

Bioassays of

Piper's Landing Property Owners' Association

Palm City, Martin County, Florida

NPDES #FL0037842-001-IW5C

Sampled 9/23/02

December 2002

Biology Section

Division of Resource Assessment & Management

Comprehensive Quality Assurance Plan #870346G

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Introduction

Piper's Landing Property Owners' Association, 6160 S.W. Thistle Terrace, Palm City, Martin County, Florida, NPDES #FL0037842-001-IW5C, test performed on 24 to 26 September 2002.

This ion exchange water treatment plant has a design flow of 0.019 MGD and an average flow of 0.00243 MGD (January to May, 2002). The untreated second stage reject brine water is discharged directly to the Class III marine surface waters of the St. Lucie River (facility information provided by Terry Davis, FDEP, Port Saint Lucie).

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 acute screening toxicity bioassays on a sample of effluent collected from the outfall of this facility. Due to the bioassay sample salinity of 14 ppt, based on conductivity and temperature, the test species used were the mysid shrimp, *Americamysis bahia*, and the inland silverside, *Menidia beryllina*. Within 24 hours of test initiation 100% mortality occurred in *A. bahia* organisms exposed to 100% sample, whereas only 10% mortality occurred in *M. beryllina* organisms over the 48-hour test (Table 1).

Total residual chlorine was detected in the bioassay sample in the laboratory at a concentration of 0.06 mg/L. Since the discharge is not chlorinated, the detection of chlorine in the sample was most likely due to interference from a compound other than chlorine. Total ammonia was not detected in the bioassay sample in the laboratory. Additional samples of effluent were collected from this facility and analyzed for nutrients, metals, organic compounds, herbicides, and pesticides. Several metals and nutrients were detected (Table 2). Copper was detected at a concentration of 7.7 ug/L, which exceeds the Class III marine surface water quality criterion of ≤ 2.9 ug/L.

The chemistry results confirmed that the ion makeup of the sample was not in seawater proportions and that the apparent 14‰ salinity of the sample was due to elevated levels of ground-water ions. The observed mortality in the *A. bahia* test is likely due to the seawater-ion imbalance of the sample. Previous research conducted by the FDEP Biology Section demonstrated that *A. bahia* is much more sensitive to seawater-ion imbalances than is *M. beryllina* (Wolfe, *et al*. 1995. *Protocols for determining Major-Seawater-Ion Toxicity in Membrane-Technology Water-Treatment Concentrate*. Florida Department of Environmental Protection, Bureau of Laboratories. 96pp.) The calcium concentration in the effluent was measured at 1,600 mg/L. This is approximately ten times the normal concentration for calcium in seawater of this salinity. The magnesium concentration in the effluent was measured at 31.9 mg/L. This is approximately three times less than the normal concentration for magnesium in seawater of this salinity. The elevated calcium

concentration and low magnesium concentration are two sources of toxicity in this sample, but other unidentified sources of toxicity cannot be ruled out without performing the major-seawater-ion imbalance toxicity testing protocols cited above.

Conclusion

The sample of effluent collected from this facility on September 23, 2002 was acutely toxic to *A. bahia* test organisms. The cause of this toxicity is partially attributed to seawater-ion imbalance, although copper or other unidentified constituents in the sample may have also contributed. The only way to determine if major-seawater-ion imbalance is the sole source of toxicity in the effluent, the facility would have to conduct the Department's ion-imbalance protocol.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from Piper's Landing Property Owners' Asssociation, 6160 S.W.Thistle Terrace, Palm City, Martin County, Florida, NPDES# FL0037842-001-IW5C, performed from 24 to 26 September 2002.

Facility:	**Piper's Landing Property Owners' Association**		**NPDES #**	**FL0037842-001-IW5C**	Facility Type: **WWTP**	**Analysts:**	Jacquelyn Brynda
Location:	6160 S.W. Thistle Terrace		Contact/District:	Davis/S.E.			Joshua Ayres
County:	Martin		Test type:	static acute screen			Christa Pierini
Sample Collection Date:	9/23/2002	Time: 0950	# tests:	2	Receiving Water: St. Lucie River, South Fork		Marshall Faircloth
Test Beginning Date:	9/24/2002	Time: 1600	Chlorination Type:	non-chlorinated	Class III Marine waters		James Daniels
Test Ending Date:	9/26/2002	Time: 1500					
					Page 1 of 1	**Reviewer:**	David Whiting

Organism: ***Americamysis bahia*** Life stage: 4 days

														Conductivity Uncorrected	
	Sample/Diluent	**SURVIVAL # Alive**			pH			Temperature[B]			Dissolved Oxygen			mmhos/cm	
Concentrations	Volume(mL)	0 hr	24 hr[A]	48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour
Control A	0/500	5	5	-	8.3	8.2	-	24.9	24.3	-	7.3	6.1	-	21.3	21.7
Control B	0/500	5	5	-	8.3	8.2	-	24.9	24.3	-	7.3	6.0	-	22.0	21.9
Control C	0/500	5	5	-	8.3	8.2	-	24.8	24.3	-	7.3	5.9	-	22.2	22.0
Control D	0/500	5	5	-	8.3	8.2	-	24.8	24.3	-	7.4	5.8	-	22.1	22.3
100% A	500/0	5	0	-	7.3	7.7	-	25.1	24.5	-	7.4	4.9	-	23.2	22.5
100% B	500/0	5	0	-	7.3	7.7	-	25.1	25.0	-	7.1	4.9	-	23.3	23.3
100% C	500/0	5	0	-	7.3	7.7	-	25.1	24.8	-	7.1	5.5	-	23.2	23.0
100% D	500/0	5	0	-	7.3	7.7	-	25.1	24.6	-	7.2	5.6	-	23.1	22.8

[A] Test terminated at 24 hours due to 100% mortality in the 100% effluent.

[B] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 24.5-26.0°C.
Incubator #3 temperature range for the test period was 24.0-25.0°C.

LIMS	
Job number:	TLH-2002-09-24-41
sample number:	624151

Data Transcription Verification	
date:	11/14/2002
by:	Joshua Ayres
	Christa Pierini

Total Residual CL2	mg/L	Method
Field:	-	-
Lab:	0.06[D]	Hach

[D] The total residual Cl2 is most likely the result of interferance in the sample.

Organism: ***Menidia beryllina*** Life stage: 13 days

														Conductivity Uncorrected	
	Sample/Diluent	**SURVIVAL # Alive**			pH			Temperature[C]			Dissolved Oxygen			mmhos/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	8.3	8.4	8.2	24.9	24.4	24.8	7.3	6.0	7.3	20.1	22.8
Control B	0/500	5	5	5	8.3	8.4	8.2	24.9	24.0	25.2	7.3	6.1	7.1	21.9	23.2
Control C	0/500	5	5	5	8.3	8.4	8.2	24.9	24.0	25.3	7.3	6.2	6.9	22.2	23.1
Control D	0/500	5	5	5	8.3	8.4	8.2	24.9	24.0	25.7	7.4	6.2	6.8	22.2	23.6
100% A	500/0	5	5	4	7.3	7.8	7.8	25.1	24.1	25.6	7.5	6.4	6.7	23.2	24.0
100% B	500/0	5	5	4	7.3	7.8	7.8	25.1	24.2	25.4	7.2	6.4	6.7	23.0	24.0
100 % C	500/0	5	5	5	7.3	7.8	7.8	25.1	24.1	25.5	7.1	6.3	6.4	23.4	24.1
100% D	500/0	5	5	5	7.3	7.8	7.8	25.1	24.0	25.6	7.0	6.3	6.4	23.4	24.0

[C] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 24.5-26.0°C.
Incubator #3 temperature range for the test period was 24.0-25.0°C.

Ammonia	Total (mg/L)	Unionized (mg/L)
Control water :	<0.017	<0.017
100% Sample:	<0.034	<0.034

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control water:	184	-
100% Sample:	575	-

Salinity [E]	ppt
Control:	14
100% sample:	14

[E] Salinity based on conductivity and temperature.

Table 2. Results of chemical analyses on the effluent from Piper's Landing Property Owners' Association sampled on September 23, 2002.

Metals

Calcium	1,600	mg/L	
Copper	7.7	ug/L	AJ
Iron	389	ug/L	
Lead	1.44	ug/L	I
Magnesium	31.9	mg/L	
Zinc	8.9	ug/L	I

Pesticides and Herbicides

None detected

Nutrients

Ammonia-N	0.054	mg N/L	
Nitrates and Nitrites	2.4	mg N/L	
Ortho-Phosphate	0.024	mg P/L	
Total Kjeldahl Nitrogen	2.5	mg N/L	
Total Phosphorous	0.031	mg P/L	I

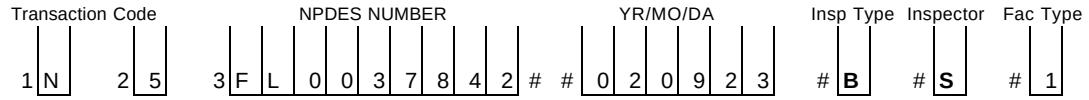
Base, Neutral, & Acid Extractable Organics

None detected.

[A] The reported value is an average of two or more values.
[I] The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
[J] The reported value is an estimated value.

The Bioassay of Piper's Landing Property Owners' Association effluent sampled on September 23, 2002, NPDES #FL0037842-001-IW5C.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, XSI-RI Optional)



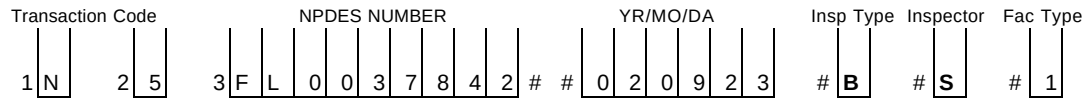
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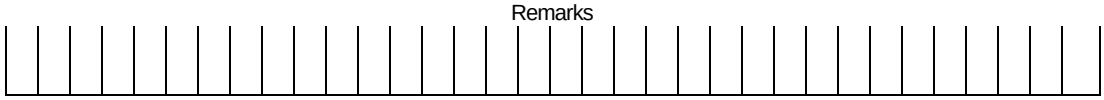
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The Priority Pollutants Analysis for Bioassay of Piper's Landing Property Owners' Association effluent sampled on September 23, 2002, NPDES #FL0037842-001-IW5C.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, XSI-RI Optional)



Remarks



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