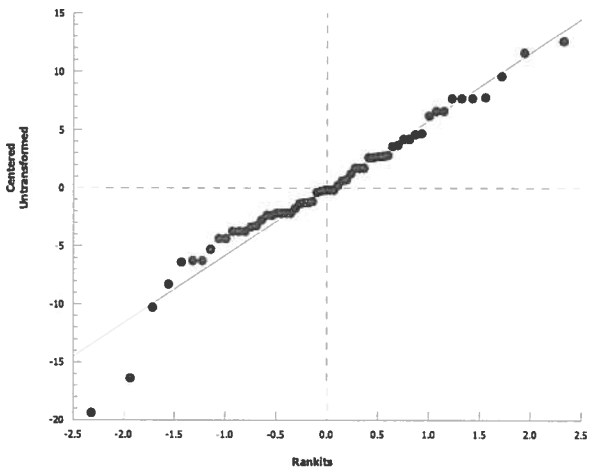
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	19.2	15.1	0.0018	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.96	0.946	0.0482	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	24.3	19.2	29.4	26	14	32	2.26	29.4%	0.0%
6.25		10	22.4	16.3	28.5	25	3	34	2.72	38.4%	7.82%
12.5		10	16.4	10.5	22.3	15	0	29	2.6	50.1%	32.5%
18.75		10	16.8	14.1	19.5	16	13	23	1.2	22.6%	30.9%
25		10	10.3	8.25	12.4	10.5	5	14	0.907	27.9%	57.6%
40		10	2.2	-0.0571	4.46	1.5	0	10	0.998	143.0%	90.9%

Graphics





CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	06-6135-9619	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	20 Sep-16 10:42	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1502066	200	Yes	Two-Point Interpolation

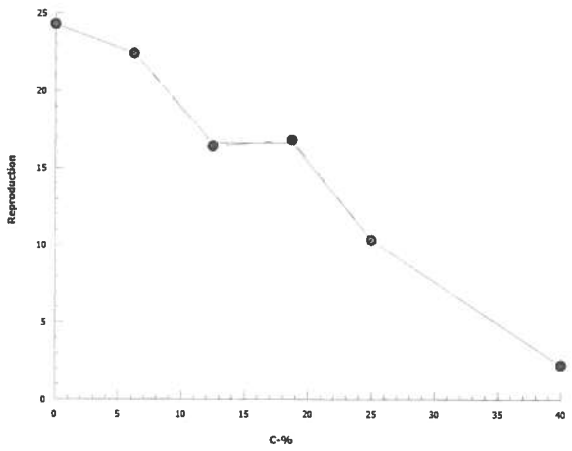
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	4	1.06	8.57	25.02	11.67	94.31
IC10	6.82	2.12	11.2	14.66	8.906	47.15
IC15	8.13	3.18	14.5	12.3	6.915	31.44
IC20	9.44	4.24	19	10.59	5.275	23.58
IC25	10.7	5.3	20.1	9.303	4.98	18.86
IC40	20.8	11.5	23.1	4.818	4.33	8.726
IC50	23.2	20.3	25.9	4.317	3.864	4.936

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	24.3	14	32	2.26	7.15	29.4%	0.0%
6.25		10	22.4	3	34	2.72	8.59	38.4%	7.82%
12.5		10	16.4	0	29	2.6	8.21	50.1%	32.5%
18.75		10	16.8	13	23	1.2	3.79	22.6%	30.9%
25		10	10.3	5	14	0.907	2.87	27.9%	57.6%
40		10	2.2	0	10	0.998	3.16	143.0%	90.9%

Graphics



Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Lab Water Control** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Randomization: ~~10.7.1/10.1.1~~ 10.6.1/10.2.1 (ws 9/7/16) Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
Lab Water Control	0	7.81		7.7		319	24.9	0	0	0	0	0	0	0	0	0	0
	1	7.96	8.00	8.0	6.7	322	25.1	0	0	0	0	0	0	0	0	0	0
	2	7.85	7.45	8.5	7.8	314	25.7	0	0	0	0	0	0	0	0	0	0
	3	7.97	7.23	8.5	6.9	312	25.5	0	0	0	0	0	0	0	0	0	0
	4	7.44	7.80	~~8.8~~ 8.4 9/11/16	7.1	311	25.7	5	6	6	6	7	7	5	6	5	6
	5	7.72	7.67	7.9	6.5	307	25.5	11	12	11	9	10	12	10	11	9	12
	6	7.85	7.87	8.4	7.7	320	25.6	0	0	9	14	15	13	11	15	0	0
	7																
	8																
							Total=	16	18	26	29	32	32	26	32	14	18

SIGN-OFF

Date: 9/7/16 New WQ: CoC Test Init: SH
Sol'n Prep: BV Time: 1640

Date: 9/8/16 New WQ: RB Counts: BV
Sol'n Prep: BV Old WQ: MD Time: 1030

Date: 9/9/16 New WQ: JAL Counts: BV
Sol'n Prep: BV Old WQ: JL Time: 1125

Date: 9/10/16 New WQ: JO Counts: JO
Sol'n Prep: JO Old WQ: DM Time: 1430

Date: 9/11/16 New WQ: JO Counts: SH
Sol'n Prep: SH Old WQ: JL Time: 1215

Date: 9/12/16 New WQ: AR Counts: SH
Sol'n Prep: SH Old WQ: AR Time: 1320

Date: 9/13/16 New WQ: JL Counts: JO
Sol'n Prep: JO Old WQ: DM Time: 1600

Date: New WQ: Counts:
Sol'n Prep: Old WQ: Time:

Date: Old WQ: Counts:
Time:

Mean Neonates/Female = 24.3

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Biological Effluent 0.2µm Filt.** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Randomization: ~~10.7.1 / 10.1.1~~ 10.6.1/10.2.1 Diluent: **UFRO Permeate 0.2µm Filt.**

6.25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.91		9.1		393	24.9	0	0	0	0	0	0	0	0	0	0
1	7.81	7.91	9.0	6.7	401	25.1	0	0	0	0	0	0	0	0	0	0
2	7.87	7.35	9.5	7.4	391	25.7	0	0	0	0	0	0	0	0	0	0
3	7.84	7.18	9.0	7.0	394	25.5	0	0	0	0	0	0	0	0	0	0
4	7.49	7.67	9.5	6.1	~~369~~ 406 SH 9/11	25.7	6	~~4~~/3	5	5	6	6	6	6	6	5
5	7.75	~~7.57~~ 7.65 SH 9/11/16	9.0	7.2	~~375~~ 401 9/12 SH	25.5	12	–	10	9	12	12	10	9	11	11
6	7.55	7.73	9.2	7.6	395	25.1	3	–	11 JR 9/13/16	11	16	0	13	10	10	0
7								–								
8								–								
						Total=	21	~~4~~/3	26	25	34	18	29	25	27	16

Mean Neonates/Female = 22.4

SIGN-OFF

Date: 9/7/16 New WQ: WC Test Init: SH
Sol'n Prep: BV Time: 1640

Date: 9/8/16 New WQ: RB Counts: BV
Sol'n Prep: BV Old WQ: MD Time: 1030

Date: 9/9/16 New WQ: JH Counts: BV
Sol'n Prep: BJ Old WQ: JL Time: 1125

Date: 9/10/16 New WQ: JO Counts: JO
Sol'n Prep: JO Old WQ: DM Time: 1430

Date: 9/11/16 New WQ: JO Counts: SH
Sol'n Prep: SH Old WQ: TA Time: 1215

Date: 9/12/16 New WQ: BR Counts: SH
Sol'n Prep: SH Old WQ: HR Time: 1320

Date: 9/13/16 New WQ: JL Counts: JO
Sol'n Prep: JO Old WQ: DM Time: 1600

Date: New WQ: Counts:
Sol'n Prep: Old WQ: Time:

Date: Old WQ: Counts:
Time:

12.5%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.87		8.9		714	0	0	0	0	0	0	0	0	0	0
1	7.65	~~7.83~~	9.4	7.7	725	0	0	0	0	0	0	0	0	0	0
2	7.90	7.32	9.6	7.4	~~770~~ 770 SH 9/9/16	0	0	0	~~1~~/0	0	0	0	0	0	0
3	7.77	7.16	9.2	6.9	725	0	0	0	–	0	0	0	0	0	0
4	7.48	7.54	10.3	6.3	~~706~~ ~~686~~ 720 SH 9/11	6	6	5	–	6	5	5	3	5	4
5	7.67	~~7.43~~	9.8	7.3	~~675~~ SH 9/12	8	10	8	–	13	12	10	9	10	10
6	7.39	7.55	9.3	6.6	715	0	0	0	–	10	0	8	0	11	0
7									–						
8															
					Total=	14	16	13	~~1~~/0	29	17	23	12	26	19

Mean Neonates/Female = 16.9

Sample ID: EFF / PERMEATE

0	44017/44018
1	44017/44018
2	44017/44018
3	44017/44018
4	44017/44018
5	44017/44018
6	44017/44018
7	
8	

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Biological Effluent 0.2µm Filt.** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Diluent: **UFRO Permeate 0.2µm Filt.**

18.75%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	8.08		8.6		1005		0	0	0	0	0	0	0	0	0	0	
1	7.64	7.88	9.7	7.4	1044		0	0	0	0	0	0	0	0	0	0	
2	8.13	7.62	9.7	7.3	1045		0	0	0	0	0	0	0	0	0	0	
3	7.96	7.35	9.2	7.0	1007		0	0	0	0	0	0	0	0	0	0	
4	7.72	7.63	10.8	6.0	1010 9665 SH		5	6	4	5	5	5	5	2	6	5	
5	7.53	7.60	9.6	7.0	SH 9/12 990 931		6	7	9	8	9	9	10	6	7	8	
6	7.32	7.52	9.4	7.3	1007		6	0	8	0	7	0	0	10	10	0	
7																	
8																	
						Total=	17	13	21	13	21	14	15	18	23	13	Mean Neonates/Female = 16.8

25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)		Survival / Reproduction A	B	C	D	E	F	G	H	I	J	
0	8.22		8.6		1328		0	0	0	0	0	0	0	0	0	0	
1	7.67	8.04	9.6	7.4	1314		0	0	0	0	0	0	0	0	0	0	
2	8.15	7.75	9.4	6.4	1301		0	0	0	0	0	0	0	0	0	0	
3	8.08	7.47	9.1	6.8	1295		0	0	0	0	0	0	0	0	0	0	
4	7.79	8.02	10.5	6.3	1255		4	5	5	4	5	6	4	4	3	x/s	
5	7.50	7.77	9.9	6.5	1304 1238 SH 9/12		0	6	8	5	7	7	5	0	0	–	
6	7.30	7.51	9.4	7.5	1279		3	0	0	0	0	1	0	6	10	–	
7																–	
8																–	
						Total=	7	11	13	9	12	14	9	10	13	x/s	Mean Neonates/Female = 10.3 9.9

9 COD 9/20

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Biological Effluent 0.2µm Filt.** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Diluent: **UFRO Permeate 0.2µm Filt.**

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
40%	0	8.18		8.7		1908		0	0	0	0	0	0	0	0	0	0
	1	7.66	8.17	9.6	7.6	1939		0	0	0	0	0	0	0	0	0	0
	2	8.23	8.04	9.5	6.4	1840		0	0	0	0	0	0	0	0	0	0
	3	8.23	8.19	9.0	6.2	1885		0	X/0 (no qlicel)	0	0	0	0	0	0	0	X/0
	4	7.90	8.18	10.7	6.1	1850		0	X/0	X/2	X/0	2	5	0	3	1	–
	5	7.50	7.95	10.0	6.0	1826		X/2	–	–	–	0	5	0	0	0	–
	6	7.24	7.57	9.5	7.5	1865		–	–	–	–	X/0	0	X/0	X/2	X/0	–
	7							–	–	–	–	–		–	–	–	–
	8							–	–	–	–	–		–	–	–	–
							Total=	X/2	X/0	X/2	X/0	X/2	10	X10	X15	X/8	X/0

Mean Neonates/Female = 2.2

9/20/16 CJD

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	01-2831-4913	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 11:11	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

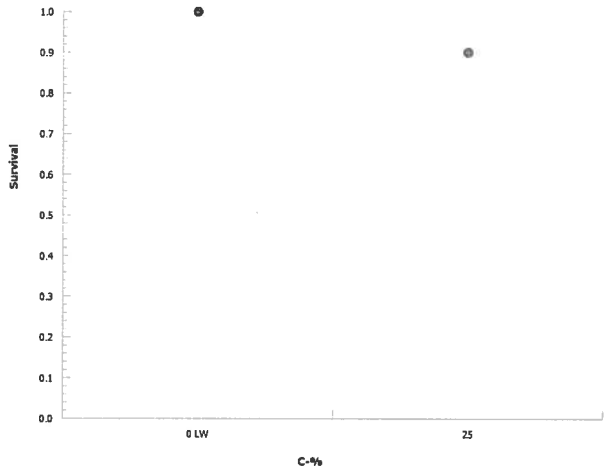
Fisher Exact Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		25	0.5	0.5000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
25		9	1	10	0.9	0.1	10.0%

Graphics



Analyst: CSD QA:

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	12-1136-1135	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 11:11	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	17.7%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		25*	8.55	1.73	4.3	18	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2247.2	2247.2	1	73.1	<0.0001	Significant Effect
Error	553	30.72222	18			
Total	2800.2		19			

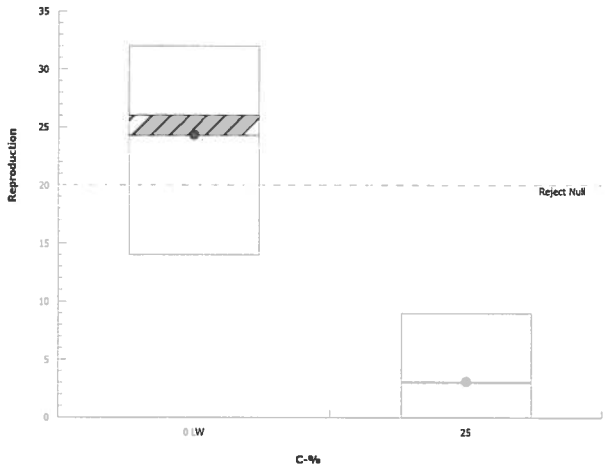
Distributional Tests

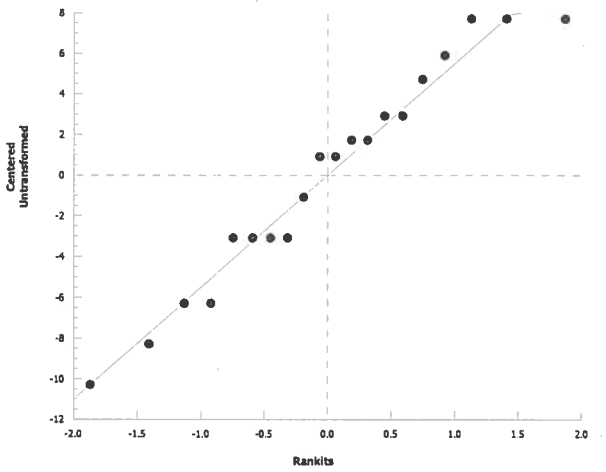
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	4.95	6.54	0.0259	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.955	0.866	0.4416	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	24.3	19.2	29.4	26	14	32	2.26	29.4%	0.0%
25		10	3.1	0.802	5.4	3	0	9	1.02	104.0%	87.2%

Graphics





Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Biological Effluent** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Randomization: ~~10.7.1/10.1.1~~ 10.2.1/10.2.1 wc 9/7/16 Control Water: UFRO Permeate- Unfiltered

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
Unfiltered 25%	0	8.40		8.8		1297		0	0	0	0	0	0	0	0	0	0	Date: 9/7/16 New WQ: WC Test Init: SH Sol'n Prep: BV Time: 1640
	1	7.78	8.40	9.8	7.9	1360		0	0	0	0	0	0	0	0	0	0	Date: 9/8/16 New WQ: RR Counts: BV Sol'n Prep: BV Old WQ: MD Time: 1030
	2	8.35	8.25	9.4	7.1	1292		0	0	0	0	0	0	0	0	0	0	Date: 9/9/16 New WQ: JM Counts: BV Sol'n Prep: BV Old WQ: JL Time: 1125
	3	8.31	7.97	9.0	7.0	1258		0	0	0	0	0	0	X/0	0	0	0	Date: 9/10/16 New WQ: JR Counts: JO Sol'n Prep: JO Old WQ: DM Time: 1430
	4	8.00	8.33	10.4	7.4	1277		0	0	0	0	0	0	–	0	0	0	Date: 9/11/16 New WQ: JR Counts: SH Sol'n Prep: SH Old WQ: TA Time: 1215
	5	7.64	8.14	9.5	6.9	1242		0	0	3	4	6	2	–	6	0	0	Date: 9/12/16 New WQ: JR Counts: SH Sol'n Prep: SH Old WQ: JR Time: 1320
	6	7.42	7.57	9.5	7.5	1274		0	0	6	0	0	0	–	0	0	4	Date: 9/13/16 New WQ: SL Counts: JO Sol'n Prep: JO Old WQ: DM Time: 1600
	7													–				Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
	8													–				Date: Old WQ: Counts: Time:
							Total=	0	0	9	4	6	2	X/0	6	0	4	Mean Neonates/Female = 3.1

Appendix C

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of the Lehigh Permanente Cement Plant Biological Effluent and Permeate Samples to *Ceriodaphnia dubia* - Day 7

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	19-0590-5450	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Chris Dudenhoeffer
Start Date:	07 Sep-16 16:40	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	UFRO Permeate
Ending Date:	14 Sep-16 15:30	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 23h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	19-2655-6215	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	06 Sep-16 09:40	**Material:**	Effluent	**Project:**	26261
Receive Date:	06 Sep-16 11:00	**Source:**	Lehigh Permanente		
Sample Age:	31h (7.1 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include Day 7 Filtered Sample

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
09-5523-7171	Reproduction	6.25	12.5	8.839	20.5%	16	Steel Many-One Rank Sum Test
17-7394-8257	Reproduction	0	>0		10.7%		Wilcoxon Rank Sum Two-Sample Test
06-4236-4393	Survival	0	>0		NA		Fisher Exact Test
14-9642-5071	Survival	25	40	31.62	NA	4	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
17-3534-4086	Reproduction	IC5	2.03	1.11	7.71	49.23	Linear Interpolation (ICPIN)
		IC10	4.06	2.22	12.9	24.62	
		IC15	6.09	3.34	15.1	16.41	
		IC20	10	4.45	17.7	10	
		IC25	14.6	5.56	19.8	6.843	
		IC40	22	19.6	24.2	4.539	
		IC50	25	22.9	27.4	4.008	
04-6038-3951	Survival	EC5	22.4	9.99	27.3	4.464	Linear Regression (MLE)
		EC10	24.1	12.3	28.8	4.154	
		EC15	25.3	14.2	29.9	3.957	
		EC20	26.3	15.8	30.9	3.807	
		EC25	27.2	17.3	31.9	3.683	
		EC40	29.5	21.4	34.9	3.388	
		EC50	31	24	37.5	3.222	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	29.9	27.8	32	26	35	0.936	2.96	9.9%	0.0%
0	Filtration Blank	10	27.2	23.6	30.8	14	31	1.58	5.01	18.4%	9.03%
6.25		10	25.3	19	31.6	3	34	2.77	8.76	34.6%	15.4%
12.5		10	23	16.6	29.4	0	32	2.84	8.99	39.1%	23.1%
18.75		10	21.3	18.4	24.2	14	27	1.27	4.03	18.9%	28.8%
25		10	14.9	11.8	18	5	22	1.37	4.33	29.1%	50.2%
40		10	2.4	-0.26	5.06	0	12	1.18	3.72	155.0%	92.0%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Filtration Blank	10	1	1	1	1	1	0	0	0.0%	0.0%
6.25		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
12.5		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
18.75		10	1	1	1	1	1	0	0	0.0%	0.0%
25		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
40		10	0.1	0	0.326	0	1	0.1	0.316	316.0%	90.0%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	28	31	26	29	32	32	26	32	28	35
0	Filtration Blank	29	31	31	27	27	27	29	14	31	26
6.25		21	3	26	25	34	33	29	25	27	30
12.5		27	32	27	0	29	17	23	24	26	25
18.75		17	23	21	23	21	14	27	18	23	26
25		13	22	17	16	17	14	16	16	13	5
40		2	0	2	0	2	12	0	5	1	0

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Filtration Blank	1	1	1	1	1	1	1	1	1	1
6.25		1	0	1	1	1	1	1	1	1	1
12.5		1	1	1	0	1	1	1	1	1	1
18.75		1	1	1	1	1	1	1	1	1	1
25		1	1	0	1	1	1	1	1	1	0
40		0	0	0	0	0	1	0	0	0	0

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Filtration Blank	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
6.25		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
18.75		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1
40		0/1	0/1	0/1	0/1	0/1	1/1	0/1	0/1	0/1	0/1

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	06-4236-4393	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 15:30	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

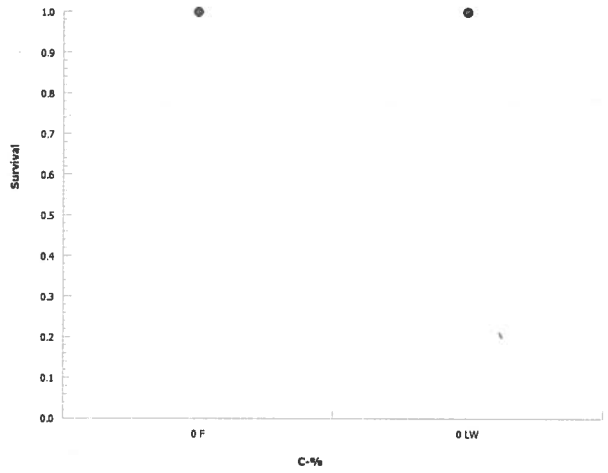
Fisher Exact Test

Control	vs	Control	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Filtration Blank	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
0	Filtration Blank	10	0	10	1	0	0.0%

Graphics



Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	17-7394-8257	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 15:30	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.7%	Passes reproduction

Wilcoxon Rank Sum Two-Sample Test

Control	vs	Control	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Filtration Blank	87.5	NA	3	18	0.0962	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	36.45	36.45	1	2.15	0.1594	Non-Significant Effect
Error	304.5	16.91667	18			
Total	340.95		19			

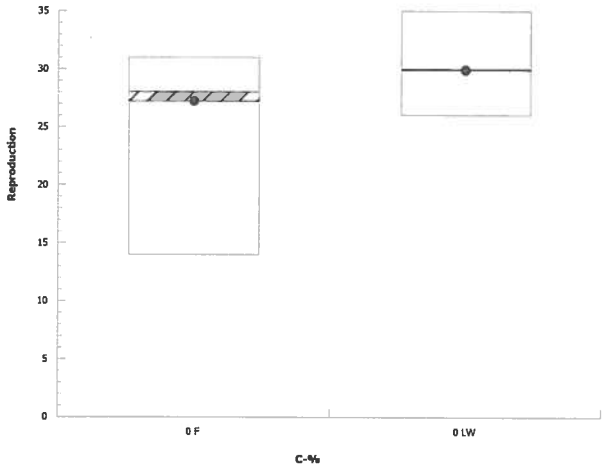
Distributional Tests

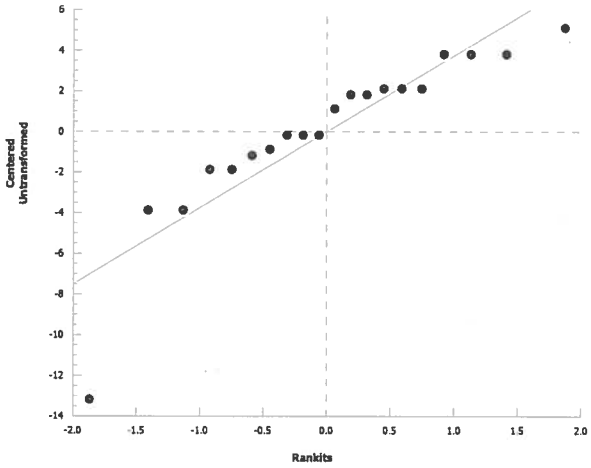
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.86	6.54	0.1335	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.837	0.866	0.0032	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	29.9	27.8	32	30	26	35	0.936	9.9%	0.0%
0	Filtration Blank	10	27.2	23.6	30.8	28	14	31	1.58	18.4%	9.03%

Graphics





Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: _____ Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Randomization: ~~10.7.1/10.1.1~~ 10.6.1/10.2.1 WC 9/5/16 Control Water: SRW 0.2µm Filt.

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
Filtered Control	0	7.87		7.5		330		0	0	0	0	0	0	0	0	0	0	Date: 9/7/16 New WQ: WC Test Init.: SH Sol'n Prep: BV Time: 1640
	1	8.10	8.37	8.6	7.8	~~322~~ 362 9/9/16		0	0	0	0	0	0	0	0	0	0	Date: 9/8/16 New WQ: RB Counts: BV Sol'n Prep: BV Old WQ: MS Time: 1030
	2	8.66	8.68	9.4	7.7	315		0	0	0	0	0	0	0	0	0	0	Date: 9/9/16 New WQ: WC Counts: BV Sol'n Prep: BV Old WQ: JL Time: 1125
	3	8.78	8.39	9.0	7.0	314		0	0	0	0	0	0	0	0	0	0	Date: 9/10/16 New WQ: JR Counts: JO Sol'n Prep: JO Old WQ: DM Time: 1430
	4	8.32	8.44	10.5	6.8	300		6	6	6	5	6	6	6	0	6	5	Date: 9/11/16 New WQ: JR Counts: SH Sol'n Prep: SH Old WQ: TA Time: 1215
	5	8.04	8.39	9.9	6.9	306		12	11	10	10	11	10	11	5	12	12	Date: 9/12/16 New WQ: JR Counts: SH Sol'n Prep: SH Old WQ: JR Time: 1320
	6	7.80	8.08	9.2	7.6	317		0	0	1*	12	10	11	12	9	13	9	Date: 9/13/16 New WQ: JL Counts: JO Sol'n Prep: JO Old WQ: DM Time: 1600
	7	–	8.18	–	7.0	337		11	14	14	0	0	0	0	0	0	0	Date: 9/14/16 New WQ: – Counts: BV Sol'n Prep: ~~BV 9/14/16~~ – Old WQ: JBL Time: 1530
	8																	Date: Old WQ: Counts: Time:
							Total=	29	31	31	27	27	27	29	14	31	26	Mean Neonates/Female = 27.2

*Split brood

CETIS Analytical Report

Test Code: 69605b | 04-3900-7115

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	14-9642-5071	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Oct-16 13:36	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	25	40	31.62	4

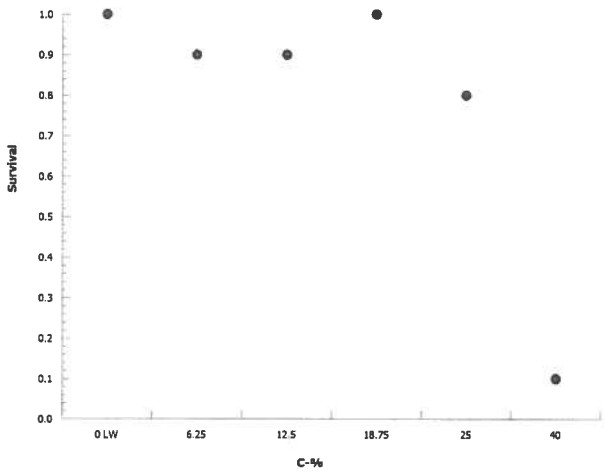
Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	0.5	1.0000	Exact	Non-Significant Effect
		12.5	0.5	1.0000	Exact	Non-Significant Effect
		18.75	1	1.0000	Exact	Non-Significant Effect
		25	0.237	0.9474	Exact	Non-Significant Effect
		40	5.95E-05	0.0003	Exact	Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
6.25		9	1	10	0.9	0.1	10.0%
12.5		9	1	10	0.9	0.1	10.0%
18.75		10	0	10	1	0	0.0%
25		8	2	10	0.8	0.2	20.0%
40		1	9	10	0.1	0.9	90.0%

Graphics



 Analyst: CJD QA: M

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	04-6038-3951	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Oct-16 13:36	**Analysis:**	Linear Regression (MLE)	**Official Results:**	Yes

Linear Regression Options

Model Function	Threshold Option	Threshold	Optimized	Pooled	Het Corr	Weighted
Log-Normal [NED=A+B*log(X)]	Control Threshold	1E-07	Yes	Yes	No	Yes

Regression Summary

Iters	LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision(α:5%)
24	-16.3	50.5	37.9	1.49	0.0861	0.897				Lack of Fit Not Tested

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC5	22.4	9.99	27.3	4.464	3.667	10.01
EC10	24.1	12.3	28.8	4.154	3.476	8.109
EC15	25.3	14.2	29.9	3.957	3.343	7.054
EC20	26.3	15.8	30.9	3.807	3.235	6.328
EC25	27.2	17.3	31.9	3.683	3.137	5.779
EC40	29.5	21.4	34.9	3.388	2.862	4.664
EC50	31	24	37.5	3.222	2.667	4.163

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(α:5%)
Threshold	0.0512	0.0362	-0.0197	0.122	1.41	0.2520	Non-Significant Parameter
Slope	11.6	4	3.78	19.5	2.91	0.0622	Non-Significant Parameter
Intercept	-17.3	6.02	-29.1	-5.52	-2.88	0.0637	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	32.5217	32.5217	1	45.5	0.0066	Significant
Residual	2.142786	0.714262	3			

Residual Analysis

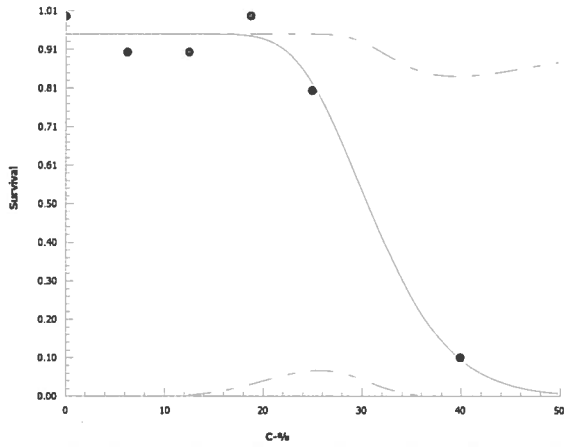
Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Goodness-of-Fit	Pearson Chi-Sq GOF	2.14	7.81	0.5433	Non-Significant Heterogenity
	Likelihood Ratio GOF	3.01	7.81	0.3895	Non-Significant Heterogenity
Distribution	Shapiro-Wilk W Normality	0.873	0.513	0.2396	Normal Distribution

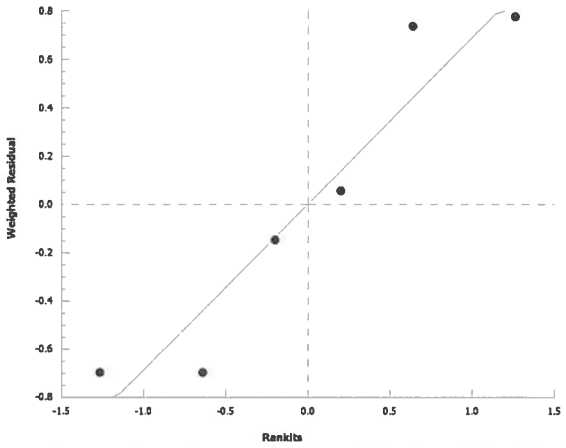
Survival Summary

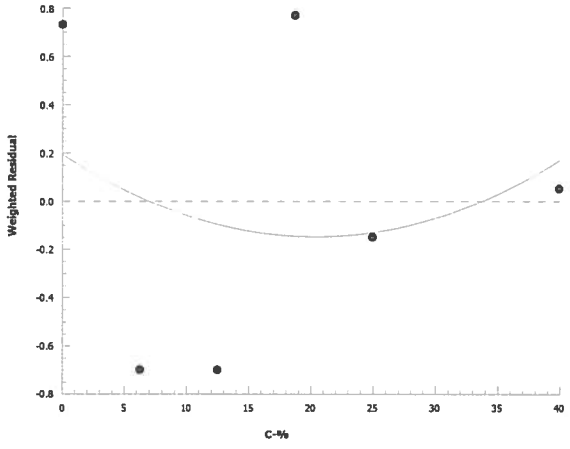
			Calculated Variate(A/B)								
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Water Contr	10	1	1	1	0	0	0.0%	0.0%	10	10
6.25		10	0.9	0	1	0.1	0.316	35.1%	10.0%	9	10
12.5		10	0.9	0	1	0.1	0.316	35.1%	10.0%	9	10
18.75		10	1	1	1	0	0	0.0%	0.0%	10	10
25		10	0.8	0	1	0.133	0.422	52.7%	20.0%	8	10
40		10	0.1	0	1	0.1	0.316	316.0%	90.0%	1	10

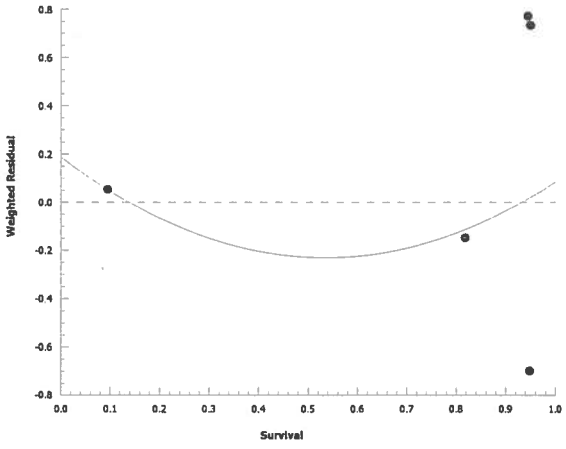
Ceriodaphnia Survival and Reproduction Test					Pacific EcoRisk
Analysis ID:	04-6038-3951	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Oct-16 13:36	**Analysis:**	Linear Regression (MLE)	**Official Results:**	Yes

Graphics Log-Normal [NED=A+B*log(X)]









CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	09-5523-7171	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Oct-16 13:36	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	20.5%	6.25	12.5	8.839	16

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	85.5	75	2	18	0.2204	Asymp	Non-Significant Effect
		12.5*	72	75	3	18	0.0261	Asymp	Significant Effect
		18.75*	58	75	1	18	0.0009	Asymp	Significant Effect
		25*	55	75	0	18	0.0004	Asymp	Significant Effect
		40*	55	75	0	18	0.0004	Asymp	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4708.533	941.7067	5	26.3	<0.0001	Significant Effect
Error	1936.4	35.85926	54			
Total	6644.933		59			

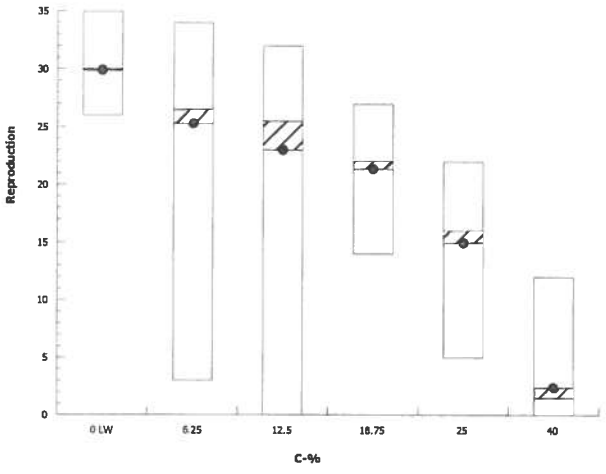
Distributional Tests

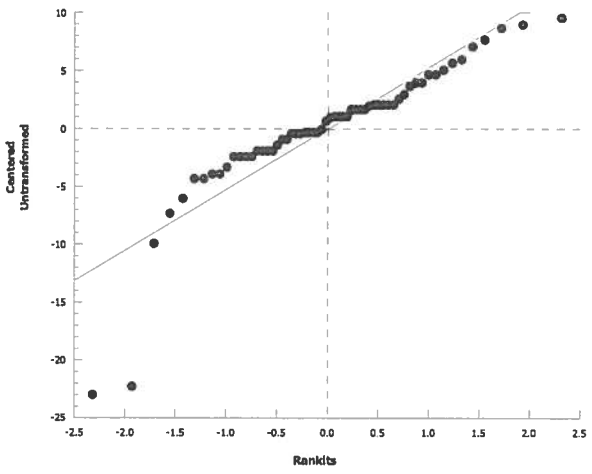
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	19.2	15.1	0.0017	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.83	0.946	<0.0001	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	29.9	27.8	32	30	26	35	0.936	9.9%	0.0%
6.25		10	25.3	19	31.6	26.5	3	34	2.77	34.6%	15.4%
12.5		10	23	16.6	29.4	25.5	0	32	2.84	39.1%	23.1%
18.75		10	21.3	18.4	24.2	22	14	27	1.27	18.9%	28.8%
25		10	14.9	11.8	18	16	5	22	1.37	29.1%	50.2%
40		10	2.4	-0.26	5.06	1.5	0	12	1.18	155.0%	92.0%

Graphics





CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	17-3534-4086	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Oct-16 13:36	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	949693	200	Yes	Two-Point Interpolation

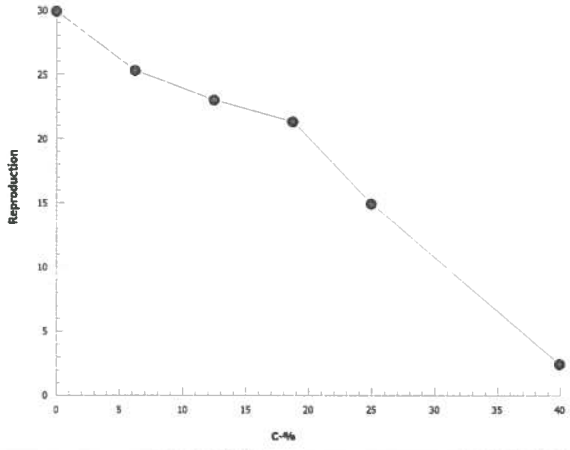
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	2.03	1.11	7.71	49.23	12.96	89.93
IC10	4.06	2.22	12.9	24.62	7.73	44.97
IC15	6.09	3.34	15.1	16.41	6.63	29.98
IC20	10	4.45	17.7	10	5.645	22.48
IC25	14.6	5.56	19.8	6.843	5.063	17.99
IC40	22	19.6	24.2	4.539	4.14	5.106
IC50	25	22.9	27.4	4.008	3.651	4.373

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	29.9	26	35	0.936	2.96	9.9%	0.0%
6.25		10	25.3	3	34	2.77	8.76	34.6%	15.4%
12.5		10	23	0	32	2.84	8.99	39.1%	23.1%
18.75		10	21.3	14	27	1.27	4.03	18.9%	28.8%
25		10	14.9	5	22	1.37	4.33	29.1%	50.2%
40		10	2.4	0	12	1.18	3.72	155.0%	92.0%

Graphics



Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Lab Water Control** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Randomization: ~~10.7.1/10.1.1~~ 10.6.1/10.2.1 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
Lab Water Control	0	7.81		7.7		319	24.9	0	0	0	0	0	0	0	0	0	0
	1	7.96	8.00	8.0	6.7	322	25.1	0	0	0	0	0	0	0	0	0	0
	2	7.85	7.45	8.5	7.8	314	25.7	0	0	0	0	0	0	0	0	0	0
	3	7.97	7.23	8.5	6.9	312	25.5	0	0	0	0	0	0	0	0	0	0
	4	7.44	7.80	~~8.8~~ 8.4 9/9/16	7.1	311	25.7	5	6	6	6	7	7	5	6	5	6
	5	7.72	7.67	7.9	6.5	307	25.5	11	12	11	9	10	12	10	11	9	12
	6	7.85	7.87	8.4	7.7	320	25.6	0	0	9	14	15	13	11	15	0	0
	7	—	8.10	—	6.2	364	25.8	12	13	0	0	0	0	0	0	14	17
	8																
							Total=	28	31	26	29	32	32	26	32	28	35

SIGN-OFF

Date: 9/7/16 New WQ: CUC Test Init.: SH
Sol'n Prep: BV Time: 1640

Date: 9/8/16 New WQ: RB Counts: BV
Sol'n Prep: BV Old WQ: MD Time: 1030

Date: 9/9/16 New WQ: JAC Counts: BV
Sol'n Prep: BV Old WQ: JL Time: 1125

Date: 9/10/16 New WQ: JO Counts: JO
Sol'n Prep: JO Old WQ: DM Time: 1430

Date: 9/11/16 New WQ: JO Counts: SH
Sol'n Prep: SH Old WQ: TK Time: 1215

Date: 9/12/16 New WQ: BR Counts: SH
Sol'n Prep: SH Old WQ: BR Time: 1320

Date: 9/13/16 New WQ: JL Counts: JO
Sol'n Prep: JO Old WQ: DM Time: 1600

Date: 9/14/16 New WQ: — Counts: BV
Sol'n Prep: — Old WQ: JBL Time: 1530

Date: Old WQ: Counts:
Time:

Mean Neonates/Female = 29.9

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Biological Effluent 0.2µm Filt.** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Randomization: ~~10.7.1/10.1.1~~ 10.6.1/10.2.1 Diluent: **UFRO Permeate 0.2µm Filt.**

6.25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.91		9.1		393	24.9	0	0	0	0	0	0	0	0	0	0
1	7.81	7.91	9.0	6.7	401	25.1	0	0	0	0	0	0	0	0	0	0
2	7.87	7.35	9.5	7.4	391	25.7	0	0	0	0	0	0	0	0	0	0
3	7.84	7.18	9.0	7.0	394	25.5	0	0	0	0	0	0	0	0	0	0
4	7.49	7.67	9.5	6.1	~~369~~ 406 SH 9/11	25.7	6	x/3	5	5	6	6	6	6	6	5
5	7.75	~~7.65~~ 7.57 SH 9/11/16	9.0	7.2	~~375~~ 401 9/11 SH	25.5	12	—	10	9	12	12	10	9	11	11
6	7.55	7.73	9.2	7.6	395	25.6	3	—	11 JBL 9/13/16	11	16	0	13	10	10	0
7	—	7.89	—	7.0	416	25.8	0	—	0	0	0	15	0	0	0	14
8								—								
						Total=	21	x/3	26	25	34	33	29	25	27	30

Mean Neonates/Female = 25.3

SIGN-OFF

Date: 9/7/16 New WQ: WC Test Init: SH
Sol'n Prep: BV Time: 1440

Date: 9/8/16 New WQ: RB Counts: BV
Sol'n Prep: BV Old WQ: MD Time: 1030

Date: 9/9/16 New WQ: JM Counts: BV
Sol'n Prep: BV Old WQ: DL Time: 1125

Date: 9/10/16 New WQ: JO Counts: JO
Sol'n Prep: JO Old WQ: DM Time: 1430

Date: 9/11/16 New WQ: JO Counts: SH
Sol'n Prep: SH Old WQ: TM Time: 1215

Date: 9/12/16 New WQ: HR Counts: SH
Sol'n Prep: SH Old WQ: HR Time: 1320

Date: 9/13/16 New WQ: JO Counts: JO
Sol'n Prep: JO Old WQ: DM Time: 1600

Date: 9/14/16 New WQ: — Counts: BV
Sol'n Prep: — Old WQ: JBL Time: 1530

Date: Old WQ: Counts:
Time:

12.5%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.87		8.9		714	0	0	0	0	0	0	0	0	0	0
1	7.65	7.83	9.4	7.7	725	0	0	0	0	0	0	0	0	0	0
2	7.90	7.32	9.6	7.4	~~749~~ 9/9/16 JM 780	0	0	0	x/0	0	0	0	0	0	0
3	7.77	7.16	9.2	6.9	725	0	0	0	—	0	0	0	0	0	0
4	7.48	7.54	10.3	6.3	~~686~~ 706 SH 9/11	6	6	5	—	6	5	5	3	5	4
5	7.67	~~7.43~~	9.8	7.3	~~675~~ 720 SH 9/12	8	10	8	—	13	12	10	9	10	10
6	7.39	7.55	9.3	6.6	715	0	0	0	—	10	0	8	0	11	0
7	—	7.66	—	6.5	850	13	16	14	—	0	x/0	0	12	0	11
8															
					Total=	27	32	27	x/0	29	17	23	24	26	25

Mean Neonates/Female = 23.0

Sample ID: EFF / PERMEATE

0	44017/44018
1	44017/44018
2	44017/44018
3	44017/44018
4	44017/44018
5	44017/44018
6	44017/44018
7	—

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Biological Effluent 0.2µm Filt.** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Diluent: **UFRO Permeate 0.2µm Filt.**

18.75%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	8.08		8.6		1005		0	0	0	0	0	0	0	0	0	0	
1	7.64	7.88	9.7	7.4	1044		0	0	0	0	0	0	0	0	0	0	
2	8.13	7.62	9.7	7.3	1045		0	0	0	0	0	0	0	0	0	0	
3	7.96	7.35	9.2	7.0	1007		0	0	0	0	0	0	0	0	0	0	
4	7.72	7.63	10.8	6.0	1010		5	6	4	5	5	5	5	2	6	5	
5	7.53	7.60	9.6	7.0	996		6	7	9	8	9	9	10	6	7	8	
6	7.32	7.52	9.4	7.3	1007		6	0	8	0	7	0	0	10	10	0	
7	—	7.59	—	6.5	1058		0	10	0	10	0	X/0	12	0	0	13	
8												—					
						Total=	17	23	21	23	21	14	27	18	23	26	Mean Neonates/Female = 21.3

25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	8.22		8.6		1328		0	0	0	0	0	0	0	0	0	0	
1	7.67	8.04	9.6	7.4	1314		0	0	0	0	0	0	0	0	0	0	
2	8.15	7.75	9.4	6.4	1301		0	0	0	0	0	0	0	0	0	0	
3	8.08	7.47	9.1	6.8	1295		0	0	0	0	0	0	0	0	0	0	
4	7.79	8.02	10.5	6.3	1255		4	5	5	4	5	6	4	4	3	X/5	
5	7.50	7.77	9.9	6.5	1304		0	6	8	5	7	7	5	0	0	—	
6	7.30	7.51	9.4	7.5	1279		3	0	0	0	0	1	0	6	10	—	
7	—	7.64	—	6.3	1387		6	11	X/4	7	5	0	7	6	4	—	
8									—							—	
						Total=	13	22	~~12~~ 17	16	17	14	16	16	~~17~~ 13	X/5	Mean Neonates/Female = ~~15.3~~ 14.9

9/20/16 COD

9/20/16 COD

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Biological Effluent 0.2µm Filt.** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Diluent: **UFRO Permeate 0.2µm Filt.**

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
40%	0	8.18		8.7		1908		0	0	0	0	0	0	0	0	0	0
	1	7.66	8.17	9.6	7.6	1939		0	0	0	0	0	0	0	0	0	0
	2	8.23	8.04	9.5	6.4	1840		0	0	0	0	0	0	0	0	0	0
	3	8.23	8.19	9.0	6.2	1885		0	30 9/8/16 X/0	0	0	0	0	0	0	0	X/0
	4	7.90	8.18	10.7	6.1	1850		0	X/0	X/2	X/0	2	5	0	3	1	—
	5	7.50	7.95	10.0	6.0	1826		X/2	—	—	-	0	5	0	0	0	—
	6	7.24	7.57	9.5	7.5	1865		—	—	—	-	X/0	0	X/0	X/2	X/0	—
	7	—	7.64	—	6.3	1935		-		—	-	-	X/2	-	-	—	—
	8							—	-	-	-	-	-	—	-	—	—
							Total=	X/2	X/0	X/2	X/0	X/2	12	X10	X15	X/1 9/14/16	X/0

9/14/16 Mean Neonates/Female = ~~0.23~~ 2.3

9/20/16

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	06-8102-0427	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 15:23	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

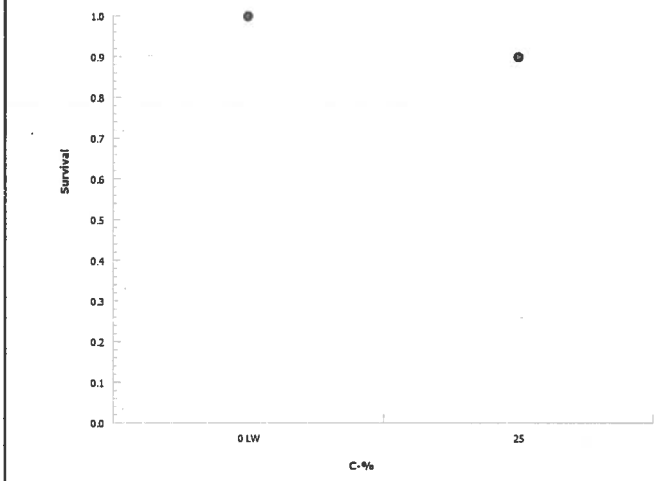
Fisher Exact Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		25	0.5	0.5000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
25		9	1	10	0.9	0.1	10.0%

Graphics



Analyst: CSD QA:

CETIS Analytical Report

Test Code: 69605b | 04-3900-7115

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	21-1333-9624	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 15:24	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.69%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		25*	13.9	1.73	2.9	18	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2714.45	2714.45	1	194	<0.0001	Significant Effect
Error	251.3	13.96111	18			
Total	2965.75		19			

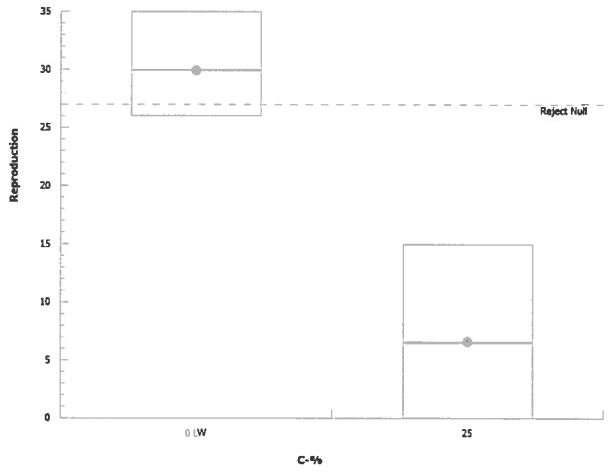
Distributional Tests

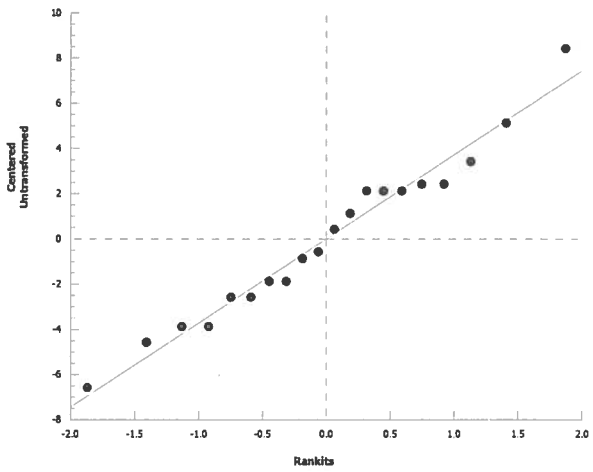
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.19	6.54	0.2598	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.976	0.866	0.8723	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	29.9	27.8	32	30	26	35	0.936	9.9%	0.0%
25		10	6.6	3.47	9.73	6.5	0	15	1.38	66.3%	77.9%

Graphics





Analyst: CJD QA:

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Biological Effluent** Test Date: 9/7/16

Project #: 26261 Test ID: 69605 Randomization: ~~10.7.1/10.1.1~~ 10.2.1/10.2.1 wc 9/7/16 Control Water: UFRO Permeate- Unfiltered

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
Unfiltered 25%	0	8.40		8.8		1297		0	0	0	0	0	0	0	0	0	0	Date: 9/7/16 New WQ: LX Test Init: SH Sol'n Prep: BV Time: 1640
	1	7.78	8.40	9.8	7.9	1360		0	0	0	0	0	0	0	0	0	0	Date: 9/8/16 New WQ: RB Counts: BV Sol'n Prep: BV Old WQ: MD Time: 1030
	2	8.35	8.25	9.6	7.1	1292		0	0	0	0	0	0	0	0	0	0	Date: 9/9/16 New WQ: JO Counts: BV Sol'n Prep: BV Old WQ: JL Time: 1125
	3	8.31	7.97	9.0	7.0	1258		0	0	0	0	0	0	X/0	0	0	0	Date: 9/10/16 New WQ: BR Counts: JO Sol'n Prep: JO Old WQ: DM Time: 1430
	4	8.00	8.33	10.4	7.4	1277		0	0	0	0	0	0	–	0	0	0	Date: 9/11/16 New WQ: BR Counts: SH Sol'n Prep: SH Old WQ: TA Time: 1215
	5	7.64	8.14	9.5	6.9	1242		0	0	3	4	6	2	–	6	0	0	Date: 9/12/16 New WQ: BR Counts: SH Sol'n Prep: SH Old WQ: MR Time: 1320
	6	7.42	7.57	9.5	7.5	1274		0	0	6	0	0	0	–	0	0	4	Date: 9/13/16 New WQ: SL Counts: JO Sol'n Prep: JO Old WQ: DM Time: 1600
	7	–	7.59	–	6.4	1352		7 (4 + 3 on 9/14/16)	4 (4 on 9/14/16)	10 (4 + 6 on 9/14/16)	11	0	8	–	3 (on 9/14/16)	2 (on 9/14/16)	0	Date: 9/14/16 New WQ: – Counts: BV Sol'n Prep: – Old WQ: Time: 1530
	8													–				Date: Old WQ: Counts: Time:
							Total=	7	4	9	15	6	10	X/0	9	2	4	Mean Neonates/Female = BV 9/19/16 6.4

Appendix D

Test Data and Summary of Statistics for the Reference Toxicant Evaluation of the *Ceriodaphnia dubia*

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Batch ID:	15-1982-3998	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	13 Sep-16 10:20	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	19 Sep-16 14:30	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 4h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	20-9824-9753	**Code:**	NaCl	**Client:**	Reference Toxicant
Sample Date:	13 Sep-16 10:20	**Material:**	Sodium chloride	**Project:**	26323
Receive Date:	13 Sep-16 10:20	**Source:**	Reference Toxicant		
Sample Age:	NA (25.6 °C)	**Station:**	In House		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
00-2773-1212	Reproduction	<500	500	NA	18.2%		Dunnett Multiple Comparison Test
07-0182-4671	Survival	1000	1500	1225	NA		Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
16-7658-0121	Reproduction	IC5	136	78.7	513		Linear Interpolation (ICPIN)
		IC10	272	157	560		
		IC15	409	236	612		
		IC20	522	315	667		
		IC25	590	393	730		
		IC40	795	662	987		
		IC50	931	765	1090		
12-2668-1557	Survival	EC5	568	247	790		Linear Regression (MLE)
		EC10	670	334	892		
		EC15	749	408	970		
		EC20	818	478	1040		
		EC25	882	547	1110		
		EC40	1070	756	1310		
		EC50	1200	904	1470		

Reproduction Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	25.6	23	28.2	17	30	1.17	3.69	14.4%	0.0%
500		10	20.9	17.1	24.7	11	27	1.67	5.28	25.3%	18.4%
1000		10	11.5	6.99	16	0	20	2	6.31	54.9%	55.1%
1500		10	2.2	0.359	4.04	0	9	0.814	2.57	117.0%	91.4%
2000		10	0.8	-0.256	1.86	0	4	0.467	1.48	184.0%	96.9%
2500		10	0	0	0	0	0	0	0		100.0%

Survival Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
500		10	1	1	1	1	1	0	0	0.0%	0.0%
1000		10	0.6	0.231	0.969	0	1	0.163	0.516	86.1%	40.0%
1500		10	0.2	0	0.502	0	1	0.133	0.422	211.0%	80.0%
2000		10	0.3	0	0.646	0	1	0.153	0.483	161.0%	70.0%
2500		10	0	0	0	0	0	0	0		100.0%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	17	26	30	27	26	28	22	27	28	25
500		11	24	23	25	27	23	21	22	21	12
1000		5	6	0	19	13	16	20	13	11	12
1500		1	2	2	2	0	1	2	9	0	3
2000		0	0	0	1	0	0	3	4	0	0
2500		0	0	0	0	0	0	0	0	0	0

Survival Detail

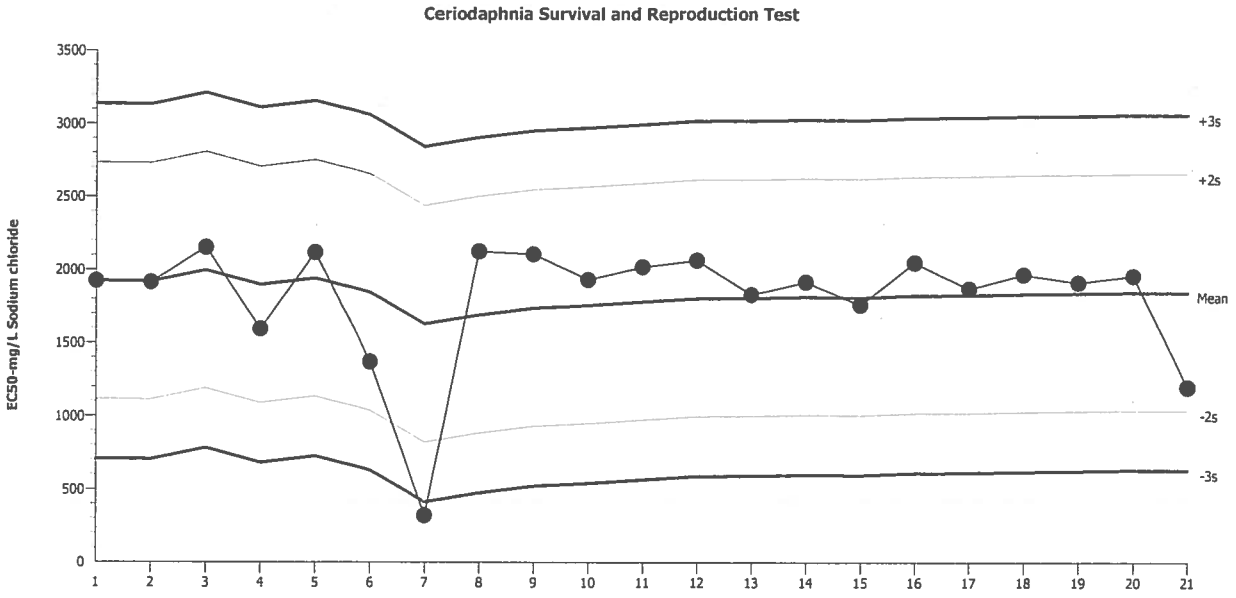
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
500		1	1	1	1	1	1	1	1	1	1
1000		0	1	0	1	1	0	1	1	0	1
1500		0	0	0	0	1	0	1	0	0	0
2000		0	0	0	1	0	0	1	1	0	0
2500		0	0	0	0	0	0	0	0	0	0

Survival Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
500		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1000		0/1	1/1	0/1	1/1	1/1	0/1	1/1	1/1	0/1	1/1
1500		0/1	0/1	0/1	0/1	1/1	0/1	1/1	0/1	0/1	0/1
2000		0/1	0/1	0/1	1/1	0/1	0/1	1/1	1/1	0/1	0/1
2500		0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Test Type:	Reproduction-Survival (7d)	**Organism:**	Ceriodaphnia dubia (Water Flea)	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-013 (2002)	**Endpoint:**	Survival	**Source:**	Reference Toxicant-REF



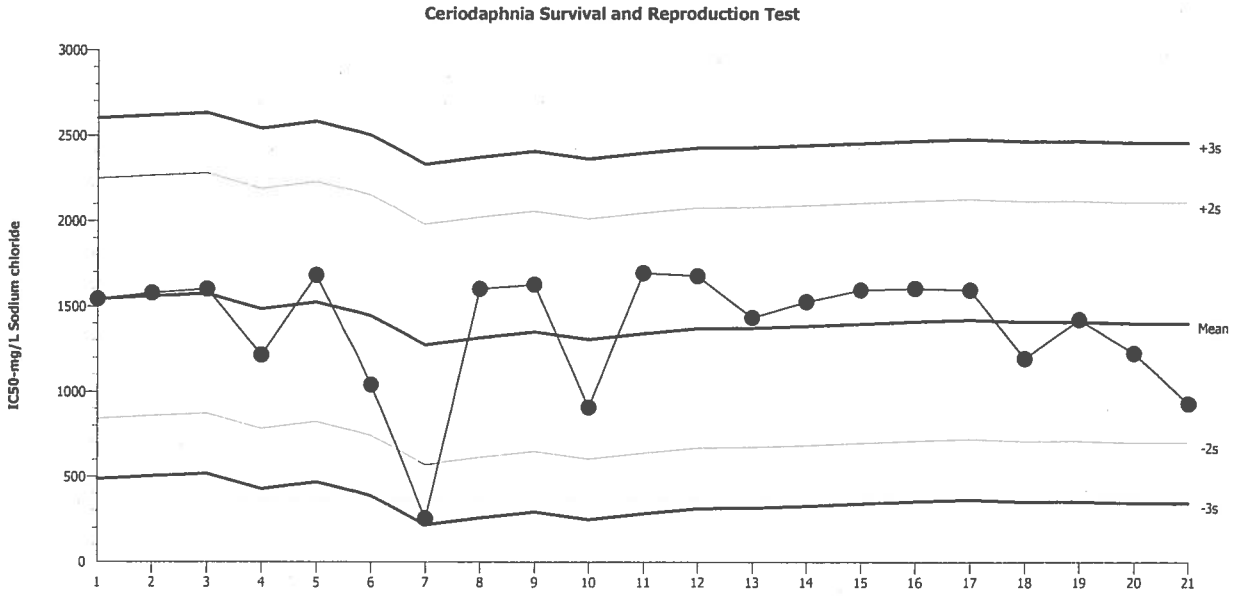
Mean:	1845	**Count:**	20	**-2s Warning Limit:**	1036	**-3s Action Limit:**	631.4
Sigma:	404.6	**CV:**	21.90%	**+2s Warning Limit:**	2654	**+3s Action Limit:**	3059

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	May	3	13:20	1923	78.39	0.1938			07-0818-2319	14-2354-2617
2			4	15:25	1914	69.28	0.1712			11-6927-8142	03-3221-2827
3			5	14:50	2153	307.6	0.7601			07-9136-0638	09-1917-4017
4			10	14:15	1594	-251.2	-0.6209			04-1900-2071	02-7180-6176
5			17	16:30	2117	272	0.6722			02-0217-2091	01-8095-6167
6			24	14:40	1369	-476	-1.176			12-4725-4616	17-8748-4211
7		Jun	14	12:15	321.4	-1524	-3.766	(-)	(-)	06-1840-5245	14-8979-7423
8			23	10:40	2125	279.7	0.6913			16-6250-9087	17-5652-1508
9			23	13:25	2105	260.4	0.6437			07-7424-9431	12-9537-7598
10			28	13:00	1933	88	0.2175			09-5722-1456	07-9253-0885
11		Jul	6	13:00	2019	173.9	0.4298			09-9739-4449	17-8269-3326
12			7	10:20	2064	219.2	0.5419			07-3590-7818	09-8307-4510
13			12	13:45	1831	-14.35	-0.03547			19-4280-6480	04-6439-4868
14		Aug	9	14:15	1918	73.36	0.1813			01-7078-3993	16-1640-2231
15			11	15:25	1759	-85.74	-0.2119			05-4282-8788	09-4783-9953
16			18	13:30	2050	204.9	0.5064			09-3523-7380	14-1088-4073
17			23	14:15	1870	24.98	0.06175			20-3175-3833	16-0364-9515
18			25	14:35	1968	123	0.304			08-0124-0684	18-2643-7985
19			30	16:05	1913	67.72	0.1674			02-5260-5089	09-5069-0405
20		Sep	8	13:40	1957	112.4	0.2779			18-2267-1225	05-8688-6279
21			13	10:20	1198	-647	-1.599			15-9643-7614	12-2668-1557

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Test Type:	Reproduction-Survival (7d)	**Organism:**	Ceriodaphnia dubia (Water Flea)	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-013 (2002)	**Endpoint:**	Reproduction	**Source:**	Reference Toxicant-REF



Mean:	1403	**Count:**	20	**-2s Warning Limit:**	697.5	**-3s Action Limit:**	345
Sigma:	352.5	**CV:**	25.10%	**+2s Warning Limit:**	2108	**+3s Action Limit:**	2460

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	May	3	13:20	1543	140.4	0.3984			07-0818-2319	01-7834-3632
2			4	15:25	1580	177.4	0.5031			11-6927-8142	19-5002-1552
3			5	14:50	1602	198.7	0.5638			07-9136-0638	05-4230-9164
4			10	14:15	1216	-187	-0.5304			04-1900-2071	20-3182-9235
5			17	16:30	1684	281.4	0.7984			02-0217-2091	07-3645-9270
6			24	14:40	1042	-361.3	-1.025			12-4725-4616	17-2108-7232
7		Jun	14	12:15	255	-1148	-3.257	(-)	(-)	06-1840-5245	10-0782-9712
8			23	10:40	1603	200.2	0.568			16-6250-9087	07-8286-1737
9			23	13:25	1628	225.2	0.6389			07-7424-9431	14-5397-9899
10			28	13:00	908.1	-494.9	-1.404			09-5722-1456	07-0717-9325
11		Jul	6	13:00	1696	293.1	0.8315			09-9739-4449	05-4282-8277
12			7	10:20	1679	276	0.7831			07-3590-7818	02-2720-1850
13			12	13:45	1435	32.03	0.09087			19-4280-6480	01-6291-6561
14		Aug	9	14:15	1528	125.3	0.3555			01-7078-3993	16-5522-9106
15			11	15:25	1598	194.5	0.5519			05-4282-8788	20-6991-7970
16			18	13:30	1607	204.3	0.5795			09-3523-7380	12-7959-5180
17			23	14:15	1598	194.9	0.5528			20-3175-3833	12-9031-4120
18			25	14:35	1196	-207.1	-0.5875			08-0124-0684	03-1672-5825
19			30	16:05	1425	22	0.06241			02-5260-5089	20-2491-5546
20		Sep	8	13:40	1226	-177.1	-0.5023			18-2267-1225	12-1761-7946
21			13	10:20	930.9	-472.1	-1.339			15-9643-7614	16-7658-0121

Analyst: RG QA: M

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/13/16

Project #: 26323 Test ID: 69779 Randomization: 10.7.5 Control Water: SRW

Lab Water Control

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.96		7.9		335		25.6	0	0	0	0	0	0	0	0	0	0
1	7.74	7.75	8.2	7.5	314	327	25.9	0	0	0	0	0	0	0	0	0	0
2	7.82	8.80	7.8	7.6	327	335	25.4	0	0	0	0	0	0	0	0	0	0
3	7.23	8.40	7.8	7.5	320	410	25.6	4	4	5	0	4	5	4	5	5	5
4	8.14	8.27	8.5	7.2	321	333	25.6	0	0	11	5	10	11	7	9	9	7
5	7.97	7.87	8.1	7.4	325	351	25.2	6	11	0	8	0	12	0	13	6	2
6	—	8.30	—	7.1	—	336	25.3	7	11	14	14	12	0	11	0	14	11
7																	
8																	
							Total=	17	26	30	27	26	28	22	27	28	25

SIGN-OFF

Day 0: Date 9/13/16 New WQ: TC Test Init JBL; Sol'n Prep: SF Time 1020

Day 1: Date: 9/14/16 New WQ: BV Counts WC; Sol'n Prep: DM Old WQ: DM Time 1110

Day 2: Date: 9/15/16 New WQ: BV Counts DM; Sol'n Prep: MDM Old WQ: YJ Time 1305

Day 3: Date: 9/16/16 New WQ: SD Counts DM; Sol'n Prep: BV Old WQ: SD Time 1505

Day 4: Date: 9/17/16 New WQ: SD Counts 1300 BV; Sol'n Prep: JLF Old WQ: SD Time BV 1300

Day 5: Date: 9/18/16 New WQ: TA Counts SF; Sol'n Prep: WC Old WQ: TA Time 1605

Day 6: Date: 9/19/16 New WQ: — Counts CJD; Sol'n Prep: G Old WQ: CA Time 1430

Day 7: Date: New WQ: Counts; Sol'n Prep: Old WQ Time

Day 8: Date: Old WQ Counts; Time

Mean Neonates/Female = 25.6

500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.73		8.2		1355		0	0	0	0	0	0	0	0	0	0
1	7.68	7.63	8.4	7.2	1393	1377	0	0	0	0	0	0	0	0	0	0
2	7.69	8.34	7.9	7.5	1302 1390	1468	0	0	0	0	0	0	0	0	0	0
3	7.17	8.18	8.0	7.4	1328	1371	1	4	5	3	5	5	4	4	4	3
4	8.03	8.19	8.6	7.2	1399	1429	10	0	8	9	0	8	9	8	6	0
5	7.88	7.77	8.6	7.5	1360	1461	0	10	10	0	12	0	0	0	2	9
6	—	8.12	—	7.0	—	1449	0	10	0	13	10	10	8	10	9	0
7																
8																
						Total=	11	24	23	25	27	23	21	22	21	12

RT BATCH NUMBER

Day 0: 229

Day 1: 229

Day 2: 229

Day 3: 229

Day 4: 229

Day 5: 229

Day 6: —

Mean Neonates/Female = 20.9

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/13/16

Project #: 26323 Test ID: 69779 Control Water: SRW

1000 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.85		8.1		2284			0	0	0	0	0	0	0	0	0	0
1	7.69	7.61	8.6	7.2	2256	2406		0	0	X/0	0	0	0	0	0	0	0
2	7.67	8.17	6.0	7.5	2262	2315		0	0	-	0	0	0	0	0	0	0
3	7.19	8.11	8.2	7.1	2264	2347		5	2	-	5	1	6	5	3	4	1
4	8.01	8.16	8.9	7.2	2282	2427		0	0	-	0	0	2	8	0	0	7
5	7.82	7.72	8.6	9/13 7.4 8.6	2282	2438		X/0	4	-	11	7	X/8	0	10	X/7	0
6	—	8.08	—	6.9	—	2400		-	0	-	3	5	-	7	0	-	4
7								-		-			-			-	
8								-		-			X/1			-	
							Total=	X/5	6	X/0	19	13	X/10	20	13	X/11	12

Mean Neonates/Female = ~~11.0~~ 11.5 M 9/29/16

1500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.70		8.4		3061			0	0	0	0	0	0	0	0	0	0
1	7.70	7.62	8.9	7.3	3129	3220		0	0	0	0	0	0	0	0	0	0
2	7.69	8.09	8.5	7.6	3140	3190		0	0	0	0	0	0	0	0	0	0
3	7.20	8.07	8.4	6.9	3140	3319		1	2	2	2	0	1	2	3	0	3
4	7.99	8.15	9.1	7.1	3177	3330		0	0	0	0	0	0	0	0	0	0
5	7.80	7.70	8.8	7.5	3190	3360		0	0	X/0	0	0	0	0	6	X/0	0
6	—	8.03	—	6.8	—	3320		X/0	X/0	-	X/0	0	X/0	0	X/0	-	X/0
7								—	—	-	—		—		—	-	—
8								—	—	-	—		—		—	-	—
							Total=	X/1	X/2	X/2	X/2	0	X/1	2	X/9	X/0	X/3

Mean Neonates/Female = 2.2

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/13/16

Project #: 26323 Test ID: 69779 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
2000 mg/L	0	7.80		8.5		4060			0	0	0	0	0	0	0	0	0	6
	1	7.72	7.62	9.3	7.4	3945	4070		0	0	0	0	0	0	0	0	0	0
	2	7.65	8.00	8.4	7.5	3996	4170		0	0	0	0	0	0	0	0	0	0
	3	7.29	8.00	8.6	6.8	3980	4164		X/0	X/0	X/0	0	X/0	X/0	0	0	X/0	X/0
	4	7.93	8.12	9.6	7.1	4152	4200		-	-	-	1	-	-	2	2	-	-
	5	7.80	7.70	9.0	7.7	4060	4225		-	-	-	0	-	-	1	1	-	-
	6	—	8.02	—	6.8	—	4210		-	-	-	0	-	-	0	1	-	-
	7								-	-	-		-	-			-	-
	8								-	-	-		-	-			-	-
								Total=	X/0	X/0	X/0	1	X/0	X/0	3	4	X/0	X/0

Mean Neonates/Female = 0.8

	Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
2500 mg/L	0	7.78		8.6		4956			0	0	0	0	0	0	0	0	0	0
	1	7.73	7.62	8.5	7.4	4956	5020		0	0	0	0	0	0	0	0	0	0
	2	7.65	7.97	8.5	7.3	4942	5010		X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0
	3	—	—	—	—	—	—		-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
	8		-		-		-		-	-	-	-	-	-	-	-	-	-
								Total=	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0

Mean Neonates/Female = 0.0

Paul Bedore
Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

October 21, 2016

Paul:

I have enclosed our report "An Evaluation of the Chronic Toxicity Persistence of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples" for the Biological Effluent and Permeate samples collected September 6, 2016.

Chronic Effects of Biological Effluent and Permeate on *Ceriodaphnia dubia*
There was no significant reduction to survival observed in the filtered effluent blend treatment; the NOEC for survival was 100% filtered blend resulting in 1 TUc. There was a significant reduction to reproduction observed in the filtered effluent blend treatment; the NOEC for reproduction was <100% filtered blend resulting in >1 TUc.

There was no significant reduction to survival observed in the unfiltered effluent blend treatment; the NOEC for survival was 100% unfiltered blend resulting in 1 TUc. There was a significant reduction to reproduction observed in the unfiltered effluent blend treatment; the NOEC for reproduction was <100% unfiltered blend resulting in >1 TUc.

If you have any questions regarding the performance and interpretation of these tests, feel free to contact my colleague Chris Dudenhoeffer or myself at (707) 207-7760.

Regards,

Stephen L. Clark
Vice President & Special Projects Director

An Evaluation of the Chronic Toxicity Persistence of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples to *Ceriodaphnia dubia*

Samples collected September 6, 2016

Prepared For:

Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

Prepared By:

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534

October 2016

PACIFIC ECORISK
ENVIRONMENTAL CONSULTING & TESTING

An Evaluation of the Chronic Persistence Toxicity of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples to *Ceriodaphnia dubia*

Samples collected September 6, 2016

Table of Contents

Appendices

1. INTRODUCTION

Under contract to the Robertson-Bryan, Pacific EcoRisk (PER) conducted an evaluation of the chronic toxicity persistence of Lehigh Permanente Southwest Cement Company Reverse-Osmosis (RO) Biological Effluent and Permeate water samples. This evaluation consisted of performing the US EPA chronic 3-brood survival and reproduction test with the crustacean *Ceriodaphnia dubia*. This test was conducted as a follow-up test that identified toxicity for samples collected on September 6, 2016. In order to assess the sensitivity of the organisms to chemical stress, a monthly reference toxicant test was performed. This report describes the performance and results of these tests.

CHRONIC TOXICITY TEST PROCEDURES

This testing followed established guidelines in "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition (EPA-821-R-02-013)".

2.1 Receipt and Handling of the Biological Effluent and Permeate Samples

On September 6th, samples of Lehigh Biological Effluent and Permeate were collected into appropriately cleaned sample containers. These samples were transported the day of collection, on ice and under chain-of-custody, to the PER laboratory in Fairfield, CA. Aliquots of each water sample were collected for analysis of initial water quality characteristics (Table 1) with the remainder of each sample being stored at 0-6˚C except when being used to prepare test solutions. The chain-of-custody record for the collection and delivery of the samples is presented in Appendix A.

Table 1. Initial water quality characteristics of the Biological Effluent and Permeate Samples.

Sample Receipt Date	Sample ID	Temp (°C)	pH	D.O. (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)	Conductivity (μS/cm)	Residual Chlorine (mg/L)	Total Ammonia (mg/L N)	Sulfide (mg/L)
9/6/16	Biological Effluent	2.0	7.63	6.4	794	2570	3960	0.54	<1.00	0.804
9/6/16	Permeate	2.0	7.79	8.5	3.7	1.2	19	0.0	<1.00	0.002

2.2 Survival and Reproduction Toxicity Testing with *Ceriodaphnia dubia*

The chronic persistence toxicity test with *C. dubia* consists of exposing individual females to a Biological Effluent/Permeate blend treatment for the length of time it takes for the Lab Control treatment females to produce three broods (typically 6-8 days), after which effects on survival and reproduction are evaluated. The specific procedures used in this testing are described below.

The Lab Water Control medium for this test consisted of a synthetic reconstituted freshwater (SRW adjusted to EPA "moderately-hard" hardness), prepared by addition of reagent grade chemicals to Type 1 lab water. The Biological Effluent and Permeate was combined at a ratio of 25:75% respectively, and used to prepare a daily 0.2µm filtered and unfiltered treatment; a filtration blank consisting of 0.2 μm-filtered control water was also tested. For each test treatment, 200 mL aliquots of test solution were amended with the alga *Selenastrum capricornutum* and Yeast-Cerophyll®-Trout Food (YCT) to provide food for the test organisms. "New" water quality characteristics (pH, D.O., and conductivity) were measured on these food-amended test solutions prior to use in this testing.

There were 10 replicates for each test treatment, each replicate consisting of 15 mL of test solution in a 30-mL plastic cup. This "3-brood" test was initiated by allocating one neonate (<24 hrs old and within 8 hrs of age) *Ceriodaphnia*, obtained from in-house laboratory cultures, into each replicate cup. The test replicate cups were placed into a temperature-controlled room at 25°C, under cool white fluorescent lighting on a 16L:8D photoperiod.

Each day of the test, fresh test solutions were prepared and characterized as before, and a "new" set of replicate cups was prepared. The test replicate cups containing the test organisms were examined, with surviving organisms being transferred to the corresponding new cup. The contents of each of the remaining "old" replicate cups was carefully examined and the number of neonate offspring produced by each parent organism was determined, after which the "old" water quality characteristics (pH, D.O., and conductivity) were measured for the old solution from one randomly-selected replicate at each treatment.

After it was determined that ≥60% of the females in the Lab Water Control treatment had produced their third brood of offspring, the test was terminated. The resulting survival and reproduction (# of offspring) data were analyzed to evaluate any impairment(s) caused by the Biological Effluent/Permeate mixture; all statistical analyses were performed using the CETIS® statistical software.

2.2.1 Reference Toxicant Testing of the *Ceriodaphnia dubia*

In order to assess the sensitivity of the test organisms to toxic stress, a monthly reference toxicant test was performed. The reference toxicant test was performed similarly to the effluent test except that test solutions consisted of modified EPA moderately-hard water spiked with NaCl at test concentrations of 500, 1000, 1500, 2000, and 2500 mg/L. The resulting test response data were statistically analyzed to determine key dose-response point estimates (e.g., EC_{50}); all statistical analyses were made using the CETIS® software. These response endpoints were then compared to the "typical response" ranges established by the mean ± 2 SD of the point estimates generated by the most recent previous reference toxicant tests performed by this lab.

3. RESULTS

3.1 Effects of Biological Effluent/Permeate on *Ceriodaphnia dubia*

There was no significant reduction to survival observed in the filtered effluent blend treatment; the NOEC for survival was 100% filtered blend resulting in 1 TUc. There was a significant reduction to reproduction observed in the filtered effluent blend treatment; the NOEC for reproduction was <100% filtered blend resulting in >1 TUc.

There was no significant reduction to survival observed in the unfiltered effluent blend treatment; the NOEC for survival was 100% unfiltered blend resulting in 1 TUc. There was a significant reduction to reproduction observed in the unfiltered effluent blend treatment; the NOEC for reproduction was <100% unfiltered blend resulting in >1 TUc.

The test data and summary of statistical analyses including the outlier for this test are presented in Appendix B; the summary of statistical analysis excluding the outlier are presented in Appendix C.

Table 2. Effects of Biological Effluent/Permeate blend on *Ceriodaphnia dubia*.

Test Treatment	% Survival	Reproduction (mean # of offspring)
Lab Water Control	100	33.8
100% Unfiltered Blend	90	11.0
Filtered Lab Water Control	90	31.9[a]/28.7
100% Filtered Blend	100	**16.2***
Summary of Statistics		
NOEC =	100% Blend	<100% Blend
TUc (where TUc = 100/NOEC)	1 TUc	>1 TUc
Survival EC25 or Reproduction IC25 =	>100% Blend	<100% Blend
TUc (where TUc = 100/EC25 or 100/IC25) =	<1 TUc	>1 TUc
Survival EC50 or Reproduction IC50 =	>100% Blend	<100% Blend
TUc (where TUc = 100/EC50 or 100/IC50) =	<1 TUc	>1 TUc

* The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).

a - There was an outlier replicate in the Filtered Lab Control treatment. The results presented here are those with the outlier excluded ("a" superscript). Per EPA guidance, the data are presented both excluding and including the outlier in Appendix B and Appendix C, respectively.

3.1.1 Reference Toxicant Toxicity to *Ceriodaphnia dubia*

The results of this test are summarized below in Table 3. The survival EC_{50} and reproduction IC_{50} for this test were consistent with the "typical response" ranges established by the reference toxicant test database for this species, indicating that these test organisms were responding to toxicant stress in a typical and consistent fashion.

The test data and summary of statistical analyses for this test are presented in Appendix D.

Table 3. Reference toxicant testing: Effects of NaCl on *Ceriodaphnia dubia*.

NaCl Treatment (mg/L)	% Survival	Reproduction (# neonates/female)
Lab Water Control	100	33.5
500	100	31.0
1000	66.7	**20.3***
1500	100	**20.7***
2000	60	5.3
2500	**0***	-
Summary of Statistics		
Survival EC_{50} or Reproduction IC_{50} =	1740	1620

* The response at this test treatment was significantly less than the Lab Control treatment response at $p < 0.05$.

4. SUMMARY & CONCLUSIONS

An evaluation of the chronic toxicity persistence of a blend of Lehigh Permanente Cement Plant Biological Effluent and Permeate water samples to *Ceriodaphnia dubia* was performed. The results of this testing follow:

Effects of Biological Effluent/Permeate on *Ceriodaphnia dubia*
There was no significant reduction to survival observed in the filtered effluent blend treatment; the NOEC for survival was 100% filtered blend resulting in 1 TUc. There was a significant reduction to reproduction observed in the filtered effluent filtered blend treatment; the NOEC for reproduction was <100% blend resulting in >1 TUc.

There was no significant reduction to survival observed in the unfiltered effluent blend treatment; the NOEC for survival was 100% unfiltered blend resulting in 1 TUc. There was a significant reduction to reproduction observed in the unfiltered effluent blend treatment; the NOEC for reproduction was <100% unfiltered blend resulting in >1 TUc.

4.1 QA/QC Summary

Test Conditions – All test conditions (pH, D.O., temperature, etc.) were within acceptable limits for these tests. All test analyses were performed according to laboratory Standard Operating Procedures.

Negative Control – The biological responses for the test organisms at the Lab Control treatments were within acceptable limits.

Positive Control – The reference toxicant test survival EC_{50} and reproduction IC_{50} were both consistent with the "typical response" ranges established by the reference toxicant test database for this species, indicating that these test organisms were responding to toxicant stress in a typical and consistent fashion.

Concentration Response Relationships – The concentration-response relationships for the reference toxicant test was evaluated as per EPA guidelines (EPA-821-B-00-004), and determined to be acceptable for this testing.

Appendix A

Chain-of-Custody Record for the Collection and Delivery of the Lehigh Permanente Cement Plant Biological Effluent and Permeate Samples

Pacific EcoRisk
2250 Cordelia Rd., Fairfield, CA 94534
(707) 207-7760 FAX (707) 207-7916

CHAIN-OF-CUSTODY RECORD

COPY

Results To:	Robertson-Bryan, Inc	**Invoice To:**	Same
Address:	9888 Kent Street Elk Grove, CA 95624	**Address:**	
Phone:	(916) 405-8918	**Phone:**	
Attn:	Paul Bedore	**Attn:**	Sam Barket
E-mail:	paul@robertson-bryan.com	**E-mail:**	sam.Barket@lehighhanson.com
Project Name:	Lehigh TRE Testing		
P.O.#/Ref:			

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Grab/ Comp	Container Number	Container Type	REQUESTED ANALYSIS: *Ceriodaphnia dubia* Survival and Reproduction, EPA 1002.0
1	Biological Effluent	9/6/16	9:40AM	FW	Grab	2	2.5-gal LDPE Cube	x
2	Permeate	9/6/16	9:50AM	FW	Grab	2	2.5-gal LDPE Cube	x
3								
4								
5								
6								
7								
8								
9								
10								

Samples collected by:

Comments/Special Instruction:

Test mixtures of permeate and biological effluent specified in Sept. 2016 test plan provided to PER by P Bedore against shared lab water control.

RELIQUINSHED BY: Courtney Perry	**RECEIVED BY:**
Signature: Courtney Perry	**Signature:**
Print:	**Print:** Lindsey Freeman
Organization: Lehigh	**Organization:** PER
Date: 9/6/16 **Time:**	**Date:** 9/6/16 **Time:** 1100
RELIQUINSHED BY:	**RECEIVED BY:**
Signature:	**Signature:**
Print:	**Print:**
Organization:	**Organization:**
Date: **Time:**	**Date:** **Time:**

***Example Matrix Codes**: (EFF - Effluent) (FW = Freshwater); (SW = Saltwater); (WW = Wastewater); (STRMW = Stormwater); (SED = Sediment); or other

Appendix B

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity Persistence of the Lehigh Permanente Cement Plant Filtered Biological Effluent/Permeate Treatment to *Ceriodaphnia dubia*: Excluding Outliers

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	01-2595-3828	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Simin Delijani
Start Date:	27 Sep-16 12:15	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Not Applicable
Ending Date:	03 Oct-16 15:30	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 3h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	08-8126-1146	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	06 Sep-16 09:40	**Material:**	Effluent	**Project:**	26376
Receive Date:	06 Sep-16 11:00	**Source:**	Lehigh Permanente		
Sample Age:	21d 3h (8.1 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats Exclude data for Filtered Sample; Stats include outlier FB-G

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
17-8785-6477	Reproduction	<100	100	NA	8.52%	>1	Equal Variance t Two-Sample Test
18-5869-1079	Reproduction	0	>0		5.03%		Equal Variance t Two-Sample Test
03-2686-4490	Survival	0	>0		NA		Fisher Exact Test
04-8842-9183	Survival	100	>100	NA	NA	1	Fisher Exact Test

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	33.8	32.5	35.1	31	36	0.573	1.81	5.37%	0.0%
0	Filtration Blank	9	31.9	30.2	33.6	29	35	0.735	2.2	6.91%	5.65%
100		10	16.2	13.2	19.2	10	22	1.32	4.18	25.8%	52.1%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Filtration Blank	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	36	34	34	31	33	35	31	36	33	35
0	Filtration Blank	29	33	30	29	33	33		31	34	35
100		17	21	12	15	17	17	20	10	11	22

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Filtration Blank	1	1	1	1	1	1	0	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Filtration Blank	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	04-8842-9183	**Endpoint:** Survival	**CETIS Version:** CETISv1.8.7
Analyzed:	05 Oct-16 15:33	**Analysis:** Single 2x2 Contingency Table	**Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

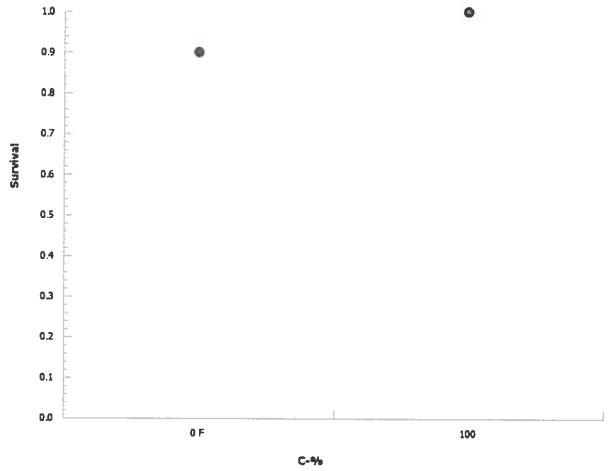
Fisher Exact Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Filtration Blank		100	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Filtration Blank	9	1	10	0.9	0.1	0.0%
100		10	0	10	1	0	-11.1%

Graphics



Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	17-8785-6477	**Endpoint:** Reproduction	**CETIS Version:** CETISv1.8.7
Analyzed:	05 Oct-16 15:33	**Analysis:** Parametric-Two Sample	**Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.52%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Filtration Blank		100*	10	1.74	2.72	17	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1165.932	1165.932	1	101	<0.0001	Significant Effect
Error	196.4889	11.55817	17			
Total	1362.421		18			

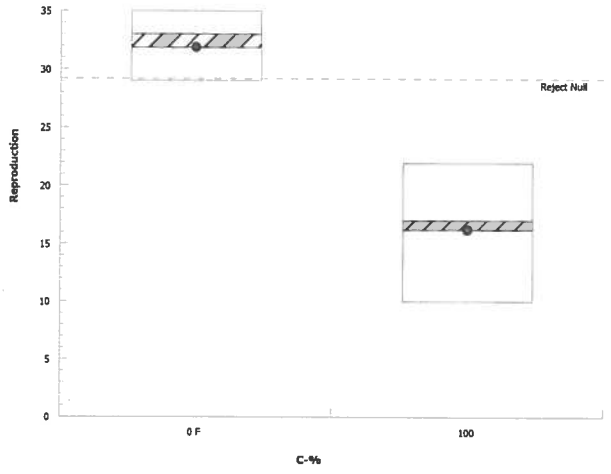
Distributional Tests

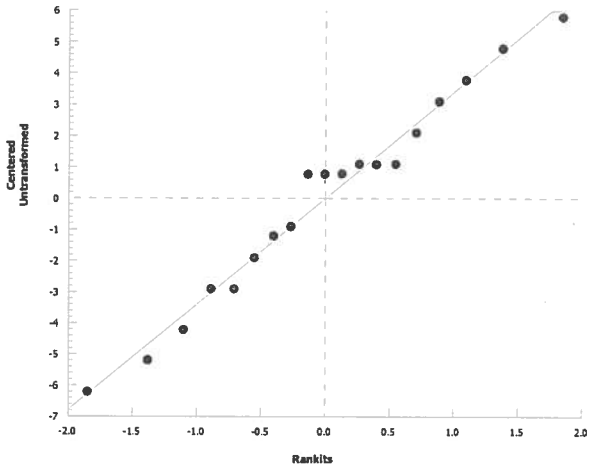
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	3.6	7.34	0.0849	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.973	0.861	0.8283	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Filtration Blank	9	31.9	30.2	33.6	33	29	35	0.735	6.91%	0.0%
100		10	16.2	13.2	19.2	17	10	22	1.32	25.8%	49.2%

Graphics





Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	03-2686-4490	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	05 Oct-16 15:34	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

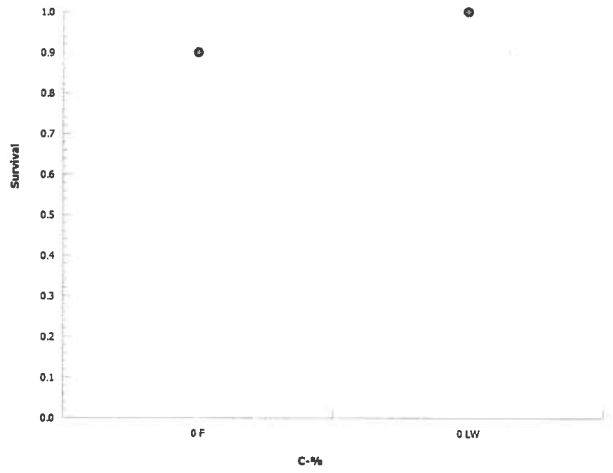
Fisher Exact Test

Control	vs	Control	Test Stat	P-Value	P-Type	Decision(α:5%)
Filtration Blank		Lab Water Control	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	-11.1%
0	Filtration Blank	9	1	10	0.9	0.1	0.0%

Graphics



Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	18-5869-1079	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	05 Oct-16 15:34	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	5.03%	Passes reproduction

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Filtration Blank		Lab Water Control	-2.07	1.74	1.6	17	0.9731	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	17.30058	17.30058	1	4.29	0.0538	Non-Significant Effect
Error	68.48889	4.028758	17			
Total	85.78947		18			

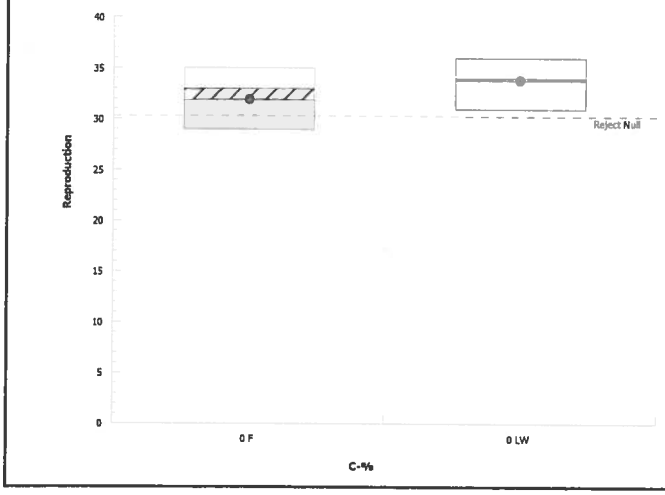
Distributional Tests

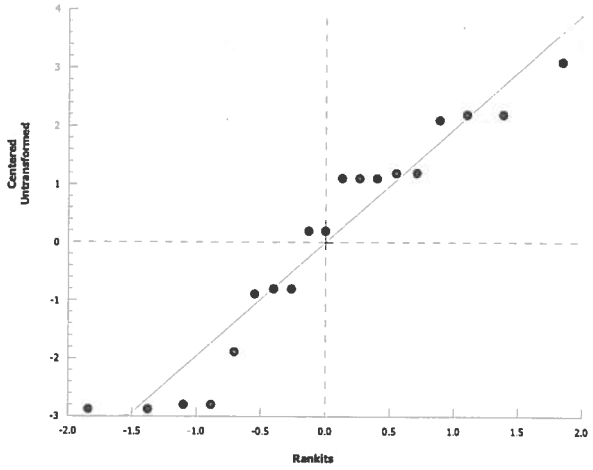
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.48	6.69	0.5713	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.915	0.861	0.0906	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	33.8	32.5	35.1	34	31	36	0.573	5.37%	0.0%
0	Filtration Blank	9	31.9	30.2	33.6	33	29	35	0.735	6.91%	5.65%

Graphics





Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Lab Water Control** Test Date: 9/27/16

Project #: 26376 Test ID: 69874 Randomization 10.4.1 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
Lab Water Control	0	7.70		7.4		319	25.3	0	0	0	0	0	0	0	0	0	0	Date: 9/27/16 New WQ: Test Init: DM Sol'n Prep: DM YL Time: 1215
	1	8.07	7.97	7.9	7.6	322	25.6	0	0	0	0	0	0	0	0	0	0	Date: 9/23/16 New WQ: JL Counts: WC Sol'n Prep: DM Old WQ: JL Time: 1330
	2	7.92	7.82	8.4	6.3	316	25.1	0	0	0	0	0	0	0	0	0	0	Date: 9/29/16 New WQ: RB Counts: SF Sol'n Prep: TK Old WQ: SF Time: 1450
	3	8.27	7.89	8.7	7.6	313	25.6	5	5	5	5	6	7	5	6	5	6	Date: 9/30/16 New WQ: RB Counts: JO Sol'n Prep: DM Old WQ: DM Time: 1215
	4	7.92	8.27	8.3	7.9	314	25.4	0	0	0	0	0	11	0	0	0	0	Date: 10/1/16 New WQ: DM Counts: TK Sol'n Prep: DM Old WQ: DJ Time: 1245
	5	7.68	7.88	7.9	5.7	310	25.4	14	11	12	10	11	0	11	12	11	12	Date: 10/2/16 New WQ: JL Counts: TK Sol'n Prep: TK Old WQ: BP Time: 1230
	6	—	8.00	—	6.6	347	25.4	17	18	17	16	16	17	15	18	17	17	Date: 10/3/16 New WQ: — Counts: TK Sol'n Prep: — Old WQ: JBL Time: 1530
	7																	Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
	8																	Date: Old WQ: Counts: Time:
							Total=	36	34	34	31	33	35	31	36	33	35	Mean Neonates/Female = 33.8

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **(0.2um Filtered) Biological Effluent/ Permeate** Test Date: 9/27/16

Project #: 26376 Test ID: 69874 Randomization 10.4-1 Control Water: SRW

(0.2 um Filtered) 25% Biological Effluent /75% Permeate

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	Sample ID
0	7.48		9.4		1293		0	0	0	0	0	0	0	0	0	0	Biological Permeate 44017 / 44018
1	7.72	7.90	8.9	7.4	1307		0	0	0	0	0	0	0	0	0	0	44017 / 44018
2	7.84	7.89	9.2	7.0	1271		0	0	0	0	0	0	0	0	0	0	44017 / 44018
3	7.92	7.70	10.2	7.6	1277		0	0	0	3	0	2	0	0	0	5	44017 / 44018
4	7.65	8.02	9.5	7.7	1318		4	5	4	0	4	0	4	4	4	0	44017 / 44018
5	7.44	7.94	9.1	6.7	1313		7	7	8	8	7	7	8	6	7	8	44017/ 44018
6	—	7.19	—	6.7	1377		6	9	0	4	6	8	8	0	0	9	—
7																	
8																	
						Total=	17	21	12	15	17	17	20	10	11	22	Mean Neonates/Female = 16.2

Appendix C

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity Persistence of the Lehigh Permanente Cement Plant Filtered Biological Effluent/Permeate Treatment to *Ceriodaphnia dubia*: Including Outliers

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	01-2595-3828	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Simin Delijani
Start Date:	27 Sep-16 12:15	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Not Applicable
Ending Date:	03 Oct-16 15:30	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 3h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	08-8126-1146	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	06 Sep-16 09:40	**Material:**	Effluent	**Project:**	26376
Receive Date:	06 Sep-16 11:00	**Source:**	Lehigh Permanente		
Sample Age:	21d 3h (8.1 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include data for Filtered Sample; Stats include outlier FB-G

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
03-9745-4367	Reproduction	<100	100	NA	21.2%	>1	Wilcoxon Rank Sum Two-Sample Test
12-6869-0015	Reproduction	0	>0		20.0%		Wilcoxon Rank Sum Two-Sample Test
03-2686-4490	Survival	0	>0		NA		Fisher Exact Test
04-8842-9183	Survival	100	>100	NA	NA	1	Fisher Exact Test

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	33.8	32.5	35.1	31	36	0.573	1.81	5.37%	0.0%
0	Filtration Blank	10	28.7	21.3	36.1	0	35	3.26	10.3	35.9%	15.1%
100		10	16.2	13.2	19.2	10	22	1.32	4.18	25.8%	52.1%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Filtration Blank	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	36	34	34	31	33	35	31	36	33	35
0	Filtration Blank	29	33	30	29	33	33	0	31	34	35
100		17	21	12	15	17	17	20	10	11	22

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Filtration Blank	1	1	1	1	1	1	0	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Filtration Blank	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	03-9745-4367	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	05 Oct-16 15:37	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	21.2%	Fails reproduction

Wilcoxon Rank Sum Two-Sample Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Filtration Blank		100*	65	NA	0	18	0.0007	Exact	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	781.25	781.25	1	12.6	0.0023	Significant Effect
Error	1111.7	61.76111	18			
Total	1892.95		19			

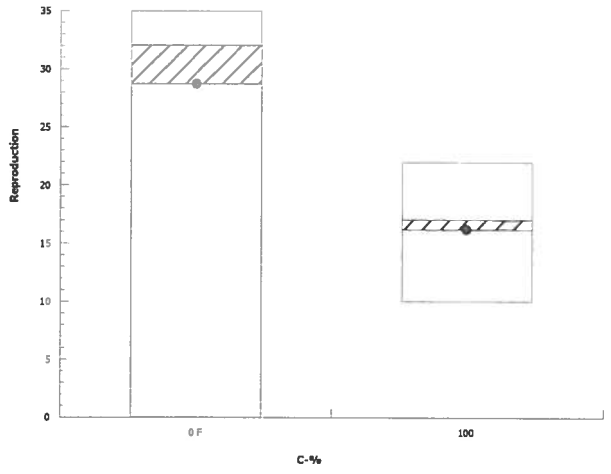
Distributional Tests

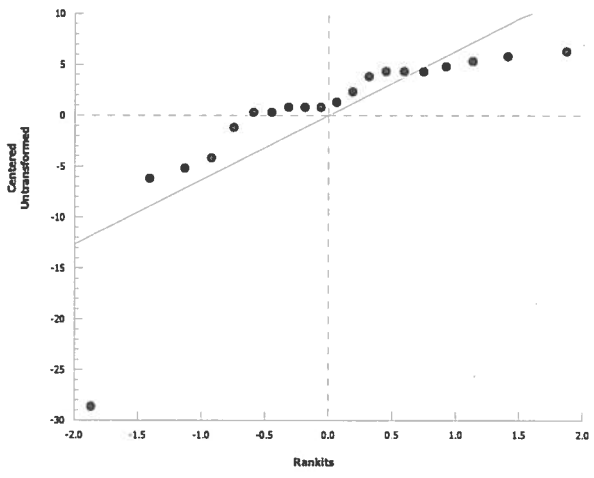
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	6.05	6.54	0.0131	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.663	0.866	<0.0001	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Filtration Blank	10	28.7	21.3	36.1	32	0	35	3.26	35.9%	0.0%
100		10	16.2	13.2	19.2	17	10	22	1.32	25.8%	43.6%

Graphics





Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	12-6869-0015	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	05 Oct-16 15:38	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	20.0%	Passes reproduction

Wilcoxon Rank Sum Two-Sample Test

Control	vs	Control	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Filtration Blank		Lab Water Control	133	NA	4	18	0.9861	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	130.05	130.05	1	2.38	0.1403	Non-Significant Effect
Error	983.7	54.65	18			
Total	1113.75		19			

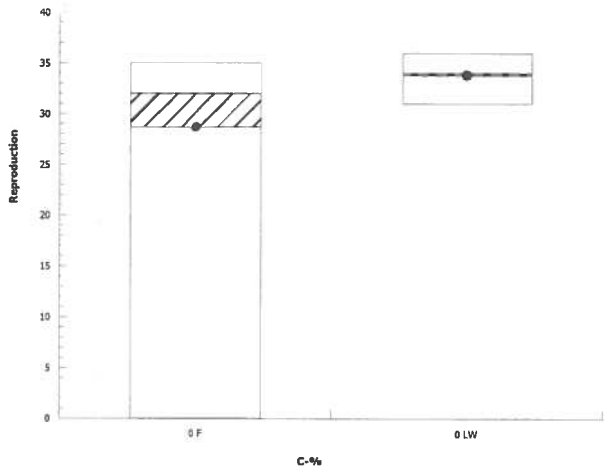
Distributional Tests

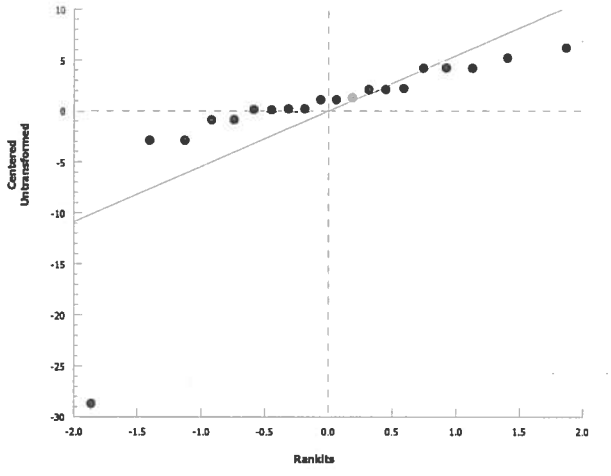
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	32.2	6.54	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.565	0.866	<0.0001	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	33.8	32.5	35.1	34	31	36	0.573	5.37%	0.0%
0	Filtration Blank	10	28.7	21.3	36.1	32	0	35	3.26	35.9%	15.1%

Graphics





Appendix D

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity Persistence of the Lehigh Permanente Cement Plant Unfiltered Biological Effluent/Permeate Treatment to *Ceriodaphnia dubia*

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	04-2168-6698	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Simin Delijani
Start Date:	27 Sep-16 12:15	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Not Applicable
Ending Date:	03 Oct-16 15:30	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 3h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	11-8505-3717	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	06 Sep-16 09:40	**Material:**	Effluent	**Project:**	26376
Receive Date:	06 Sep-16 11:00	**Source:**	Lehigh Permanente		
Sample Age:	21d 3h (8.1 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include data for Unfiltered Sample

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
06-2788-9967	Reproduction	<100	100	NA	12.5%	>1	Unequal Variance t Two-Sample Test
04-4922-6902	Survival	100	>100	NA	NA	1	Fisher Exact Test

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	33.8	32.5	35.1	31	36	0.573	1.81	5.37%	0.0%
100		10	11	5.89	16.1	3	24	2.26	7.15	65.0%	67.5%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	36	34	34	31	33	35	31	36	33	35
100		24	3	3	9	4	13	12	12	9	21

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
100		1	0	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	04-4922-6902	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 14:53	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

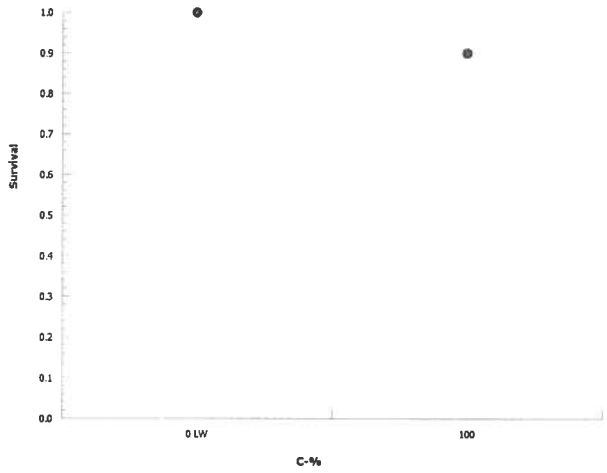
Fisher Exact Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		100	0.5	0.5000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
100		9	1	10	0.9	0.1	10.0%

Graphics



CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	06-2788-9967	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:07	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	12.5%	Fails reproduction

Unequal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		100*	9.78	1.81	4.23	10	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2599.2	2599.2	1	95.6	<0.0001	Significant Effect
Error	489.6	27.2	18			
Total	3088.8		19			

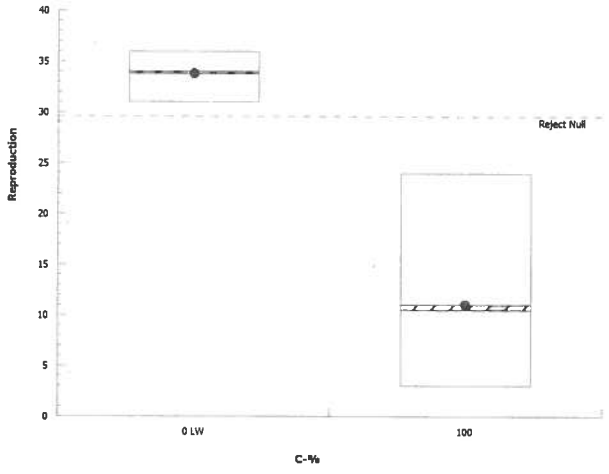
Distributional Tests

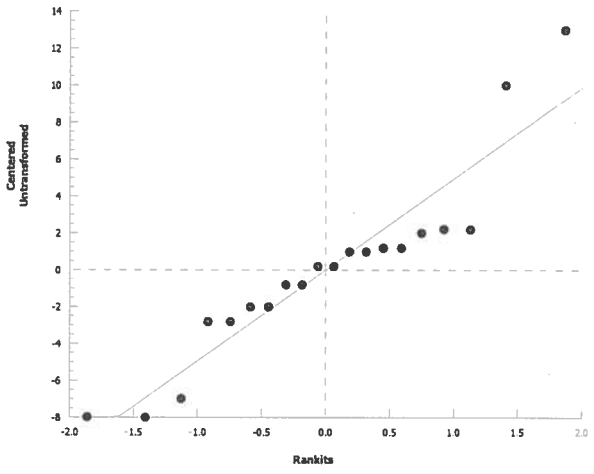
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	15.5	6.54	0.0004	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.891	0.866	0.0286	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	33.8	32.5	35.1	34	31	36	0.573	5.37%	0.0%
100		10	11	5.89	16.1	10.5	3	24	2.26	65.0%	67.5%

Graphics





Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **(Unfiltered) Biological Effluent/ Permeate** Test Date: 9/27/16

Project #: 26376 Test ID: 69874 Randomization 10.4.1 Control Water: SRW

(Unfiltered) 25% Biological Effluent /75% Permeate

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	Sample ID
0	7.44		9.0		1264		0	0	0	0	0	0	0	0	0	0	Biological / Permeate 44017 / 44018
1	7.64	7.80	8.8	7.8	1289		0	0	0	0	0	0	0	0	0	0	44017 / 44018
2	7.59	7.83	9.1	7.0	1243		0	0	0	0	0	0	0	0	0	0	44017 / 44018
3	7.93	7.78	10.1	7.8	1252		0	0	0	0	0	4	0	0	0	2	44017 / 44018
4	7.62	7.96	9.9	7.9	1287		0	3	3	5	4	0	3	4	3	0	44017 / 44018
5	7.38	7.88	9.2	6.2	1308		Trans 16	0	0	0	0	9	3	8	Trans 80	9	44017 / 44018
6	— JBL 10/3	6.91 ~~7.79~~	—	6.3	1353		8	X/0	0	4	0	0	6	0	6	10	—
7								—									
8								—									
						Total=	24	X/3	3	9	4	13	12	12	9	Trans ~~22~~ 21	Mean Neonates/Female = 11

Appendix E

Test Data and Summary of Statistics for the Reference Toxicant Evaluation of *Ceriodaphnia dubia*

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	15-1022-7721	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	27 Sep-16 12:50	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	03 Oct-16 14:05	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 1h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	04-5687-9373	**Code:**	NaCl	**Client:**	Reference Toxicant
Sample Date:	27 Sep-16 12:50	**Material:**	Sodium chloride	**Project:**	26308
Receive Date:	27 Sep-16 12:50	**Source:**	Reference Toxicant		
Sample Age:	NA (25.6 °C)	**Station:**	In House		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
16-6965-0530	Reproduction	500	1000	707.1	22.5%		Wilcoxon/Bonferroni Adj Test
05-1926-9841	Survival	2000	2500	2236	NA		Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
01-8681-6691	Reproduction	IC5	335	177	574		Linear Interpolation (ICPIN)
		IC10	541	353	882		
		IC15	620	523	1080		
		IC20	700	606	1140		
		IC25	780	678	1270		
		IC40	1510	849	1580		
		IC50	1620	959	1680		
03-6116-4434	Survival	EC50	1740	1460	2080		Spearman-Kärber

Reproduction Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	33.5	31.7	35.3	30	38	0.778	2.46	7.35%	0.0%
500		10	31	28.5	33.5	26	38	1.09	3.43	11.1%	7.46%
1000		9	20.3	9.21	31.5	0	33	4.82	14.5	71.1%	39.3%
1500		10	20.7	17.5	23.9	9	24	1.43	4.52	21.8%	38.2%
2000		10	5.3	1.16	9.44	0	18	1.83	5.79	109.0%	84.2%
2500		10	0	0	0	0	0	0	0		100.0%

Survival Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
500		10	1	1	1	1	1	0	0	0.0%	0.0%
1000		9	0.667	0.282	1	0	1	0.167	0.5	75.0%	33.3%
1500		10	1	1	1	1	1	0	0	0.0%	0.0%
2000		10	0.6	0.231	0.969	0	1	0.163	0.516	86.1%	40.0%
2500		10	0	0	0	0	0	0	0		100.0%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	34	31	31	38	30	36	34	35	33	33
500		33	38	28	32	26	32	27	31	32	31
1000		32	33	31	30	0	27	4	26	0	
1500		24	24	21	24	9	23	23	20	20	19
2000		0	0	0	7	9	4	18	8	0	7
2500		0	0	0	0	0	0	0	0	0	0

Survival Detail

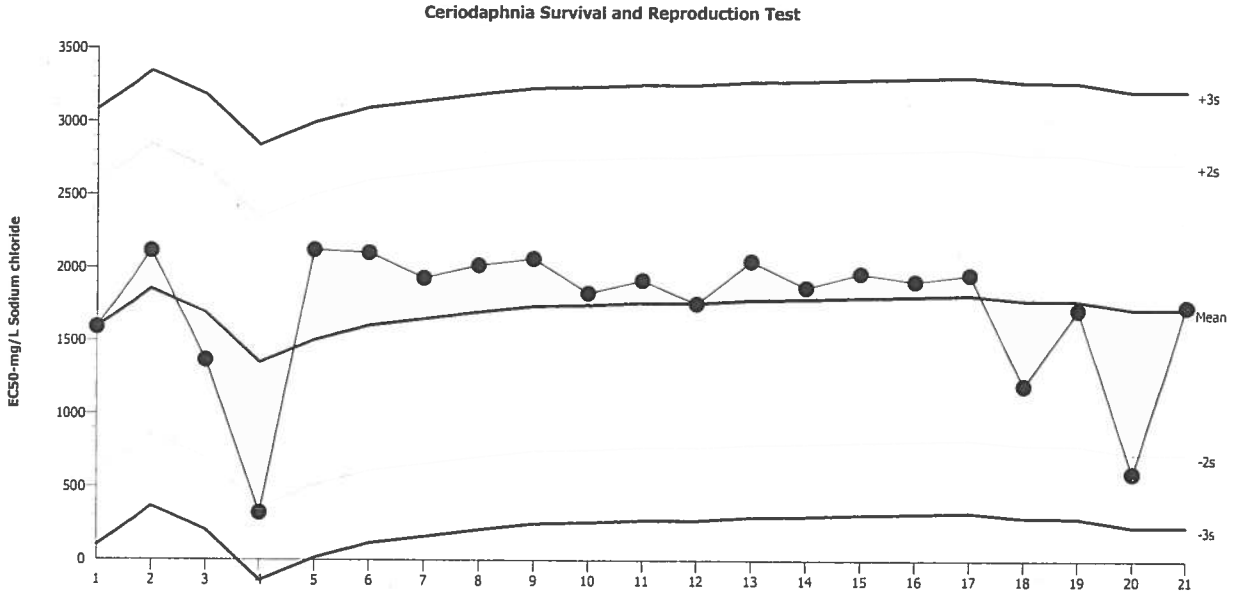
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
500		1	1	1	1	1	1	1	1	1	1
1000		1	1	1	1	0	1	0	1	0	
1500		1	1	1	1	1	1	1	1	1	1
2000		0	0	0	1	1	1	1	1	0	1
2500		0	0	0	0	0	0	0	0	0	0

Survival Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
500		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1000		1/1	1/1	1/1	1/1	0/1	1/1	0/1	1/1	0/1	
1500		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
2000		0/1	0/1	0/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
2500		0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Test Type:	Reproduction-Survival (7d)	**Organism:**	Ceriodaphnia dubia (Water Flea)	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-013 (2002)	**Endpoint:**	Survival	**Source:**	Reference Toxicant-REF



Mean:	1721	**Count:**	20	**-2s Warning Limit:**	727.8	**-3s Action Limit:**	231
Sigma:	496.8	**CV:**	28.90%	**+2s Warning Limit:**	2715	**+3s Action Limit:**	3212

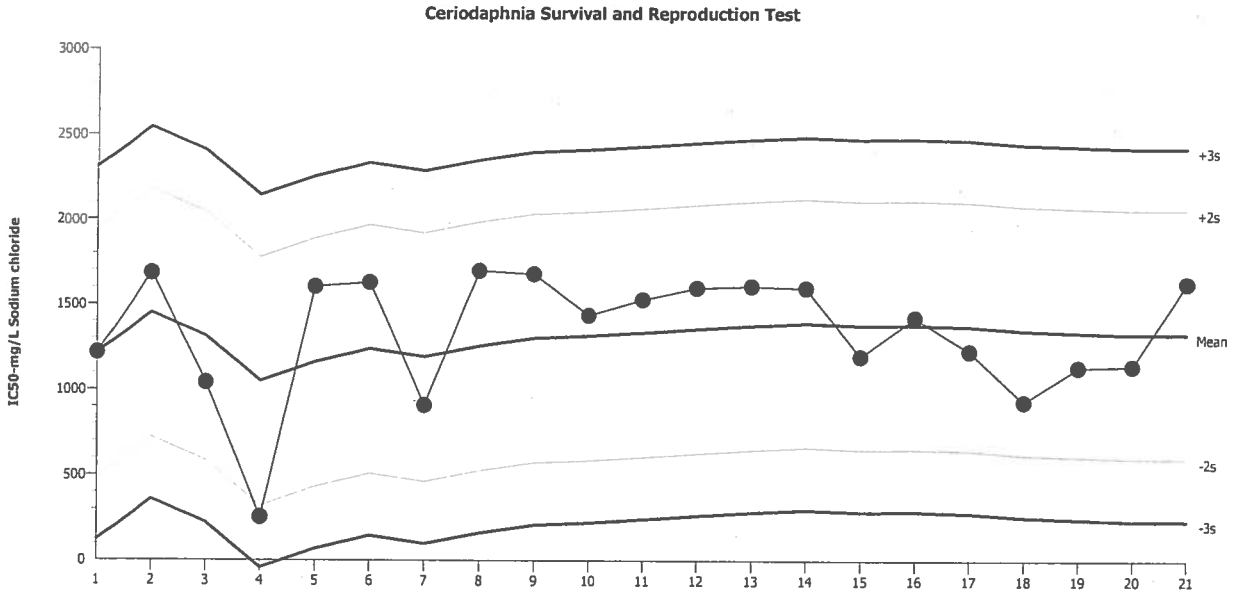
Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	May	10	14:15	1594	-127.2	-0.2561			04-1900-2071	02-7180-6176
2			17	16:30	2117	396	0.7971			02-0217-2091	01-8095-6167
3			24	14:40	1369	-352	-0.7085			12-4725-4616	17-8748-4211
4		Jun	14	12:15	321.4	-1400	-2.817	(-)		06-1840-5245	14-8979-7423
5			23	10:40	2125	403.7	0.8126			16-6250-9087	17-5652-1508
6			23	13:25	2105	384.4	0.7738			07-7424-9431	12-9537-7598
7			28	13:00	1933	212	0.4267			09-5722-1456	07-9253-0885
8		Jul	6	13:00	2019	297.9	0.5996			09-9739-4449	17-8269-3326
9			7	10:20	2064	343.2	0.6909			07-3590-7818	09-8307-4510
10			12	13:45	1831	109.6	0.2207			19-4280-6480	04-6439-4868
11		Aug	9	14:15	1918	197.4	0.3973			01-7078-3993	16-1640-2231
12			11	15:25	1759	38.26	0.07701			05-4282-8788	09-4783-9953
13			18	13:30	2050	328.9	0.662			09-3523-7380	14-1088-4073
14			23	14:15	1870	149	0.2999			20-3175-3833	16-0364-9515
15			25	14:35	1968	247	0.4972			08-0124-0684	18-2643-7985
16			30	16:05	1913	191.7	0.3859			02-5260-5089	09-5069-0405
17		Sep	8	13:40	1957	236.4	0.4759			18-2267-1225	05-8688-6279
18			13	10:20	1198	-523	-1.053			15-9643-7614	12-2668-1557
19			15	14:20	1718	-3.382	-0.00681			16-2243-5631	01-5480-0827
20			20	15:00	597.9	-1123	-2.261	(-)		18-2996-3053	17-7702-4069
21			27	12:50	1739	17.88	0.03599			02-6694-9084	03-6116-4434

CETIS QC Plot

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Test Type:	Reproduction-Survival (7d)	**Organism:**	Ceriodaphnia dubia (Water Flea)	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-013 (2002)	**Endpoint:**	Reproduction	**Source:**	Reference Toxicant-REF



Mean:	1326	**Count:**	20	**-2s Warning Limit:**	598.4	**-3s Action Limit:**	234.4
Sigma:	364	**CV:**	27.50%	**+2s Warning Limit:**	2054	**+3s Action Limit:**	2418

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	May	10	14:15	1216	-110	-0.3021			04-1900-2071	20-3182-9235
2			17	16:30	1684	358.4	0.9847			02-0217-2091	07-3645-9270
3			24	14:40	1042	-284.3	-0.7811			12-4725-4616	17-2108-7232
4		Jun	14	12:15	255	-1071	-2.942	(-)		06-1840-5245	10-0782-9712
5			23	10:40	1603	277.2	0.7616			16-6250-9087	07-8286-1737
6			23	13:25	1628	302.2	0.8303			07-7424-9431	14-5397-9899
7			28	13:00	908.1	-417.9	-1.148			09-5722-1456	07-0717-9325
8		Jul	6	13:00	1696	370.1	1.017			09-9739-4449	05-4282-8277
9			7	10:20	1679	353	0.9699			07-3590-7818	02-2720-1850
10			12	13:45	1435	109	0.2995			19-4280-6480	01-6291-6561
11		Aug	9	14:15	1528	202.3	0.5558			01-7078-3993	16-5522-9106
12			11	15:25	1598	271.5	0.746			05-4282-8788	20-6991-7970
13			18	13:30	1607	281.3	0.7727			09-3523-7380	12-7959-5180
14			23	14:15	1598	271.9	0.7469			20-3175-3833	12-9031-4120
15			25	14:35	1196	-130.1	-0.3574			08-0124-0684	03-1672-5825
16			30	16:05	1425	99	0.272			02-5260-5089	20-2491-5546
17		Sep	8	13:40	1226	-100.1	-0.2749			18-2267-1225	12-1761-7946
18			13	10:20	930.9	-395.1	-1.086			15-9643-7614	16-7658-0121
19			15	14:20	1132	-193.7	-0.5323			16-2243-5631	01-2656-4408
20			20	15:00	1140	-186.3	-0.5118			18-2996-3053	19-4443-0639
21			27	12:50	1624	297.8	0.818			02-6694-9084	01-8681-6691

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/16

Project #: 26308 Test ID: 69790 Randomization: 10.6.1 Control Water: SRW

Lab Water Control

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	8.01		8.6		321		25.6	0	0	0	0	0	0	0	0	0	0	Date: 9/27/16 New WQ: Test Init.: WC Sol'n Prep: WC YK Time: 1250
1	8.53	8.17	8.0	7.1	324	334	25.0	0	0	0	0	0	0	0	0	0	0	Date: 9/28/16 New WQ: YK Counts: WDM Sol'n Prep: WC Old WQ: JZ Time: 1310
2	8.30	7.92	9.0	7.2	328	375	25.1	0	0	0	0	0	0	0	0	0	0	Date: 9/29/16 New WQ: YK Counts: ~~137~~ Sol'n Prep: SL Old WQ: JZ Time: 1137
3	7.92	8.30	8.3	6.1	328	335	25.3	6	5	5	6	6	6	6	0	5	0	Date: 9/30/16 New WQ: RB Counts: TK Sol'n Prep: TK Old WQ: RB Time: 1235
4	7.86	7.92	8.2	7.3	329	~~3895~~ 369	25.4	0	0	0	0	0	0	0	7	0	6	Date: 10/1/16 New WQ: TK Counts: TK Sol'n Prep: TK Old WQ: DT Time: 1400
5	7.75	8.00	7.9	6.3	309	343	25.1	12	14	13	14	11	13	12	13	12	13	Date: 10/2/16 New WQ: JZ Counts: SH Sol'n Prep: SH Old WQ: AR Time: 1405 S
6	—	7.59	—	7.4	—	339	24.9	16	12	13	18	13	17	16	15	16	14	Date: 10/3/16 New WQ: — Counts: JZ Sol'n Prep: — Old WQ: TK Time: 1405
7																		Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
8																		Date: Old WQ: Counts: Time:
							Total=	34	31	31	38	30	36	34	35	33	33	Mean Neonates/Female = 33.5

500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	RT BATCH NUMBER
0	7.82		8.0		1310		0	0	0	0	0	0	0	0	0	0	230
1	7.56	8.04	8.3	7.0	1346	1391	0	0	0	0	0	0	0	0	0	0	230
2	8.10	7.74	9.0	8.0	1337	1453	0	0	0	0	0	0	0	0	0	0	230
3	7.87	8.19	8.5	6.5	1270	1427	5	5	4	6	4	5	5	0	0	0	230
4	7.73	7.83	8.3	7.4	1333	1497	0	0	0	0	0	13	0	6	5	6	230
5	7.67	7.87	8.0	6.7	1355	1445	12	15	11	12	9	0	14	8	12	13	230
6	—	7.55	—	6.8	—	1459	16	18	13	14	13	14	8	17	15	12	—
7																	
8																	
							Total= 33	38	28	32	26	32	27	31	32	31	Mean Neonates/Female = 31.0

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/6

Project #: 26308 Test ID: 69790 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
1000 mg/L	0	7.81		8.1		2208			0	0	0	0	0	0	0	0	0	0
	1	7.47	7.99	8.5	7.6	2196	2358		0	0	0	0	0	0	0	0	0	0
	2	7.62	7.70	8.7	7.9	2274	2335		0	0	0	0	0	0	0	0	0	0
	3	7.86	8.16	8.8	6.8	2184	2510		0	6	0	5	X/0	0	4	0	X/0	0
	4	7.69	7.86	8.6	7.4	2157	2624		6	0	6	0	-	5	0	5	-	7
	5	7.60	7.87	8.1	6.6	2186	2350		13	13	12	12	-	9	X/0	9	-	-/12
	6	—	7.55	—	7.3	—	2512		13	14	13	13	-	13	—	12	-	-
	7												-		-		-	-
	8												-		-		-	-
								Total=	32	33	31	30	X/0	27	X/4	26	X/6	-/19

Mean Neonates/Female = 20.3

	Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
1500 mg/L	0	7.81		8.6		2965			0	0	0	0	0	0	0	0	0	0
	1	7.50	7.97	8.8	7.8	3130	3280		0	0	0	0	0	0	0	0	0	0
	2	7.61	7.70	8.9	8.0	3126	3400		0	0	0	0	0	0	0	0	0	0
	3	7.85	8.13	9.1	6.6	3050	3410		0	0	0	5	0	5	4	4	0	0
	4	7.68	7.88	8.7	7.3	3020	3410		4	5	4	0	-	0	0	0	4	4
	5	7.61	7.87	8.3	4.7	3073	3420		9	10	11	9	0	10	7	8	9	7
	6	—	7.55	—	7.1	—	3460		11	9	6	10	6	8	12	8	7	8
	7																	
	8																	
								Total=	24	24	21	24	9	23	23	20	20	19

Mean Neonates/Female = 20.7

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/16

Project #: 26308 Test ID: 69790 Control Water: SRW

2000 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.80		8.6		3910			0	0	0	0	0	0	0	0	0	0
1	7.50	7.97	9.0	7.7	4000	4120		0	0	0	0	0	0	0	0	0	0
2	7.64	7.71	9.1	8.5	3972	3901		X/0	X/0	X/0	0	0	0	0	0	X/0	0
3	7.84	8.12	9.0	6.9	3920	4300		-	-	-	0	0	0	0	0	-	0
4	7.65	7.85	9.0	7.5	4070	4360		-	-	-	2	0	0	2	0	-	0
5	7.62	7.83	8.5	6.6	3938	4470		-	-	-	8	3	0	6	3	-	4
6								-	-	-	0	6	4	10	5	-	3
7								-	-	-						-	
8								-	-	-						-	RL w/M/W
							Total=	X/0	X/0	X/0	7	9	4	18	8	X/0	X7

Mean Neonates/Female = ~~5.0~~ 5.3 RL w/M/W

2500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.77		9.1		4800			0	0	0	0	0	0	0	0	0	0
1	7.52	7.95	9.3	7.7	4850	5060		0	0	0	0	0	0	0	0	0	0
2	7.61	7.67	9.5	8.7	4837	5091		X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0
3	—	—	—	—	—	—		-	-	-	-	-	-	-	-	-	-
4	—	—	—	—	—	—		-	-	-	-	-	-	-	-	-	-
5	—	—	—	—	—	—		-	-	-	-	-	-	-	-	-	-
6	—	—	—	—	—	—		-	-	-	-	-	-	-	-	-	-
7	—	—	—	—	—	—		-	-	-	-	-	-	-	-	-	-
8		—		—		—		-	-	-	-	-	-	-	-	-	-
							Total=	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0

Mean Neonates/Female = 0

AQUA SCIENCE

Environmental Toxicology Specialists

TOXICITY REDUCTION EVALUATION: *CERIODAPHNIA DUBIA*

LEHIGH SOUTHWEST CEMENT CO.

9/7/16

SUBMITTED TO:

Robertson-Bryan, Inc.
9888 Kent St.
Elk Grove, CA 95624
Attention: Paul Bedore

SUBMITTED BY:

AQUA-Science
630 Cantrill Drive
Davis, CA 95618

September 28, 2016

EFFLUENT TOXICITY TESTS FOR ASSESSING COMPLIANCE WITH NPDES CHRONIC TOXICITY LIMITS

1.0 CLIENT INFORMATION

Client:	**Robertson-Bryan, Inc.** 9888 Kent St. Elk Grove, CA 95624
Contact:	**Paul Bedore**
Phone:	(916) 405-8918
email:	paul@robertson-bryan.com

2.0 BIOTOXICITY TESTING REQUIREMENTS

Project:	**Lehigh Southwest Cement Co.**
NPDES No:	**CA 0030210**
Test Type:	**Chronic 7-Day *Ceriodaphnia dubia* Survival and Reproduction**
Test Protocol:	**EPA 821-R-02-013 (see Attachment 1 for protocol summary)**
Dilution Series:	**Lab control, 6.25, 12.5. 18.75, 25 & 40% biologically-treated effluent diluted in permeate - filtered (0.22 um)** **Lab control & 25% biologically-treated effluent diluted in permeate - unfiltered**

3.0 CURRENT TEST INFORMATION

Event:	**Toxicity Reduction Evaluation (TRE)**
Test Samples:	**Biologically-treated Effluent diluted in Permeate**
Sample Dates:	**9/6/16 (grab samples)**
Test Initiation:	**9/7/16**
Test Completion:	**9/14/16**

4.0 SUMMARY OF RESULTS

The purpose of this test was to determine the *C. dubia* chronic toxicity of varying ratios of filtered and unfiltered reverse-osmosis permeate mixed with biologically-treated effluent (see Attachment 2). The dilution series with filtered samples detected no dose-related mortality, but severe reproductive impairment was observed (90.0 TUc; 100/EC_{25}). The test with the 25% unfiltered biologically-treated effluent had 60% survival and severe reproductive impairment (0 neonates/female).

5.0 TEST RESULTS

5.1 *Filtered Test Mixtures (0.22 um)*

5.1.1 Current Effluent Test Data

Sample Concentration (%)	*% Survival*	*Reproduction (neonates/female)*	*QA/QC Requirements Met:*
Lab Control	100	17.0	• ≥80% survival in controls • average neonates/female in controls ≥15 • 60% of surviving control females produced at least three broods
6.25	90	3.5*	
12.5	100	7.4*	
18.75	100	2.8*	
25	100	9.9*	
40	80	0.2*	

* Significantly different than control (p<0.05)

5.1.2 Current Effluent Test Results

Test Endpoint[a]		*NOEC (%)*	*LOEC (%)*	*EC_{25} (%)*	*EC_{50} (%)*	*PMSD*[b] *(%)*
Survival	**% Effluent**	40	> 40	> 40	> 40	*c*
	TUc	2.5	n/a	**< 2.5**	< 2.5	
Reproduction	**% Effluent**	< 6.25	6	1.1	3.6	*31.1*
	TUc	> 16.0	n/a	**90.9**	27.8	

a Cetis™ v. 1.8.7.7 was used to calculate test endpoint

b PMSD = Percent Minimum Significant Difference

c Value could not be calculated due to statistical method used

5.1.3 Comments

Based on the EC_{25} (TUc = 100/EC_{25}), the biologically-treated effluent/permeate mixtures produced significant reproductive toxicity (90.9 TUc) in the chronic *C. dubia* survival and reproduction test. There was no mortality detected at any test concentration.

5.2 *Unfiltered Test Mixtures*

5.2.1 Current Effluent Test Data

Sample Concentration (%)	*Survival (%)*	*Survival (NOEC %)*	*PMSD*[b] *(%)*	*Reproduction (neonates/ female)*	*Reproduction (NOEC %)*	*PMSD*[b] *(%)*	*Toxic Units*[c]
Lab Control	100	n/a	--	23.2	n/a	--	--
25	**60***	**< 25**	d	**0***	**< 25**	9.0	**> 4.0**

* Significantly different than control (p<0.05)

a Cetis™ v. 1.8.7.7 was used to calculate test endpoint

b PMSD = percent minimum significant difference

c Toxic Units (TUc) = 100/NOEC; based on the most sensitive endpoint

d Value could not be calculated due to statistical method used

5.2.2 Comments

The unfiltered 25% biologically-treated effluent/permeate mixture produced significant mortality and reproductive effects in the chronic *C. dubia* toxicity test (NOEC < 25%).

6.0 QA/QC

All protocol and QA/QC requirements were met in these tests.

7.0 TESTING FACILITY

***AQUA*-Science**
630 Cantrill Drive
Davis, CA 95618
(530) 753-5456

California Department of Health Services ELAP
Certification No. 2205 (1/31/17)

File Reference: Lehigh (2016-03 TRE)

Approved By/Issue Date: 9/28/16
Jeffrey L. Miller, Ph.D., DABT
President

ATTACHMENT 1

SUMMARY OF TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

SUMMARY OF TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA FOR DAPHNID, *CERIODAPHNIA DUBIA*, SURVIVAL AND REPRODUCTION TOXICITY TESTS WITH EFFLUENTS AND RECEIVING WATERS (TEST METHOD 1002.0)[1]

1. Test type:	Static-renewal (required)
2. Temperature:	25 ± 1 °C (recommended) Test temperatures should not deviate (i.e. maximum minus minimum temperature) by more than 3 °C during the test (required)
3. Light quality:	Ambient laboratory illumination (recommended)
4. Light intensity:	10-20 μE/m^2/s, or 50-100 ft-c (ambient laboratory levels) (recommended)
5. Photoperiod:	16 h light, 8 h dark (recommended)
6. Test chamber size:	30 mL (recommended minimum)
7. Test solution volume:	15 mL (recommended minimum)
8. Renewal of test solutions:	Daily (required)
9. Age of test organisms:	Less than 24 h; and all released within an 8-h period (required)
10. No. neonates per test chamber:	1 Assigned using blocking by known parentage (required)
11. No. replicate test chambers per concentration:	10 (required minimum)
12. No. neonates per test Concentration:	10 (required minimum)
13. Feeding regime:	Feed 0.1 mL each of YCT and algal suspension per test chamber daily (recommended)
14. Cleaning:	Use freshly cleaned glass beakers or new plastic cups daily (recommended)
15. Aeration:	None (recommended)
16. Dilution water:	Uncontaminated source of receiving or other natural water, synthetic water prepared using MILLIPORE MILLI-Q® or equivalent deionized water and reagent grade chemicals or DMW (available

[1] For the purposes of reviewing WET test data submitted under NPDES permits, each test condition listed above is identified as required or recommended. Additional requirements may be provided in individual permits, such as specifying a given test condition where several options are given in the method.

options)

SUMMARY OF TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA FOR DAPHNID, *CERIODAPHNIA DUBIA*, SURVIVAL AND REPRODUCTION TOXICITY TESTS WITH EFFLUENTS AND RECEIVING WATERS (TEST METHOD 1002.0) (continued)

17. Test concentrations:	Effluents:	5 and a control (required minimum)
	Receiving water:	100% receiving water (or minimum of 5) and a control (recommended)
18. Dilution factor:	Effluents:	≥ 0.5 (recommended)
	Receiving water:	None or ≥ 0.5 (recommended)
19. Test duration:	Until 60% or more surviving control females have three broods (maximum test duration 8 days) (required)	
20. Endpoints:	Survival and reproduction (required)	
21. Test acceptability criteria:	80% or greater survival of all control organisms and an average of 15 or more young per surviving female in the control solutions. 60% of surviving control females must produce three broods (required)	
22. Sampling requirements:	For on-site tests, samples collected daily and used within 24 h or the time they are removed from the sampling device. For off-site tests, a minimum of three samples (e.g., collected on days one, three, and five) with a maximum holding time of 36 h before first use (required)	
23. Sample volume required:	1 L/day (recommended)	

ATTACHMENT 2

LEHIGH PILOT RO SYSTEM STUDY PLAN

Lehigh Pilot RO System Testing

Test Event 2 – September 6, 2016

Testing of an ultra-filtration reverse osmosis (UFRO)/biological system is planned. Information provided to date indicates that the UFRO/biological system is producing a final, combined effluent consisting of 25% biologically treated concentrate (i.e., biological effluent) + 75% permeate. Different mixtures of varying ratios of permeate and biological effluent will be tested by the lab.

- Biological effluent and permeate will be collected separately by Lehigh staff.
    - Permeate – 2 x 2.5 gallon grab samples. Equal volume aliquots from the two grab samples should be combined for use as the "permeate" in the test.
    - Biological effluent 2 x 2.5 gallon grab samples. Equal volume aliquots from the two grab samples should be combined for use as the "biological effluent" in the test.
    - No renewal samples will be collected for the test.
- Aeration – Biological effluent will have low DO and elevated sulfides when received. Aerate the biological effluent to ≥ 6 mg/L DO and < 0.1 mg/L sulfide prior to making test mixtures.
- Mixtures listed in **Table 1** will be used in chronic *C. dubia* testing against a shared lab water control – some mixtures will be tested after filtration, and one mixture tested without filtration.
    - Mixtures requiring 0.2 µm filtration to remove pathogens – 5 mixtures.
    - Mixture not requiring filtration – 1 mixture (to evaluate whether pathogens are removed with filtration).

Table 1. Ratios of biological effluent to permeate for chronic C. dubia toxicity tests.

	Mixtures Receiving 0.20 µm filtration					Mixture - Unfiltered
Biological Effluent	40%	25%	18.75%	12.5%	6.25%	25%
Permeate	60%	75%	81.25%	87.5%	93.75%	75%

- Sample pick-up:
    - Laboratory courier is needed. Sample will be ready for pick-up on September 6 at 11:00 a.m. at the Lehigh gate.
    - Expect two coolers labeled "**Aqua Science**"
    - Please bring two coolers to replace the coolers that Lehigh has on-hand.
    - Lehigh address: 4001 Stevens Creek Blvd, Los Altos, CA 94024.

CERIODAPHNIA 7-DAY SURVIVAL AND REPRODUCTION TEST

Statistics and Raw Data

CETIS Summary Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Aqua-Science**

Batch ID:	17-2397-0602	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	C. Walker
Start Date:	07 Sep-16 12:35	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Permeate
Ending Date:	14 Sep-16 14:10	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	7d 2h	**Source:**	In-House Culture	**Age:**	<24h
Sample ID:	15-1922-4009	**Code:**	5A8D84C9	**Client:**	Lehigh Cement
Sample Date:	06 Sep-16 09:20	**Material:**	Industrial Effluent	**Project:**	Accelerated Monitoring
Receive Date:	06 Sep-16 13:30	**Source:**	NPDES Permit #CA0030210 (Lehigh Ceme		
Sample Age:	27h (14.2 °C)	**Station:**	Biological Effluent		

Sample Note: 0.22 µm Filtered

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
15-4262-5064	7d Survival Rate	40	>40	NA	NA	2.5	Fisher Exact/Bonferroni-Holm Test
08-7949-9670	Reproduction	<6.25	6.25	NA	31.1%	>16	Steel Many-One Rank Sum Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
17-3269-1605	7d Survival Rate	EC5	26.75	1.693	N/A	3.739	Linear Interpolation (ICPIN)
		EC10	30.6	26.35	N/A	3.267	
		EC15	35	28.14	N/A	2.857	
		EC20	40	30.6	N/A	2.5	
		EC25	>40	N/A	N/A	<2.5	
		EC40	>40	N/A	N/A	<2.5	
		EC50	>40	N/A	N/A	<2.5	
06-9195-8089	Reproduction	IC5	0.1638	0.1398	0.2095	610.5	Linear Interpolation (ICPIN)
		IC10	0.3545	0.2991	0.463	282.1	
		IC15	0.5763	0.4806	0.7695	173.5	
		IC20	0.8345	0.6876	1.14	119.8	
		IC25	1.135	0.9234	1.589	88.1	
		IC40	2.366	1.848	3.581	42.27	
		IC50	3.558	2.7	5.701	28.1	

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
15-4262-5064	7d Survival Rate	Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria
17-3269-1605	7d Survival Rate	Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria
06-9195-8089	Reproduction	Control Resp	17	15 - NL	Yes	Passes Acceptability Criteria
08-7949-9670	Reproduction	PMSD	0.3109	0.13 - 0.47	Yes	Passes Acceptability Criteria

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	10	1	1	1	1	1	0	0	0.0%	0.0%
6.25		10	0.9	0.6738	1	0	1	0.1	0.3162	35.14%	10.0%
12.5		10	1	1	1	1	1	0	0	0.0%	0.0%
18.75		10	1	1	1	1	1	0	0	0.0%	0.0%
25		10	1	1	1	1	1	0	0	0.0%	0.0%
40		10	0.8	0.4984	1	0	1	0.1333	0.4216	52.7%	20.0%

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	10	17	12.39	21.61	9	27	2.039	6.446	37.92%	0.0%
6.25		10	3.5	1.361	5.639	0	10	0.9458	2.991	85.45%	79.41%
12.5		10	7.4	1.567	13.23	0	22	2.579	8.154	110.2%	56.47%
18.75		10	2.8	0.9903	4.61	0	9	0.8	2.53	90.35%	83.53%
25		10	9.9	5.602	14.2	0	19	1.9	6.008	60.69%	41.76%
40		10	0.2	-0.2524	0.6524	0	2	0.2	0.6325	316.2%	98.82%

Ceriodaphnia 7-d Survival and Reproduction Test — Aqua-Science

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	1	1	1	1	1	1	1	1	1	1
6.25		1	1	1	1	1	1	1	1	1	0
12.5		1	1	1	1	1	1	1	1	1	1
18.75		1	1	1	1	1	1	1	1	1	1
25		1	1	1	1	1	1	1	1	1	1
40		1	1	1	1	1	1	0	0	1	1

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	15	27	13	22	25	11	21	9	10	17
6.25		3	0	0	6	2	10	3	5	4	2
12.5		3	0	0	22	4	11	0	4	10	20
18.75		3	2	2	4	3	0	9	3	2	0
25		13	17	11	8	10	13	19	0	4	4
40		0	0	2	0	0	0	0	0	0	0

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Aqua-Science**

Analysis ID: 08-7949-9670 **Endpoint:** Reproduction **CETIS Version:** CETISv1.8.7
Analyzed: 19 Sep-16 14:09 **Analysis:** Nonparametric-Control vs Treatments **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	31.1%	<6.25	6.25	NA	>16

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water		6.25*	56.5	75	1	18	0.0006	Asymp	Significant Effect
		12.5*	72.5	75	3	18	0.0288	Asymp	Significant Effect
		18.75*	55.5	75	1	18	0.0004	Asymp	Significant Effect
		25	77.5	75	4	18	0.0711	Asymp	Non-Significant Effect
		40*	55	75	0	18	0.0004	Asymp	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1844.6	368.92	5	13.84	<0.0001	Significant Effect
Error	1439	26.64815	54			
Total	3283.6		59			

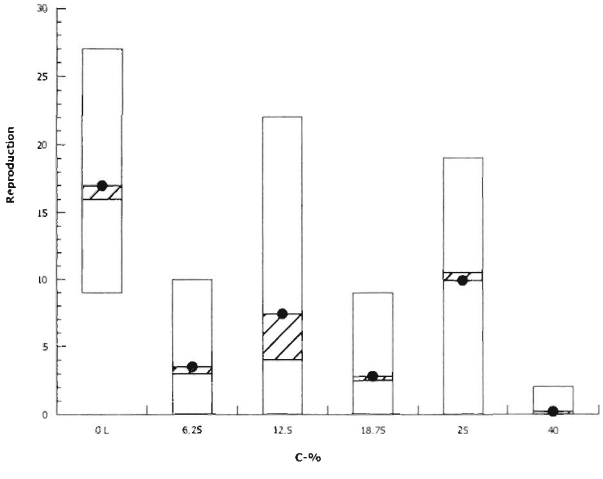
Distributional Tests

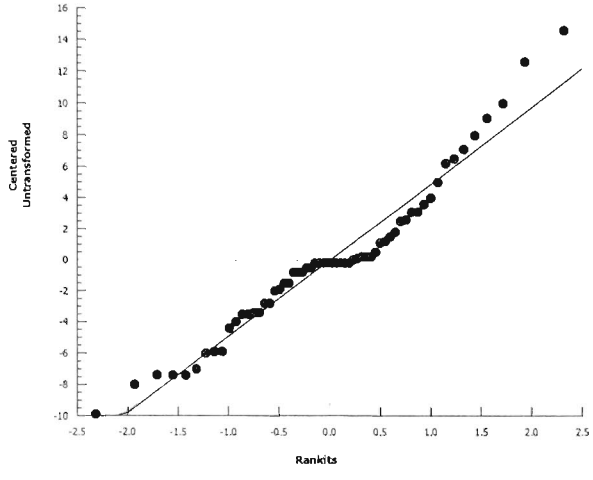
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	43.61	15.09	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.9537	0.9459	0.0232	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water	10	17	12.39	21.61	16	9	27	2.039	37.92%	0.0%
6.25		10	3.5	1.361	5.639	3	0	10	0.9458	85.45%	79.41%
12.5		10	7.4	1.567	13.23	4	0	22	2.579	110.2%	56.47%
18.75		10	2.8	0.9903	4.61	2.5	0	9	0.8	90.35%	83.53%
25		10	9.9	5.602	14.2	10.5	0	19	1.9	60.69%	41.76%
40		10	0.2	-0.2524	0.6524	0	0	2	0.2	316.2%	98.82%

Graphics





Ceriodaphnia 7-d Survival and Reproduction Test — Aqua-Science

Analysis ID:	17-3269-1605	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 14:09	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1775267	200	Yes	Two-Point Interpolation

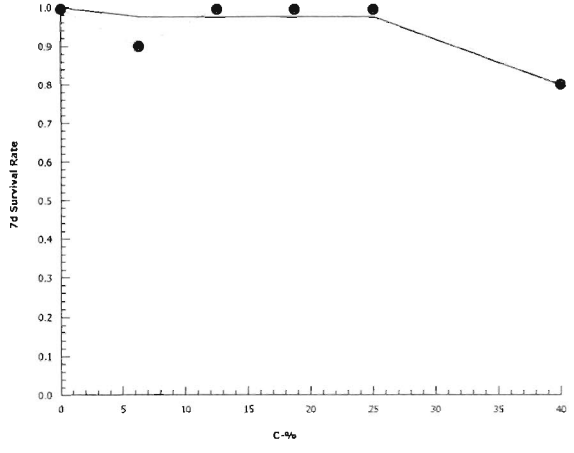
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
EC5	26.75	1.693	N/A	3.739	NA	59.08
EC10	30.6	26.35	N/A	3.267	NA	3.795
EC15	35	28.14	N/A	2.857	NA	3.554
EC20	40	30.6	N/A	2.5	NA	3.267
EC25	>40	N/A	N/A	<2.5	NA	NA
EC40	>40	N/A	N/A	<2.5	NA	NA
EC50	>40	N/A	N/A	<2.5	NA	NA

7d Survival Rate Summary — Calculated Variate(A/B)

C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Lab Water	10	1	1	1	0	0	0.0%	0.0%	10	10
6.25		10	0.9	0	1	0.1	0.3162	35.14%	10.0%	9	10
12.5		10	1	1	1	0	0	0.0%	0.0%	10	10
18.75		10	1	1	1	0	0	0.0%	0.0%	10	10
25		10	1	1	1	0	0	0.0%	0.0%	10	10
40		10	0.8	0	1	0.1333	0.4216	52.7%	20.0%	8	10

Graphics



Ceriodaphnia 7-d Survival and Reproduction Test — Aqua-Science

Analysis ID:	06-9195-8089	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 14:09	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1077142	200	Yes	Two-Point Interpolation

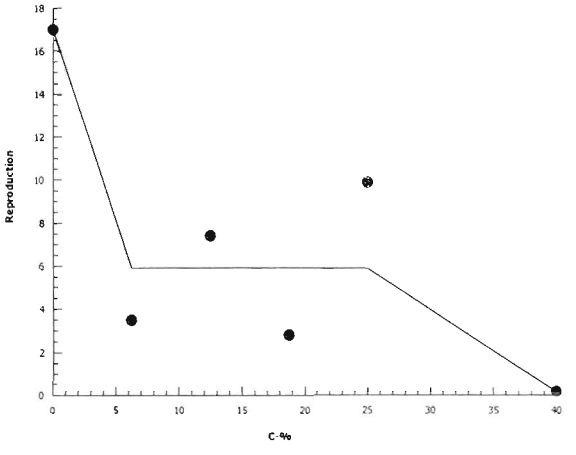
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	0.1638	0.1398	0.2095	610.5	477.3	715.5
IC10	0.3545	0.2991	0.463	282.1	216	334.4
IC15	0.5763	0.4806	0.7695	173.5	130	208.1
IC20	0.8345	0.6876	1.14	119.8	87.7	145.4
IC25	1.135	0.9234	1.589	88.1	62.95	108.3
IC40	2.366	1.848	3.581	42.27	27.93	54.12
IC50	3.558	2.7	5.701	28.1	17.54	37.04

Reproduction Summary — Calculated Variate

C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	10	17	9	27	2.039	6.446	37.92%	0.0%
6.25		10	3.5	0	10	0.9458	2.991	85.45%	79.41%
12.5		10	7.4	0	22	2.579	8.154	110.2%	56.47%
18.75		10	2.8	0	9	0.8	2.53	90.35%	83.53%
25		10	9.9	0	19	1.9	6.008	60.69%	41.76%
40		10	0.2	0	2	0.2	0.6325	316.2%	98.82%

Graphics



Ceriodaphnia 7-d Survival and Reproduction Test — Aqua-Science

Analysis ID:	15-4262-5064	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 14:09	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	40	>40	NA	2.5

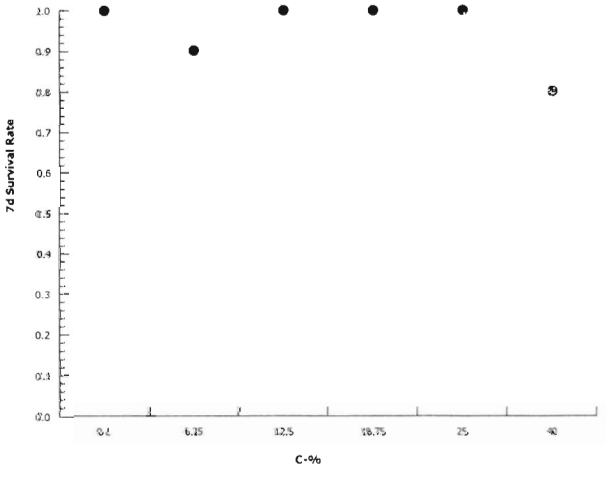
Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water		6.25	0.5	1.0000	Exact	Non-Significant Effect
		12.5	1	1.0000	Exact	Non-Significant Effect
		18.75	1	1.0000	Exact	Non-Significant Effect
		25	1	1.0000	Exact	Non-Significant Effect
		40	0.2368	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water	10	0	10	1	0	0.0%
6.25		9	1	10	0.9	0.1	10.0%
12.5		10	0	10	1	0	0.0%
18.75		10	0	10	1	0	0.0%
25		10	0	10	1	0	0.0%
40		8	2	10	0.8	0.2	20.0%

Graphics



CETIS Summary Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Aqua-Science**

Batch ID:	20-6676-6038	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	C. Walker
Start Date:	07 Sep-16 12:50	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Permeate
Ending Date:	14 Sep-16 14:40	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	7d 2h	**Source:**	In-House Culture	**Age:**	<24h
Sample ID:	15-1922-4009	**Code:**	5A8D84C9	**Client:**	Lehigh Cement
Sample Date:	06 Sep-16 09:20	**Material:**	Industrial Effluent	**Project:**	Accelerated Monitoring
Receive Date:	06 Sep-16 13:30	**Source:**	NPDES Permit #CA0030210 (Lehigh Ceme		
Sample Age:	27h (14.2 °C)	**Station:**	Biological Effluent		

Sample Note: UNFILTERED

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
03-3525-4794	7d Survival Rate	<25	25	NA	NA	>4	Fisher Exact Test
03-2619-8455	Reproduction	<25	25	NA	9.04%	>4	Wilcoxon Rank Sum Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
03-3525-4794	7d Survival Rate	Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria
03-2619-8455	Reproduction	PMSD	0.09038	0.13 - 0.47	Yes	Below Acceptability Criteria

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	10	1	1	1	1	1	0	0	0.0%	0.0%
25		10	0.6	0.2306	0.9694	0	1	0.1633	0.5164	86.07%	40.0%

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water	10	23.2	20.46	25.94	16	28	1.209	3.824	16.48%	0.0%
25		10	0	0	0	0	0	0	0		100.0%

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	1	1	1	1	1	1	1	1	1	1
25		1	1	1	1	0	1	0	1	0	0

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	25	24	21	19	27	28	27	23	16	22
25		0	0	0	0	0	0	0	0	0	0

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Aqua-Science**

Analysis ID:	03-2619-8455	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Sep-16 14:15	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.04%	Fails reproduction

Wilcoxon Rank Sum Two-Sample Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water		25*	55	NA	0	18	<0.0001	Exact	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2691.2	2691.2	1	368.1	<0.0001	Significant Effect
Error	131.6	7.311111	18			
Total	2822.8		19			

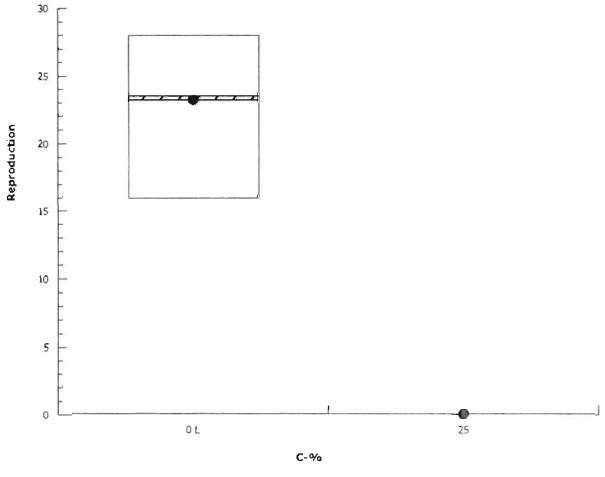
Distributional Tests

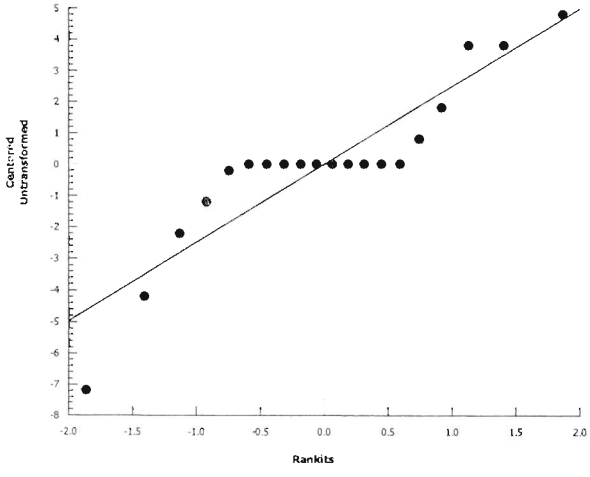
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	19.06	8.285	0.0004	Unequal Variances
Variances	Levene Equality of Variance	19.47	8.285	0.0003	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8509	0.866	0.0055	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water	10	23.2	20.46	25.94	23.5	16	28	1.209	16.48%	0.0%
25		10	0	0	0	0	0	0	0		100.0%

Graphics





Ceriodaphnia 7-d Survival and Reproduction Test

Aqua-Science

Analysis ID: 03-3525-4794 **Endpoint:** 7d Survival Rate **CETIS Version:** CETISv1.8.7
Analyzed: 19 Sep-16 14:14 **Analysis:** Single 2x2 Contingency Table **Official Results:** Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Fails 7d survival rate

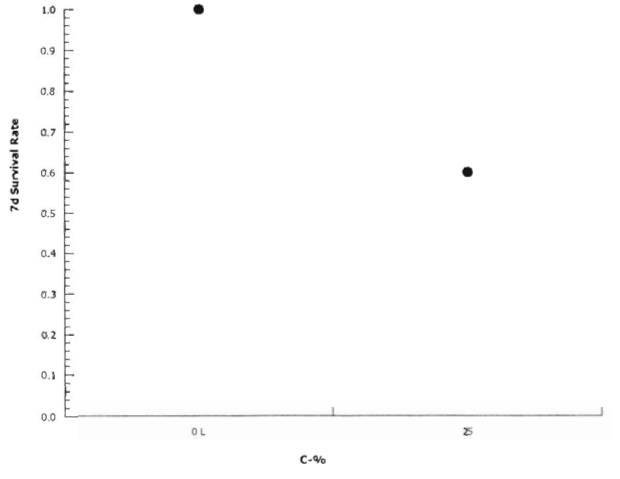
Fisher Exact Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water		25	0.04334	0.0433	Exact	Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water	10	0	10	1	0	0.0%
25		6	4	10	0.6	0.4	40.0%

Graphics



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Environmental Toxicology Specialists

CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

Effluent Concentration (%): **Lab Control**

ADULT SURVIVAL/MORTALITY RECORD

Day	REPLICATE NUMBER										
No.	1	2	3	4	5	6	7	8	9	10	n
1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
3	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
4	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
5	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
6	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
7	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
n	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	

NEONATE REPRODUCTION RECORD

Day	REPLICATE NUMBER										
No.	1	2	3	4	5	6	7	8	9	10	n
1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
3	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
4	3	4	4	5	5	2	5	2	4	5	39
5	4	10	5	4	4	3	Ø	Ø	3	Ø	33
6	Ø	Ø	Ø	Ø	Ø	Ø	4	Ø	Ø	4	8
7	8	13	4	13	16	6	12	7	3	8	90
n	15	17	13	12	15	11	21	9	10	17	

Tech Init.	Obs. Date
~	09/08
SD	09/09
SD	09/10
~	09/11
~	09/12
~	09/13
~	09/14

TOTAL NUMBER OF ADULTS AT STUDY TERMINATION DATE	10
TOTAL NUMBER OF NEONATES PRODUCED	170
MEAN NUMBER OF NEONATES PRODUCED PER ADULT	17.0
STANDARD DEVIATION FOR THE ABOVE MEAN	6.4

Additional Comments/Observations

Test Initiated / Animals Fed by ~ @ 1235

Test Terminated by ~ @ 1410

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time of Observation / Feeding:	1330	1410	1345	1410	1330	1420	1410

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CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

Effluent Concentration (%): **6.25**

ADULT SURVIVAL/MORTALITY RECORD

Day No.	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	n
1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
3	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
4	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	1
5	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	/	Ø
6	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	/	Ø
7	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	/	Ø
n	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	

NEONATE REPRODUCTION RECORD

Day No.	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	n	Tech Init.	Obs. Date
1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	[illegible]	09/08
2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	SD	09/09
3	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	SD	09/10
4	3	Ø	Ø	4	2	4	3	2	4	2	24	[illegible]	09/11
5	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	/	0	[illegible]	09/12
6	Ø	Ø	Ø	Ø	Ø	6	Ø	Ø	Ø	/	6	[illegible]	09/13
7	Ø	Ø	Ø	2	Ø	Ø	Ø	3	Ø	/	5	[illegible]	09/14
n	3	Ø	Ø	6	2	10	3	5	4	2			

TOTAL NUMBER OF ADULTS AT STUDY TERMINATION DATE	9
TOTAL NUMBER OF NEONATES PRODUCED	35
MEAN NUMBER OF NEONATES PRODUCED PER ADULT	3.5
STANDARD DEVIATION FOR THE ABOVE MEAN	3.0

Additional Comments/Observations

Time of Observation / Feeding:	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	1332	1413	1357	1415	1335	1422	1415

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CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

Effluent Concentration (%): **12.5**

ADULT SURVIVAL/MORTALITY RECORD

Day	REPLICATE NUMBER										
No.	1	2	3	4	5	6	7	8	9	10	n
1	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
2	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
3	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
4	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
5	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
6	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
7	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘
n	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	

NEONATE REPRODUCTION RECORD

Day	REPLICATE NUMBER											Tech	Obs.
No.	1	2	3	4	5	6	7	8	9	10	n	Init.	Date
1	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	~	09/08
2	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	SD	09/09
3	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	SD	09/10
4	3	⊘	⊘	5	4	2	⊘	4	2	5	25	~	09/11
5	⊘	⊘	⊘	5	⊘	⊘	⊘	⊘	⊘	9	14	~	09/12
6	⊘	⊘	⊘	12	⊘	⊘	⊘	⊘	8	6	26	~	09/13
7	⊘	⊘	⊘	⊘	⊘	9	⊘	⊘	⊘	⊘	9	~	09/14
n	3	⊘	⊘	22	4	11	⊘	4	10	20			

TOTAL NUMBER OF ADULTS AT STUDY TERMINATION DATE	10
TOTAL NUMBER OF NEONATES PRODUCED	94
MEAN NUMBER OF NEONATES PRODUCED PER ADULT	9.4
STANDARD DEVIATION FOR THE ABOVE MEAN	8.2

Additional Comments/Observations

Time of Observation / Feeding:	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	1339	1416	1401	1420	1340	1424	1420

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CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

Effluent Concentration (%): **18.75**

ADULT SURVIVAL/MORTALITY RECORD

Day	REPLICATE NUMBER										
No.	1	2	3	4	5	6	7	8	9	10	n
1	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
2	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
3	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
4	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
5	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
6	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
7	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
n	0	0	0	0	0	0	0	0	0	0	

NEONATE REPRODUCTION RECORD

Day	REPLICATE NUMBER											Tech	Obs.
No.	1	2	3	4	5	6	7	8	9	10	n	Init.	Date
1	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	~	09/08
2	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	SD	09/09
3	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	0	SD	09/10
4	3	2	2	4	3	∅	2	3	∅	∅	19	~	09/11
5	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	0	~	09/12
6	∅	∅	∅	∅	∅	∅	7	∅	2	∅	9	~	09/13
7	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	0	~	09/14
n	3	2	2	4	3	0	9	3	2	0			

TOTAL NUMBER OF ADULTS AT STUDY TERMINATION DATE	10
TOTAL NUMBER OF NEONATES PRODUCED	28
MEAN NUMBER OF NEONATES PRODUCED PER ADULT	2.8
STANDARD DEVIATION FOR THE ABOVE MEAN	2.5

Additional Comments/Observations

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time of Observation / Feeding:	1336	1419	1405	1425	1345	1426	1425

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CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

Effluent Concentration (%): **25**

ADULT SURVIVAL/MORTALITY RECORD

Day	REPLICATE NUMBER										
No.	1	2	3	4	5	6	7	8	9	10	n
1	○	○	○	○	○	○	○	○	○	○	○
2	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀
3	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀
4	○	○	○	○	○	○	○	○	○	○	○
5	○	○	○	○	○	○	○	○	○	○	○
6	○	○	○	○	○	○	○	○	○	○	○
7	○	○	○	○	○	○	○	○	○	○	○
n	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	

NEONATE REPRODUCTION RECORD

Day	REPLICATE NUMBER											Tech	Obs.
No.	1	2	3	4	5	6	7	8	9	10	n	Init.	Date
1	○	○	○	○	○	○	○	○	○	○	○	w	09/08
2	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	SD	09/09
3	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	⌀	SD	09/10
4	4	2	○	2	4	2	4	○	○	3	21	w	09/11
5	○	6	○	○	○	○	7	○	○	○	13	w	09/12
6	9	9	○	○	○	11	8	○	4	1	42	w	09/13
7	○	○	11	6	6	○	○	○	○	○	23	w	09/14
n	13	17	11	8	10	13	9	○	4	4			

TOTAL NUMBER OF ADULTS AT STUDY TERMINATION DATE	10
TOTAL NUMBER OF NEONATES PRODUCED	99
MEAN NUMBER OF NEONATES PRODUCED PER ADULT	9.9
STANDARD DEVIATION FOR THE ABOVE MEAN	6.0

Additional Comments/Observations

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time of Observation / Feeding:	1338	1424	1408	1430	1350	1423	1430

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Environmental Toxicology Specialists

CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

Effluent Concentration (%): **40**

ADULT SURVIVAL/MORTALITY RECORD

Day No.	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	n
1	○	○	○	○	○	○	○	○	○	○	○
2	○	○	○	○	○	○	○	○	○	○	○
3	○	○	○	○	○	○	○	1	○	○	1
4	○	○	○	○	○	○	○	/	○	○	○
5	○	○	○	○	○	○	○	/	○	○	○
6	○	○	○	○	○	○	1	/	○	○	1
7	○	○	○	○	○	○	/	/	○	○	○
n	♀	♀	♀	♀	♀	♀	1	1	♀	♀	

NEONATE REPRODUCTION RECORD

Day No.	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	n	Tech Init.	Obs. Date
1	○	○	○	○	○	○	○	○	○	○	○	✓	09/08
2	○	○	○	○	○	○	○	○	○	○	○	SD	09/09
3	○	○	○	○	○	○	○	○	○	○	♀	SD	09/10
4	○	○	2	○	○	○	○	/	○	○	2	✓	09/11
5	○	○	○	○	○	○	○	/	○	○	♀	✓	09/12
6	○	○	○	○	○	○	○	/	○	○	♀	✓	09/13
7	○	○	○	○	○	○	/	/	○	○	♀	✓	09/14
n	♀	♀	2	♀	♀	♀	♀	♀	♀	♀			

TOTAL NUMBER OF ADULTS AT STUDY TERMINATION DATE	7
TOTAL NUMBER OF NEONATES PRODUCED	2
MEAN NUMBER OF NEONATES PRODUCED PER ADULT	0.2
STANDARD DEVIATION FOR THE ABOVE MEAN	0.6

Additional Comments/Observations

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time of Observation / Feeding:	1340	1430	1411	1435	1355	1430	1435

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CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

Effluent Concentration (%): **Lab Control**

ADULT SURVIVAL/MORTALITY RECORD

Day No.	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	n
1	○	○	○	○	○	○	○	○	○	○	○
2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
3	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
4	○	○	○	○	○	○	○	○	○	○	○
5	○	○	○	○	○	○	○	○	○	○	○
6	○	○	○	○	○	○	○	○	○	○	○
7	○	○	○	○	○	○	○	○	○	○	○
n	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	

NEONATE REPRODUCTION RECORD

Day No.	REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	n	Tech Init.	Obs. Date
1	○	○	○	○	○	○	○	○	○	○	○	~	09/08
2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	SD	09/09
3	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	SD	09/10
4	6	4	6	5	5	5	6	5	Ø	6	48	~	09/11
5	9	10	7	6	10	11	6	8	6	6	79	~	09/12
6	10	10	8	8	12	12	15	10	10	10	105	~	09/13
7	○	○	○	○	○	○	○	○	○	○	Ø	~	09/14
n	25	24	21	19	17	28	27	23	16	22			

TOTAL NUMBER OF ADULTS AT STUDY TERMINATION DATE	10
TOTAL NUMBER OF NEONATES PRODUCED	137
MEAN NUMBER OF NEONATES PRODUCED PER ADULT	13.7
STANDARD DEVIATION FOR THE ABOVE MEAN	3.8

Additional Comments/Observations

Test Initiated / Animals Fed by KW @ 1250

Test Terminated by KW @ 1440

Time of Observation / Feeding:	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	1342	1436	1417	1440	1400	1435	1440

AQUA-Science

Environmental Toxicology Specialists

CERIODAPHNIA SURVIVAL AND REPRODUCTION TEST

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

Effluent Concentration (%): **25**

ADULT SURVIVAL/MORTALITY RECORD

Day	REPLICATE NUMBER										
No.	1	2	3	4	5	6	7	8	9	10	n
1	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀
2	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀
3	♀	♀	♀	♀	1	♀	♀	♀	1	1	3
4	♀	♀	♀	♀	/	♀	♀	♀	/	/	♀
5	♀	♀	♀	♀	/	♀	♀	♀	/	/	♀
6	♀	♀	♀	♀	/	♀	1	♀	/	/	1
7	♀	♀	♀	♀	/	♀	/	♀	/	/	♀
n	♀	♀	♀	♀	1	♀	1	♀	1	1	

NEONATE REPRODUCTION RECORD

Day	REPLICATE NUMBER											Tech	Obs.
No.	1	2	3	4	5	6	7	8	9	10	n	Init.	Date
1	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	~	09/08
2	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	SD	09/09
3	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	SD	09/10
4	♀	♀	♀	♀	/	♀	♀	♀	/	/	♀	KM	09/11
5	♀	♀	♀	♀	/	♀	♀	♀	/	/	♀	~	09/12
6	♀	♀	♀	♀	/	♀	♀	♀	/	/	♀	~	09/13
7	♀	♀	♀	♀	/	♀	/	♀	/	/	♀	~	09/14
n	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀			

TOTAL NUMBER OF ADULTS AT STUDY TERMINATION DATE	10
TOTAL NUMBER OF NEONATES PRODUCED	0
MEAN NUMBER OF NEONATES PRODUCED PER ADULT	0
STANDARD DEVIATION FOR THE ABOVE MEAN	n/a

Additional Comments/Observations

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time of Observation / Feeding:	1344	1440	1419	1445	1405	1438	1445

AQUA-Science

Environmental Toxicology Specialists

DOSE PREPARATION SHEET

09/07/16

Lehigh 16-03 A

7-day static renewal chronic bioassay

Ceriodaphnia dubia

Test concentrations:

Lab Control and 6.25, 12.5, 18.75, 25 and 40% effluent in permeate dilution water + **0.22 µm Filtration**

Effluent = Biological effluent (09/06/16) in permeate (09/06/16) dilution water

Lab Ctrl water= 2X carbon filtered reverse osmosis well water at EPAMH specifications using EPA salts.

All surface waters filtered through 60 µm screen

Biological effluent was aerated to ≥ 6 mg/L DO and < 0.1 mg/L sulfide prior to solution preparation

20ml/Replicate: 1- <24 hr neonate/Replicate: 10 Replicates/Concentration

Concentration (%)	Amount Effluent (mL)	Lab Water (mL)	Permeate Water (mL)	Total (mL)*
Lab Control	0	220	0	220
6.25	14	0	QS to 220	220
12.5	28	0	QS to 220	220
18.75	41	0	QS to 220	220
25	55	0	QS to 220	220
40	88	0	QS to 220	220

*20 mL used for pH measurement inoculate 200 mL for test.

Test Day	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Technician	SD	SD	TP	TP	~	~	~
Time	1130	1130	1140	1145	1130	1310	1408
Date	09/07/16	09/08/16	09/09/16	09/10/16	09/11/16	09/12/16	09/13/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (0)	Date:	09/07/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.7	8.16	62	282	80	24	6.9	7.85
6.25	24	7.5	8.08	① 50	404	① 170	24	6.7	7.65
12.5	24	7.6	7.96	-	697	-	24	6.5	7.48
18.75	24	7.6	7.91	① 110	916	① 620	24	6.3	7.40
25	25	7.7	7.88	-	1161	-	24	5.7	7.35
40	25	7.8	7.87	① 290	1689	① 1050	24	5.4	7.43
							SD 09/08/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID C6

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS: ① Measurement taken in a 10 mL sample volume SD 09/07/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = R/O EPAMH #126+CNS

All surface waters filtered through a 60 µm screen daily

Technician: SD Date: 09/07/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS	Day (1)	Date:	09/08/16			24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.8	8.07	62	281	80	24	7.1	7.76
6.25	25	7.9	8.00	① 60	386	① 180	24	6.7	7.82
12.5	25	7.9	7.88	-	691	-	24	6.4	7.63
18.75	25	7.9	7.84	① 160	925	① 630	24	6.3	7.52
25	25	7.9	7.82	-	1176	-	24	5.9	7.46
40	25	7.9	7.79	① 280	1679	① 1040	24	5.3	7.52
							TP	09/09/16	

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID ~~08~~ 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS: ① Measurement taken in a 10 mL sample volume SD 09/08/16
② Entry error SD 09/08/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = R/O EPAMH #126 + CMS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/08/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS	Day (2)	Date:	09/09/16			24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.6	8.11	62	285	80	24	6.9	7.84
6.25	24	7.7	8.07	①50	388	① 180	24	7.1	7.65
12.5	24	7.8	7.97	-	600	-	24	6.4	7.59
18.75	24	8.0	7.85	①170	896	① 620	24	6.3	7.40
25	24	8.0	7.78	-	1140	-	24	6.1	7.31
40	24	8.0	7.68	①280	1663	① 1050	24	5.6	7.22
							TP 09/10/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID C3

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS: ① measurements taken in 10 mL sample volume TP 09/09/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = RO EPAMH # 126 HCWS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/09/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (3)	Date:	09/10/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.6	8.23	62	279	80	24	7.2	8.23
6.25	24	7.8	8.13	① 50	363	① 180	24	6.9	7.98
12.5	24	7.8	7.95	-	653	-	24	6.4	7.75
18.75	24	7.9	7.86	① 170	889	① 620	24	6.2	7.65
25	24	8.0	7.75	-	1141	-	24	6.0	7.60
40	24	8.1	7.63	① 250	1638	① 1050	24	5.8	7.53
							~ 09/11/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS: ① measurements taken in 10mL sample volume TP 09/10/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = R10 EPAMH #126 FCNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/10/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (4)	Date:	09/11/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.9	7.91	62	277	80	24	6.5	8.07
6.25	24	8.0	7.77	① 60	351	① 180	24	6.5	7.93
12.5	24	8.0	7.62	-	645	-	24	6.2	7.71
18.75	24	8.0	7.50	① 170	885	① 620	24	5.9	7.57
25	24	8.1	7.40	-	1114	-	24	5.8	7.51
40	24	8.2	7.28	① 280	1631	① 1050	24	5.6	7.39
							~ 09/12/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS:

① Measurement taken in 10mL sample volume ~ 09/11/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = RO EPAMH + 12C + CNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/11/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (5)	Date:	09/12/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.8	7.84	62	277	80	24	6.3	8.33
6.25	24	7.9	7.71	① 60	356	① 180	24	6.6	8.20
12.5	24	7.9	7.46	-	646	-	24	6.4	8.01
18.75	24	8.0	7.39	② 170	879	② 620	24	6.2	7.84
25	24	8.0	7.33	-	1098	-	24	6.1	7.76
40	24	8.1	7.21	① 280	1592	① 1050	24	5.7	7.63
							km 09/13/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS:

① Measurement taken in 10mL sample volume km 09/12/16

② entry error km 09/12/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.

Control water ID = ~~R/O EPA/MH @ 128 + CNS~~ R/O EPA/MH @ 126 + CNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/12/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 A	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water + 0.22 µm Filtration		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (6)	Date:	09/13/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.6	8.32	62	279	80	25	6.1	8.11
6.25	24	8.0	8.20	① 60	356	① 180	25	6.0	7.90
12.5	24	8.0	8.02	-	629	-	25	5.9	7.71
18.75	24	8.0	7.91	① 170	378	① 620	25	5.7	7.62
25	24	8.0	7.78	-	1112	-	25	5.6	7.50
40	24	8.0	7.62	① 280	1613	① 1050	25	5.5	7.39
							SD 09/14/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS:

① Measurement taken in 10mL sample volume on 09/13/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = RO EPA MH #126 + CNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/13/16

AQUA-Science
Environmental Toxicology Consultants

CERIODAPHNIA RANDOMIZATION FORM

Client: Lenzen 16-03 A

TEMPLATE #1

	Loading Order									
Female No.	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	1	3	~~10~~	~~9~~	6	~~8~~	~~7~~	4	2	5
2	~~10~~	~~8~~	4	2	~~7~~	5	~~9~~	6	1	3
3	~~7~~	2	~~9~~	5	~~10~~	3	6	4	1	~~8~~
4	2	4	~~8~~	~~9~~	~~10~~	~~7~~	5	6	1	3
5	3	~~10~~	5	2	~~7~~	1	~~9~~	~~8~~	6	4
6	~~7~~	6	1	~~10~~	~~8~~	3	4	2	~~9~~	5
7	5	~~8~~	6	3	1	~~10~~	~~9~~	2	4	~~7~~
8	~~10~~	4	5	6	~~7~~	2	1	~~9~~	~~8~~	3
9	3	4	~~9~~	~~10~~	6	2	5	~~7~~	~~8~~	1
10	~~8~~	~~8~~	~~10~~	1	4	5	~~7~~	3	6	2

	Female Description		*Sample Description*
1	09/01 culture ♀	1	Lab control
2	↓	4	6.25
3	↓	6	12.5
4	09/01 Brood ♀	3	18.75
5	↓	5	25
6	↓	6	40
7	↓	7	—
8	↓	8	—
9	↓	10	—
10	↓	14	—

Technician _____ Date 09/07/16

AQUA-Science

Environmental Toxicology Specialists

DOSE PREPARATION SHEET

09/07/16

Lehigh 16-03 B

7-day static renewal chronic bioassay

Ceriodaphnia dubia

Test concentrations: **Lab Control and 25% effluent in permeate dilution water**

Effluent = Biological effluent (09/06/16) in permeate (09/06/16) dilution water

Lab Ctrl water= 2X carbon filtered reverse osmosis well water at EPAMH specifications using EPA salts.

All surface waters filtered through 60 µm screen

Biological effluent was aerated to ≥ 6 mg/L DO and < 0.1 mg/L sulfide prior to solution preparation

20ml/Replicate: 1- <24 hr neonate/Replicate: 10 Replicates/Concentration

Concentration (%)	Amount Effluent (mL)	Lab Water (mL)	Permeate Water (mL)	Total (mL)*
Lab Control	0	220	0	220
25	55	0	QS to 220	220

*20 mL used for pH measurement inoculate 200 mL for test.

Test Day	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Technician	SD	SD	TP	TP	~	~	~
Time	1200	1115	1115	1115	1120	1300	1400
Date	09/07/16	09/08/16	09/09/16	09/10/16	09/11/16	09/12/16	09/13/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS	Day (0)	Date:	09/07/16			24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.9	8.11	62	280	80	24	6.0	8.20
25	25	8.2	7.95	©190	1191	©610	24	5.9	7.83
							SD 09/08/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

**Alkalinity (mg/L CaCO3); HACH Test Kit

^^= pH: Meter ID 03

~=Water Hardness (mg/L CaCO3); HACH Test Kit

^=Conductivity/Salinity (µmohs): Meter ID 06

ADDITIONAL COMMENTS: © measurement taken in a 10 mL sample volume SD 09/07/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = R/O EPAMH #126+CNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/07/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS	Day (1)	Date:	09/08/16			24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.7	7.97	58	278	80	24	6.0	8.01
25	25	8.1	7.53	① 180	1153	① 600	24	5.6	7.51
							TP	09/09/16	

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 04

**Alkalinity (mg/L CaCO3); HACH Test Kit

^^= pH: Meter ID 03

~=Water Hardness (mg/L CaCO3); HACH Test Kit

^=Conductivity/Salinity (µmohs): Meter ID ①~~08~~ 06

ADDITIONAL COMMENTS: ① measurement taken in a 10 mL sample volume SD 09/08/16
② entry error SD 09/08/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = R10 EPAMH #127 +CNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/08/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS	Day (2)	Date:	09/09/16			24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.6	8.02	58	276	80	24	6.0	7.99
25	24	8.1	7.43	① 180	1124	① 610	24	5.7	7.49
							TP 09/10/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

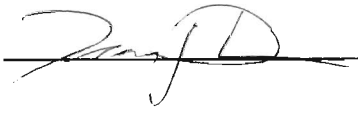
**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS: ① measurements taken in 10mL sample volume TP 09/09/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = R/O EPA mix # 127 + CNS

All surface waters filtered through a 60 µm screen daily

Technician: 

Date: 09/09/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (3)	Date:	09/10/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.8	8.00	58	276	80	24	6.4	8.28
25	24	8.0	7.50	①180	1126	①610	24	5.8	7.71
							km 09/11/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS: ① measurements taken in 10 mL sample volume TP 09/10/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = RO EPA MH #127 tons

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/10/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (4)	Date:	09/11/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	8.1	7.99	57	274	81	24	6.6	8.18
25	24	8.5 (98%)	7.52	① 190	1118	① ~~600~~ ② 610	24	6.2	7.62

m 09/12/16

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 04

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS:

① measurement taken in 10mL sample volume on 09/11/16

② entry error on 09/11/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = RO EPAMH B128 + CNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/11/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (5)	Date:	09/12/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.9	7.94	57	279	81	24	6.5	8.34
25	24	8.3	7.41	① 190	1121	① ~~160~~ ② 610	24	6.2	7.82

m 09/13/16

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS:

① Measurement taken in 10mL sample volume ~ 09/12/16

② entry error ~ 09/12/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = R/O EPAMH B 128 +CNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/12/16

AQUA-Science

Environmental Toxicology Specialists

WATER QUALITY REPORT FOR AQUATIC BIOASSAYS

Test Number:	Lehigh 16-03 B	Study Director:	J.L. Miller
Protocol No.:	EPA 821-R-02-013	Technicians:	Walker/McIntyre/Pham/Davis
Test Material:	Biological effluent (09/06/16) in permeate (09/06/16) dilution water		
Test Species:	*Ceriodaphnia dubia*	Animal Lot No.:	A/S RO: 090716
Initiation Date:	September 7, 2016	Termination Date:	September 14, 2016

	OBSERVATIONS		Day (6)	Date:	09/13/16		24 Hour Obsv.		
Effluent Conc. (%)	Temperature (°C)	Dissolved Oxygen*	pH^^	Alkalinity **	Conductivity ^	Water Hardness ~	Temp.	D.O.*	pH^^
Lab Control	24	7.7	8.35	57	271	84	25	6.1	8.09
25	24	7.9	7.80	ⓓ 190	1122	ⓓ 620	25	6.3	7.62
							SD 09/14/16		

UNIT INSTRUMENTATION LEGEND

*=Dissolved oxygen (mg/L): Meter ID 09

^^= pH: Meter ID 03

^=Conductivity/Salinity (µmohs): Meter ID 06

**Alkalinity (mg/L CaCO3); HACH Test Kit

~=Water Hardness (mg/L CaCO3); HACH Test Kit

ADDITIONAL COMMENTS:

ⓓ Measurement taken in 10mL sample volume on 09/13/16

Lab Control = 2x carbon filtered reverse osmosis water at EPA moderately hard level using EPA salts.
Control water ID = R/O EPA Mix # 129 + CNS

All surface waters filtered through a 60 µm screen daily

Technician: _____ Date: 09/13/16

AQUA-Science
Environmental Toxicology Consultants

CERIODAPHNIA RANDOMIZATION FORM

Client: Lehigh 16-03B

TEMPLATE #2

	Loading Order									
Female No.	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	~~9~~	~~4~~	2	~~6~~	~~7~~	~~8~~	1	~~3~~	~~5~~	~~10~~
2	~~8~~	~~3~~	~~6~~	~~4~~	~~9~~	2	~~10~~	~~5~~	~~7~~	1
3	~~4~~	1	~~8~~	~~7~~	~~5~~	~~3~~	~~9~~	~~6~~	~~10~~	2
4	1	~~5~~	~~10~~	~~3~~	~~4~~	2	~~8~~	~~9~~	~~8~~	~~7~~
5	~~8~~	~~9~~	2	1	~~5~~	~~4~~	~~7~~	~~8~~	~~10~~	~~3~~
6	~~8~~	1	~~10~~	~~4~~	2	~~7~~	~~8~~	~~9~~	~~3~~	~~5~~
7	1	~~4~~	~~5~~	~~6~~	~~9~~	2	~~10~~	~~3~~	~~7~~	~~8~~
8	~~9~~	~~5~~	~~7~~	~~8~~	~~6~~	~~4~~	2	~~3~~	1	~~10~~
9	~~4~~	1	~~6~~	~~9~~	~~3~~	~~8~~	2	~~10~~	~~5~~	~~7~~
10	2	~~5~~	~~3~~	~~8~~	1	~~7~~	~~10~~	~~9~~	~~6~~	~~4~~

	Female Description		*Sample Description*
1	09/01 culture ♀	1	Lab Control
2		4	25
3		6	—
4	09/01 Brood ♀	3	—
5		5	—
6		6	—
7		7	—
8		8	—
9		10	—
10		14	—

Technician [signature]

Date 09/07/14

AQUA-Science
Environmental Toxicology Consultants

LABORATORY NOTES

Date: 09/06/16

Lehigh 16-03

① Equal volume aliquots from the two grab samples were combined for both the permeate and effluent samples

② the permeate used in the 16-03A dilution was 0.22 µm filtered the rest of the permeate remained unfiltered for 16-03B

③ Biological effluent had initial dissolved oxygen of 3.8 mg/L and initial sulfides at 593 mg/L S^{2-}

Sample was placed under aeration @ 1400 on 09/06/16 and removed from aeration @ 0930 on 09/07/16

Final sulfides: 3 mg/L S^{2-}

This effluent sample was then split, some was reserved for the 16-03B dilution and the rest was 0.22 µm filtered for use in the 16-03A dilution

Technician: _____ Date: 09/06/16

CHAIN OF CUSTODY FORMS

Chain of Custody

AQUA-	Client: RBI, Paul Bedore	
Environmental Toxicology	Address: 9888 Kent St., Elk Grove, CA 95624	
630 Cantrill Dr.; Davis, CA 95618	Billing Address: Same	P.O. No.:
(530) 753- aquasci@aol.com	Phone 916-405-8918	Fax No.: ( )
Project No.:	Project Name: Lehigh TRE	Sampler (Print Name): Courtney Perry (Sign Name): Courtney Perry

Date Sampled	Time Sampled	Matrix	(Container Type/ Amt.	Preservative	Sample Description/ Site	Composite temp @ time of collection (°C)	Grab Comp	Comments
9/6/16	9:20AM	Aq	2 2.5 gallon		Biological Effluent	18°	Grab	See notes
9/6/16	9:30AM	Aq	2 2.5 gallon		Permeate		Grab	See notes
					B.E. P			
					T: 14.2 °C 11.2 °C			
					DO. 3.8 mg/L 8.9 mg/L			
					pH: 7.04 8.62			

Notes: Test mixtures of permeate and biological effluent specified in test plan provided to Aqua Science by P Bedore against shared lab water control.

Relinquished by:	Date/ Time:	Received by:	Date/ Time:
Courtney Perry	9/6/16 @ :		9.6.16 . 11 30
	9.6.16 1:30		09/06/16 1330

Paul Bedore
Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

October 24, 2016

Paul:

I have enclosed our *Supplemental* report "Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples" for the Biological Effluent and Permeate samples collected September 26, 2016. The test procedures section of the report was updated to correct the description of the hardness control preparation; the revision does not change the conclusions of the testing.

Chronic Effects of Biological Effluent and Permeate on *Ceriodaphnia dubia*

There were no significant reductions to survival or reproduction observed in the filtered effluent blend treatments when compared to the Hardness Blank; the NOEC for both endpoints was 100% filtered effluent blend resulting in 1 TUc. There were no significant reductions to survival observed in the filtered effluent blend treatments when compared to the Lab Water Control; the NOEC for survival was 100% filtered effluent, resulting in 1 TUc. There were significant reductions to reproduction in the filtered effluent blend treatments when compared to the Lab Water Control; the EC_{25} for reproduction was 57.1% filtered effluent blend, resulting in 1.8 TUc.

There were no significant reductions to survival or reproduction observed in the 100% unfiltered effluent blend treatment compared to both the Hardness Blank and Lab Water Control; the NOEC for both endpoints was 100% unfiltered effluent blend, resulting in 1 TUc.

If you have any questions regarding the performance and interpretation of these tests, feel free to contact my colleague Chris Dudenhoeffer or myself at (707) 207-7760.

Regards,

Stephen L. Clark
Vice President & Special Projects Director

Supplemental Report

An Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples to *Ceriodaphnia dubia*

Samples collected September 26, 2016

Prepared For:

Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

Prepared By:

Pacific EcoRisk
2250 Cordelia Road
Fairfield, CA 94534

Original Report Submitted October 21, 2016
Revised Report Submitted October 24, 2016

PACIFIC ECORISK
ENVIRONMENTAL CONSULTING & TESTING

Supplemental Report

An Evaluation of the Chronic Toxicity of Lehigh Permanente Cement Plant Pilot Reverse-Osmosis (RO) Water Samples to *Ceriodaphnia dubia*

Samples collected September 26, 2016

Table of Contents

Appendices

1. INTRODUCTION

Under contract to the Robertson-Bryan, Pacific EcoRisk (PER) conducted an evaluation of the chronic toxicity of Lehigh Permanente Southwest Cement Company Reverse-Osmosis (RO) Biological Effluent and Permeate water samples. This evaluation consisted of performing the US EPA chronic 3-brood survival and reproduction test with the crustacean *Ceriodaphnia dubia*. This test was conducted on samples collected on September 26, 2016. In order to assess the sensitivity of the organisms to chemical stress, a monthly reference toxicant test was performed. This report describes the performance and results of these tests.

CHRONIC TOXICITY TEST PROCEDURES

This testing followed established guidelines in "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition (EPA-821-R-02-013)".

2.1 Receipt and Handling of the Biological Effluent and Permeate Samples

On September 26th, samples of Lehigh Biological Effluent and Permeate were collected into appropriately cleaned sample containers. These samples were transported the day of collection, on ice and under chain-of-custody, to the PER laboratory in Fairfield, CA. Aliquots of each water sample were collected for analysis of initial water quality characteristics (Table 1) with the remainder of each sample being stored at 0-6˚C except when being used to prepare test solutions. Based on client guidance, the Biological Effluent and Permeate samples were areared for 15 minutes upon receipt to address concerns about D.O. and sulfide concentrations. The post-aeration sulfide concentrations were 0.090 mg/L and 0.001 mg/L for the Biological Effluent and Permeate samples, respectively. The chain-of-custody records for the collection and delivery of the samples are presented in Appendix A.

Table 1. Initial water quality characteristics of the Biological Effluent and Permeate Samples.

Sample Receipt Date	Sample ID	Temp (°C)	pH	D.O. (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)	Conductivity (μS/cm)	Residual Chlorine (mg/L)	Total Ammonia (mg/L N)	Sulfide (mg/L)
9/27/16	Biological Effluent	0.5	7.36	4.9	860	2850	3960	0.54**	1.28	0.41
9/27/16	Permeate	0.5	7.47	10.2*	4.9	2.1	20	0	<1.00	0.001

* Sample was received on ice the day of sample collection; the temperature of the temperature blank was <6ºC.
** Chlorine reading is thought to have been caused by interference due to the turbidity of the sample.

2.2 Survival and Reproduction Toxicity Testing with *Ceriodaphnia dubia*

The chronic toxicity test with *C. dubia* consists of exposing individual females to several Biological Effluent/Permeate mixtures for the length of time it takes for the Lab Control treatment females to produce three broods (typically 6-8 days), after which effects on survival and reproduction are evaluated. The specific procedures used in this testing are described below.

The Lab Water Control medium for this testing consisted of a synthetic reconstituted freshwater (SRW adjusted to EPA "moderately-hard" hardness), prepared by addition of reagent grade chemicals to Type 1 lab water. A second Lab Water Control medium was also prepared and consisted of Type 1 lab water adjusted to the hardness value of a routine compliance monitoring site for this project (Pond 4A); this hardness value was also relatively consistent with the hardness of the 25:75% Biological Effluent/Permeate mixture. The Biological Effluent and Permeate was combined at a ratio of 1:3 respectively, and used to prepare daily test mixtures at concentrations of 6.25%, 12.5%, 25%, 50% and 100% Biological Effluent/permeate, using the synthetic High-Hardness Control as the test diluent. Before sample preparation both the Biological Effluent and Permeate samples were filtered using a 0.2µm filter; a filtration blank consisting of 0.2 μm-filtered control water was also tested. A separate unfiltered 100% (25:75% Biological Effluent/Permeate), treatment was tested in addition to the filtered dilution series. For each test treatment, 200 mL aliquots of test solution were amended with the alga *Selenastrum capricornutum* and Yeast-Cerophyll®-Trout Food (YCT) to provide food for the test organisms. "New" water quality characteristics (pH, D.O., and conductivity) were measured on these food-amended test solutions prior to use in this testing.

There were 10 replicates for each test treatment, each replicate consisting of 15 mL of test solution in a 30-mL plastic cup. This "3-brood" test was initiated by allocating one neonate (<24 hrs old and within 8 hrs of age) *Ceriodaphnia*, obtained from in-house laboratory cultures, into each replicate cup. The test replicate cups were placed into a temperature-controlled room at 25˚C, under cool white fluorescent lighting on a 16L:8D photoperiod.

Each day of the test, fresh test solutions were prepared and characterized as before, and a "new" set of replicate cups was prepared. The test replicate cups containing the test organisms were examined, with surviving organisms being transferred to the corresponding new cup. The contents of each of the remaining "old" replicate cups was carefully examined and the number of neonate offspring produced by each parent organism was determined, after which the "old" water quality characteristics (pH, D.O., and conductivity) were measured for the old solution from one randomly-selected replicate at each treatment.

After it was determined that ≥60% of the females in the Lab Water Control treatment had produced their third brood of offspring, the test was terminated. The resulting survival and reproduction (# of offspring) data were analyzed to evaluate any impairment(s) caused by the Biological Effluent/Permeate mixtures; all statistical analyses were performed using the CETIS® statistical software.

2.2.1 Reference Toxicant Testing of the *Ceriodaphnia dubia*

In order to assess the sensitivity of the test organisms to toxic stress, a monthly reference toxicant test was performed. The reference toxicant test was performed similarly to the effluent test except that test solutions consisted of modified EPA moderately-hard water spiked with NaCl at test concentrations of 500, 1000, 1500, 2000, and 2500 mg/L. The resulting test response data were statistically analyzed to determine key dose-response point estimates (e.g., EC_{50}); all statistical analyses were made using the CETIS® software. These response endpoints were then compared to the "typical response" ranges established by the mean ± 2 SD of the point estimates generated by the most recent previous reference toxicant tests performed by this lab.

3. RESULTS

3.1 Effects of Filtered Biological Effluent/Permeate Blend on *Ceriodaphnia dubia* compared to the Hardness Blank

As there was a significant reduction in reproduction in the Hardness Blank compared to the Lab Control treatment and the Filtration Blank, the results of the effluent blend statistically compared to both the Hardness Blank are provided in Table 2. There were no significant reductions to survival or reproduction observed in the filtered effluent blend treatments compared to the Hardness Blank; the NOEC for both endpoints was 100% filtered effluent blend resulting in 1 TUc. As there was a statistical outlier in the Hardness Blank treatment, the data are presented both excluding and including the outlier. The test data and summary of statistical analyses compared to the Hardness Blank for this test excluding the outlier are presented in Appendix B; the statistical analyses compared to the Hardness Blank for this test including the outlier are presented in Appendix C.

Table 2. Effects of Filtered Biological Effluent/Permeate on *Ceriodaphnia dubia*: Comparison to the Hardness Blank.

Test Treatment	% Survival	Reproduction (mean # of offspring)
Lab Water Control	100	34.4
Filtration Blank	100	33.3
Hardness Blank	90	24.1[a/]22.6
6.25% Filtered Effluent Blend	90	25.2
12.5% Filtered Effluent Blend	80	26.7
25% Filtered Effluent Blend	80	24.4
50% Filtered Effluent Blend	100	28.1
100% Filtered Effluent Blend	100	24.0
Summary of Statistics		
NOEC =	100% Effluent Blend	100% Effluent Blend
TUc (where TUc = 100/NOEC)	1 TUc	1 TUc
Survival EC25 or Reproduction IC25 =	>100% Effluent Blend	>100% Effluent Blend
TUc (where TUc = 100/EC25 or 100/IC25) =	<1 TUc	<1 TUc
Survival EC50 or Reproduction IC50 =	>100% Effluent Blend	>100% Effluent Blend
TUc (where TUc = 100/EC50 or 100/IC50) =	<1 TUc	<1 TUc

a- There was an outlier replicate in the Hardness Blank treatment. The results presented here are those with the outlier excluded. Per EPA guidance, the data is presented both excluding and including the outlier in Appendix B and C, respectively.

3.2 Effects of Filtered Biological Effluent/Permeate Blend on *Ceriodaphnia dubia* compared to the Lab Water Control

The results of this test are summarized below in Table 3. There were no significant reductions to survival observed in the filtered effluent blend treatments when compared to the Lab Water Control; the NOEC for survival was 100% filtered effluent, resulting in 1 TUc. There were significant reductions to reproduction observed in the filtered effluent blend treatments when compared to the Lab Water Control; the EC_{25} for reproduction was 57.1% filtered effluent blend, resulting in 1.8 TUc. The test data and summary of statistical analyses for this test are presented in Appendix D.

Table 3. Effects of Filtered Biological Effluent/Permeate on *Ceriodaphnia dubia*: Comparison to the Lab Water Control.

Test Treatment	% Survival	Reproduction (mean # of offspring)
Hardness Blank	90	**24.1***
Lab Water Control	100	34.4
6.25% Filtered Effluent Blend	90	**25.2***
12.5% Filtered Effluent Blend	80	26.7
25% Filtered Effluent/ Blend	80	**24.4***
50% Filtered Effluent Blend	100	**28.1***
100% Filtered Effluent Blend	100	**24.0***
Summary of Statistics		
NOEC =	100% Effluent Blend	12.5% Effluent Blend
TUc (where TUc = 100/NOEC)	1 TUc	8 TUc
Survival EC25 or Reproduction IC25 =	>100% Effluent Blend [a]	57.1% Effluent Blend
TUc (where TUc = 100/EC25 or 100/IC25) =	<1 TUc	1.8 TUc
Survival EC50 or Reproduction IC50 =	>100% Effluent Blend [a]	>100% Effluent Blend
TUc (where TUc = 100/EC50 or 100/IC50) =	<1 TUc	<1 TUc

* - The response at this test treatment was significantly less than the Lab Control treatment response ($p < 0.05$).

a - Due to the absence of significant mortalities, the EC point estimates could not be calculated, but can be determined by inspection to be >100% site water.

3.3 Effects of Unfiltered Biological Effluent/Permeate Blend on *Ceriodaphnia dubia* compared to the Lab Water Control

The results of this test are summarized below in Table 4. There were no significant reductions to survival or reproduction observed in the unfiltered 25% effluent blend treatment compared to either the Hardness Blank or Lab Water Control; the NOEC for both endpoints was 100% unfiltered effluent blend, resulting in 1 TUc. As there was a statistical outlier in the Hardness Blank treatment, the data are presented both excluding and including the outlier. The test data and summary of statistical analyses compared to the Hardness Blank for this test excluding the outlier are presented in Appendix D; the statistical analyses compared to the Hardness Blank for this test including the outlier are presented in Appendix E.

Table 4. Effects of Unfiltered Biological Effluent/Permeate on *Ceriodaphnia dubia*: Comparison to the Hardness Blank and Lab Control.

Test Treatment	% Survival	Reproduction (mean # of offspring)
Lab Water Control	100	34.4
Hardness Blank	90	24.1[a/]22.6
100% Unfiltered Effluent Blend	100	30.2[b]
Summary of Statistics		
NOEC =	100% Effluent Blend	100% Effluent Blend
TUc (where TUc = 100/NOEC)	1 TUc	1 TUc
Survival EC25 or Reproduction IC25 =	>100% Effluent Blend	>100% Effluent Blend
TUc (where TUc = 100/EC25 or 100/IC25) =	<1 TUc	<1 TUc
Survival EC50 or Reproduction IC50 =	>100% Effluent Blend	>100% Effluent Blend
TUc (where TUc = 100/EC50 or 100/IC50) =	<1 TUc	<1 TUc

a- There was an outlier replicate in the Hardness Blank treatment. The results presented here are those with the outlier excluded. Per EPA guidance, the data is presented both including and excluding the outlier in Appendix D and E, respectively.

b – Although there was 12.2% reduction in reproduction that was statistically less than the Lab Water Control, the sample is not considered toxic per EPA guidance since the reduction compared to the Control and the test PMSD (10.5%) were both less than the lower 10th percentile PMSD of 13% established for this method.

3.4 Reference Toxicant Toxicity to *Ceriodaphnia dubia*

The results of this test are summarized below in Table 5. The survival EC_{50} and reproduction IC_{50} for this test were consistent with the "typical response" ranges established by the reference toxicant test database for this species, indicating that these test organisms were responding to toxicant stress in a typical and consistent fashion. The test data and summary of statistical analyses for this test are presented in Appendix F.

Table 5. Reference toxicant testing: Effects of NaCl on *Ceriodaphnia dubia*.

NaCl Treatment (mg/L)	% Survival	Reproduction (# neonates/female)
Lab Water Control	100	33.5
500	100	31.0
1000	66.7	**20.3***
1500	100	**20.7***
2000	60	5.3
2500	**0***	-
Survival EC_{50} or Reproduction IC_{50} =	1740	1620

* The response at this test treatment was significantly less than the Lab Control treatment response at $p < 0.05$.

4. SUMMARY & CONCLUSIONS

An evaluation of the chronic toxicity of Lehigh Permanente Cement Plant Biological Effluent and Permeate water samples to *Ceriodaphnia dubia* was performed. The results of this testing follow:

Effects of Biological Effluent/Permeate on *Ceriodaphnia dubia*
There were no significant reductions to survival or reproduction observed in the filtered effluent blend treatments when compared to the Hardness Blank; the NOEC for both endpoints was 100% filtered effluent blend resulting in 1 TUc. There were no significant reductions to survival observed in the filtered effluent blend treatments when compared to the Lab Water Control; the NOEC for survival was 100% filtered effluent, resulting in 1 TUc. There were significant reductions to reproduction in the filtered effluent blend treatments when compared to the Lab Water Control; the EC_{25} for reproduction was 57.1% filtered effluent blend, resulting in 1.8 TUc.

There were no significant reductions to survival or reproduction observed in the 100% unfiltered effluent blend treatment compared to both the Hardness Blank and Lab Water Control; the NOEC for both endpoints was 100% unfiltered effluent blend, resulting in 1 TUc.

4.1 QA/QC Summary

Test Conditions – All test conditions (pH, D.O., temperature, etc.) were within acceptable limits for these tests. All test analyses were performed according to laboratory Standard Operating Procedures.

Negative Control – The biological responses for the test organisms at the Lab Control treatments were within acceptable limits.

Positive Control – The reference toxicant test survival EC_{50} and reproduction IC_{50} were both consistent with the "typical response" ranges established by the reference toxicant test database for this species, indicating that these test organisms were responding to toxicant stress in a typical and consistent fashion.

Concentration Response Relationships –The concentration-response relationships for these tests were evaluated as per EPA guidelines (EPA-821-B-00-004). There was an interrupted concentration response relationship for the Lab Water Control comparison to the filtered effluent blend. All concentration response treatments were determined to be acceptable for this testing.

Appendix A

Chain-of-Custody Record for the Collection and Delivery of the Lehigh Permanente Cement Plant Biological Effluent and Permeate Samples

Pacific EcoRisk
2250 Cordelia Rd., Fairfield, CA 94534
(707) 207-7760 FAX (707) 207-7916

CHAIN-OF-CUSTODY RECORD

Results To:	Robertson-Bryan, Inc	**Invoice To:**	Same
Address:	9888 Kent Street Elk Grove, CA 95624	**Address:**	
Phone:	(916) 405-8918	**Phone:**	
Attn:	Paul Bedore	**Attn:**	
E-mail:	paul@robertson-bryan.com	**E-mail:**	
Project Name:	Lehigh TRE Testing		
P.O.#/Ref:			

	Client Sample ID	Sample Date	Sample Time	Sample Matrix*	Grab/ Comp	Container Number	Container Type	REQUESTED ANALYSIS: *Ceriodapnia dubia* Surival and Reproduction, EPA 1002.0	Hold
1	Biological Effluent	9/26/16	1530	FW	Grab	4	2.5-gal LDPE Cube	x	
2	Permeate	9/26/16	1515	FW	Grab	4	2.5-gal LDPE Cube	x	
3	Influent			FW	Grab	1	2.5-gal LDPE Cube		x
4									
5									
6									
7									
8									
9									
10									

Samples collected by:

Comments/Special Instruction:

Dilution series test of 25% biological effluent + 75% permeate using high-hardness water as diluent. Dilution series tested on filtered samples.

One-concentration test of 25% biological effluent + 75% permeate on unfiltered samples.

High hardness water made with Pond 4A recipe, adjusted to hardness of 25% biological effluent + 75% permeate.

See Test Plan provided by P Bedore.

RELIQUINSHED BY:	RECEIVED BY:
Signature: S. Jeej	**Signature:**
Print: MANJUNATH SHIVALINGAPPA	**Print:** Sam Boykin
Organization: LEHIGH HANSON	**Organization:** PER
Date: 9/27/16 **Time:** 0800	**Date:** 9/27/16 **Time:** 1183
RELIQUINSHED BY:	**RECEIVED BY:**
Signature:	**Signature:**
Print:	**Print:**
Organization:	**Organization:**
Date: **Time:**	**Date:** **Time:**

***Example Matrix Codes:** (**EFF** - Effluent) (**FW** = Freshwater); (**SW** = Saltwater); (**WW** = Wastewater); (**STRMW** = Stormwater); (**SED** = Sediment); or other

Appendix B

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of the Filtered Biological Effluent/ Permeate Treatments to *Ceriodaphnia dubia*: Analysis vs. Hardness Blank and Excluding Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	19-5180-4571	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Simin Delijani
Start Date:	27 Sep-16 17:20	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Hard Synthetic Water
Ending Date:	03 Oct-16 15:15	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	01-7517-1601	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 15:30	**Material:**	Effluent	**Project:**	26377
Receive Date:	27 Sep-16 11:03	**Source:**	Lehigh Permanente		
Sample Age:	26h (0.5 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include data for Filtered Sample. Stats exclude outlier Hardness Ctl-G

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-8286-3784	Reproduction	0	>0		9.49%		Equal Variance t Two-Sample Test
15-8193-6253	Reproduction	0	>0		8.24%		Equal Variance t Two-Sample Test
20-1075-9519	Reproduction	100	>100	NA	33.9%	1	Wilcoxon/Bonferroni Adj Test
15-8674-6369	Survival	0	>0		NA		Fisher Exact Test
21-3131-5098	Survival	0	>0		NA		Fisher Exact Test
16-8839-4248	Survival	100	>100	NA	NA	1	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
14-4043-9818	Reproduction	IC5	87.7	12.1	N/A	1.14	Linear Interpolation (ICPIN)
		IC10	>100	N/A	N/A	<1	
		IC15	>100	N/A	N/A	<1	
		IC20	>100	N/A	N/A	<1	
		IC25	>100	N/A	N/A	<1	
		IC40	>100	N/A	N/A	<1	
		IC50	>100	N/A	N/A	<1	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	30	40	0.884	2.8	8.13%	0.0%
0	Filtration Blank	10	33.3	31.9	34.7	30	37	0.633	2	6.01%	3.2%
0	Hardness Contr	9	24.1	21.9	26.4	20	29	0.978	2.93	12.2%	29.9%
6.25		10	25.2	19.1	31.3	11	33	2.68	8.48	33.7%	26.7%
12.5		10	26.7	19.9	33.5	12	36	3.01	9.53	35.7%	22.4%
25		10	24.4	18	30.8	13	36	2.84	8.97	36.8%	29.1%
50		10	28.1	23.3	32.9	14	35	2.13	6.74	24.0%	18.3%
100		10	24	20.2	27.8	18	29	1.67	5.29	22.0%	30.2%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Filtration Blank	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Hardness Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
6.25		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
12.5		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
25		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	37	32	30	35	34	35	34	40	35	32
0	Filtration Blank	30	33	34	32	33	31	35	34	37	34
0	Hardness Contr	26	25	29	21	23	24		27	20	22
6.25		15	30	33	30	31	33	11	14	26	29
12.5		13	35	32	28	32	36	12	15	34	30
25		29	33	26	32	36	30	13	13	17	15
50		27	28	33	29	35	32	14	19	30	34
100		28	18	18	29	28	25	29	18	29	18

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Filtration Blank	1	1	1	1	1	1	1	1	1	1
0	Hardness Contr	1	1	1	1	1	1	0	1	1	1
6.25		1	1	1	1	1	1	0	1	1	1
12.5		1	1	1	1	1	1	0	0	1	1
25		1	1	1	1	1	1	1	1	0	0
50		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Filtration Blank	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Hardness Contr	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	02-7538-0358	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	21 Oct-16 14:38	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

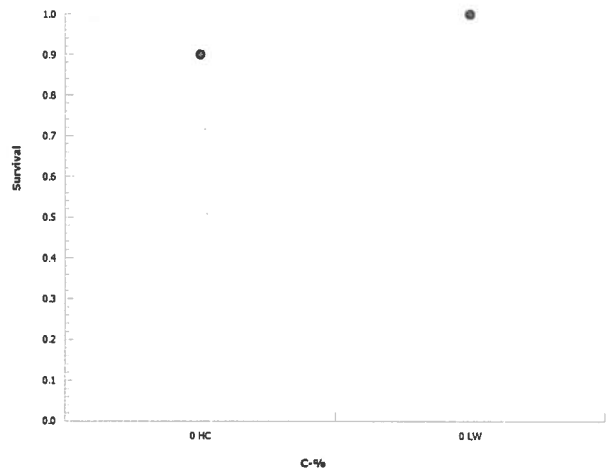
Fisher Exact Test

Control	vs	Control	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Hardness Control	0.5	0.5000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
0	Hardness Contr	9	1	10	0.9	0.1	10.0%

Graphics



CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	18-4708-1450	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	21 Oct-16 14:38	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.65%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Hardness Control	7.82	1.74	2.29	17	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	501.448	501.448	1	61.2	<0.0001	Significant Effect
Error	139.2889	8.193464	17			
Total	640.7369		18			

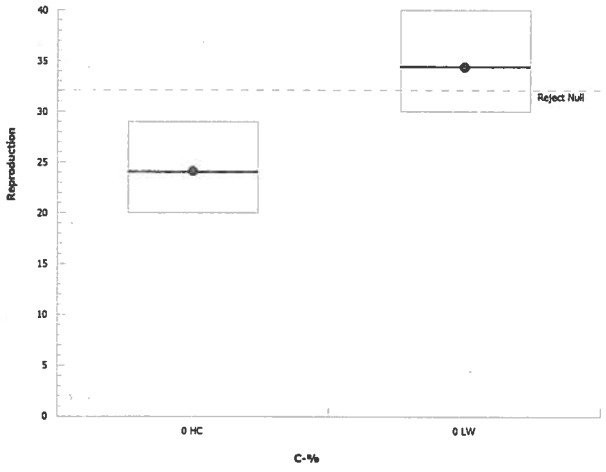
Distributional Tests

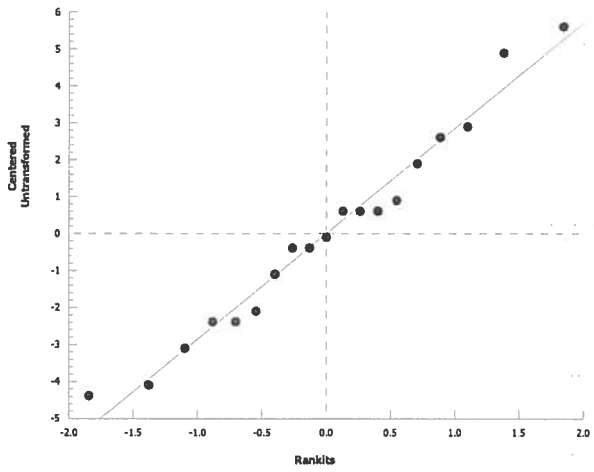
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.1	6.69	0.8811	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.969	0.861	0.7620	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	34.5	30	40	0.884	8.13%	0.0%
0	Hardness Contr	9	24.1	21.9	26.4	24	20	29	0.978	12.2%	29.9%

Graphics





Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Lab Water Control** Test Date: 9/27/16

Project #: 26377 Test ID: 69875 Randomization: 10.7.3 / 102.5 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
Lab Water Control	0	7.91		8.4		322	25.1	0	0	0	0	0	0	0	0	0	0	Date: 9/27/16 New WQ: JL Test Init.: TRO Sol'n Prep: DM Time: DM
	1	7.70	7.81	7.8	7.2	314	25.0	0	0	0	0	0	0	0	0	0	0	Date: 9/28/16 New WQ: MK Counts: DM Sol'n Prep: DM Old WQ: JZ Time: 1235
	2	8.14	8.15	7.7	7.3	322	25.3	0	0	0	0	0	0	0	0	0	0	Date: 9/29/16 New WQ: JZ Counts: TK Sol'n Prep: TK Old WQ: SF Time: 1500
	3	7.77	7.88	8.6	7.2	316	25.4	5	0	0	0	0	0	5	7	0	0	Date: 9/30/16 New WQ: RB Counts: DM Sol'n Prep: DM Old WQ: RB Time: 1215
	4	7.76	7.60	8.7	8.0	315	25.2	0	6	4	6	7	6	8	0	6	7	Date: 10/1/16 New WQ: DM Counts: DM Sol'n Prep: DM Old WQ: DJ Time: 1215
	5	7.74	8.13	8.4	6.8	311	25.4	12	10	11	11	12	11	0	13	13	10	Date: 10/2/16 New WQ: DJ Counts: TK Sol'n Prep: TK Old WQ: SH Time: 1415
	6	—	7.53	—	7.7	327	25.4	20	16	15	18	15	18	21	20	16	15	Date: 10/3/16 New WQ: — Counts: NOM Sol'n Prep: — Old WQ: CC Time: 1515
	7																	Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
	8																	Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
							Total=	37	32	30	35	34	35	34	40	35	32	Mean Neonates/Female = 34.4

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	16-5421-9636	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	21 Oct-16 14:59	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

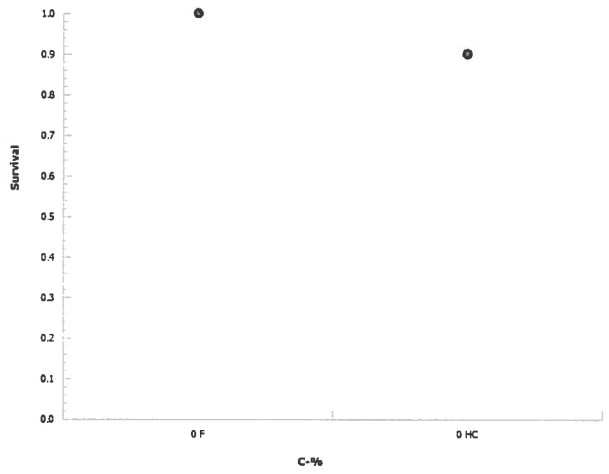
Fisher Exact Test

Control	vs	Control	Test Stat	P-Value	P-Type	Decision(α:5%)
Filtration Blank		Hardness Control	0.5	0.5000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Filtration Blank	10	0	10	1	0	0.0%
0	Hardness Contr	9	1	10	0.9	0.1	10.0%

Graphics



Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	13-0601-2250	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	21 Oct-16 15:01	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	5.96%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Filtration Blank		Hardness Control	8.05	1.74	1.99	17	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	399.9585	399.9585	1	64.8	<0.0001	Significant Effect
Error	104.9889	6.175817	17			
Total	504.9474		18			

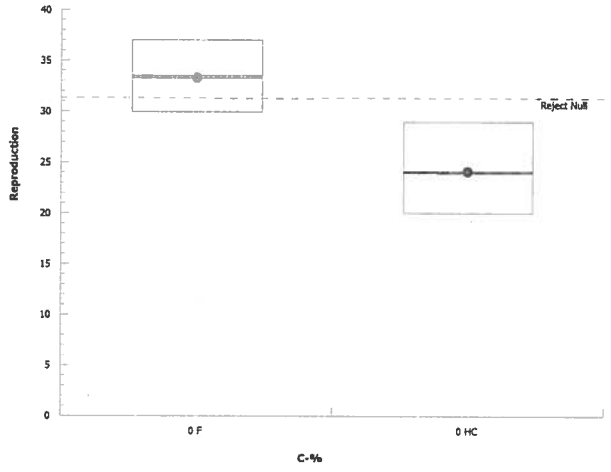
Distributional Tests

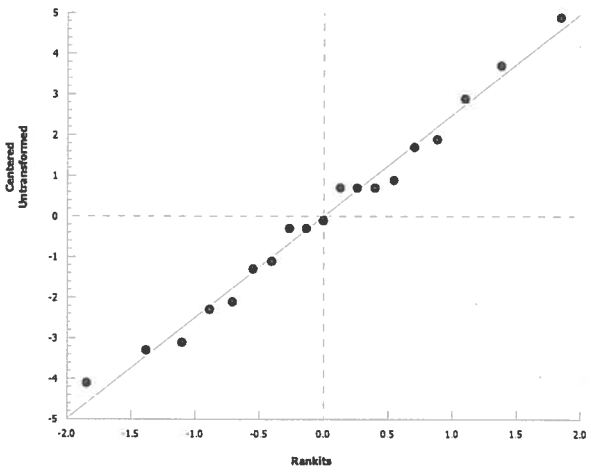
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	2.15	6.69	0.2763	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.982	0.861	0.9594	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Hardness Contr	9	24.1	21.9	26.4	24	20	29	0.978	12.2%	0.0%
0	Filtration Blank	10	33.3	31.9	34.7	33.5	30	37	0.633	6.01%	-38.1%

Graphics





Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **Filter Blank** Test Date: 9/27/16

Project #: 26377 Test ID: 69875 Randomization: 107.3/102.5 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
Filter Blank	0	7.87		8.4		315		0	0	0	0	0	0	0	0	0	0	Date: 9/27/16 New WQ: Test Init: DM Sol'n Prep: DM JZ Time: 1720
	1	8.45	8.43	8.9	7.6	315		0	0	0	0	0	0	0	0	0	0	Date: 9/28/16 New WQ: Counts: DM Sol'n Prep: DM Old WQ: JZ Time: 1235
	2	8.46	8.64	9.3	7.8	305		0	0	0	0	0	0	0	0	0	0	Date: 9/29/16 New WQ: JZ Counts: TK Sol'n Prep: TK Old WQ: JZ Time: 1500
	3	8.32	8.16	10.2	6.3	DM 9/30/16 ~~338~~ 316		4	6	0	4	0	0	4	0	0	0	Date: 9/30/16 New WQ: RB Counts: DM Sol'n Prep: DM Old WQ: RB Time: 1215
	4	7.70	8.24	9.6	8.0	322		0	0	5	0	6	6	0	5	6	5	Date: 10/1/16 New WQ: DM Counts: DM Sol'n Prep: DM Old WQ: DJ Time: 1215
	5	8.08	8.28	9.1	8.2	313		12	11	11	10	9	9	12	10	13	12	Date: 10/2/16 New WQ: DJ Counts: TK Sol'n Prep: TK Old WQ: SH Time: 1415
	6	—	7.97	—	7.8	337		14	16	18	18	18	16	19	19	18	17	Date: 10/3/16 New WQ: — Counts: MM Sol'n Prep: — Old WQ: AC Time: 1515
	7																	Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
	8																	Date: Old WQ: Counts: Time:
							Total=	30	33	34	32	33	31	35	34	37	34	Mean Neonates/Female = 33.3

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	16-8839-4248	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:31	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	100	>100	NA	1

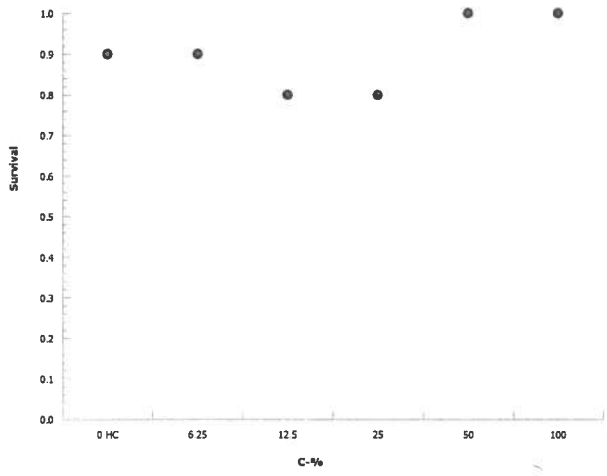
Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Hardness Control		6.25	0.763	1.0000	Exact	Non-Significant Effect
		12.5	0.5	1.0000	Exact	Non-Significant Effect
		25	0.5	1.0000	Exact	Non-Significant Effect
		50	1	1.0000	Exact	Non-Significant Effect
		100	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Hardness Contr	9	1	10	0.9	0.1	0.0%
6.25		9	1	10	0.9	0.1	0.0%
12.5		8	2	10	0.8	0.2	11.1%
25		8	2	10	0.8	0.2	11.1%
50		10	0	10	1	0	-11.1%
100		10	0	10	1	0	-11.1%

Graphics



Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	20-1075-9519	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:33	**Analysis:**	Nonparametric-Multiple Comparison	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	33.9%	100	>100	NA	1

Wilcoxon/Bonferroni Adj Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Hardness Control		6.25	115	NA	2	17	1.0000	Exact	Non-Significant Effect
		12.5	117	NA	0	17	1.0000	Exact	Non-Significant Effect
		25	106	NA	2	17	1.0000	Exact	Non-Significant Effect
		50	124	NA	2	17	1.0000	Exact	Non-Significant Effect
		100	102	NA	2	17	1.0000	Exact	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	134.6535	26.9307	5	0.489	0.7831	Non-Significant Effect
Error	2919.889	55.09224	53			
Total	3054.542		58			

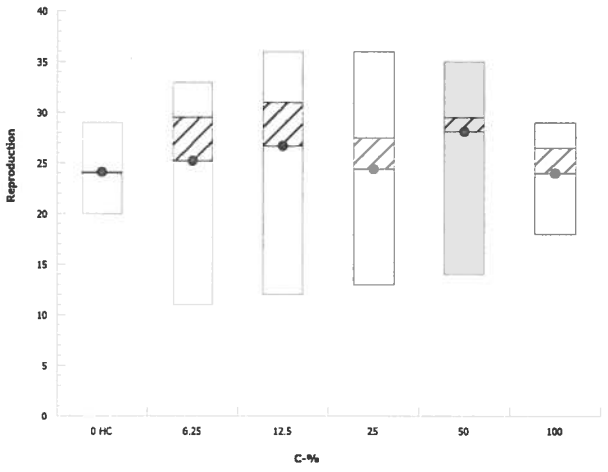
Distributional Tests

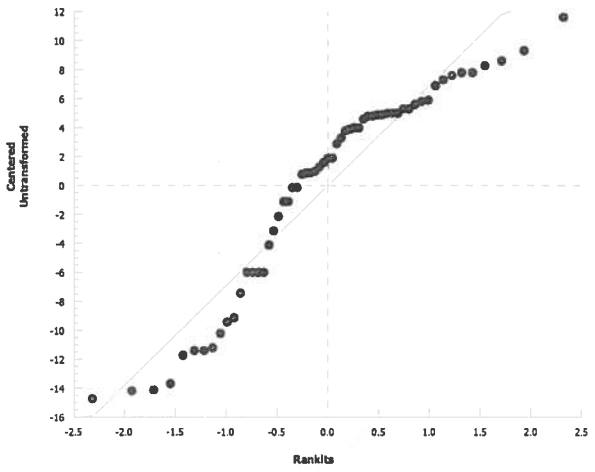
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	11.8	15.1	0.0372	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.912	0.945	0.0004	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Hardness Contr	9	24.1	21.9	26.4	24	20	29	0.978	12.2%	0.0%
6.25		10	25.2	19.1	31.3	29.5	11	33	2.68	33.7%	-4.52%
12.5		10	26.7	19.9	33.5	31	12	36	3.01	35.7%	-10.7%
25		10	24.4	18	30.8	27.5	13	36	2.84	36.8%	-1.2%
50		10	28.1	23.3	32.9	29.5	14	35	2.13	24.0%	-16.5%
100		10	24	20.2	27.8	26.5	18	29	1.67	22.0%	0.46%

Graphics





CETIS Analytical Report

Test Code: 69875-f | 12-2963-0781

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	14-4043-9818	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:33	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	513337	200	Yes	Two-Point Interpolation

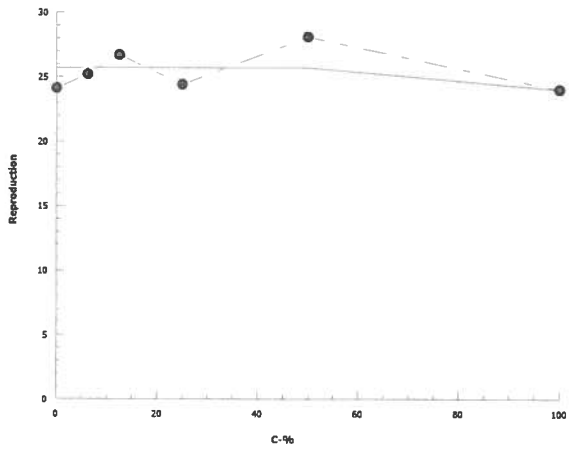
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	87.7	12.1	N/A	1.14	NA	8.238
IC10	>100	N/A	N/A	<1	NA	NA
IC15	>100	N/A	N/A	<1	NA	NA
IC20	>100	N/A	N/A	<1	NA	NA
IC25	>100	N/A	N/A	<1	NA	NA
IC40	>100	N/A	N/A	<1	NA	NA
IC50	>100	N/A	N/A	<1	NA	NA

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Hardness Control	9	24.1	20	29	0.978	2.93	12.2%	0.0%
6.25		10	25.2	11	33	2.68	8.48	33.7%	-4.52%
12.5		10	26.7	12	36	3.01	9.53	35.7%	-10.7%
25		10	24.4	13	36	2.84	8.97	36.8%	-1.2%
50		10	28.1	14	35	2.13	6.74	24.0%	-16.5%
100		10	24	18	29	1.67	5.29	22.0%	0.46%

Graphics



Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **25%:75% 0.2 um Filt. Biological Effluent/ Permeate** Test Date: 9/27/16

Project #: 26377 Test ID: 69875 Randomization: 10.7.3/10.2.5 Control Water: Hardness Control

Hardness Control

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	7.51		8.1		1712	25.1	0	0	0	0	0	0	0	0	0	0	Date: 9/27/16 New WQ: JV Test Init.: DM Sol'n Prep: DM Time: 1720
1	7.39	7.76	8.3	7.0	1720	25.0	0	0	0	0	0	0	0	0	0	0	Date: 9/28/16 New WQ: MC Counts: DM Sol'n Prep: DM Old WQ: JV Time: 1235
2	7.71	7.82	9.5	7.4	1729	25.3	0	0	0	0	0	0	0	0	0	0	Date: 9/29/16 New WQ: JV Counts: TK Sol'n Prep: TK Old WQ: SF Time: 1500
3	7.50	7.68	8.9	7.1	1688	25.4	5	4	0	0	0	0	3	0	0	0	Date: 9/30/16 New WQ: RB Counts: DM Sol'n Prep: DM Old WQ: RB Time: 1215
4	7.33	8.00	10.5	6.9	1732	25.2	0	0	5	2	4	3	6	5	4	3	Date: 10/1/16 New WQ: DM Counts: DM Sol'n Prep: DM Old WQ: DJ Time: 1215
5	7.86	7.62	9.1	8.9	1720	25.4	9	8	8	5	7	7	X/0	8	7	8	Date: 10/2/16 New WQ: DJ Counts: TK Sol'n Prep: TK Old WQ: SH Time: 1415
6	—	7.24	—	7.5	1786	25.4	12	17	16	14	12	14	—	14	9	11	Date: 10/3/16 New WQ: — Counts: MDM Sol'n Prep: — Old WQ: MC Time: 1515
7													—				Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
8													—				Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
						Total=	26	25	29	21	23	24	X/9	27	20	22	Mean Neonates/Female = 22.6

6.25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SAMPLE ID
0	7.47		8.4		1699	0	0	0	0	0	0	0	0	0	0	Permeate / Biological 44185 44186
1	7.45	7.86	9.1	7.5	1713	0	0	0	0	0	0	0	0	0	0	44185 / 44186
2	7.73	7.84	9.8	7.3	1721	0	0	0	0	0	0	0	0	0	0	44185 / 44186
3	7.55	7.89	9.2	7.1	1702	5	5	0	0	0	0	6	4	0	0	44185 / 44186
4	7.36	7.39	10.6	7.7	1725	0	0	6	5	5	6	5	0	6	5	44185 / 44186
5	7.48	7.65	8.8	8.1	1666	10	9	10	10	11	11	X/6	10	9	7	44185 / 44186
6	—	7.25	—	7.8	1758 ~~1789~~	0	16	17	15	15	16	—	0	11	17	
7												—				
8												—				
					Total=	15	30	33	30	31	33	X/11	14	26	29	Mean Neonates/Female = 25.2

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **25%:75% 0.2 um Filt. Biological Effluent/ Permeate** Test Date: 9/27/16

Project #: 26377 Test ID: 69875 Randomization: 10-73/10-25 Control Water: Hardness Control

12.5%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	7.50		8.5		1688	25.1	0	0	0	0	0	0	0	0	0	0	
1	7.62	7.93	8.6	7.7	1692	25.0	0	0	0	0	0	0	0	0	0	0	
2	7.76	7.90	9.9	7.2	1705	25.3	0	0	0	0	0	0	0	0	0	0	
3	7.63	7.97	10.0	6.6	1684	25.4	2	0	0	3	0	0	4	5	0	0	
4	7.41	7.54	10.7	7.6	1700	25.2	0	6	5	0	7	8	8	0	8	8	
5	7.52	7.70	9.3	7.9	1690	25.4	11	12	12	8	9	10	X/0	10	9	10	
6	—	~~7.39~~ 7.35	—	7.7	~~1750~~ 1755	25.4	0	17	15	17	16	18	-	X/0	17	12	
7													—	-			
8													—	-			
						Total=	13	35	32	28	32	36	X/12	X/15	34	30	Mean Neonates/Female = 26.7

25%

Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	
0	7.57		8.8		1640	0	0	0	0	0	0	0	0	0	0	
1	7.70	8.00	9.0	7.8	1646	0	0	0	0	0	0	0	0	0	0	
2	7.80	7.98	9.9	7.4	1659	0	0	0	0	0	0	0	0	0	0	
3	7.71	8.12	10.0	6.8	1620	2	4	4	0	0	0	4	4	6	0	
4	7.51	7.68	10.6	7.4	1654	0	0	0	6	5	6	0	0	0	6	
5	7.56	7.77	9.4	7.8	1644	10	11	10	9	12	10	9	9	11	9	
6	—	7.40	—	7.6	1697	17	18	12	17	19	14	0	0	X/0	X/0	
7														-	-	
8														-	-	
					Total=	29	33	26	32	36	30	13	13	X/17	X/15	Mean Neonates/Female = 24.6

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **25%:75% 0.2 um Filt. Biological Effluent/ Permeate** Test Date: 9/27/16

Project #: 26377 Test ID: 69875 Randomization: 10-7-5 / 10-2-5 Control Water: Hardness Control

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
50%	0	7.63		8.9		1532	25.1	0	0	0	0	0	0	0	0	0	0	
	1	7.94	8.07	8.1	7.6	1540	25.0	0	0	0	0	0	0	0	0	0	0	
	2	7.88	8.00	9.8	7.2	1533	25.3	0	0	0	0	0	0	0	0	0	0	
	3	7.83	8.01	10.1	8.0	1516	25.4	3	3	0	3	0	0	6	7	0	0	
	4	7.61	7.83	10.5	7.6	1547	25.2	0	0	5	0 (PM 16/18)	6	6	0	0	6	8	
	5	7.62	7.83	9.4	7.9	1534	25.4	8	11	10	11	10	10	8	12	10	9	
	6	—	7.46	—	7.5	1589	25.4	16	14	18	15	19	16	0	0	14	17	
	7																	
	8																	
							Total=	27	24	33	29	35	32	14	19	30	34	Mean Neonates/Female = 28.1

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	
100%	0	7.73		8.8		1297	0	0	0	0	0	0	0	0	0	0	
	1	8.02	8.15	8.9	6.9	1303	0	0	0	0	0	0	0	0	0	0	
	2	8.04	8.13	9.6	8.2	1305	0	0	0	0	0	0	0	0	0	0	
	3	8.05	8.32	10.2	6.9	1278	0	0	0	0	0	0	0	0	0	0	
	4	7.81	7.96	10.5	7.7	1306	4	4	0	4	7	5	7	0	6	5	
	5	7.74	7.92	9.3	7.7	1293	8	0	0	9	8	8	8	5	9	0	
	6	—	7.61	—	7.4	1348	16	14	18	16	13	12	14	13	14	13	
	7																
	8																
							Total=	28	18	18	29	28	25	29	18	29	18	Mean Neonates/Female = 24.0

Appendix C

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of the Filtered Biological Effluent/ Permeate Treatments to *Ceriodaphnia dubia*: Analysis vs. Hardness Blank and Including Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	19-5180-4571	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Simin Delijani
Start Date:	27 Sep-16 17:20	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Hard Synthetic Water
Ending Date:	03 Oct-16 15:15	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	01-7517-1601	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 15:30	**Material:**	Effluent	**Project:**	26377
Receive Date:	27 Sep-16 11:03	**Source:**	Lehigh Permanente		
Sample Age:	26h (0.5 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include data for Filtered Sample. Stats include outlier Hardness Ctl-G

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
16-3379-7479	Reproduction	0	>0		15.0%		Equal Variance t Two-Sample Test
01-0336-3186	Reproduction	100	>100	NA	34.5%	1	Steel Many-One Rank Sum Test
11-9836-8720	Reproduction	0	>0		14.3%		Wilcoxon Rank Sum Two-Sample Test
15-8674-6369	Survival	0	>0		NA		Fisher Exact Test
21-3131-5098	Survival	0	>0		NA		Fisher Exact Test
16-8839-4248	Survival	100	>100	NA	NA	1	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
08-6315-4303	Reproduction	IC5	95.4	18.4	N/A	1.049	Linear Interpolation (ICPIN)
		IC10	>100	N/A	N/A	<1	
		IC15	>100	N/A	N/A	<1	
		IC20	>100	N/A	N/A	<1	
		IC25	>100	N/A	N/A	<1	
		IC40	>100	N/A	N/A	<1	
		IC50	>100	N/A	N/A	<1	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	30	40	0.884	2.8	8.13%	0.0%
0	Filtration Blank	10	33.3	31.9	34.7	30	37	0.633	2	6.01%	3.2%
0	Hardness Contr	10	22.6	18.7	26.5	9	29	1.75	5.52	24.4%	34.3%
6.25		10	25.2	19.1	31.3	11	33	2.68	8.48	33.7%	26.7%
12.5		10	26.7	19.9	33.5	12	36	3.01	9.53	35.7%	22.4%
25		10	24.4	18	30.8	13	36	2.84	8.97	36.8%	29.1%
50		10	28.1	23.3	32.9	14	35	2.13	6.74	24.0%	18.3%
100		10	24	20.2	27.8	18	29	1.67	5.29	22.0%	30.2%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Filtration Blank	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Hardness Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
6.25		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
12.5		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
25		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	37	32	30	35	34	35	34	40	35	32
0	Filtration Blank	30	33	34	32	33	31	35	34	37	34
0	Hardness Contr	26	25	29	21	23	24	9	27	20	22
6.25		15	30	33	30	31	33	11	14	26	29
12.5		13	35	32	28	32	36	12	15	34	30
25		29	33	26	32	36	30	13	13	17	15
50		27	28	33	29	35	32	14	19	30	34
100		28	18	18	29	28	25	29	18	29	18

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Filtration Blank	1	1	1	1	1	1	1	1	1	1
0	Hardness Contr	1	1	1	1	1	1	0	1	1	1
6.25		1	1	1	1	1	1	0	1	1	1
12.5		1	1	1	1	1	1	0	0	1	1
25		1	1	1	1	1	1	1	1	0	0
50		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Filtration Blank	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Hardness Contr	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	00-1061-9004	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	21 Oct-16 14:40	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.87%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	Control	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		Hardness Control	6.03	1.73	3.39	18	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	696.2	696.2	1	36.3	<0.0001	Significant Effect
Error	344.8	19.15556	18			
Total	1041		19			

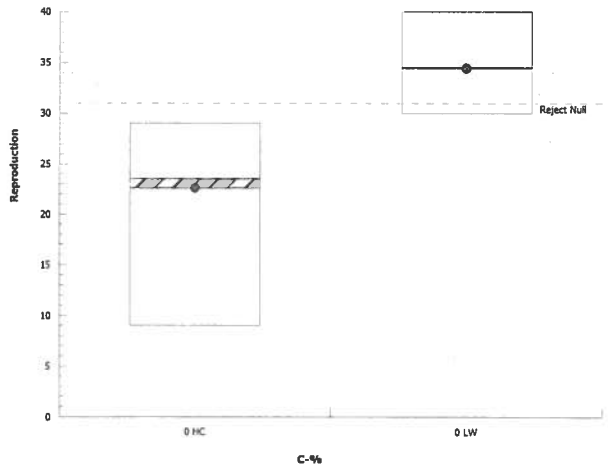
Distributional Tests

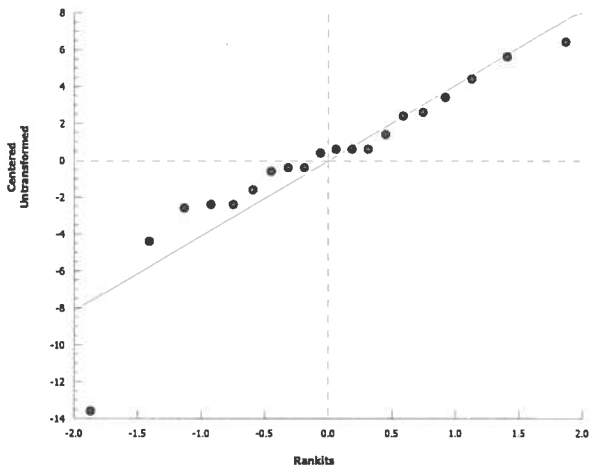
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	3.9	6.54	0.0552	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.876	0.866	0.0150	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	34.5	30	40	0.884	8.13%	0.0%
0	Hardness Contr	10	22.6	18.7	26.5	23.5	9	29	1.75	24.4%	34.3%

Graphics





Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	04-0638-3526	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	21 Oct-16 14:59	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.67%	Fails reproduction

Wilcoxon Rank Sum Two-Sample Test

Control	vs	Control	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Filtration Blank		Hardness Control	55	NA	0	18	<0.0001	Exact	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	572.45	572.45	1	33.2	<0.0001	Significant Effect
Error	310.5	17.25	18			
Total	882.95		19			

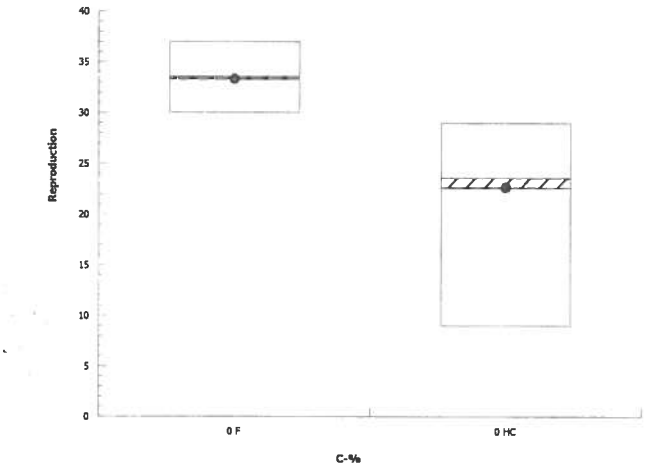
Distributional Tests

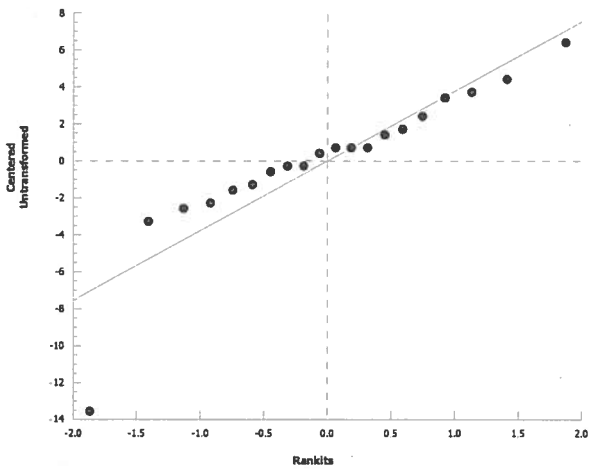
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	7.6	6.54	0.0058	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.839	0.866	0.0035	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Hardness Contr	10	22.6	18.7	26.5	23.5	9	29	1.75	24.4%	0.0%
0	Filtration Blank	10	33.3	31.9	34.7	33.5	30	37	0.633	6.01%	-47.3%

Graphics





Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	01-0336-3186	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:31	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	34.5%	100	>100	NA	1

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Hardness Control		6.25	125	75	2	18	0.9974	Asymp	Non-Significant Effect
		12.5	127	75	0	18	0.9986	Asymp	Non-Significant Effect
		25	116	75	2	18	0.9754	Asymp	Non-Significant Effect
		50	134	75	2	18	0.9999	Asymp	Non-Significant Effect
		100	112	75	2	18	0.9455	Asymp	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	194.9333	38.98667	5	0.674	0.6452	Non-Significant Effect
Error	3125.4	57.87778	54			
Total	3320.333		59			

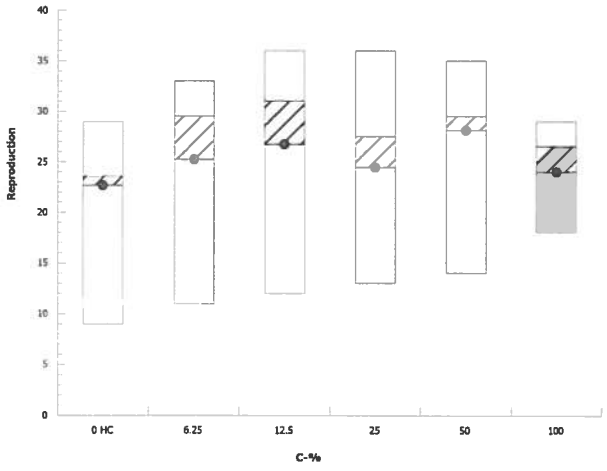
Distributional Tests

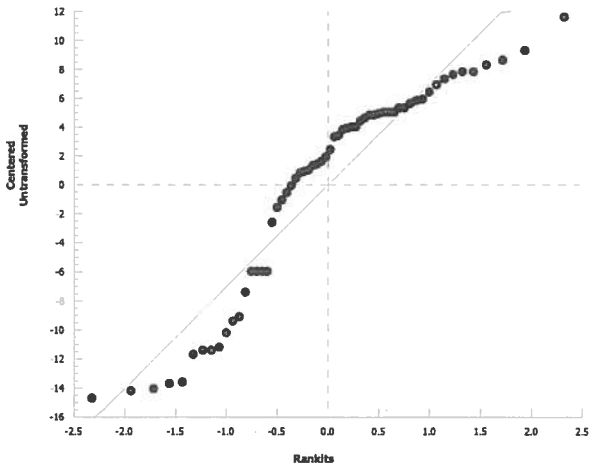
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	5.26	15.1	0.3844	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.896	0.946	<0.0001	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Hardness Contr	10	22.6	18.7	26.5	23.5	9	29	1.75	24.4%	0.0%
6.25		10	25.2	19.1	31.3	29.5	11	33	2.68	33.7%	-11.5%
12.5		10	26.7	19.9	33.5	31	12	36	3.01	35.7%	-18.1%
25		10	24.4	18	30.8	27.5	13	36	2.84	36.8%	-7.96%
50		10	28.1	23.3	32.9	29.5	14	35	2.13	24.0%	-24.3%
100		10	24	20.2	27.8	26.5	18	29	1.67	22.0%	-6.19%

Graphics





CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	08-6315-4303	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:31	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	46065	200	Yes	Two-Point Interpolation

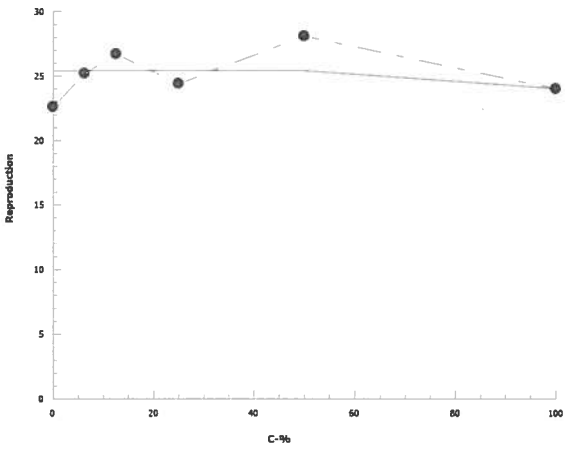
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	95.4	18.4	N/A	1.049	NA	5.448
IC10	>100	N/A	N/A	<1	NA	NA
IC15	>100	N/A	N/A	<1	NA	NA
IC20	>100	N/A	N/A	<1	NA	NA
IC25	>100	N/A	N/A	<1	NA	NA
IC40	>100	N/A	N/A	<1	NA	NA
IC50	>100	N/A	N/A	<1	NA	NA

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Hardness Control	10	22.6	9	29	1.75	5.52	24.4%	0.0%
6.25		10	25.2	11	33	2.68	8.48	33.7%	-11.5%
12.5		10	26.7	12	36	3.01	9.53	35.7%	-18.1%
25		10	24.4	13	36	2.84	8.97	36.8%	-7.96%
50		10	28.1	14	35	2.13	6.74	24.0%	-24.3%
100		10	24	18	29	1.67	5.29	22.0%	-6.19%

Graphics



Appendix D

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of the Filtered Biological Effluent/ Permeate Treatments to *Ceriodaphnia dubia*: Analysis vs. Lab Water Control

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Batch ID:	19-5180-4571	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Simin Delijani
Start Date:	27 Sep-16 17:20	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Hard Synthetic Water
Ending Date:	03 Oct-16 15:15	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	01-7517-1601	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 15:30	**Material:**	Effluent	**Project:**	26377
Receive Date:	27 Sep-16 11:03	**Source:**	Lehigh Permanente		
Sample Age:	26h (0.5 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include data for Filtered Sample vs. Lab Water. [redacted]

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-5394-8405	Reproduction	<0	0		6.65%		Equal Variance t Two-Sample Test
02-4776-5248	Reproduction	12.5	25	17.68	22.3%	8	Steel Many-One Rank Sum Test
07-3132-7549	Survival	0	>0		NA		Fisher Exact Test
17-6796-2189	Survival	100	>100	NA	NA	1	Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
13-4352-7607	Reproduction	IC5	1.3	0.983	2.58	77.21	Linear Interpolation (ICPIN)
		IC10	2.59	1.97	5.17	38.6	
		IC15	3.89	2.95	15	25.74	
		IC20	5.18	3.93	63.1	19.3	
		IC25	57.1	4.91	N/A	1.75	
		IC40	>100	N/A	N/A	<1	
		IC50	>100	N/A	N/A	<1	

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	30	40	0.884	2.8	8.13%	0.0%
0	Filtration Blank	10	33.3	31.9	34.7	30	37	0.633	2	6.01%	3.2%
0	Hardness Contr	9	24.1	21.9	26.4	20	29	0.978	2.93	12.2%	29.9%
6.25		10	25.2	19.1	31.3	11	33	2.68	8.48	33.7%	26.7%
12.5		10	26.7	19.9	33.5	12	36	3.01	9.53	35.7%	22.4%
25		10	24.4	18	30.8	13	36	2.84	8.97	36.8%	29.1%
50		10	28.1	23.3	32.9	14	35	2.13	6.74	24.0%	18.3%
100		10	24	20.2	27.8	18	29	1.67	5.29	22.0%	30.2%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Filtration Blank	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Hardness Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
6.25		10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
12.5		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
25		10	0.8	0.498	1	0	1	0.133	0.422	52.7%	20.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	37	32	30	35	34	35	34	40	35	32
0	Filtration Blank	30	33	34	32	33	31	35	34	37	34
0	Hardness Contr	26	25	29	21	23	24	9	27	20	22
6.25		15	30	33	30	31	33	11	14	26	29
12.5		13	35	32	28	32	36	12	15	34	30
25		29	33	26	32	36	30	13	13	17	15
50		27	28	33	29	35	32	14	19	30	34
100		28	18	18	29	28	25	29	18	29	18

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Filtration Blank	1	1	1	1	1	1	1	1	1	1
0	Hardness Contr	1	1	1	1	1	1	0	1	1	1
6.25		1	1	1	1	1	1	0	1	1	1
12.5		1	1	1	1	1	1	0	0	1	1
25		1	1	1	1	1	1	1	1	0	0
50		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Filtration Blank	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Hardness Contr	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
6.25		1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
12.5		1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1
50		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Test Code: 69875-f | 12-2963-0781

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	17-6796-2189	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Oct-16 14:43	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	100	>100	NA	1

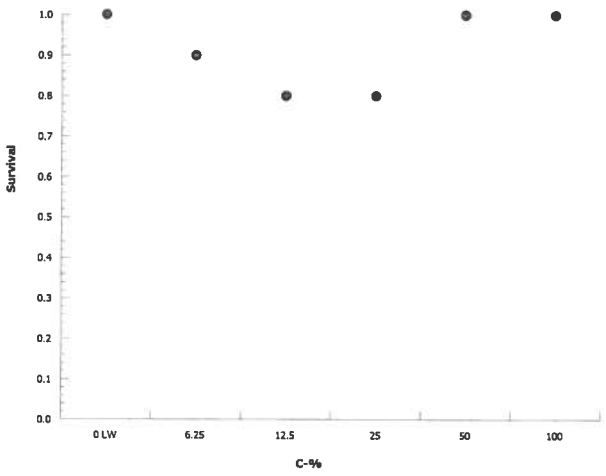
Fisher Exact/Bonferroni-Holm Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25	0.5	1.0000	Exact	Non-Significant Effect
		12.5	0.237	1.0000	Exact	Non-Significant Effect
		25	0.237	1.0000	Exact	Non-Significant Effect
		50	1	1.0000	Exact	Non-Significant Effect
		100	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
6.25		9	1	10	0.9	0.1	10.0%
12.5		8	2	10	0.8	0.2	20.0%
25		8	2	10	0.8	0.2	20.0%
50		10	0	10	1	0	0.0%
100		10	0	10	1	0	0.0%

Graphics



Analyst: SD QA: M

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	02-4776-5248	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Oct-16 14:50	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	22.3%	12.5	25	17.68	8

Steel Many-One Rank Sum Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		6.25*	63	76	1	18	0.0028	Asymp	Significant Effect
		12.5	78	76	4	18	0.0654	Asymp	Non-Significant Effect
		25*	68.5	76	2	18	0.0104	Asymp	Significant Effect
		50*	71	76	4	18	0.0177	Asymp	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	631.72	157.93	4	2.66	0.0446	Significant Effect
Error	2669.4	59.32	45			
Total	3301.12		49			

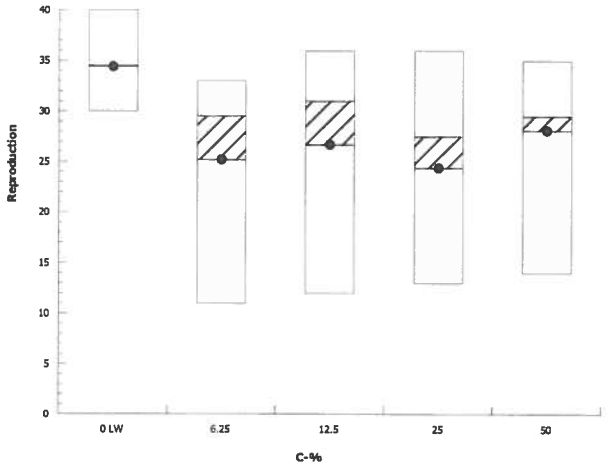
Distributional Tests

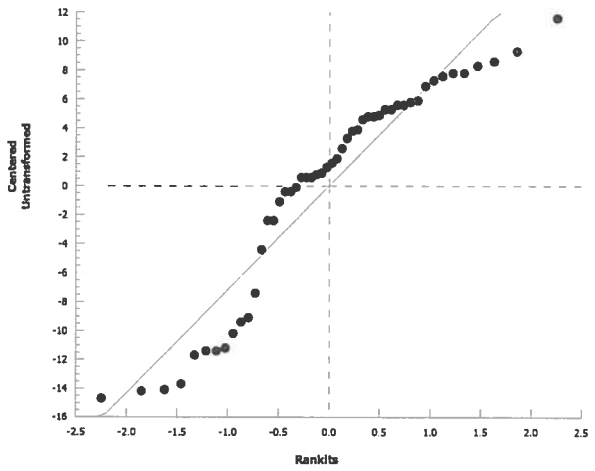
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	11.8	13.3	0.0190	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.902	0.937	0.0006	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	34.5	30	40	0.884	8.13%	0.0%
6.25		10	25.2	19.1	31.3	29.5	11	33	2.68	33.7%	26.7%
12.5		10	26.7	19.9	33.5	31	12	36	3.01	35.7%	22.4%
25		10	24.4	18	30.8	27.5	13	36	2.84	36.8%	29.1%
50		10	28.1	23.3	32.9	29.5	14	35	2.13	24.0%	18.3%

Graphics





CETIS Analytical Report

Test Code: 69875-f | 12-2963-0781

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	13-4352-7607	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	12 Oct-16 15:01	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	683713	200	Yes	Two-Point Interpolation

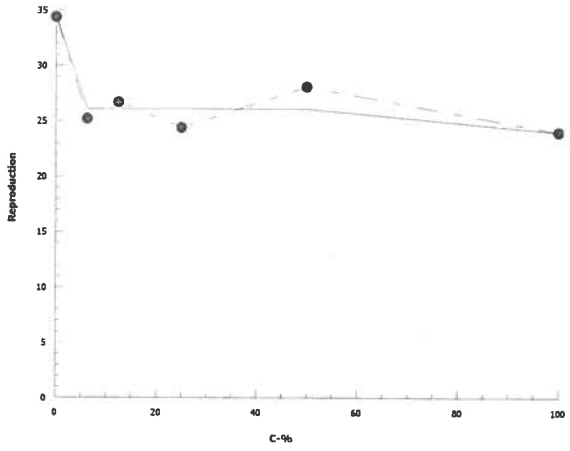
Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	1.3	0.983	2.58	77.21	38.7	101.8
IC10	2.59	1.97	5.17	38.6	19.35	50.89
IC15	3.89	2.95	15	25.74	6.672	33.93
IC20	5.18	3.93	63.1	19.3	1.585	25.44
IC25	57.1	4.91	N/A	1.75	NA	20.36
IC40	>100	N/A	N/A	<1	NA	NA
IC50	>100	N/A	N/A	<1	NA	NA

Reproduction Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	34.4	30	40	0.884	2.8	8.13%	0.0%
6.25		10	25.2	11	33	2.68	8.48	33.7%	26.7%
12.5		10	26.7	12	36	3.01	9.53	35.7%	22.4%
25		10	24.4	13	36	2.84	8.97	36.8%	29.1%
50		10	28.1	14	35	2.13	6.74	24.0%	18.3%
100		10	24	18	29	1.67	5.29	22.0%	30.2%

Graphics



Analyst: SD QA: M

Appendix E

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of the Unfiltered Biological Effluent/Permeate treatment to *Ceriodaphnia dubia*: Analysis Excluding Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	18-3704-3903	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Simin Delijani
Start Date:	27 Sep-16 17:20	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Not Applicable
Ending Date:	03 Oct-16 15:15	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	16-3029-0970	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 15:30	**Material:**	Effluent	**Project:**	26377
Receive Date:	27 Sep-16 11:03	**Source:**	Lehigh Permanente		
Sample Age:	26h (0.5 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include data for Unfiltered Sample. Stats exclude outlier Hardness Ctl-G

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
00-5972-6365	Reproduction	0	>0		9.49%		Equal Variance t Two-Sample Test
13-1577-8981	Reproduction	100	>100	NA	15.9%	1	Equal Variance t Two-Sample Test
02-5474-4033	Survival	100	>100	NA	NA	1	Fisher Exact Test
12-2568-4449	Survival	0	>0		NA		Fisher Exact Test

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	30	40	0.884	2.8	8.13%	0.0%
0	Hardness Contr	9	24.1	21.9	26.4	20	29	0.978	2.93	12.2%	29.9%
100		10	30.2	25.9	34.5	18	39	1.89	5.98	19.8%	12.2%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Hardness Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	37	32	30	35	34	35	34	40	35	32
0	Hardness Contr	26	25	29	21	23	24		27	20	22
100		31	25	32	31	18	26	30	39	35	35

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Hardness Contr	1	1	1	1	1	1	0	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Hardness Contr	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	02-5474-4033	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:41	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

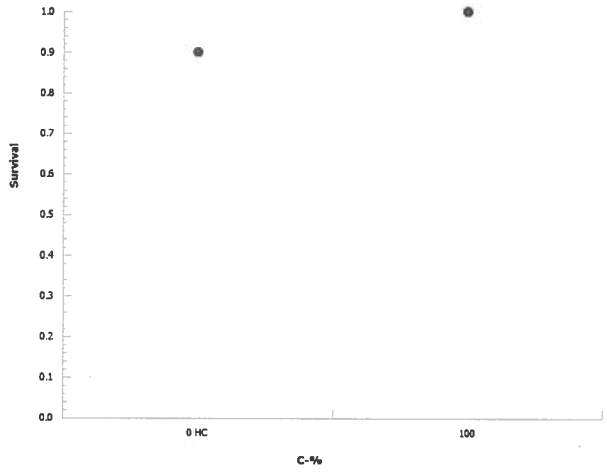
Fisher Exact Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Hardness Control		100	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Hardness Contr	9	1	10	0.9	0.1	0.0%
100		10	0	10	1	0	-11.1%

Graphics



CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	13-1577-8981	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:43	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	15.9%	Passes reproduction

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Hardness Control		100	-2.77	1.74	3.83	17	0.9934	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	175.6164	175.6164	1	7.65	0.0132	Significant Effect
Error	390.4889	22.96993	17			
Total	566.1053		18			

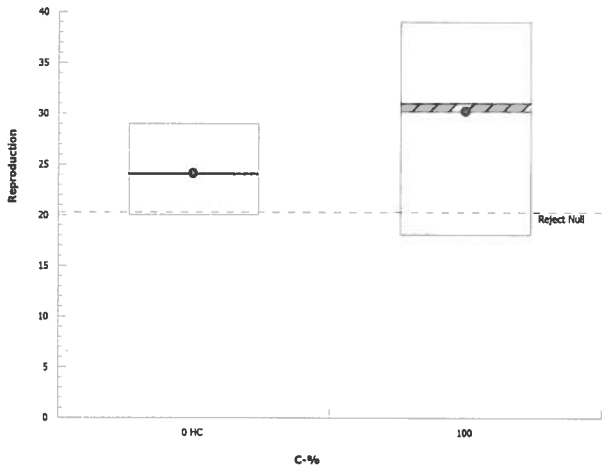
Distributional Tests

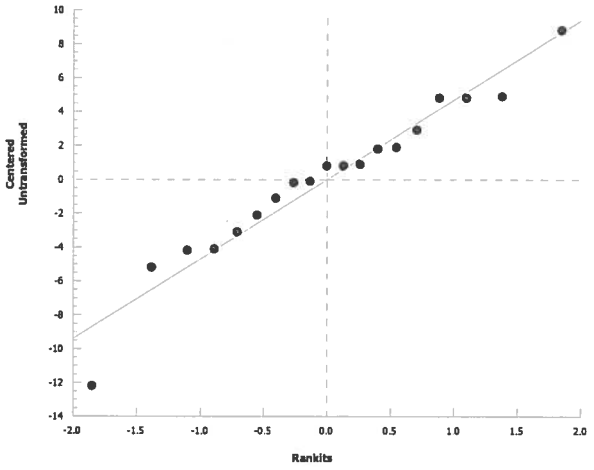
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	4.15	7.34	0.0575	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.959	0.861	0.5566	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Hardness Contr	9	24.1	21.9	26.4	24	20	29	0.978	12.2%	0.0%
100		10	30.2	25.9	34.5	31	18	39	1.89	19.8%	-25.3%

Graphics





CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Analysis ID:	14-3417-0923	**Endpoint:**	Survival	**CETIS Version:**	CETISv1.8.7
Analyzed:	21 Oct-16 15:34	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	Test Result
Untransformed		C > T	NA	NA	Passes survival

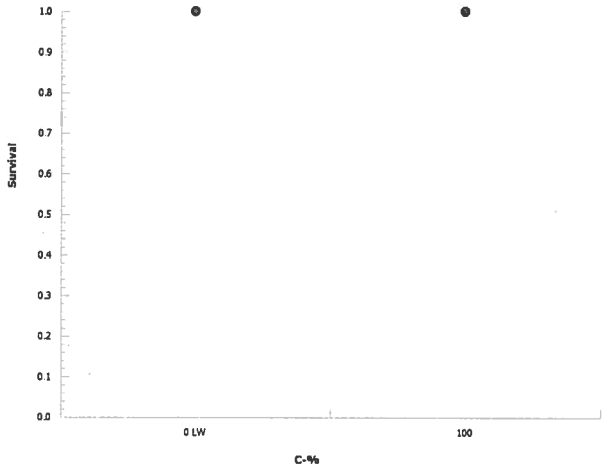
Fisher Exact Test

Control	vs	C-%	Test Stat	P-Value	P-Type	Decision(α:5%)
Lab Water Control		100	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Lab Water Cont	10	0	10	1	0	0.0%
100		10	0	10	1	0	0.0%

Graphics



CETIS Analytical Report

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	08-6511-1156	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	21 Oct-16 15:35	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	10.5%	Fails reproduction

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Lab Water Control		100*	2.01	1.73	3.62	18	0.0297	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	88.2	88.2	1	4.05	0.0594	Non-Significant Effect
Error	392	21.77778	18			
Total	480.2		19			

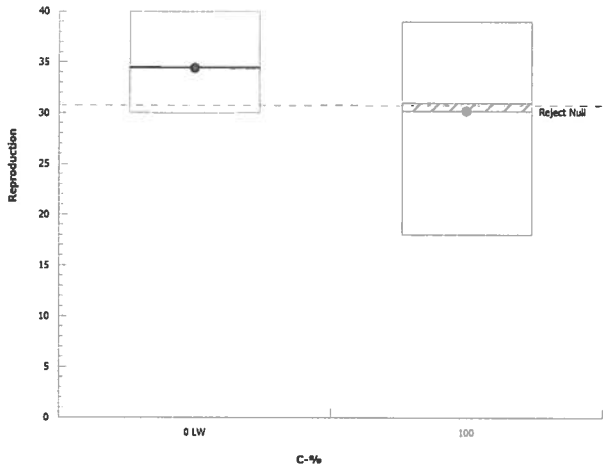
Distributional Tests

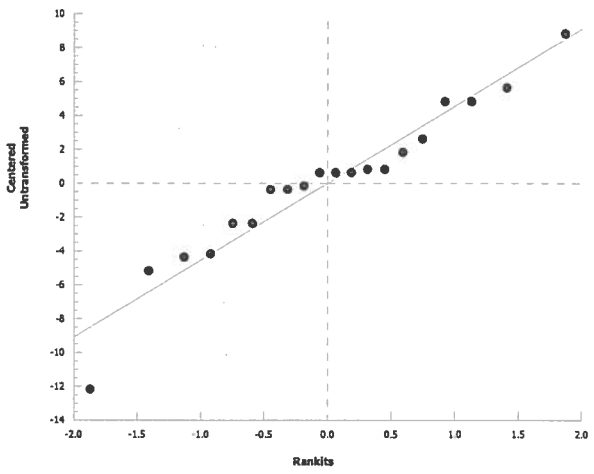
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	4.57	6.54	0.0336	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.949	0.866	0.3526	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	34.5	30	40	0.884	8.13%	0.0%
100		10	30.2	25.9	34.5	31	18	39	1.89	19.8%	12.2%

Graphics





Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Lehigh Permanente** Material: **25%:75% Unfiltered Biological Effluent/Permeate** Test Date: 9/27/16

Project #: 26377 Test ID: 69875 Randomization 10.7.3 / 10.2.5 Control Water: Hardness Control

	Day	pH New	pH Old	D.O. New	D.O. Old	Cond. (µS/cm)	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	Sample ID
100%	0	7.80		8.8		1263		0	0	0	0	0	0	0	0	0	0	44185 / 44186
	1	8.04	8.08	9.0	7.5	1281		0	0	0	0	0	0	0	0	0	0	44185 / 44186
	2	8.07	8.14	9.6	7.7	1272		0	0	0	0	0	0	0	0	0	0	44185 / 44186
	3	8.04	8.40	10.3	7.1	1259		6	2	0	4	0	0	7	6	0	0	44185 / 44186
	4	7.89	7.99	10.3	8.1	1299		0	0	6	0	3	5	0	0	7	7	44185 / 44186
	5	7.80	7.97	8.8	8.0	1269		9	7	10	10	0	8	8	13	12	11	44185 / 44186
	6	—	7.72	—	7.7	1328		16	16	16	17	15	13	15	20	16	17	—
	7																	
	8																	
							Total=	31	25	32	31	18	26	30	39	35	35	Mean Neonates/Female = 30.2

Appendix F

Test Data and Summary of Statistics for the Evaluation of the Chronic Toxicity of the Unfiltered Biological Effluent/Permeate treatment to *Ceriodaphnia dubia*: Analysis Including Outlier Data

CETIS Summary Report

Ceriodaphnia Survival and Reproduction Test — **Pacific EcoRisk**

Batch ID:	18-3704-3903	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Simin Delijani
Start Date:	27 Sep-16 17:20	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Not Applicable
Ending Date:	03 Oct-16 15:15	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	5d 22h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	16-3029-0970	**Code:**	Effluent	**Client:**	Lehigh Permanente
Sample Date:	26 Sep-16 15:30	**Material:**	Effluent	**Project:**	26377
Receive Date:	27 Sep-16 11:03	**Source:**	Lehigh Permanente		
Sample Age:	26h (0.5 °C)	**Station:**	75:25% Permeate:Biological Effluent		

Batch Note: Stats include data for Unfiltered Sample. Stats include outlier Hardness Ctl-G

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
04-0759-1667	Reproduction	0	>0		15.0%		Equal Variance t Two-Sample Test
13-1435-2613	Reproduction	100	>100	NA	19.7%	1	Equal Variance t Two-Sample Test
02-5474-4033	Survival	100	>100	NA	NA	1	Fisher Exact Test
12-2568-4449	Survival	0	>0		NA		Fisher Exact Test

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	34.4	32.4	36.4	30	40	0.884	2.8	8.13%	0.0%
0	Hardness Contr	10	22.6	18.7	26.5	9	29	1.75	5.52	24.4%	34.3%
100		10	30.2	25.9	34.5	18	39	1.89	5.98	19.8%	12.2%

Survival Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
0	Hardness Contr	10	0.9	0.674	1	0	1	0.1	0.316	35.1%	10.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	37	32	30	35	34	35	34	40	35	32
0	Hardness Contr	26	25	29	21	23	24	9	27	20	22
100		31	25	32	31	18	26	30	39	35	35

Survival Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
0	Hardness Contr	1	1	1	1	1	1	0	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Survival Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
0	Hardness Contr	1/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
100		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Analysis ID:	13-1435-2613	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	04 Oct-16 15:41	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	19.7%	Passes reproduction

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Hardness Control		100	-2.95	1.73	4.46	18	0.9957	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	288.8	288.8	1	8.72	0.0085	Significant Effect
Error	596	33.11111	18			
Total	884.8		19			

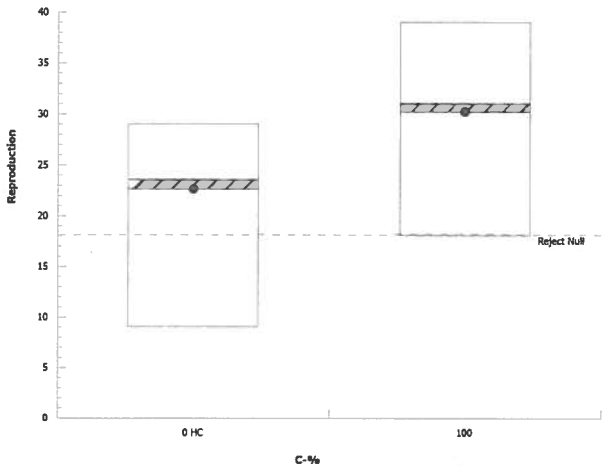
Distributional Tests

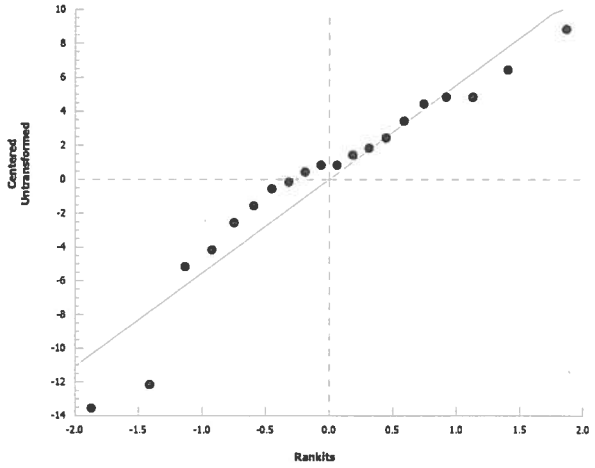
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	1.17	6.54	0.8170	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.915	0.866	0.0806	Normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Hardness Contr	10	22.6	18.7	26.5	23.5	9	29	1.75	24.4%	0.0%
100		10	30.2	25.9	34.5	31	18	39	1.89	19.8%	-33.6%

Graphics





Appendix G

Test Data and Summary of Statistics for the Reference Toxicant Evaluation of *Ceriodaphnia dubia*

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Batch ID:	15-1022-7721	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Robert Gee
Start Date:	27 Sep-16 12:50	**Protocol:**	EPA-821-R-02-013 (2002)	**Diluent:**	Laboratory Water
Ending Date:	03 Oct-16 14:05	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	6d 1h	**Source:**	In-House Culture	**Age:**	1

Sample ID:	04-5687-9373	**Code:**	NaCl	**Client:**	Reference Toxicant
Sample Date:	27 Sep-16 12:50	**Material:**	Sodium chloride	**Project:**	26308
Receive Date:	27 Sep-16 12:50	**Source:**	Reference Toxicant		
Sample Age:	NA (25.6 °C)	**Station:**	In House		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
16-6965-0530	Reproduction	500	1000	707.1	22.5%		Wilcoxon/Bonferroni Adj Test
05-1926-9841	Survival	2000	2500	2236	NA		Fisher Exact/Bonferroni-Holm Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
01-8681-6691	Reproduction	IC5	335	177	574		Linear Interpolation (ICPIN)
		IC10	541	353	882		
		IC15	620	523	1080		
		IC20	700	606	1140		
		IC25	780	678	1270		
		IC40	1510	849	1580		
		IC50	1620	959	1680		
03-6116-4434	Survival	EC50	1740	1460	2080		Spearman-Kärber

Reproduction Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	33.5	31.7	35.3	30	38	0.778	2.46	7.35%	0.0%
500		10	31	28.5	33.5	26	38	1.09	3.43	11.1%	7.46%
1000		9	20.3	9.21	31.5	0	33	4.82	14.5	71.1%	39.3%
1500		10	20.7	17.5	23.9	9	24	1.43	4.52	21.8%	38.2%
2000		10	5.3	1.16	9.44	0	18	1.83	5.79	109.0%	84.2%
2500		10	0	0	0	0	0	0	0		100.0%

Survival Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Water Contr	10	1	1	1	1	1	0	0	0.0%	0.0%
500		10	1	1	1	1	1	0	0	0.0%	0.0%
1000		9	0.667	0.282	1	0	1	0.167	0.5	75.0%	33.3%
1500		10	1	1	1	1	1	0	0	0.0%	0.0%
2000		10	0.6	0.231	0.969	0	1	0.163	0.516	86.1%	40.0%
2500		10	0	0	0	0	0	0	0		100.0%

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Reproduction Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	34	31	31	38	30	36	34	35	33	33
500		33	38	28	32	26	32	27	31	32	31
1000		32	33	31	30	0	27	4	26	0	
1500		24	24	21	24	9	23	23	20	20	19
2000		0	0	0	7	9	4	18	8	0	7
2500		0	0	0	0	0	0	0	0	0	0

Survival Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1	1	1	1	1	1	1	1	1	1
500		1	1	1	1	1	1	1	1	1	1
1000		1	1	1	1	0	1	0	1	0	
1500		1	1	1	1	1	1	1	1	1	1
2000		0	0	0	1	1	1	1	1	0	1
2500		0	0	0	0	0	0	0	0	0	0

Survival Binomials

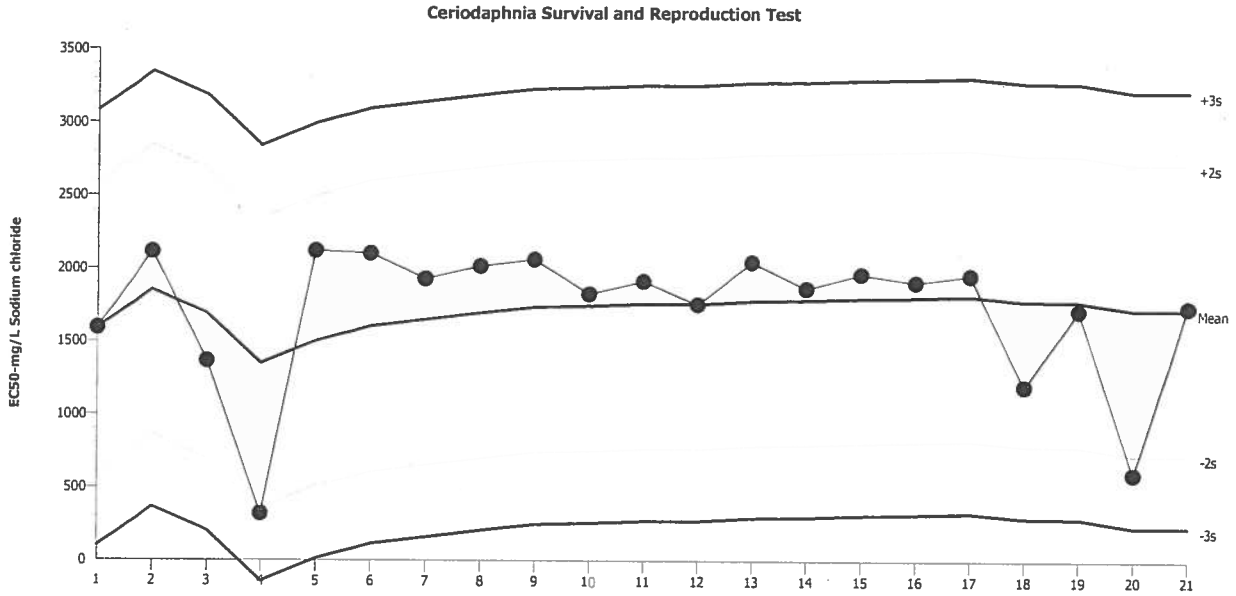
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water Contr	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
500		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
1000		1/1	1/1	1/1	1/1	0/1	1/1	0/1	1/1	0/1	
1500		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
2000		0/1	0/1	0/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1
2500		0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1

CETIS QC Plot

Report Date: 04 Oct-16 09:50 (1 of 1)

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Test Type:	Reproduction-Survival (7d)	**Organism:**	Ceriodaphnia dubia (Water Flea)	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-013 (2002)	**Endpoint:**	Survival	**Source:**	Reference Toxicant-REF



Mean:	1721	**Count:**	20	**-2s Warning Limit:**	727.8	**-3s Action Limit:**	231
Sigma:	496.8	**CV:**	28.90%	**+2s Warning Limit:**	2715	**+3s Action Limit:**	3212

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	May	10	14:15	1594	-127.2	-0.2561			04-1900-2071	02-7180-6176
2			17	16:30	2117	396	0.7971			02-0217-2091	01-8095-6167
3			24	14:40	1369	-352	-0.7085			12-4725-4616	17-8748-4211
4		Jun	14	12:15	321.4	-1400	-2.817	(-)		06-1840-5245	14-8979-7423
5			23	10:40	2125	403.7	0.8126			16-6250-9087	17-5652-1508
6			23	13:25	2105	384.4	0.7738			07-7424-9431	12-9537-7598
7			28	13:00	1933	212	0.4267			09-5722-1456	07-9253-0885
8		Jul	6	13:00	2019	297.9	0.5996			09-9739-4449	17-8269-3326
9			7	10:20	2064	343.2	0.6909			07-3590-7818	09-8307-4510
10			12	13:45	1831	109.6	0.2207			19-4280-6480	04-6439-4868
11		Aug	9	14:15	1918	197.4	0.3973			01-7078-3993	16-1640-2231
12			11	15:25	1759	38.26	0.07701			05-4282-8788	09-4783-9953
13			18	13:30	2050	328.9	0.662			09-3523-7380	14-1088-4073
14			23	14:15	1870	149	0.2999			20-3175-3833	16-0364-9515
15			25	14:35	1968	247	0.4972			08-0124-0684	18-2643-7985
16			30	16:05	1913	191.7	0.3859			02-5260-5089	09-5069-0405
17		Sep	8	13:40	1957	236.4	0.4759			18-2267-1225	05-8688-6279
18			13	10:20	1198	-523	-1.053			15-9643-7614	12-2668-1557
19			15	14:20	1718	-3.382	-0.00681			16-2243-5631	01-5480-0827
20			20	15:00	597.9	-1123	-2.261	(-)		18-2996-3053	17-7702-4069
21			27	12:50	1739	17.88	0.03599			02-6694-9084	03-6116-4434

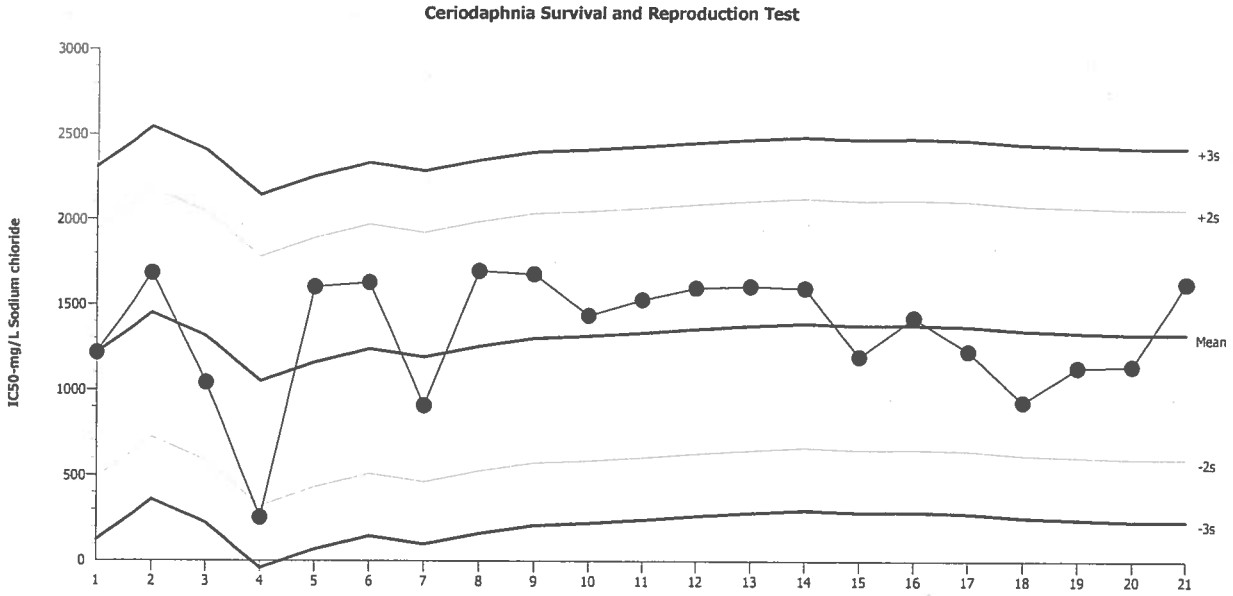
Analyst: RG QA: SD

CETIS QC Plot

Report Date: 04 Oct-16 09:51 (1 of 1)

Ceriodaphnia Survival and Reproduction Test — Pacific EcoRisk

Test Type:	Reproduction-Survival (7d)	**Organism:**	Ceriodaphnia dubia (Water Flea)	**Material:**	Sodium chloride
Protocol:	EPA-821-R-02-013 (2002)	**Endpoint:**	Reproduction	**Source:**	Reference Toxicant-REF



Mean:	1326	**Count:**	20	**-2s Warning Limit:**	598.4	**-3s Action Limit:**	234.4
Sigma:	364	**CV:**	27.50%	**+2s Warning Limit:**	2054	**+3s Action Limit:**	2418

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2016	May	10	14:15	1216	-110	-0.3021			04-1900-2071	20-3182-9235
2			17	16:30	1684	358.4	0.9847			02-0217-2091	07-3645-9270
3			24	14:40	1042	-284.3	-0.7811			12-4725-4616	17-2108-7232
4		Jun	14	12:15	255	-1071	-2.942	(-)		06-1840-5245	10-0782-9712
5			23	10:40	1603	277.2	0.7616			16-6250-9087	07-8286-1737
6			23	13:25	1628	302.2	0.8303			07-7424-9431	14-5397-9899
7			28	13:00	908.1	-417.9	-1.148			09-5722-1456	07-0717-9325
8		Jul	6	13:00	1696	370.1	1.017			09-9739-4449	05-4282-8277
9			7	10:20	1679	353	0.9699			07-3590-7818	02-2720-1850
10			12	13:45	1435	109	0.2995			19-4280-6480	01-6291-6561
11		Aug	9	14:15	1528	202.3	0.5558			01-7078-3993	16-5522-9106
12			11	15:25	1598	271.5	0.746			05-4282-8788	20-6991-7970
13			18	13:30	1607	281.3	0.7727			09-3523-7380	12-7959-5180
14			23	14:15	1598	271.9	0.7469			20-3175-3833	12-9031-4120
15			25	14:35	1196	-130.1	-0.3574			08-0124-0684	03-1672-5825
16			30	16:05	1425	99	0.272			02-5260-5089	20-2491-5546
17		Sep	8	13:40	1226	-100.1	-0.2749			18-2267-1225	12-1761-7946
18			13	10:20	930.9	-395.1	-1.086			15-9643-7614	16-7658-0121
19			15	14:20	1132	-193.7	-0.5323			16-2243-5631	01-2656-4408
20			20	15:00	1140	-186.3	-0.5118			18-2996-3053	19-4443-0639
21			27	12:50	1624	297.8	0.818			02-6694-9084	01-8681-6691

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/16

Project #: 26308 Test ID: 69790 Randomization: 10.6.1 Control Water: SRW

Lab Water Control

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	SIGN-OFF
0	8.01		8.6		321		25.6	0	0	0	0	0	0	0	0	0	0	Date: 9/27/16 New WQ: Test Init.: WC Sol'n Prep: WC Old WQ: YK Time: 1250
1	8.53	8.17	8.0	7.1	324	334	25.0	0	0	0	0	0	0	0	0	0	0	Date: 9/28/16 New WQ: YK Counts: WDM Sol'n Prep: WC Old WQ: JZ Time: 1310
2	8.30	7.92	9.0	7.2	328	325	25.1	0	0	0	0	0	0	0	0	0	0	Date: 9/29/16 New WQ: YK Counts: ~~1137~~ 1137 (9/29/16 SC) Sol'n Prep: SC Old WQ: JZ Time: 1137
3	7.92	8.30	8.3	6.1	328	335	25.3	6	5	5	6	6	6	6	0	5	0	Date: 9/30/16 New WQ: RB Counts: TK Sol'n Prep: TK Old WQ: RB Time: 1235
4	7.86	7.92	8.2	7.3	329	~~325~~ 369	25.4	0	0	0	0	0	0	0	7	0	6	Date: 10/1/16 New WQ: TK Counts: TK Sol'n Prep: TK Old WQ: DT Time: 1400
5	7.75	8.00	7.9	6.3	309	343	25.1	12	14	13	14	11	13	12	13	12	13	Date: 10/2/16 New WQ: JZ Counts: SH Sol'n Prep: SH Old WQ: AR Time: 1405
6	—	7.59	—	7.4	—	339	24.9	16	12	13	18	13	17	16	15	16	14	Date: 10/3/16 New WQ: — Counts: JZ Sol'n Prep: — Old WQ: TK Time: 1405
7																		Date: New WQ: Counts: Sol'n Prep: Old WQ: Time:
8																		Date: Old WQ: Counts: Time:
							Total=	34	31	31	38	30	36	34	35	33	33	Mean Neonates/Female = 33.5

500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Survival / Reproduction A	B	C	D	E	F	G	H	I	J	RT BATCH NUMBER
0	7.82		8.0		1310		0	0	0	0	0	0	0	0	0	0	230
1	7.56	8.04	8.3	7.0	1346	1391	0	0	0	0	0	0	0	0	0	0	230
2	8.10	7.74	9.0	8.0	1337	1453	0	0	0	0	0	0	0	0	0	0	230
3	7.87	8.19	8.5	6.5	1270	1427	5	5	4	6	4	5	5	0	0	0	230
4	7.73	7.83	8.3	7.4	1333	1447	0	0	0	0	0	13	0	6	5	6	230
5	7.62	7.87	8.0	6.7	1355	1445	12	15	11	12	9	0	14	8	12	13	230
6	—	7.55	—	6.8	—	1459	16	18	13	14	13	14	8	17	15	12	—
7																	
8																	
							Total= 33	38	28	32	26	32	27	31	32	31	Mean Neonates/Female = 31.0

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/6

Project #: 26308 Test ID: 69790 Control Water: SRW

	Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
1000 mg/L	0	7.81		8.1		2208			0	0	0	0	0	0	0	0	0	0
	1	7.47	7.99	8.5	7.6	2196	2358		0	0	0	0	0	0	0	0	0	0
	2	7.62	7.70	8.7	7.9	2274	2335		0	0	0	0	0	0	0	0	0	0
	3	7.86	8.16	8.8	6.8	2184	2510		0	6	0	5	X/0	0	4	0	X/0	0
	4	7.69	7.86	8.6	7.4	2157	2624		6	0	6	0	-	5	0	5	-	7
	5	7.60	7.87	8.1	6.6	2186	2350		13	13	12	12	-	9	X/0	9	-	-/12
	6	—	7.55	—	7.3	—	2512		13	14	13	13	-	13	—	12	-	-
	7												-		-		-	-
	8												-		-		-	-
								Total=	32	33	31	30	X/0	27	X/4	26	X/6	-/19

Mean Neonates/Female = 20.3

	Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
1500 mg/L	0	7.81		8.6		2965		0	0	0	0	0	0	0	0	0	0
	1	7.50	7.97	8.8	7.8	3130	3280	0	0	0	0	0	0	0	0	0	0
	2	7.61	7.70	8.9	8.0	3288	3400	0	0	0	0	0	0	0	0	0	0
	3	7.85	8.13	9.1	6.6	3050	3410	0	0	0	5	0	5	4	4	0	0
	4	7.65	7.88	8.7	7.3	3020	3410	4	5	4	0	X/3	0	0	0	4	4
	5	7.61	7.87	8.3	4.7	3073	3420	9	10	11	9	0	10	7	8	9	7
	6	—	7.55	—	7.1	—	3460	11	9	6	10	6	8	12	8	7	8
	7																
	8																
								Total= 24	24	21	24	9	23	23	20	20	19

Mean Neonates/Female = 20.7

Short-Term Chronic 3-Brood *Ceriodaphnia dubia* Survival & Reproduction Test Data

Client: **Reference Toxicant** Material: **Sodium Chloride** Test Date: 9/27/16

Project #: 26308 Test ID: 69790 Control Water: SRW

2000 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Temp (°C)	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.80		8.6		3910			0	0	0	0	0	0	0	0	0	0
1	7.50	7.97	9.0	7.7	4000	4120		0	0	0	0	0	0	0	0	0	0
2	7.64	7.71	9.1	8.5	3972	3901		X/0	X/0	X/0	0	0	0	0	0	X/0	0
3	7.84	8.12	9.0	6.9	3920	4300		-	-	-	0	0	0	0	0	-	0
4	7.65	7.85	9.0	7.5	4070	4360		-	-	-	2	0	0	2	0	-	0
5	7.62	7.83	8.5	6.6	3938	4470		-	-	-	8	3	0	6	3	-	4
6								-	-	-	0	6	4	10	5	-	3
7								-	-	-						-	
8								-	-	-						-	NR w/M/H
							Total=	X/0	X/0	X/0	7	9	4	18	8	X/0	~~X~~ 7

Mean Neonates/Female = ~~5.2~~ 5.3 NR w/M/H

2500 mg/L

Day	pH New	pH Old	D.O. New	D.O. Old	Conductivity (µS/cm) New	Conductivity (µS/cm) Old	Survival / Reproduction A	B	C	D	E	F	G	H	I	J
0	7.77		9.1		4800		0	0	0	0	0	0	0	0	0	0
1	7.52	7.95	9.3	7.7	4850	5060	0	0	0	0	0	0	0	0	0	0
2	7.61	7.67	9.5	8.7	4837	5091	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0
3	—	—	—	—	—	—	-	-	-	-	-	-	-	-	-	-
4	—	—	—	—	—	—	-	-	-	-	-	-	-	-	-	-
5	—	—	—	—	—	—	-	-	-	-	-	-	-	-	-	-
6	—	—	—	—	—	—	-	-	-	-	-	-	-	-	-	-
7	—	—	—	—	—	—	-	-	-	-	-	-	-	-	-	-
8		—		—		—	-	-	-	-	-	-	-	-	-	-
						Total=	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0	X/0

Mean Neonates/Female = 0