RESULTS OF CHRONIC TOXICITY TESTS

ON EFFLUENT FROM THE APS FOUR CORNERS POWER PLANT

COLLECTED 20 - 24 August 2012

NPDES Permit No. NN0000019

Prepared for:

Arizona Public Service Company
Four Corners Power Plant, Environmental Services
P.O. Box 355, CR6675
Fruitland, New Mexico 87416
Attn: Arnold Slowman

Submitted by:

Aquatic Consulting & Testing, Inc.
1525 West University Drive, Suite 106
Tempe, Arizona 85281

AQUATIC CONSULTING & TESTING, INC.

1525 W. University Drive, Suite 106
P.O. Box 1510
Tempe, Arizona 85281
Phone: (480) 921-8044 • Fax: (480) 921-0049

Lic. No. AZ0003

September 28, 2012

RECEIVED
OCT - 8 2012
APS
Environmental
Services

Arnold Slowman
Arizona Public Service - Four Corners
P.O. Box 355
Fruitland, NM 87416

Permit Number - NN0000019
Sample Source - Arizona Public Service - Four Corners

Dear Mr. Slowman,

The results of your *Ceriodaphnia dubia*, *Pimephales promelas*, and *Pseudokirchneriella subcapitata** toxicity tests are attached. Please see the following page or the detail section of each species for your test results. EPA test review criteria for these toxicity testing procedures are in accordance with EPA guidelines. There were no significant deficiencies found in sample handling, test performance, or reporting. The test results were entered into the permittee's records in the database.

The PMSD on your *Pimephales promelas* and *Pseudokirchneriella subcapitata** analyses fell below the lower acceptability criterion. However, no toxicity was observed and the test is acceptable when the relative difference from the control is less than the lower PMSD bounds in Table 6 of the current EPA Manual.

Samples were received intact, within holding times and temperature requirements, and were held at 4°C until testing commenced. Chain of Custody forms are attached.

Reference toxicant tests were within acceptable ranges for organism response and met quality control criteria.

Respectfully,

Frederick A. Amalfi, Ph.D., Laboratory Director

Enclosure(s)

* Reclassified in 2012. Previously named *Raphidocelis subcapitata* and *Selenastrum capricornutum.*

RESULTS SUMMARY **Facility:** **APS - Four Corners** **Aug-12**

Test Organism	Test Type	End Point	Results	Limits	Result Code
Ceriodaphnia dubia	Chronic	TU=100/NOEC	1.0	2.0 single test	A
				1.0 monthly median	review all data for month
Pimephales promelas	Chronic	TU=100/NOEC	1.0	2.0 single test	A
				1.0 monthly median	review all data for month
Pseudokirchneriella subcapitata *	Chronic	TU=100/NOEC	1.0	2.0 single test	A
				1.0 monthly median	review all data for month

Results Code:

A - Unqualified Pass — Test PMSD was within bounds and there was no significant difference between the means for the control and the instream waste concentration (IWC) treatment. The regulatory agency would conclude that there was no toxicity at the IWC

B - Unqualified Fail — Test PMSD was larger than the lower bound (but not greater than the upper bound) and there was a significant difference between the means for the control and the IWC treatment. The regulatory agency would conclude that there was toxicity at the IWC concentration.

C - Lacks Test Sensitivity — Test PMSD exceeded the upper bound and there is no significant difference between the means for the control and the IWC treatment. The test is considered invalid. A new effluent sample must be collected and another toxicity test must be

D - Lacks Test Sensitivity — Test PMSD exceeded the upper bound and there is a significant difference between the means for the control and the IWC treatment. The test is considered valid. The regulatory agency would conclude that there was toxicity at the IWC concentration.

E - Very Small but Significant Difference — The relative difference between the means for the control and IWC treatment was smaller than the lower bound and the difference is statistically significant. The test is acceptable. The NOEC was determined.

F - Other — There are no chronic effluent toxicity limits for this permit. The P/F code is based on the IWC of 100% effluent.

Note: The permittee is responsible for assuring that the test results are submitted to the regulatory agency. The table above is provided as a courtesy and is based on the most recent permit submitted to our laboratory. It is the permittee's responsibility to communicate to the laboratory the specific tests and end points required to comply with their permit, review their results to determine compliance, and determine if any follow up testing is needed.

* Reclassified in 2012, previously named *Raphidocelis subcapitata* and *Selenastrum capricornutum*.

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Phone: (480) 921-8044 • Fax: (480) 921-0049

CHAIN OF CUSTODY

PWS ID # N/A

Client Name: Arizona Public Service
Address: P.O. Box 355 (Street)
Fruitland, NM 87416 (City, State, Zip)
Phone: 505-598-8443 or 8442
Fax: 505-598-8292
Contact: Arnold Slowman or Debra Yazzie
Sampler Signature: [signature]

PO#
Project NNU000019
Remarks:

SAMPLE ID	SAMPLE Date	SAMPLE Time		SAMPLE TYPE	Metals (See Below)	☐ TDS ☐ TSS ☐ TS ☐ SETT ☐ TVS ☐ VSS	☐ O+G ☐ TPHC ☐ MBAS ☐ CN ☐ Sulfide	☐ BOD ☐ COD ☐ New Source	☐ Tot.P ☐ O-PO4	☐ Nitrate + Nitrite ☐ Nitrite	☐ TKN ☐ Ammonia	☐ THM's ☐ HAAS	☐ Phenol ☐ 420.1 ☐ 625 ☐ 8270	☐ 8260 ☐ 624 ☐ BTEX	☐ Perchlorate ☐ Radio ☐ Asbestos	Total Coliform ☐ P/A ☐ Colifert ☐ MPN	☐ E. Coli ☐ Fecal Strep	Fecal Coliform ☐ MPN ☐ MF	☐ MICRO SCOPE ID	☐ Plate Count ☐ BIOLOG		☐ Acute ☒ Chronic	☐ AWET (SWRO)			Na2S2O3	H2SO4	HNO3	NONE	NaOH	NaOH/ZnAc	Laboratory Number
APS-4C's Aug 20, 2012	8/20/12	249	AM PM	Water																	X							3			BU-09134
			AM PM																												
			AM PM																												
			AM PM																												
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Metals: ☐ Al ☐ Sb ☐ As ☐ Ba ☐ Be ☐ B ☐ Cd ☐ Ca ☐ Cr ☐ Co ☐ Cu ☐ Au ☐ Fe ☐ Pb ☐ Mg ☐ Mn ☐ Hg ☐ Mo ☐ Ni ☐ Se ☐ Ag ☐ Na ☐ Sr ☐ Tl ☐ Sn ☐ Ti ☐ V ☐ Zn

[ ] TOTAL [ ] DISSOLVED [ ] SDWA [ ] TCLP [ ] RCRA

Sample Types: DW, GW, SW, WW, AQ, Soil, Sludge or Solid

Sample Receiving: on ice
Intact: X Yes ___ No
Temp: 6°C Auth Init: ___
Pres: Lab Yes (N) / X No/Lab
Sterile: ___ Yes X No
Total # containers: 3

1. Relinquished By: [signature]	2. Relinquished By: Fed Ex	3. Relinquished By:
Date: 8/20/2012 Time: 310 AM PM	Date: Time: AM PM	Date: Time: AM PM
1. Received By: Fed Ex	**2. Received By:** T. Johnson	**3. Received By:**
Date: Time: AM PM	Date: 8-21-12 Time: 10:23 AM PM	Date: Time: AM PM

Attn: Your signature on this document authorizes analysis regardless of sample condition at time of submittal

By signing this chain of custody, the designated client and agent agree to pay Aquatic Consulting & Testing, Inc. for all services rendered in conjunction with the submitted samples within 30 days of invoice. It is the client's responsibility to note purchase order numbers or other responsible parties on the form and failure to do so does not constitute justification for non-payment.

White-Laboratory Yellow-Report Pink-Client

Sample delivery group # : -005

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Phone: (480) 921-8044 • Fax: (480) 921-0049

CHAIN OF CUSTODY

PWS ID # N/A

Client Name: Arizona Public Service Co.
Address: P.O. Box 355 (Street)
Fruitland, NM 87416 (City, State, Zip)
Phone: 505-598-8442
Fax: 505-598-8292
Contact: Arnold Slowman or Debra Yazzie
Sampler Signature:

PO#
Project
Remarks: Permit # NN0000019

SAMPLE ID	SAMPLE Date	SAMPLE Time		SAMPLE TYPE	Chemistry: Metals (See Below)	☐ TDS ☐ TSS ☐ SETT ☐ TVS ☐ VSS	☐ O+G ☐ TPHC ☐ MBAS ☐ CN ☐ Sulfide	☐ BOD ☐ COD ☐ New Source	☐ Tot.P ☐ O-PO_4	☐ Nitrate + Nitrite ☐ Nitrite	☐ TKN ☐ Ammonia	☐ THM's ☐ HAAS	☐ Phenol ☐ 420.1 ☐ 625 ☐ 8270	☐ 8260 ☐ 624 ☐ BTEX	☐ Perchlorate ☐ Radio ☐ Asbestos	Biology: Total Coliform ☐ P/A ☐ Colilert ☐ MPN	☐ E. Coli ☐ Fecal Strep	Fecal Coliform ☐ MPN ☐ MF	☐ MICRO SCOPE ID	☐ Plate Count ☐ BIOLOG		Biomon: ☐ Acute ☒ Chronic	☐ AWET (SWRC)			No. of Containers: $Na_2S_2O_3$	H_2SO_4	HNO_3	NONE	NaOH	NaOH/ZnAc	Laboratory Number
APS-4C's Aug. 22, 2012	8-22-2012	12:00	AM PM	Water																	X						3			BV-09182
			AM PM																											
			AM PM																											
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Metals: ☐ Al ☐ Sb ☐ As ☐ Ba ☐ Be ☐ B ☐ Cd ☐ Ca ☐ Cr ☐ Co ☐ Cu ☐ Au ☐ Fe ☐ Pb ☐ Mg ☐ Mn ☐ Hg ☐ Mo ☐ Ni ☐ Se ☐ Ag ☐ Na ☐ Sr ☐ Tl ☐ Sn ☐ Ti ☐ V ☐ Zn

[ ] TOTAL [ ] DISSOLVED [ ] SDWA [ ] TCLP [ ] RCRA

Sample Types: DW, GW, SW, WW, AQ, Soil, Sludge or Solid

Sample Receiving: on ice
Intact: X Yes ___ No
Temp: 4°C Auth Init: ___
Pres: 1L Lab Yes (N) 37 X No/Lab
Sterile: ___ Yes X No
Total # containers: 3

1. Relinquished By:	2. Relinquished By:	3. Relinquished By:
Date: 8/22/2012 Time: 1330 AM (PM)	Date: Time: AM PM	Date: Time: AM PM
1. Received By:	**2. Received By:**	**3. Received By:**
Date: Time: AM PM	Date: 8-23-12 Time: 10:25 AM (PM)	Date: Time: AM PM

Relinquished By 2: Fed Ex

Attn: Your signature on this document authorizes analysis regardless of sample condition at time of submittal

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White-Laboratory Yellow-Report Pink-Client

Sample delivery group # : -001

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CHAIN OF CUSTODY

PWS ID # N/A

Client Name: Arizona Public Service Co.
Address: P.O. Box 355 (Street)
Fruitland, NM 87416 (City, State, Zip)
Phone: 505-598-8442
Fax: 505-598-8292
Contact: Arnold Slowman or Debra Yazzie
Sampler Signature: [signature]

PO#
Project
Remarks: Permit # NN0000019

SAMPLE ID	SAMPLE Date	SAMPLE Time		SAMPLE TYPE	Metals (See Below)	☐ TDS ☐ TSS ☐ SETT ☐ TVS ☐ VSS	☐ O+G ☐ TPHC ☐ MBAS ☐ CN ☐ Sulfide	☐ BOD ☐ COD ☐ New Source	☐ Tot.P ☐ O-PO_4	☐ Nitrate + Nitrite ☐ Nitrite	☐ TKN ☐ Ammonia	☐ THM's ☐ HAAS	☐ Phenol ☐ 420.1 ☐ 625 ☐ 8270	☐ 8260 ☐ 624 ☐ BTEX	☐ Perchlorate ☐ Radio ☐ Asbestos	Total Coliform ☐ P/A ☐ Colilert ☐ MPN	☐ E. Coli ☐ Fecal Strep	Fecal Coliform ☐ MPN ☐ MF	☐ MICRO SCOPE ID	☐ Plate Count ☐ BIOLOG		☐ Acute ☒ Chronic	☐ AWET (SWRO)			No. of Containers: $Na_2S_2O_3$	H_2SO_4	HNO_3	NONE	NaOH	NaOH/ZnAc	Laboratory Number
APS-4C's Aug 24, 2012	8-24-12	10:00	AM PM	Water																	X						3			BU09232
			AM PM																											
			AM PM																											
			AM PM																											
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Metals: ☐ Al ☐ Sb ☐ As ☐ Ba ☐ Be ☐ B ☐ Cd ☐ Ca ☐ Cr ☐ Co ☐ Cu ☐ Au ☐ Fe ☐ Pb ☐ Mg ☐ Mn ☐ Hg ☐ Mo ☐ Ni ☐ Se ☐ Ag ☐ Na ☐ Sr ☐ Tl ☐ Sn ☐ Ti ☐ V ☐ Zn

[ ] TOTAL [ ] DISSOLVED [ ] SDWA [ ] TCLP [ ] RCRA

Sample Types: DW, GW, SW, WW, AQ, Soil, Sludge or Solid

Sample Receiving:
Intact: X Yes ___ No
Temp: 4°C Auth Init: ___
Pres: Lab Yes/No 3 No/Lab
Sterile: ___ Yes 3 No
Total # containers: 3

1. Relinquished By: [signature]	2. Relinquished By: FED EX	3. Relinquished By:
Date: 8-24-2012 Time: 12:00 AM PM	Date: Time: AM PM	Date: Time: AM PM
1. Received By: FED EX	2. Received By: A Zool	3. Received By:
Date: Time: AM PM	Date: 8/25/12 Time: 1017 AM PM	Date: Time: AM PM

Attn: Your signature on this document authorizes analysis regardless of sample condition at time of submittal

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White-Laboratory Yellow-Report Pink-Client

Sample delivery group # : 1M1

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Lic. No. AZ0003

LABORATORY REPORT

Client: Arizona Public Service - 4 Corners
P.O. Box 355
Fruitland, NM 87416

Date Submitted: 8/21/2012
Date Reported: 9/06/2012

Attn: Arnold Slowman

Project: NN0000019

RESULTS

Client ID: Effluent
ACT Lab No.: BU09134
Sample Type: Wastewater
Sample Date/Time: 08/20/12 14:49

Parameter	Analysis Date Start	Analysis Date End	Result	Unit
Alkalinity, Total	8/29/2012	8/29/2012	97.	mg/L as CaCO3
Ammonia - N	8/29/2012	8/29/2012	0.05	mg/L as N
Total Hardness	8/29/2012	8/29/2012	316.	mg/L as CaCO3
Conductivity	8/23/2012	8/23/2012	1110.	umho/cm @ 25 C
pH	8/21/2012	8/21/2012	7.1@24C	SU

Client ID: Effluent
ACT Lab No.: BU09184
Sample Type: Wastewater
Sample Date/Time: 08/22/12 12:00

Parameter	Analysis Date Start	Analysis Date End	Result	Unit
Alkalinity, Total	8/29/2012	8/29/2012	101.	mg/L as CaCO3
Ammonia - N	8/29/2012	8/29/2012	0.04	mg/L as N
Total Hardness	8/29/2012	8/29/2012	312.	mg/L as CaCO3
Conductivity	8/29/2012	8/29/2012	1100.	umho/cm @ 25 C
pH	8/23/2012	8/23/2012	7.4@24C	SU

RESULTS

Client ID: Effluent
ACT Lab No.: BU09232

Sample Type: Wastewater
Sample Date/Time: 08/24/12 10:00

Parameter	Analysis Date Start	Analysis Date End	Result	Unit
Alkalinity, Total	8/29/2012	8/29/2012	99.	mg/L as CaCO3
Ammonia - N	8/29/2012	8/29/2012	<0.03	mg/L as N
Total Hardness	8/29/2012	8/29/2012	316.	mg/L as CaCO3
Conductivity	8/29/2012	8/29/2012	1100.	umho/cm @ 25 C
pH	8/25/2012	8/25/2012	8.1@23C	SU

Ceriodaphnia dubia

EFFLUENT TEST DATA

CETIS Test Evaluation Report

Facility:	Arizona Public Service - Four Corners	**Test Name:**	Ceriodaphnia 7-d Survival and Reproduction Test
Sample Site:	Outfall 001 Cooling Pond	**Organism:**	Ceriodaphnia dubia (Water Flea)
Sample Code:	77623BB5	**Protocol:**	EPA/821/R-02-013 (2002)
Sample Date:	20 Aug-12 02:49	**Start Date:**	21 Aug-12 11:15
Sample Age:	32h (6 °C)	**End Date:**	28 Aug-12 11:00
Project:	Effluent Characterization (Annual)	**Duration:**	7d **Organism Age:** <24

Permitee:	Arizona Public Service - Four Corners	**Laboratory:**	Aquatic Consulting & Testing, Inc.
Address:	P.O. Box 355 Fruitland, NM 87416	**Address:**	1525 W. University Drive Suite 106 Tempe, AZ 85281
Contact:	Arnold Slowman	**Contact:**	Rick Amalfi, Vice President
Phone:	505-598-8442, 505-598-8292(fax)	**Phone:**	480-921-8044, 480-921-0049(fax)
Email:		**Email:**	ramalfi@aquaticconsulting.com

Chronic Toxicity Evaluation

Endpoint	Parameter	C-%	IWC	Pass/Fail	Method
7d Survival Rate	NOEL/LOEL	100/>100	50	Pass	Fisher Exact/Bonferroni-Holm Test
Reproduction	NOEL/LOEL	100/>100	50	Pass	Steel Many-One Rank Sum Test

Test Acceptability Criteria

Endpoint	Attribute	Test Stat	Limits	Pass/Fail
7d Survival Rate	Control Resp	1	0.8 - N/A	Pass
Reproduction	Control Resp	20.4	15 - N/A	Pass
Reproduction	PMSD	0.2293	0.13 - 0.47	Pass

Test Review Comments

Test Reviewer

Reviewer:	Frederick A. Amalfi, Ph.D., Laboratory Director
Phone:	480-921-8044, 480-921-0049(fax)
Email:	ramalfi@aquaticconsulting.com

Frederick A Amalfi
Signature

09-28-12
Date

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	1	1	1	1	1	0	0	0.0%	0.0%
12.5		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%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
75		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%

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	20.4	19.06	21.74	15	25	1.137	3.596	17.63%	0.0%
12.5		10	23.4	21.89	24.91	16	28	1.275	4.033	17.24%	-14.71%
25		10	26.2	24.45	27.95	15	31	1.482	4.686	17.88%	-28.43%
50		10	24.7	22.79	26.61	14	32	1.62	5.122	20.74%	-21.08%
75		10	21.6	19.67	23.53	14	28	1.634	5.168	23.93%	-5.88%
100		10	26.4	24.68	28.12	16	31	1.454	4.6	17.42%	-29.41%

CETIS Summary Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Aquatic Consulting & Testing, Inc.**

Batch ID:	09-4255-9315	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 11:15	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	28 Aug-12 11:00	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	7d	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	32h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Sample Renewals

Renewal	Sample Code	Sample Date	Receive Date	Renewal Date	Temp °C
1	BU09184	22 Aug-12 12:00	23 Aug-12 10:25	23 Aug-12 11:15	4
2	BU09232	24 Aug-12 10:00	25 Aug-12 10:17	25 Aug-12 11:15	4

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
17-2500-4942	7d Survival Rate	100	>100	NA	NA	1	Fisher Exact/Bonferroni-Holm Test
17-9376-3186	Reproduction	100	>100	NA	22.9%	1	Steel Many-One Rank Sum Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
06-8799-8313	Reproduction	IC5	>100	N/A	N/A	<1	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	

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
17-2500-4942	7d Survival Rate	Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria
06-8799-8313	Reproduction	Control Resp	20.4	15 - NL	Yes	Passes Acceptability Criteria
17-9376-3186	Reproduction	Control Resp	20.4	15 - NL	Yes	Passes Acceptability Criteria
17-9376-3186	Reproduction	PMSD	0.2293	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	Dilution Water	10	1	1	1	1	1	0	0	0.0%	0.0%
12.5		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%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
75		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%

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	20.4	19.06	21.74	15	25	1.137	3.596	17.63%	0.0%
12.5		10	23.4	21.89	24.91	16	28	1.275	4.033	17.24%	-14.71%
25		10	26.2	24.45	27.95	15	31	1.482	4.686	17.88%	-28.43%
50		10	24.7	22.79	26.61	14	32	1.62	5.122	20.74%	-21.08%
75		10	21.6	19.67	23.53	14	28	1.634	5.168	23.93%	-5.88%
100		10	26.4	24.68	28.12	16	31	1.454	4.6	17.42%	-29.41%

Ceriodaphnia 7-d Survival and Reproduction Test — **Aquatic Consulting & Testing, Inc.**

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	Dilution Water	1	1	1	1	1	1	1	1	1	1
12.5		1	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
75		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	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	Dilution Water	15	17	17	25	21	24	24	22	22	17
12.5		24	28	16	21	28	27	24	20	20	26
25		23	28	30	31	27	15	25	28	25	30
50		26	26	25	25	23	14	19	28	32	29
75		26	17	14	23	27	15	23	18	25	28
100		16	28	31	30	25	24	23	30	30	27

CETIS Analytical Report

Report Date: 28 Sep-12 09:02 (p 1 of 1)
Test Code: BU09134CCd | 02-6437-7543

Ceriodaphnia 7-d Survival and Reproduction Test — **Aquatic Consulting & Testing, Inc.**

Analysis ID:	17-2500-4942	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:01	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Batch ID:	09-4255-9315	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 11:15	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	28 Aug-12 11:00	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	7d	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	32h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

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%)
Dilution Water		12.5	1	1.0000	Exact	Non-Significant Effect
		25	1	1.0000	Exact	Non-Significant Effect
		50	1	1.0000	Exact	Non-Significant Effect
		75	1	1.0000	Exact	Non-Significant Effect
		100	1	1.0000	Exact	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	1	0.8 - NL	Yes	Passes Acceptability Criteria

Data Summary

C-%	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Dilution Water	10	0	10	1	0	0.0%
12.5		10	0	10	1	0	0.0%
25		10	0	10	1	0	0.0%
50		10	0	10	1	0	0.0%
75		10	0	10	1	0	0.0%
100		10	0	10	1	0	0.0%

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	Dilution Water	1	1	1	1	1	1	1	1	1	1
12.5		1	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
75		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

CETIS Analytical Report

Ceriodaphnia 7-d Survival and Reproduction Test — **Aquatic Consulting & Testing, Inc.**

Analysis ID:	17-9376-3186	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:01	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	09-4255-9315	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 11:15	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	28 Aug-12 11:00	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	7d	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	32h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	22.9%	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%)
Dilution Water		12.5	124.5	75	2	18	0.9970	Asymp	Non-Significant Effect
		25	141.5	75	2	18	1.0000	Asymp	Non-Significant Effect
		50	135	75	1	18	0.9999	Asymp	Non-Significant Effect
		75	115.5	75	3	18	0.9727	Asymp	Non-Significant Effect
		100	140.5	75	2	18	1.0000	Asymp	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	20.4	15 - NL	Yes	Passes Acceptability Criteria
PMSD	0.2293	0.13 - 0.47	Yes	Passes Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	298.8833	59.77667	5	2.863	0.0230	Significant Effect
Error	1127.3	20.87593	54			
Total	1426.183		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	1.636	15.09	0.8969	Equal Variances
Variances	Mod Levene Equality of Variance	0.1963	3.377	0.9626	Equal Variances
Variances	Levene Equality of Variance	0.3513	3.377	0.8792	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.936	0.9459	0.0036	Non-normal Distribution
Distribution	Kolmogorov-Smirnov D	0.144	0.1331	0.0034	Non-normal Distribution
Distribution	D'Agostino Skewness	2.412	2.576	0.0159	Normal Distribution
Distribution	D'Agostino Kurtosis	0.3014	2.576	0.7631	Normal Distribution
Distribution	D'Agostino-Pearson K2 Omnibus	5.908	9.21	0.0521	Normal Distribution
Distribution	Anderson-Darling A2 Normality	1.331	3.878	0.0014	Non-normal Distribution

Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	10	20.4	17.83	22.97	21.5	15	25	1.137	17.63%	0.0%
12.5		10	23.4	20.51	26.29	24	16	28	1.275	17.24%	-14.71%
25		10	26.2	22.85	29.55	27.5	15	31	1.482	17.88%	-28.43%
50		10	24.7	21.04	28.36	25.5	14	32	1.62	20.74%	-21.08%
75		10	21.6	17.9	25.3	23	14	28	1.634	23.93%	-5.88%
100		10	26.4	23.11	29.69	27.5	16	31	1.454	17.42%	-29.41%

Ceriodaphnia 7-d Survival and Reproduction Test — **Aquatic Consulting & Testing, Inc.**

Analysis ID:	17-9376-3186	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:01	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

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	Dilution Water	15	17	17	25	21	24	24	22	22	17
12.5		24	28	16	21	28	27	24	20	20	26
25		23	28	30	31	27	15	25	28	25	30
50		26	26	25	25	23	14	19	28	32	29
75		26	17	14	23	27	15	23	18	25	28
100		16	28	31	30	25	24	23	30	30	27

CETIS Analytical Report

Report Date: 28 Sep-12 09:02 (p 1 of 1)
Test Code: BU09134CCd | 02-6437-7543

Ceriodaphnia 7-d Survival and Reproduction Test — Aquatic Consulting & Testing, Inc.

Analysis ID:	06-8799-8313	Endpoint:	Reproduction	CETIS Version:	CETISv1.8.5
Analyzed:	28 Sep-12 9:01	Analysis:	Linear Interpolation (ICPIN)	Official Results:	Yes

Batch ID:	09-4255-9315	Test Type:	Reproduction-Survival (7d)	Analyst:	Elizabeth Atkinson
Start Date:	21 Aug-12 11:15	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	Mod-Hard Synthetic Water
Ending Date:	28 Aug-12 11:00	Species:	Ceriodaphnia dubia	Brine:	Not Applicable
Duration:	7d	Source:	In-House Culture	Age:	<24

Sample ID:	20-0292-6517	Code:	77623BB5	Client:	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	Material:	POTW Effluent	Project:	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	Source:	Arizona Public Service - Four Corners (NN0	Latitude	36°42'27"N
Sample Age:	32h (6 °C)	Station:	Outfall 001 Cooling Pond	Longitude	108°28'7"W

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	0	280	Yes	Two-Point Interpolation

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	20.4	15 - NL	Yes	Passes Acceptability Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>100	N/A	N/A	<1	NA	NA
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	Dilution Water	10	20.4	15	25	1.137	3.596	17.63%	0.0%
12.5		10	23.4	16	28	1.275	4.033	17.24%	-14.71%
25		10	26.2	15	31	1.482	4.686	17.88%	-28.43%
50		10	24.7	14	32	1.62	5.122	20.74%	-21.08%
75		10	21.6	14	28	1.634	5.168	23.93%	-5.88%
100		10	26.4	16	31	1.454	4.6	17.42%	-29.41%

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	Dilution Water	15	17	17	25	21	24	24	22	22	17
12.5		24	28	16	21	28	27	24	20	20	26
25		23	28	30	31	27	15	25	28	25	30
50		26	26	25	25	23	14	19	28	32	29
75		26	17	14	23	27	15	23	18	25	28
100		16	28	31	30	25	24	23	30	30	27

CLIENT/PROJECT NAME APS 4 Corners

SAMPLE I.D. BU09134 9184 9232

CLIENT I.D Effluent

SAMPLE TYPE: Grab Composite

From:_____ to 8/20 @ 1449

From:_____ to 8/22 @ 1200

From:_____ to 8/24 @ 1000

ANALYST: [illegible]

TEMPLATE #: 10

AQUATIC CONSULTING & TESTING, INC.

TEST ORGANISM: C. dubia Age: <24 hrs 8-hour range

TEST TYPE 1002.0

TEST START DATE/TIME 8-21-12 @ 1115

TEST END DATE/TIME 8-28-12 @ 1100

DILUTION WATER (synthetic) receiving matched

SAMPLE CHEMISTRY

Chlorine, mg/L <0.05 <0.05 <0.05

Alkalinity, mg/L 97 101 99

Hardness, mg/L 316 312 316

Ammonia-N, mg.L 0.05 0.04 <0.03

CONCENTRATION: 0.0%

Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of Adults	Young per Adult
1	0	0	0	0	0	0	0	0	0	0			
2	0	0	0	0	0	0	0	0	0	0			
3	2	2	1	3	2	2	4	2	2	2	22		
4	0	0	0	0	0	0	0	0	0	0	0		
5	0	4	7	9	9	10	7	9	0	6	61		
6	9	0	0	0	0	0	0	0	11	0	20		
7	4	11	9	13	10	12	13	11	9	9	101		
8													
Total	15	17	17	25	21	24	24	22	22	17	204	10	20.4

CONCENTRATION: 12.5%

Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of Adults	Young per Adult
1	0	0	0	0	0	0	0	0	0	0			
2	0	0	0	0	0	0	0	0	0	0			
3	2	3	2	0	4	4	3	2	1	2	23		
4	0	0	0	4	0	0	0	0	0	0	4		
5	10	11	0	0	9	10	8	7	9	11	75		
6	0	0	14	8	0	0	0	0	0	0	22		
7	12	14	0	9	15	13	13	11	10	13	110		
8													
Total	24	28	16	21	28	27	24	20	20	26	234	10	23.4

CONCENTRATION: 25.0%

Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of Adults	Young per Adult
1	0	0	0	0	0	0	0	0	0	0			
2	0	0	0	0	0	0	0	0	0	0			
3	2	2	4	3	2	1	4	3	4	4	29		
4	0	0	0	0	0	3	0	0	0	0	3		
5	8	11	10	14	9	0	7	9	8	10	86		
6	0	0	0	0	0	11	0	0	0	0	11		
7	13	15	16	14	16	0	14	16	13	16	133		
8													
Total	23	28	30	31	27	15	25	28	25	30	262	10	26.2

CONCENTRATION: 50.0%

Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of Adults	Young per Adult
1	0	0	0	0	0	0	0	0	0	0			
2	0	0	0	0	0	0	0	0	0	0			
3	3	2	2	4	2	0	3	4	4	3	27		
4	0	0	0	0	0	3	0	0	0	0	3		
5	6	9	11	8	9	0	7	9	11	10	80		
6	0	0	0	0	0	11	0	0	0	0	11		
7	17	15	12	13	12	0	9	15	17	16	126		
8													
Total	26	26	25	25	23	14	19	28	32	29	247	10	24.7

CONCENTRATION: 75.0%

Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of Adults	Young per Adult
1	0	0	0	0	0	0	0	0	0	0			
2	0	0	0	0	0	0	0	0	0	0			
3	2	2	1	3	2	4	4	2	4	4	28		
4	0	0	0	0	0	0	0	0	0	0	0		
5	11	0	4	6	9	0	7	7	8	9	61		
6	0	15	9	0	0	0	0	0	0	0	24		
7	13	0	0	14	16	11	12	9	13	15	103		
8													
Total	26	17	14	23	27	15	23	18	25	28	216	10	21.6

CONCENTRATION: 100.0%

Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of Adults	Young per Adult
1	0	0	0	0	0	0	0	0	0	0			
2	0	0	0	0	0	0	0	0	0	0			
3	0	4	4	3	2	0	1	3	4	4	25		
4	6	0	0	0	0	6	5	0	0	0	17		
5	0	10	11	9	9	0	0	13	9	8	69		
6	10	0	0	0	0	8	8	0	0	0	26		
7	0	14	16	18	14	10	9	14	17	15	127		
8													
Total	16	28	31	~~29~~ 30	25	24	23	30	30	27	264	10	26.4

APS 1

DAILY CHEMICAL/PHYSICAL MEASUREMENTS

PROJECT NAME: APS 4 Corners

ORGANISM: ___ *Pimephales promelas* ✓ *Ceriodaphnia dubia*

SAMPLE I.D.: BU09134 9184 9232

TEST TYPE: 1002.0

DAY

Conc: 0.0%	1	2	3	4	5	6	7
Temp Init	24.9	25.1	25.1	25.2	25.2	25.1	25.1
Temp Final	25.3	24.9	25.0	25.3	24.3	24.9	25.6
D.O. Initial	8.4	8.3	8.3	8.3	8.4	8.3	8.4
D.O. Final	8.3	8.2	8.4	8.4	8.1	8.0	7.7
pH Initial	7.4	7.4	7.4	7.4	7.4	7.4	7.3
pH Final	8.5	8.5	8.4	8.4	8.5	8.5	8.6
Conductivity Init	310	300	310	300	300	300	310
Conductivity Final	300	310	300	290	310	310	320
Alkalinity	68	68	68	68	68	68	68
Hardness	92	92	92	92	92	92	92

DAY

Conc: 50.0%	1	2	3	4	5	6	7
Temp Init	25.1	24.9	25.2	25.2	25.3	25.1	24.9
Temp Final	25.2	24.9	24.9	25.4	24.3	24.9	25.5
D.O. Initial	7.9	7.9	8.1	8.0	8.1	8.0	7.9
D.O. Final	8.0	7.8	7.9	7.8	7.8	7.8	7.4
pH Initial	7.4	7.4	7.5	7.5	7.4	7.4	7.4
pH Final	8.5	8.5	8.6	8.6	8.5	8.5	8.6
Conductivity Init	680	690	690	690	680	690	680
Conductivity Final	670	700	680	680	690	700	690

Conc: 12.5%	1	2	3	4	5	6	7
Temp Init	25.0	25.1	25.1	25.2	25.3	25.1	25.1
Temp Final	25.3	24.9	24.9	25.2	24.3	24.8	25.5
D.O. Initial	8.3	8.2	8.3	8.2	8.3	8.1	8.0
D.O. Final	8.1	8.0	8.2	8.1	8.0	7.9	7.7
pH Initial	7.4	7.4	7.4	7.4	7.4	7.4	7.4
pH Final	8.5	8.5	8.4	8.4	8.4	8.5	8.6
Conductivity Init	400	400	400	400	400	400	400
Conductivity Final	390	410	390	410	410	390	410

Conc: 75.0%	1	2	3	4	5	6	7
Temp Init	25.1	24.8	25.2	25.3	25.2	25.1	24.9
Temp Final	25.2	24.9	25.0	25.4	24.6	24.9	25.6
D.O. Initial	7.7	7.8	7.9	7.8	8.0	7.9	7.7
D.O. Final	7.9	7.7	7.7	7.6	7.7	7.6	7.3
pH Initial	7.4	7.4	7.6	7.5	7.3	7.3	7.4
pH Final	8.5	8.5	8.5	8.6	8.6	8.5	8.6
Conductivity Init	870	860	870	860	860	860	870
Conductivity Final	880	870	860	850	870	850	870

Conc: 25.0%	1	2	3	4	5	6	7
Temp Init	25.1	25.0	25.1	25.2	25.3	25.1	25.0
Temp Final	25.2	24.8	25.0	25.3	24.4	24.9	25.5
D.O. Initial	8.1	8.0	8.2	8.1	8.2	8.0	7.9
D.O. Final	8.0	7.9	7.9	8.0	7.9	7.8	7.5
pH Initial	7.4	7.4	7.5	7.4	7.4	7.4	7.4
pH Final	8.5	8.4	8.4	8.4	8.4	8.5	8.6
Conductivity Init	500	510	500	500	500	500	510
Conductivity Final	490	500	490	510	500	490	520

Conc: 100.0%	1	2	3	4	5	6	7
Temp Init	25.2	24.8	25.2	25.3	25.3	25.1	24.9
Temp Final	25.2	25.0	25.1	25.2	24.7	24.9	25.5
D.O. Initial	7.6	7.8	7.8	7.7	7.9	7.7	7.6
D.O. Final	7.8	7.6	7.5	7.6	7.6	7.6	7.3
pH Initial	7.4	7.4	7.7	7.6	7.3	7.3	7.4
pH Final	8.5	8.5	8.6	8.5	8.6	8.5	8.6
Conductivity Init	1060	1050	1060	1050	1050	1050	1060
Conductivity Final	1050	1070	1040	1060	1060	1060	1070
Alkalinity	97	97	101	101	99	99	99
Hardness	316	316	312	312	316	316	316

ANALYST: Uea

ANALYSIS DATES: 8/21-28/12

APS2

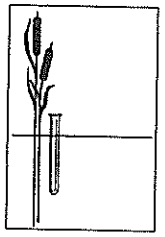
CLIENT/PROJECT NAME APS 4 Corners

SAMPLE NUMBERS B1209134 9184 9232

EPA METHOD
CHRONIC SURVIVAL/GROWTH, 1000.0 _____
CHRONIC SURVIVAL/REPRODUCTION , 1002.0 ✓
ACUTE _____

TEST ORGANISM (circle)

P. promelas	(*C. dubia*)	Other
FOOD-*Artemia* nauplii	FOOD-*P. subcapitata*	FOOD-Yeast/Trout Chow
AMOUNT, grams	AMOUNT, mLs 0.1 mLs/ 15 mLs sample	AMOUNT, mLs/ 0.1 mLs/15 mLs sample
FREQUENCY	FREQUENCY daily at renewal	FREQUENCY daily at renewal
	LOT NO. ~~081312Ps~~ 082042 Ps	LOT NO. 081312YT 082012YT



AERATION
Not needed ✓
If required, D.O. value_____
Date_____
Rate/Type_____

Vessel Capacity, mLs 30
Vessel Type glass plastic
Sample volume, mLs 15
Depth of liquid, cm 1.8

Date of Renewal	8.22.12	8.23.12	8.24.12	8.25.12	8.26.12	8.27.12	8.28.12
Time of Renewal	1000-1100	1100-1200	1000-1100	1045-1130	0930-1030	0930-1030	1000-1100
Vessel Number	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
1	B1C1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1
2	↓	↓	↓	↓	↓	↓	↓
3	↓	↓	↓	↓	↓	↓	↓
4	↓	↓	↓	↓	↓	↓	↓
5	↓	↓	↓	↓	↓	↓	↓
6	↓	↓	↓	↓	↓	↓	↓
7	↓	↓	↓	↓	↓	↓	↓
8	↓	↓	↓	↓	↓	↓	↓
9	↓	↓	↓	↓	↓	↓	↓
10	↓	↓	↓	↓	↓	↓	↓
11	B1C1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1
12	↓	↓	↓	↓	↓	↓	↓
13	↓	↓	↓	↓	↓	↓	↓
14	↓	↓	↓	↓	↓	↓	↓
15	↓	↓	↓	↓	↓	↓	↓
16	↓	↓	↓	↓	↓	↓	↓
17	↓	↓	↓	↓	↓	↓	↓
18	↓	↓	↓	↓	↓	↓	↓
19	↓	↓	↓	↓	↓	↓	↓
20	↓	↓	↓	↓	↓	↓	↓
21	B1C1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1
22	↓	↓	↓	↓	↓	↓	↓
23	↓	↓	↓	↓	↓	↓	↓
24	↓	↓	↓	↓	↓	↓	↓
25	↓	↓	↓	↓	↓	↓	↓
26	↓	↓	↓	↓	↓	↓	↓
27	↓	↓	↓	↓	↓	↓	↓
28	↓	↓	↓	↓	↓	↓	↓
29	↓	↓	↓	↓	↓	↓	↓
30	↓	↓	↓	↓	↓	↓	↓

FOOD INTAKE A1 Very Good
A2 Adequate
A3 Poor
A4 Not at all

ACTIVITY B1 Very active
B2 Moderate
B3 Limited
B4 None at all

APPEARANCE C1 Healthy, normal
C2 Mildly impaired
C3 Little growth/repro
C4 Ghosting/ puny

ANALYST: Ma

DATES OF ANALYSIS: 8/21 –28/12

APS 3

CLIENT/PROJECT NAME APS 4 Corners

TEST METHOD/SPECIES 1002.0

SAMPLE NUMBERS BU09134 9184 9232

Date of Renewal	pg 1	pg 1	pg 1	pg 1	pg 1	pg 1	pg 1
Time of Renewal							
Vessel Number	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
31	B1C1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1
32	↓	↓	↓	↓	↓	↓	↓
33	↓	↓	↓	↓	↓	↓	↓
34	↓	↓	↓	↓	↓	↓	↓
35	↓	↓	↓	↓	↓	↓	↓
36	↓	↓	↓	↓	↓	↓	↓
37	↓	↓	↓	↓	↓	↓	↓
38	↓	↓	↓	↓	↓	↓	↓
39	↓	↓	↓	↓	↓	↓	↓
40	↓	↓	↓	↓	↓	↓	↓
41	B1C1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1
42	↓	↓	↓	↓	↓	↓	↓
43	↓	↓	↓	↓	↓	↓	↓
44	↓	↓	↓	↓	↓	↓	↓
45	↓	↓	↓	↓	↓	↓	↓
46	↓	↓	↓	↓	↓	↓	↓
47	↓	↓	↓	↓	↓	↓	↓
48	↓	↓	↓	↓	↓	↓	↓
49	↓	↓	↓	↓	↓	↓	↓
50	↓	↓	↓	↓	↓	↓	↓
51	B1C1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1	B1C1A1
52	↓	↓	↓	↓	↓	↓	↓
53	↓	↓	↓	↓	↓	↓	↓
54	↓	↓	↓	↓	↓	↓	↓
55	↓	↓	↓	↓	↓	↓	↓
56	↓	↓	↓	↓	↓	↓	↓
57	↓	↓	↓	↓	↓	↓	↓
58	↓	↓	↓	↓	↓	↓	↓
59	↓	↓	↓	↓	↓	↓	↓
60	↓	↓	↓	↓	↓	↓	↓

FOOD INTAKE A1 Very Good
A2 Adequate
A3 Poor
A4 Not at all

ACTIVITY B1 Very active
B2 Moderate
B3 Limited
B4 None at all

APPEARANCE C1 Healthy, normal
C2 Mildly impaired
C3 Little growth/repro
C4 Ghosting/ puny

ANALYST: [illegible]

DATES OF ANALYSIS: 8/21-28/12

NOTES:

APS4

Pimephales promelas

EFFLUENT TEST DATA

CETIS Test Evaluation Report

Facility:	Arizona Public Service - Four Corners	**Test Name:**	Fathead Minnow 7-d Larval Survival and Growth Test
Sample Site:	Outfall 001 Cooling Pond	**Organism:**	Pimephales promelas (Fathead Minnow)
Sample Code:	77623BB5	**Protocol:**	EPA/821/R-02-013 (2002)
Sample Date:	20 Aug-12 02:49	**Start Date:**	21 Aug-12 12:15
Sample Age:	33h (6 °C)	**End Date:**	28 Aug-12 12:30
Project:	Effluent Characterization (Annual)	**Duration:**	7d 0h **Organism Age:** <24

Permitee:	Arizona Public Service - Four Corners	**Laboratory:**	Aquatic Consulting & Testing, Inc.
Address:	P.O. Box 355 Fruitland, NM 87416	**Address:**	1525 W. University Drive Suite 106 Tempe, AZ 85281
Contact:	Arnold Slowman	**Contact:**	Rick Amalfi, Vice President
Phone:	505-598-8442, 505-598-8292(fax)	**Phone:**	480-921-8044, 480-921-0049(fax)
Email:		**Email:**	ramalfi@aquaticconsulting.com

Chronic Toxicity Evaluation

Endpoint	Parameter	C-%	IWC	Pass/Fail	Method
7d Survival Rate	NOEL/LOEL	100/>100	50	Pass	Steel Many-One Rank Sum Test
Mean Dry Biomass-mg	NOEL/LOEL	100/>100	50	Pass	Dunnett Multiple Comparison Test

Test Acceptability Criteria

Endpoint	Attribute	Test Stat	Limits	Pass/Fail
7d Survival Rate	Control Resp	0.95	0.8 - N/A	Pass
Mean Dry Biomass-mg	Control Resp	0.3982	0.25 - N/A	Pass
Mean Dry Biomass-mg	PMSD	0.07394	0.08 - 0.22	Fail

Test Review Comments

Test Reviewer

Reviewer:	Frederick A. Amalfi, Ph.D., Laboratory Director
Phone:	480-921-8044, 480-921-0049(fax)
Email:	ramalfi@aquaticconsulting.com

Frederick A. Amalfi
Signature

09-28-12
Date

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.95	0.9284	0.9716	0.9	1	0.02887	0.05774	6.08%	0.0%
12.5		4	1	1	1	1	1	0	0	0.0%	-5.26%
25		4	1	1	1	1	1	0	0	0.0%	-5.26%
50		4	0.975	0.9563	0.9937	0.9	1	0.025	0.05	5.13%	-2.63%
75		4	1	1	1	1	1	0	0	0.0%	-5.26%
100		4	0.975	0.9563	0.9937	0.9	1	0.025	0.05	5.13%	-2.63%

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.3982	0.3888	0.4077	0.37	0.422	0.01264	0.02528	6.35%	0.0%
12.5		4	0.437	0.4292	0.4448	0.408	0.457	0.01038	0.02077	4.75%	-9.73%
25		4	0.4305	0.4266	0.4344	0.42	0.44	0.005236	0.01047	2.43%	-8.1%
50		4	0.443	0.4352	0.4508	0.414	0.463	0.01043	0.02086	4.71%	-11.24%
75		4	0.4555	0.4526	0.4584	0.445	0.463	0.003862	0.007724	1.7%	-14.38%
100		4	0.4378	0.4336	0.4419	0.423	0.449	0.005498	0.011	2.51%	-9.92%

CETIS Summary Report

Fathead Minnow 7-d Larval Survival and Growth Test — **Aquatic Consulting & Testing, Inc.**

Batch ID:	08-6500-6209	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 12:15	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	28 Aug-12 12:30	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	<24

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	33h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Sample Renewals

Renewal	Sample Code	Sample Date	Receive Date	Renewal Date	Temp °C
1	BU09184	22 Aug-12 12:00	23 Aug-12 10:25	23 Aug-12 12:15	4
2	BU09232	24 Aug-12 10:00	25 Aug-12 10:17	25 Aug-12 12:15	4

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
04-3828-0051	7d Survival Rate	100	>100	NA	6.69%	1	Steel Many-One Rank Sum Test
16-8071-9356	Mean Dry Biomass-mg	100	>100	NA	7.39%	1	Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
17-4972-9543	Mean Dry Biomass-mg	IC5	>100	N/A	N/A	<1	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	

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
04-3828-0051	7d Survival Rate	Control Resp	0.95	0.8 - NL	Yes	Passes Acceptability Criteria
16-8071-9356	Mean Dry Biomass-mg	Control Resp	0.3982	0.25 - NL	Yes	Passes Acceptability Criteria
17-4972-9543	Mean Dry Biomass-mg	Control Resp	0.3982	0.25 - NL	Yes	Passes Acceptability Criteria
16-8071-9356	Mean Dry Biomass-mg	PMSD	0.07394	0.08 - 0.22	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	Dilution Water	4	0.95	0.9284	0.9716	0.9	1	0.02887	0.05774	6.08%	0.0%
12.5		4	1	1	1	1	1	0	0	0.0%	-5.26%
25		4	1	1	1	1	1	0	0	0.0%	-5.26%
50		4	0.975	0.9563	0.9937	0.9	1	0.025	0.05	5.13%	-2.63%
75		4	1	1	1	1	1	0	0	0.0%	-5.26%
100		4	0.975	0.9563	0.9937	0.9	1	0.025	0.05	5.13%	-2.63%

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.3982	0.3888	0.4077	0.37	0.422	0.01264	0.02528	6.35%	0.0%
12.5		4	0.437	0.4292	0.4448	0.408	0.457	0.01038	0.02077	4.75%	-9.73%
25		4	0.4305	0.4266	0.4344	0.42	0.44	0.005236	0.01047	2.43%	-8.1%
50		4	0.443	0.4352	0.4508	0.414	0.463	0.01043	0.02086	4.71%	-11.24%
75		4	0.4555	0.4526	0.4584	0.445	0.463	0.003862	0.007724	1.7%	-14.38%
100		4	0.4378	0.4336	0.4419	0.423	0.449	0.005498	0.011	2.51%	-9.92%

Fathead Minnow 7-d Larval Survival and Growth Test — **Aquatic Consulting & Testing, Inc.**

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.9	0.9	1
12.5		1	1	1	1
25		1	1	1	1
50		1	1	1	0.9
75		1	1	1	1
100		0.9	1	1	1

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.417	0.37	0.384	0.422
12.5		0.408	0.444	0.457	0.439
25		0.44	0.439	0.423	0.42
50		0.444	0.463	0.451	0.414
75		0.455	0.463	0.445	0.459
100		0.423	0.442	0.449	0.437

CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — Aquatic Consulting & Testing, Inc.

Analysis ID:	04-3828-0051	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:11	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	08-6500-6209	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 12:15	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	28 Aug-12 12:30	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	<24

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	33h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	6.69%	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%)
Dilution Water		12.5	22	10	2	6	0.9908	Asymp	Non-Significant Effect
		25	22	10	2	6	0.9908	Asymp	Non-Significant Effect
		50	20	10	3	6	0.9516	Asymp	Non-Significant Effect
		75	22	10	2	6	0.9908	Asymp	Non-Significant Effect
		100	20	10	3	6	0.9516	Asymp	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.95	0.8 - NL	Yes	Passes Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.02213278	0.004426555	5	1.2	0.3485	Non-Significant Effect
Error	0.06639833	0.003688796	18			
Total	0.08853111		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	2	4.248	0.1274	Equal Variances
Variances	Levene Equality of Variance	10.4	4.248	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8314	0.884	0.0010	Non-normal Distribution
Distribution	Kolmogorov-Smirnov D	0.3333	0.2056	<0.0001	Non-normal Distribution
Distribution	D'Agostino Skewness	2.056	2.576	0.0398	Normal Distribution
Distribution	D'Agostino Kurtosis	1.094	2.576	0.2738	Normal Distribution
Distribution	D'Agostino-Pearson K2 Omnibus	5.426	9.21	0.0663	Normal Distribution
Distribution	Anderson-Darling A2 Normality	2.123	3.878	<0.0001	Non-normal Distribution

7d Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.95	0.8581	1	0.95	0.9	1	0.02887	6.08%	0.0%
12.5		4	1	1	1	1	1	1	0	0.0%	-5.26%
25		4	1	1	1	1	1	1	0	0.0%	-5.26%
50		4	0.975	0.8954	1	1	0.9	1	0.025	5.13%	-2.63%
75		4	1	1	1	1	1	1	0	0.0%	-5.26%
100		4	0.975	0.8954	1	1	0.9	1	0.025	5.13%	-2.63%

Fathead Minnow 7-d Larval Survival and Growth Test — **Aquatic Consulting & Testing, Inc.**

Analysis ID:	04-3828-0051	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:11	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	1.331	1.181	1.48	1.331	1.249	1.412	0.04705	7.07%	0.0%
12.5		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	-6.12%
25		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	-6.12%
50		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	-3.06%
75		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	-6.12%
100		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	-3.06%

7d Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.9	0.9	1
12.5		1	1	1	1
25		1	1	1	1
50		1	1	1	0.9
75		1	1	1	1
100		0.9	1	1	1

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1.412	1.249	1.249	1.412
12.5		1.412	1.412	1.412	1.412
25		1.412	1.412	1.412	1.412
50		1.412	1.412	1.412	1.249
75		1.412	1.412	1.412	1.412
100		1.249	1.412	1.412	1.412

Fathead Minnow 7-d Larval Survival and Growth Test — Aquatic Consulting & Testing, Inc.

Analysis ID:	16-8071-9356	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:12	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	08-6500-6209	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 12:15	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	28 Aug-12 12:30	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	<24

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	33h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	7.39%	100	>100	NA	1

Dunnett Multiple Comparison Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	-3.168	2.407	0.029	6	1.0000	CDF	Non-Significant Effect
		25	-2.636	2.407	0.029	6	0.9999	CDF	Non-Significant Effect
		50	-3.658	2.407	0.029	6	1.0000	CDF	Non-Significant Effect
		75	-4.68	2.407	0.029	6	1.0000	CDF	Non-Significant Effect
		100	-3.229	2.407	0.029	6	1.0000	CDF	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.3982	0.25 - NL	Yes	Passes Acceptability Criteria
PMSD	0.07394	0.08 - 0.22	Yes	Below Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.007423874	0.001484775	5	4.961	0.0050	Significant Effect
Error	0.005387479	0.0002993043	18			
Total	0.01281135		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	5.377	15.09	0.3716	Equal Variances
Variances	Mod Levene Equality of Variance	1.46	4.248	0.2514	Equal Variances
Variances	Levene Equality of Variance	1.985	4.248	0.1299	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9389	0.884	0.1543	Normal Distribution
Distribution	Kolmogorov-Smirnov D	0.1471	0.2056	0.1946	Normal Distribution
Distribution	D'Agostino Skewness	1.156	2.576	0.2475	Normal Distribution
Distribution	D'Agostino Kurtosis	0.2699	2.576	0.7872	Normal Distribution
Distribution	D'Agostino-Pearson K2 Omnibus	1.41	9.21	0.4940	Normal Distribution
Distribution	Anderson-Darling A2 Normality	0.5399	3.878	0.1698	Normal Distribution

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.3982	0.358	0.4385	0.4005	0.37	0.422	0.01264	6.35%	0.0%
12.5		4	0.437	0.404	0.47	0.4415	0.408	0.457	0.01038	4.75%	-9.73%
25		4	0.4305	0.4138	0.4472	0.431	0.42	0.44	0.005236	2.43%	-8.1%
50		4	0.443	0.4098	0.4762	0.4475	0.414	0.463	0.01043	4.71%	-11.24%
75		4	0.4555	0.4432	0.4678	0.457	0.445	0.463	0.003862	1.7%	-14.38%
100		4	0.4378	0.4203	0.4552	0.4395	0.423	0.449	0.005498	2.51%	-9.92%

Fathead Minnow 7-d Larval Survival and Growth Test — **Aquatic Consulting & Testing, Inc.**

Analysis ID:	16-8071-9356	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:12	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.417	0.37	0.384	0.422
12.5		0.408	0.444	0.457	0.439
25		0.44	0.439	0.423	0.42
50		0.444	0.463	0.451	0.414
75		0.455	0.463	0.445	0.459
100		0.423	0.442	0.449	0.437

CETIS Analytical Report

Report Date: 28 Sep-12 09:13 (p 1 of 1)
Test Code: BU09134CPp | 14-4907-7790

Fathead Minnow 7-d Larval Survival and Growth Test — Aquatic Consulting & Testing, Inc.

Analysis ID:	17-4972-9543	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:12	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	08-6500-6209	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 12:15	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	28 Aug-12 12:30	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	<24

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	33h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	0	280	Yes	Two-Point Interpolation

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.3982	0.25 - NL	Yes	Passes Acceptability Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>100	N/A	N/A	<1	NA	NA
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

Mean Dry Biomass-mg Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.3982	0.37	0.422	0.01264	0.02528	6.35%	0.0%
12.5		4	0.437	0.408	0.457	0.01038	0.02077	4.75%	-9.73%
25		4	0.4305	0.42	0.44	0.005236	0.01047	2.43%	-8.1%
50		4	0.443	0.414	0.463	0.01043	0.02086	4.71%	-11.24%
75		4	0.4555	0.445	0.463	0.003862	0.007724	1.7%	-14.38%
100		4	0.4378	0.423	0.449	0.005498	0.011	2.51%	-9.92%

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.417	0.37	0.384	0.422
12.5		0.408	0.444	0.457	0.439
25		0.44	0.439	0.423	0.42
50		0.444	0.463	0.451	0.414
75		0.455	0.463	0.445	0.459
100		0.423	0.442	0.449	0.437

AQUATIC CONSULTING & TESTING, INC.

CLIENT/PROJECT NAME	APS 4 Corners
SAMPLE I.D.	BU09134 9184 9232
CLIENT I.D.	Effluent

TEST TYPE:	METHOD 1000.0 Survival and Growth
TEST START DATE/TIME	8·21·12 @ 1215
TEST END DATE/TIME	8·28·12 @ 1230
TEST ORGANISM	*Pimephales promelas*
AGE <24 hours	SOURCE Aquatic Biosystems, Inc.

SAMPLE TYPE: GRAB COMPOSITE		
DATE	8/20	@ 1449
DATE	8/22	@ 1200
DATE	8/24	@ 1000

DILUTION WATER TYPE: (synthetic) receiving		
DATE PREPARED:	8/19 – 26/12	
CHEMISTRY:	Alkalinity, mg/L	68
	Hardness, mg/l	92
	pH, SU	9.3-9.4
	Conductivity, umhos/cm	300-310

SAMPLE CHEMISTRY				
	Alkalinity, mg/L	97	101	99
	Hardness, mg/l	316	312	316
	NH3-N, mg/L	0.05	0.04	<0.03
	pH, SU	7.1	7.4	8.1
	Cl2, mg/L	<0.05		
	Conductivity, umhos/cm	1110	1100	1100

ILLUMINATION	
HRS LIGHT	16
HRS DARK	8
uE	

DIL'N/ REP#		0 hrs	24 hrs	48 hrs	72 hrs	96 hrs	120 hrs	144 hrs	168 hrs	TARE mg	DRY + TARE, mg	DRY WT mg	PAN COUNT
0.0%	1	10	10	10	10	10	10	10	10	33.09	37.26	4.17	10
	2	10	↓	↓	↓	↓	9	9	9	33.13	36.83	3.70	9
	3	10	↓	↓	↓	↓	9	9	9	34.02	37.86	3.84	9
	4	10	↓	↓	↓	↓	10	10	10	34.15	38.37	4.22	10
12.5 %	5	10	10	10	10	10	10	10	10	33.28	37.36	4.08	10
	6	10	↓	↓	↓	↓	↓	↓	↓	34.33	38.77	4.44	10
	7	10	↓	↓	↓	↓	↓	↓	↓	34.19	38.76	4.57	10
	8	10	↓	↓	↓	↓	↓	↓	↓	33.88	38.27	4.39	10
25.0 %	9	10	10	10	10	10	10	10	10	32.97	37.37	4.40	10
	10	10	↓	↓	↓	↓	↓	↓	↓	33.40	37.79	4.39	10
	11	10	↓	↓	↓	↓	↓	↓	↓	33.55	37.78	4.23	10
	12	10	↓	↓	↓	↓	↓	↓	↓	32.81	37.01	4.20	10
50.0 %	13	10	10	10	10	10	10	10	10	33.45	37.89	4.44	10
	14	10	↓	↓	↓	↓	↓	↓	↓	32.17	36.80	4.63	10
	15	10	↓	↓	↓	↓	↓	↓	↓	32.98	37.49	4.51	10
	16	10	↓	9	9	9	9	9	9	32.49	36.63	4.14	9
75.0 %	17	10	10	10	10	10	10	10	10	33.85	38.40	4.55	10
	18	10	↓	↓	↓	↓	↓	↓	↓	34.97	39.60	4.63	10
	19	10	↓	↓	↓	↓	↓	↓	↓	33.85	38.30	4.45	10
	20	10	↓	↓	↓	↓	↓	↓	↓	34.18	38.77	4.59	10
100.0 %	21	10	10	9	9	9	9	9	9	33.90	38.13	4.23	9
	22	10	↓	10	10	10	10	10	10	33.85	38.27	4.42	10
	23	10	↓	↓	↓	↓	↓	↓	↓	34.10	38.59	4.49	10
	24	10	↓	↓	↓	↓	↓	↓	↓	33.07	37.44	4.37	10
FEEDING TIMES			0530	0515	0540	0515	0525	0630					
AMT. g			1640	1645	1610	1640	1635	1745					

ANALYSTS: Beth Atkinson

BALANCE CHECK, g	1.91459
DATE WEIGHED	9.1.12
HOURS DRIED 6	TEMP 100°C

DAILY CHEMICAL/PHYSICAL MEASUREMENTS

PROJECT NAME: APS 4 Corners **ORGANISM:** ✓ *Pimephales promelas* ____ *Ceriodaphnia dubia*

SAMPLE I.D.: BU09134 9184 9232 **TEST TYPE:** 1000.0

DAY

Conc: 0.0%	1	2	3	4	5	6	7
Temp Init	25.1	25.1	25.1	25.2	25.2	25.1	25.1
Temp Final	25.4	25.6	24.7	25.4	25.1	25.3	24.7
D.O. Initial	8.4	8.3	8.3	8.3	8.4	8.3	8.4
D.O. Final	7.9	8.0	7.8	7.9	7.8	7.7	7.9
pH Initial	7.4	7.4	7.4	7.4	7.4	7.4	7.3
pH Final	7.8	7.8	7.9	7.9	7.9	7.9	7.8
Conductivity Init	310	300	310	300	300	300	310
Conductivity Final	320	310	320	310	310	290	320
Alkalinity	68	68	68	68	68	68	68
Hardness	92	92	92	92	92	92	92

DAY

Conc: 50.0%	1	2	3	4	5	6	7
Temp Init	25.0	25.1	25.1	25.1	25.3	25.2	25.0
Temp Final	25.4	25.5	25.3	25.5	24.7	24.8	24.9
D.O. Initial	8.0	7.8	8.1	8.0	8.1	8.0	7.8
D.O. Final	7.6	7.3	7.4	7.3	7.2	7.0	7.0
pH Initial	7.4	7.4	7.5	7.5	7.4	7.4	7.4
pH Final	7.8	7.9	7.9	7.9	7.9	7.8	7.8
Conductivity Init	680	690	690	690	680	690	680
Conductivity Final	690	700	680	700	690	700	690

Conc: 12.5%	1	2	3	4	5	6	7
Temp Init	25.1	25.1	25.1	25.2	25.3	25.2	25.1
Temp Final	25.4	24.9	25.7	24.9	25.2	25.4	24.9
D.O. Initial	8.3	8.2	8.3	8.2	8.3	8.1	8.1
D.O. Final	7.9	7.6	7.7	7.4	7.5	7.3	7.4
pH Initial	7.4	7.4	7.4	7.4	7.4	7.4	7.4
pH Final	7.8	7.9	7.9	7.8	7.8	7.9	7.9
Conductivity Init	400	400	400	400	400	400	400
Conductivity Final	410	410	410	400	410	390	410

Conc: 75.0%	1	2	3	4	5	6	7
Temp Init	24.9	25.1	25.1	25.1	25.4	25.2	24.9
Temp Final	25.4	24.8	25.3	24.9	24.4	25.1	24.7
D.O. Initial	7.7	7.8	7.9	7.8	8.0	7.9	7.7
D.O. Final	7.5	7.3	7.2	7.2	7.1	6.9	6.7
pH Initial	7.4	7.4	7.6	7.5	7.4	7.3	7.4
pH Final	7.8	7.9	7.9	7.9	7.8	7.9	7.9
Conductivity Init	870	860	870	860	860	860	870
Conductivity Final	880	850	860	870	870	850	880

Conc: 25.0%	1	2	3	4	5	6	7
Temp Init	25.0	25.1	25.1	25.2	25.3	25.2	25.0
Temp Final	25.4	25.0	24.3	24.4	25.1	24.6	24.9
D.O. Initial	8.1	8.0	8.2	8.1	8.2	8.0	7.9
D.O. Final	7.7	7.4	7.5	7.4	7.3	7.2	7.1
pH Initial	7.4	7.4	7.5	7.4	7.4	7.4	7.4
pH Final	7.8	7.8	7.9	7.8	7.8	7.9	7.9
Conductivity Init	500	510	500	500	500	500	510
Conductivity Final	510	520	510	490	510	490	520

Conc: 100.0%	1	2	3	4	5	6	7
Temp Init	24.9	25.1	25.1	25.0	25.4	25.2	24.8
Temp Final	25.5	24.9	24.4	24.6	24.5	24.3	24.9
D.O. Initial	7.6	7.8	7.8	7.7	7.9	7.7	7.6
D.O. Final	7.4	7.2	7.1	7.2	7.0	6.7	6.5
pH Initial	7.4	7.4	7.7	7.6	7.3	7.3	7.4
pH Final	7.8	7.9	7.9	7.9	7.8	7.9	7.9
Conductivity Init	1060	1050	1060	1050	1050	1050	1060
Conductivity Final	1050	1060	1070	1060	1040	1060	1070
Alkalinity	97	97	101	101	99	99	99
Hardness	316	316	312	312	316	316	316

ANALYST: Lba ANALYSIS DATES: 8/21-28/12

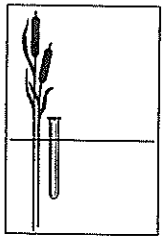
APS6

CLIENT/PROJECT NAME APS 4 Corners

SAMPLE NUMBERS BU09134 9184 9232

EPA METHOD	
	CHRONIC SURVIVAL/GROWTH, 1000.0 ✓
	CHRONIC SURVIVAL/REPRODUCTION , 1002.0 _____
	ACUTE _____

TEST ORGANISM		
(*P. promelas*)	*C. dubia*	Other
FOOD-*Artemia* nauplii	FOOD- n/a	FOOD-n/a
AMOUNT, grams 0.1 g/250 mLs	AMOUNT	AMOUNT
FREQUENCY am/pm daily	FREQUENCY	FREQUENCY



AERATION
Not needed ✓
If required, D.O. value_____
Date_____
Rate/Type_____

Vessel Capacity, mLs 600
Vessel type glass plastic
Sample volume, mLs 250
Depth of Liquid, cm 5.0

Date of Renewal	8.22.12	8.23.12	8.24.12	8.25.12	8.26.12	8.27.12	8.28.12
Time of Renewal	1100-1200	1200-1300	1100-1200	1130-1215	1030-1130	1030-1130	1130-1230
Vessel Number	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
1	BICI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI
2	↓	↓	↓	↓	↓ 1dead	↓	↓
3	↓	↓	↓	↓	↓ 1dead	↓	↓
4	↓	↓	↓	↓	↓	↓	↓
5	BICI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI
6	↓	↓	↓	↓	↓	↓	↓
7	↓	↓	↓	↓	↓	↓	↓
8	↓	↓	↓	↓	↓	↓	↓
9	BICI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI
10	↓	↓	↓	↓	↓	↓	↓
11	↓	↓	↓	↓	↓	↓	↓
12	↓	↓	↓	↓	↓	↓	↓
13	BICI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI
14	↓	↓	↓	↓	↓	↓	↓
15	↓	↓	↓	↓	↓	↓	↓
16	↓	↓ 1dead	↓	↓	↓	↓	↓
17	BICI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI
18	↓	↓	↓	↓	↓	↓	↓
19	↓	↓	↓	↓	↓	↓	↓
20	↓	↓	↓	↓	↓	↓	↓
21	BICI	BICIAI 1dead	BICIAI	BICIAI	BICIAI	BICIAI	BICIAI
22	↓	↓	↓	↓	↓	↓	↓
23	↓	↓	↓	↓	↓	↓	↓
24	↓	↓	↓	↓	↓	↓	↓

FOOD INTAKE		ACTIVITY		APPEARANCE	
A1	Very Good	B1	Very active	C1	Healthy, normal
A2	Adequate	B2	Moderate	C2	Mildly impaired
A3	Poor	B3	Limited	C3	Little growth/repro
A4	Not at all	B4	None at all	C4	Ghosting/ puny

ANALYST: ba

DATES OF ANALYSIS: 8/21-28/12

APS7

Pseudokirchneriella subcapitata

EFFLUENT TEST DATA

CETIS Test Evaluation Report

Facility:	Arizona Public Service - Four Corners	**Test Name:**	Selenastrum Growth Test
Sample Site:	Outfall 001 Cooling Pond	**Organism:**	Pseudokirchneriella subcapitata (Green Alga)
Sample Code:	77623BB5	**Protocol:**	EPA/821/R-02-013 (2002)
Sample Date:	20 Aug-12 02:49	**Start Date:**	21 Aug-12 15:00
Sample Age:	36h (6 °C)	**End Date:**	25 Aug-12 15:00
Project:	Effluent Characterization (Annual)	**Duration:**	96h **Organism Age:**

Permitee:	Arizona Public Service - Four Corners	**Laboratory:**	Aquatic Consulting & Testing, Inc.
Address:	P.O. Box 355 Fruitland, NM 87416	**Address:**	1525 W. University Drive Suite 106 Tempe, AZ 85281
Contact:	Arnold Slowman	**Contact:**	Rick Amalfi, Vice President
Phone:	505-598-8442, 505-598-8292(fax)	**Phone:**	480-921-8044, 480-921-0049(fax)
Email:		**Email:**	ramalfi@aquaticconsulting.com

Chronic Toxicity Evaluation

Endpoint	Parameter	C-%	IWC	Pass/Fail	Method
Light Absorbance	NOEL/LOEL	100/>100	50	Pass	Dunnett Multiple Comparison Test

Test Acceptability Criteria

Endpoint	Attribute	Test Stat	Limits	Pass/Fail
Light Absorbance	Control CV	0.01432	N/A - 0.2	Pass
Light Absorbance	PMSD	0.08466	0.091 - 0.29	Fail

Test Review Comments

Test Reviewer

Reviewer:	Frederick A. Amalfi, Ph.D., Laboratory Director
Phone:	480-921-8044, 480-921-0049(fax)
Email:	ramalfi@aquaticconsulting.com

Signature: Frederick A. Amalfi

Date: 09·28·12

Light Absorbance Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.1192	0.1186	0.1199	0.117	0.121	0.0008539	0.001708	1.43%	0.0%
12.5		4	0.1485	0.1473	0.1497	0.145	0.152	0.001555	0.003109	2.09%	-24.53%
25		4	0.1782	0.1761	0.1804	0.17	0.183	0.002869	0.005737	3.22%	-49.48%
50		4	0.204	0.2003	0.2077	0.193	0.215	0.004933	0.009866	4.84%	-71.07%
75		4	0.2297	0.2283	0.2312	0.227	0.235	0.001887	0.003775	1.64%	-92.66%
100		4	0.245	0.2423	0.2477	0.239	0.255	0.003674	0.007348	3.0%	-105.5%

CETIS Summary Report

Report Date: 28 Sep-12 09:17 (p 1 of 1)
Test Code: BU09134CPs | 12-5216-3093

Selenastrum Growth Test — Aquatic Consulting & Testing, Inc.

Batch ID:	20-9312-0966	**Test Type:**	Cell Growth	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Algal Culture Media
Ending Date:	25 Aug-12 15:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	Not Applicable
Duration:	96h	**Source:**	Aquatic Biosystems, CO	**Age:**	

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	36h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
06-9280-7439	Light Absorbance	100	>100	NA	8.47%	1	Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
03-3654-8944	Light Absorbance	IC5	>100	N/A	N/A	<1	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	

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
03-3654-8944	Light Absorbance	Control CV	0.01432	NL - 0.2	Yes	Passes Acceptability Criteria
06-9280-7439	Light Absorbance	Control CV	0.01432	NL - 0.2	Yes	Passes Acceptability Criteria
06-9280-7439	Light Absorbance	PMSD	0.08466	0.091 - 0.29	Yes	Below Acceptability Criteria

Light Absorbance Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.1192	0.1186	0.1199	0.117	0.121	0.0008539	0.001708	1.43%	0.0%
12.5		4	0.1485	0.1473	0.1497	0.145	0.152	0.001555	0.003109	2.09%	-24.53%
25		4	0.1782	0.1761	0.1804	0.17	0.183	0.002869	0.005737	3.22%	-49.48%
50		4	0.204	0.2003	0.2077	0.193	0.215	0.004933	0.009866	4.84%	-71.07%
75		4	0.2297	0.2283	0.2312	0.227	0.235	0.001887	0.003775	1.64%	-92.66%
100		4	0.245	0.2423	0.2477	0.239	0.255	0.003674	0.007348	3.0%	-105.5%

Light Absorbance Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.117	0.12	0.119	0.121
12.5		0.147	0.15	0.152	0.145
25		0.17	0.183	0.179	0.181
50		0.193	0.209	0.215	0.199
75		0.227	0.23	0.227	0.235
100		0.24	0.239	0.246	0.255

CETIS Analytical Report

Report Date: 28 Sep-12 09:17 (p 1 of 2)
Test Code: BU09134CPs | 12-5216-3093

Selenastrum Growth Test — **Aquatic Consulting & Testing, Inc.**

Analysis ID:	06-9280-7439	**Endpoint:**	Light Absorbance	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:16	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	20-9312-0966	**Test Type:**	Cell Growth	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Algal Culture Media
Ending Date:	25 Aug-12 15:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	Not Applicable
Duration:	96h	**Source:**	Aquatic Biosystems, CO	**Age:**	

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	36h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	8.47%	100	>100	NA	1

Dunnett Multiple Comparison Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	-6.974	2.407	0.010	6	1.0000	CDF	Non-Significant Effect
		25	-14.07	2.407	0.010	6	1.0000	CDF	Non-Significant Effect
		50	-20.21	2.407	0.010	6	1.0000	CDF	Non-Significant Effect
		75	-26.35	2.407	0.010	6	1.0000	CDF	Non-Significant Effect
		100	-29.98	2.407	0.010	6	1.0000	CDF	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control CV	0.01432	NL - 0.2	Yes	Passes Acceptability Criteria
PMSD	0.08466	0.091 - 0.29	Yes	Below Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.04651271	0.009302542	5	264.4	<0.0001	Significant Effect
Error	0.00063325	3.518056E-05	18			
Total	0.04714596		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	8.78	15.09	0.1182	Equal Variances
Variances	Mod Levene Equality of Variance	2.467	4.248	0.0719	Equal Variances
Variances	Levene Equality of Variance	3.369	4.248	0.0254	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9855	0.884	0.9719	Normal Distribution
Distribution	Kolmogorov-Smirnov D	0.07771	0.2056	1.0000	Normal Distribution
Distribution	D'Agostino Skewness	0.2395	2.576	0.8107	Normal Distribution
Distribution	D'Agostino Kurtosis	0.4649	2.576	0.6420	Normal Distribution
Distribution	D'Agostino-Pearson K2 Omnibus	0.2735	9.21	0.8722	Normal Distribution
Distribution	Anderson-Darling A2 Normality	0.191	3.878	0.9500	Normal Distribution

Light Absorbance Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.1192	0.1165	0.122	0.1195	0.117	0.121	0.0008539	1.43%	0.0%
12.5		4	0.1485	0.1436	0.1534	0.1485	0.145	0.152	0.001555	2.09%	-24.53%
25		4	0.1782	0.1691	0.1874	0.18	0.17	0.183	0.002869	3.22%	-49.48%
50		4	0.204	0.1883	0.2197	0.204	0.193	0.215	0.004933	4.84%	-71.07%
75		4	0.2297	0.2237	0.2358	0.2285	0.227	0.235	0.001887	1.64%	-92.66%
100		4	0.245	0.2333	0.2567	0.243	0.239	0.255	0.003674	3.0%	-105.5%

Selenastrum Growth Test — **Aquatic Consulting & Testing, Inc.**

Analysis ID:	06-9280-7439	**Endpoint:**	Light Absorbance	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:16	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Light Absorbance Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.117	0.12	0.119	0.121
12.5		0.147	0.15	0.152	0.145
25		0.17	0.183	0.179	0.181
50		0.193	0.209	0.215	0.199
75		0.227	0.23	0.227	0.235
100		0.24	0.239	0.246	0.255

CETIS Analytical Report

Report Date: 28 Sep-12 09:17 (p 1 of 1)
Test Code: BU09134CPs | 12-5216-3093

Selenastrum Growth Test — Aquatic Consulting & Testing, Inc.

Analysis ID:	03-3654-8944	**Endpoint:**	Light Absorbance	**CETIS Version:**	CETISv1.8.5
Analyzed:	28 Sep-12 9:16	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	20-9312-0966	**Test Type:**	Cell Growth	**Analyst:**	Elizabeth Atkinson
Start Date:	21 Aug-12 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Algal Culture Media
Ending Date:	25 Aug-12 15:00	**Species:**	Pseudokirchneriella subcapitata	**Brine:**	Not Applicable
Duration:	96h	**Source:**	Aquatic Biosystems, CO	**Age:**	

Sample ID:	20-0292-6517	**Code:**	77623BB5	**Client:**	Arizona Public Service - Four Corners
Sample Date:	20 Aug-12 02:49	**Material:**	POTW Effluent	**Project:**	Effluent Characterization (Annual)
Receive Date:	21 Aug-12 10:23	**Source:**	Arizona Public Service - Four Corners (NN0	**Latitude**	36°42'27"N
Sample Age:	36h (6 °C)	**Station:**	Outfall 001 Cooling Pond	**Longitude**	108°28'7"W

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	0	280	Yes	Two-Point Interpolation

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control CV	0.01432	NL - 0.2	Yes	Passes Acceptability Criteria

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC5	>100	N/A	N/A	<1	NA	NA
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

Light Absorbance Summary

			Calculated Variate						
C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.1192	0.117	0.121	0.0008539	0.001708	1.43%	0.0%
12.5		4	0.1485	0.145	0.152	0.001555	0.003109	2.09%	-24.53%
25		4	0.1782	0.17	0.183	0.002869	0.005737	3.22%	-49.48%
50		4	0.204	0.193	0.215	0.004933	0.009866	4.84%	-71.07%
75		4	0.2297	0.227	0.235	0.001887	0.003775	1.64%	-92.66%
100		4	0.245	0.239	0.255	0.003674	0.007348	3.0%	-105.5%

Light Absorbance Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.117	0.12	0.119	0.121
12.5		0.147	0.15	0.152	0.145
25		0.17	0.183	0.179	0.181
50		0.193	0.209	0.215	0.199
75		0.227	0.23	0.227	0.235
100		0.24	0.239	0.246	0.255

Pseudokirschneriella subcapitata (reclassified)

CHRONIC TOXICITY WORKSHEET

Lab ID	BU09134	Date/Time Start	8·21·12C 1500
Project	APS 4 Corners	Date/Time End	8·25·12C 1500

Cell Density Measured by hemocytometer				
Initial Cell Density , cells/mL:	1.0x 10⁴			
Final Cell Density (average of 4 control replicates), cells/mL:	1.98 x 10⁷			
Cell Density in each control replicate , cells/mL	A 2.00 x 10⁷	B 1.96 x 10⁷	C 1.94 x 10⁷	D 2.02 x 10⁷

END OF TEST MEASUREMENTS

ABSORBANCE BY SPECTROPHOTOMETER @ 750 nm

	Replicate A	B	C	D
CONTROL	0.117	0.120	0.119	0.121
12.5%	0.147	0.150	0.152	0.145
25.0%	0.170	0.183	0.179	0.181
50.0%	0.193	0.209	0.215	0.199
75.0%	0.227	0.230	0.227	0.235
100.0%	0.240	0.239	0.246	0.255

START OF TEST PHYSICAL/CHEMICAL MEASUREMENTS

	ALK	TOT-HRD	EC @ 25	pH
CONTROL	12	14	70	7.4
12.5%	/	/	190	7.4
25.0%	30	90	320	7.4
50.0%	/	/	570	7.4
75.0%	80	240	810	7.4
100.0%	97	316	~~90~~ 1060	~~7.6~~ 7.4

FLASKS SHAKEN BY HAND 2X/DAY TIME OF MEASUREMENTS INDICATED BY X

DATE	8·21·12	8·22·12		8·23·12		8·24·12		8·25·12	
TIME 1	/	0600X-bu		0530		0540		0505	
TIME 2	1500	1530X		1510 X		1540X		1500X	
	DAY 0 pH/Temp	DAY 1 pH/Temp		DAY 2 pH/Temp		DAY 3 pH/Temp		DAY 4 pH/Temp	
Control	25.1	8.4	25.9	8.6	25.7	8.8	25.3	9.1	25.5
12.5%	25.2	8.5	25.5	8.7	25.4	8.9	25.6	9.2	25.2
25.0%	25.3	8.5	24.8	8.7	25.9	9.0	25.4	9.3	24.9
50.0%	25.3	8.6	25.7	8.8	25.8	9.1	24.9	9.3	25.0
75.0%	25.2	8.6	25.3	8.8	24.9	9.1	25.1	9.4	24.7
100.0%	25.3	8.7	25.4	8.9	24.6	9.2	24.7	9.5	25.8

DILUTION/CULTURE WATER PREPARED ON/BY: 8/21/12 bu

SAMPLE FILTERED BY n/a ON

OTHER CONDITIONS/NOTES

AQUATIC CONSULTING & TESTING, INC. ANALYST: Beth Atkinson

APS 8 4