

Bioassays of

Arrowhead Campground Wastewater Treatment Plant

Marianna, Jackson County, Florida

NPDES/State Permit #FL0028738-01

Sampled 2/17/98

May 1998

Biology Section

Division of Administrative & Technical Services

Comprehensive Quality Assurance Plan #870346G

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Biology Section
Bureau of Laboratories
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Introduction

Arrowhead Campground Wastewater Treatment Facility, 4820 E. Highway 90, Marianna, Jackson County, NPDES/State Permit #FL0028738-01, tests performed on 18 to 20 February, 1998.

This wastewater treatment facility has a design flow of 0.015 MGD and a mean flow of 0.005 MGD. Treatment of wastewater includes the utilization of a grease trap, a trash removal tank, aeration, secondary clarification, and chlorination for disinfection. Effluent is dechlorinated prior to discharge to the Class III waters of Merritt Mill Pond (facility summary provided by Glenn Butts and Derek Adkins, FDEP, Pensacola).

The toxicity tests discussed in this report were performed in accordance with methods described by Weber, 1993, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th Edition, EPA/600/4-90/027F.

Results and Discussion

The FDEP Biology Section performed two 48-hour static acute screening toxicity bioassays on a sample of effluent from this facility. Two additional 48-hour screening bioassays were performed on aliquots of the sample that were dechlorinated in the laboratory by the addition of 0.55 mL of 0.025N sodium thiosulfate per liter of sample. The test species used for these bioassays were the water flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. The chlorinated sample was toxic, producing 100% mortality in both test species within 24 hours. The dechlorinated sample was not toxic, producing only 5% mortality in the *Ceriodaphnia dubia* and no mortality in the *Cyprinella leedsi* (Table 1).

The total residual chlorine of the 100% whole effluent sample was 0.77 mg/L in the field and 0.4 mg/L in the laboratory. The total residual chlorine of the dechlorinated aliquot of sample was 0.04 mg/L. Chorine toxicity is highly dependent upon the form of chlorine present in the sample. Concentrations of various forms of chlorine as low as 0.006 mg/L to 0.015 mg/L have produced acute toxicity in *Ceriodaphnia dubia* (Taylor, P.A. 1993. An evaluation of the toxicity of various forms of chlorine to *Ceriodaphnia dubia*. *Environ. Toxicol. Chem.* 5:925-930). Total residual chlorine levels as low as 0.045 mg/L have been found to be acutely toxic to the fish species (*Notropis anogenus*), which is closely related to *Cyprinella leedsi* (USEPA, 1985. Ambient Water Quality Criteria for Chlorine-1984, EPA 440/5-84-030). Total ammonia was not detected in the bioassay sample, but it was detected in the sample submitted for chemical analysis at a concentration of 0.095 mg/L. Further chemical analyses were performed on the sample and several metals were identified (Table 2).

Conclusion

The sample of effluent collected from this facility on January 20, 1998, was toxic to both the *Ceriodaphnia dubia* and *Cyprinella leedsi* test organisms. The dechlorinated aliquot of sample did not demonstrate toxicity to either test species. We attribute the toxicity to the total residual chlorine concentration in the sample.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Arrowhead Campground WWTF, Marianna, Jackson County, Florida, NPDES Permit #FL0028738-01, performed on 18 to 20 February,1998.

Facility:	Arrowhead Campground WWTF			NPDES Permit #	FL0028738-01	Facility Type:	Wastewater Treatment
Location:	4820 E. Hwy. 90			Contact/District:	Glenn Butts/Northwest		Facility
County:	Jackson			Test type:	static acute screen		
Sample Collection Date:	2/17/98	Time:	1100	# tests:	2	Receiving Water:	Merritt Mill Pond
Test Beginning Date:	2/18/98	Time:	1410	Chlorination Type:	Chlorinated		
Test Ending Date:	2/20/98	Time:	1400				Page 1 of 1

Total Residual CL2	mg/L	Method
Field:	0.77	-
Lab:	0.4	DR-100
Dechlorinated Sample:	0.04	DR-100

Ammonia	Total (mg/L)	Unionized (mg/L)
Control Water (fish):	<0.017	<0.017
Control Water (20% DMW) (cladocerans):	<0.017	<0.017
100% Sample:	<0.017	<0.017

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	136	138
Control Water (20% DMW) (cladocerans):	78	88
100% Sample:	54	159

Salinity	(ppt)
Control Water (fish):	0
Control Water (20% DMW) (cladocerans):	0
100% Sample:	0

Organism: *Ceriodaphnia dubia* Life stage: < 24 hours old

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[A]			Dissolved Oxygen			Conductivity Uncorrected µmhos/cm	
Concentrations	Volume(mL)	0 hr	24 hr	48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	48 hour
Control A	0/20	5	5	5	8.1	-	8.1	23.7	-	24.3	7.8	-	7.9	190	180
Control B	0/20	5	5	5	-	-	8.2	-	-	24.3	-	-	7.7	-	180
Control C	0/20	5	5	5	-	-	8.2	-	-	24.3	-	-	7.8	-	180
Control D	0/20	5	5	5	-	-	8.2	-	-	24.2	-	-	7.8	-	185
100% A	20/0	5	0	-	7.2	7.8	-	23.8	24.1	-	7.2	7.8	-	445	480[B]
100% B	20/0	5	0	-	-	7.8	-	-	24.2	-	-	7.8	-	-	485[B]
100% C	20/0	5	0	-	-	7.9	-	-	24.2	-	-	7.8	-	-	490[B]
100% D	20/0	5	0	-	-	7.9	-	-	24.3	-	-	7.8	-	-	495[B]
Decl100% A	20/0	5	5	5	7.2	-	8.0	24.2	-	24.1	7.3	-	7.9	460	485
Decl100% B	20/0	5	5	4	-	-	8.0	-	-	24.1	-	-	7.9	-	500
Decl100% C	20/0	5	5	5	-	-	8.0	-	-	24.0	-	-	8.0	-	495
Decl100% D	20/0	5	5	5	-	-	8.0	-	-	23.9	-	-	7.9	-	515

Decl = Dechlorinated sample

[A] Temperature of test incubator # 1 and test room were continously recorded on strip chart recorders. Incubator temperature range for the test period was 23.8-25.0°C. [B] 24-hour reading. Test room temperature range for the test period was 24.5-25.8°C.

Organism: *Cyprinella leedsi* Age: 13 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[C]			Dissolved Oxygen			Conductivity Uncorrected µmhos/cm	
Concentrations	Volume(mL)	0 hr	24 hr	48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	48 hour
Control A	0/500	5	5	5	7.8	8.3	8.3	24.8	24.9	24.3	7.6	7.4	7.9	255	260
Control B	0/500	5	5	5	7.8	8.3	8.3	24.8	25.0	24.6	7.6	7.5	8.0	255	260
Control C	0/500	5	5	5	7.8	8.3	8.3	24.8	25.2	24.7	7.7	7.5	7.9	255	260
Control D	0/500	5	5	5	7.8	8.3	8.3	24.9	24.5	24.7	7.7	7.4	7.9	255	260
100% A	500/0	5	0	-	7.2	7.9	-	24.2	24.6	-	7.0	7.6	-	470	480[D]
100% B	500/0	5	0	-	7.2	7.9	-	24.1	24.8	-	7.0	7.6	-	470	480[D]
100% C	500/0	5	0	-	7.2	7.8	-	24.1	24.9	-	5.9	7.4	-	470	485[D]
100% D	500/0	5	0	-	7.2	7.8	-	24.5	24.7	-	5.8	7.3	-	470	480[D]
Decl100% A	500/0	5	5	5	7.2	7.7	7.9	24.4	24.6	24.8	7.4	7.4	7.7	470	490
Decl100% B	500/0	5	5	5	7.2	7.7	7.9	24.4	24.6	24.7	7.5	7.4	7.6	475	490
Decl100% C	500/0	5	5	5	7.2	7.7	7.9	24.4	24.7	24.7	7.5	7.4	7.7	475	495
Decl100% D	500/0	5	5	5	7.2	7.7	7.9	24.4	24.7	24.6	7.5	7.4	7.6	475	490

Decl = Dechlorinated sample

[C] Temperature of test incubator # 3 and test room were continously recorded on strip chart recorders. Incubator temperature range for the test period was 25.5-27.0°C. [D] 24-hour reading. Test room temperature range for the test period was 24.5-25.5°C.

Table 2. Results of chemical analyses on the effluent from the Arrowhead Campground Wastewater Treatment Facility sampled on February 17, 1998.

Metals		
Aluminum	76	µg/L [J]
Cadmium	0.03	µg/L [I]
Calcium	48.3	mg/L [A]
Copper	2.3	µg/L
Iron	19	µg/L [I]
Magnesium	9.27	mg/L [A]
Zinc	124	µg/L [A]

[A] Value reported is the mean of two or more determinations.
[I] Value reported is less than the minimum quantitation limit and greater than or equal to the minimum detection limit.
[J] Estimated value.

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: ~~Lyn Haven~~ incorrect name MF 4/6/98 - Arrowhead WWTP
County: JACKSON
Contact / District: Butts / NW-PeN
NPDES Permit #: FL00 28738
LIMS Sample #: ~~308192~~ LIMS Job #: 1998 02-18-07
sample log 2/17/98 AW

Sample Collection: Date 2/17/98 Time 11:00
Test Beginning: Date 2/18/98 Time 1410
Test Ending: Date 2/25/98 Time 1400
Organism Batch #: 89 Diluent Batch #: 5
Organism Age: mf 24hrs 24 hours
Test Organism: Ceriodaphnia dubia

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through
Temperature range: room 24.5-25.8°C
incubator 23.8-25.0°C
Test Number: 1 of 2
Remarks: D = dead, M = missing

Sample dechlorinated with 0.55mL of 0.025N sodium thiosulfate per liter of sample for dechlor test
TRC of dechlorinated sample: 0.04mg/L

Instrument Calibrations:	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	23.4 @ 23.5	5.2 @ 25.1 °C	99.3 @ 96.3 991 @ 1005 @ 25.1 °C
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.7 @ 23.5	8.1 @ 25.4 °C	99.5 @ 96.3 1009 @ 1005 @ 25.6 °C
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.2 @ 23.3	5.2 @ 25.3 °C	96.5 @ 96.3 975 @ 1005 @ 24.6 °C

Conc.	Chamber #	Number Live 0 hr	24 h	48 h	pH 0 hr	24 h	48 h	Temperature (°C) 0 hr	24 h	48 h	D.O. (mg/L) 0 hr	24 h	48 h	UNCORRECTED Cond. (mmhos/cm) (Cond. (µmhos/cm)) 0 hr	24 h	48 h
C+LA	A	5	5	5	8.1		8.1	23.7		24.3	7.8		7.9	190		180
C+LB	B	5	5	5			8.2			24.3			7.7			180
C+LC	C	5	5	5			8.2			24.3			7.8			180
C+LD	D	5	5	5			8.2			24.2			7.8			185
100%A	A	5	0 SD	—	7.2	7.8	—	23.8	24.1	—	7.2	7.8	—	445	480	—
100%B	B	5	0 SD	—		7.8	—		24.2	—		7.8	—		485	—
100%C	C	5	0 SD	—		7.9	—		24.2	—		7.8	—		490	—
100%D	D	5	0 SD	—		7.9	—		24.3	—		7.8	—		495	—
100%DUPA	A	5	5	5	7.2		8.0	24.2		24.1	7.3		7.9	460		485
100%DUPB	B	5	5	4 ID			8.0			24.1			7.9			500
100%DUPC	C	5	5	5			8.0			24.0			8.0			495
100%DUPD	D	5	5	5			8.0			23.9			7.9			515
Measured/Loaded by:		FW	DAW	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF
Recorded by:		MF	DAW	MF	FW	DAW	FW	FW	DAW	FW	FW	DAW	FW	FW	DAW	FW

Investigators' Signatures
Jean Weckel
Marshall Faircloth
Taylor LeCroy
David Wainright

Salt Water | Water Quality Parameters Verified by MF

	Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L)			0.77	—	Glenn Butts
Lab Total Residual Cl2 (mg/L)		<0.03	0.4	DR/20	DW/DAW
Alkalinity (mg/L as $CaCO_3$)		78	54	Hach	DAW
Hardness (mg/L as $CaCO_3$)		88	159	Hach	DAW
Total ammonia (mg/L as N)		<0.017	<0.017	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope -58.4 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

reviewer form updated 4/01/96

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: ~~Lynn Haven~~ (Incorrect name MFS-6 48) - Arrowhead WWTP
County: JACKSON
Contact / District: Butts / NW-PEN
NPDES Permit #: FL00 28738
LIMS Sample #: 308192 LIMS Job #: 98F 02-18-07
sample log: 2/23 MF DW

Sample Collection: Date 2/17/98 Time 11:00
Test Beginning: Date 2/18/98 Time 1410
Test Ending: Date 2/20/98 Time 1400
Organism Batch #: 10 Diluent Batch #: well H2O
Organism Age: 13 days old
Test Organism: Cyprinella leedsi

Test Type: (Screening) / Definitive
(Static) / Static Renewal / Flow-through
Temperature range: room 24.5-25.8°C
incubator 25.0-26.5°C
Test Number: 2 of 2
Remarks: D = dead, M = missing
Sample dechlorinated with 0.55 mL of 0.025 N sodium thiosulfate per liter of sample for dechlorinated test. TRC of dechlorinated sample = 0.04 mg/L

Instrument Calibrations:	pH	Temperature °C	D.O. mg/L	Conductivity µmhos/cm
meter #	7851	90H018262	90H018262	G9005749
0 hr	7.0 @ 7.0 9.0 @ 9.0	23.4 @ 23.5	8.2 @ 25.1 °C	99.3 @ 96.3 991 @ 1005 @ 25.7 °C 9930 @ 10049
24 hr	7.0 @ 7.0 9.0 @ 9.0	23.7 @ 23.5	8.1 @ 25.4 °C	99.5 @ 96.3 1009 @ 1005 @ 25.6 °C 9980 @ 10049
48 hr	7.0 @ 7.0 9.0 @ 9.0	23.2 @ 23.3	8.2 @ 25.3 °C	96.4 @ 96.3 9869 @ 1005 @ 25.6 °C 9750 @ 10049

Conc.	Chamber #	Number Live 0 hr	Number Live 24 h	Number Live 48 h	pH 0 hr	pH 24 h	pH 48 h	Temperature (°C) 0 hr	Temperature (°C) 24 h	Temperature (°C) 48 h	D.O. (mg/L) 0 hr	D.O. (mg/L) 24 h	D.O. (mg/L) 48 h	UNCORRECTED Cond. (mmhos/cm) (µmhos/cm) 0 hr	UNCORRECTED Cond. (µmhos/cm) 24 h	UNCORRECTED Cond. (µmhos/cm) 48 h
Ctl A	E1	5	5	5	7.8	8.3	8.3	24.5	24.9	24.3	7.6	7.4	7.4	255	255	260
Ctl B	E2	5	5	5	7.8	8.3	8.3	24.6	25.0	24.6	7.6	7.5	8.0	255	255	260
Ctl C	E3	5	5	5	7.8	8.3	8.3	24.5	25.2	24.7	7.7	7.5	7.9	255	260	260
Ctl D	E4	5	5	5	7.8	8.3	8.3	24.9	24.5	24.7	7.7	7.4	7.9	255	255	260
100% A	E5	5	0 (5D)	—	7.2	7.7	—	24.2	24.6	—	7.0	7.6	—	470	480	—
100% B	E6	5	0 (5D)	—	7.2	7.9	—	24.1	24.8	—	7.0	7.6	—	470	480	—
100% C	E7	5	0 (5D)	—	7.2	7.8	—	24.1	24.9	—	5.9	7.4	—	470	485	—
100% D	E8	5	0 (5D)	—	7.2	7.8	—	24.5	24.7	—	5.5	7.3	—	470	480	—
100% A:C	E9	5	5	5	7.2	7.7	7.9	24.4	24.6	24.8	7.4	7.4	7.7	470	490	490
100% B:C	E10	5	5	5	7.2	7.7	7.9	24.4	24.6	24.7	7.5	7.4	7.6	475	480	490
100% C:C	E11	5	5	5	7.2	7.7	7.9	24.4	24.7	24.7	7.5	7.4	7.7	475	485	495
100% D:C	E12	5	5	5	7.2	7.7	7.9	24.4	24.7	24.6	7.5	7.4	7.6	475	480	490
Measured/Loaded by:		DW	TL	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF	MF	DW	MF
Recorded by:		MF	TL	MF	FW	DW	FW	FW	DW	FW	FW	DW	FW	FW	MW	FW

Investigators' Signatures

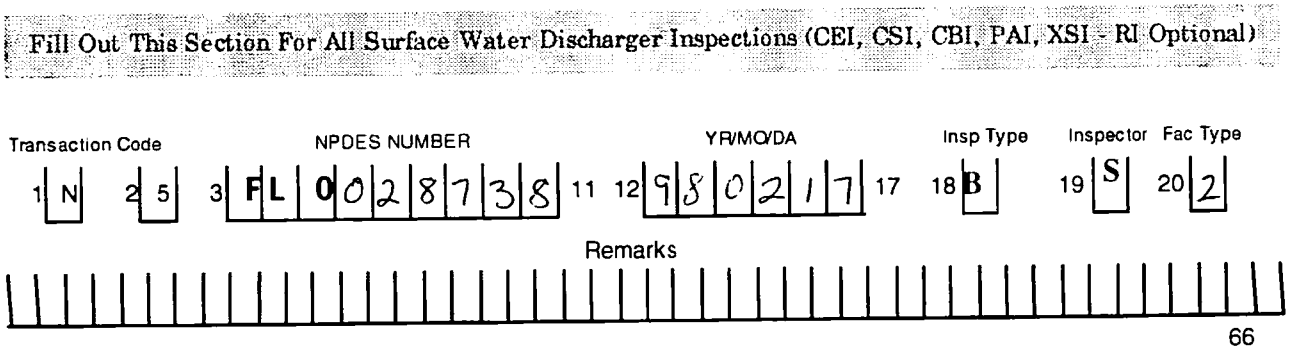
Water Quality Parameters verified by MF

	Salt Water: Well Water	20% Min Water	Sample	Method	Measured by
Field Total Residual Cl2 (mg/L):			0.77	—	Glenn Butts
Lab Total Residual Cl2 (mg/L):	<0.03		0.4	DR-100	DW/DAW
Alkalinity (mg/L as $CaCO_3$):	136		54	Hach	DAW
Hardness (mg/L as $CaCO_3$):	138		159	Hach	DAW
Total ammonia (mg/L as N):	<0.017		<0.017	Orion	MF

Ammonia Meter #98136 Ammonia Meter Slope: -55.8 Ammonia Blank: <0.017 Control Salinity: 0 ppt Sample Salinity: 0 ppt

reviewer: form updated 1/21/98

The Bioassay of the Arrowhead Campground WWTF effluent sampled on February 17, 1998, NPDES/State Permit #FL0028738-01.



The Priority Pollutants Analysis for the Bioassay of the Arrowhead Campground WWTF effluent sampled on February 17, 1998, NPDES/State Permit #FL0028738-01.

