

Bioassays of

Cape Coral Reverse Osmosis Plant

Cape Coral, Lee County, Florida

NPDES #FL0034932 & #FL0040088

Sampled 6/2/92

July 1992

Biology Section
Division of Technical Services

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Bureau of Laboratories
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Introduction

Cape Coral Reverse Osmosis Plant, Cape Coral, Lee County, Florida, NPDES #FL0034932 & FL0040088, tests performed on 3 to 5 June, 1992.

This facility produces potable water by the reverse osmosis process and is located at Southwest 20th Avenue. The effluent is brine reject water which is discharged to the Lake Finastere, a man-made saltwater lake, whose outlet canal is near the mouth of the Caloosahatchee River (personal communication Gary Millington, 6/30/92).

A reconnaissance inspection, performed by FDER South District staff in June, 1991, noted no significant deficiencies at the plant. A phone conversation with Gary Millington of the FDER South District on 6/16/92 revealed that the discharge from the facility was actually the combined effluent from two reverse osmosis operations located in the same building. The design flows of the separate discharges were 1.6 MGD (#FL0034932) and 1.2 MGD (#FL0040088). The average combined discharge volume was not known.

The toxicity tests discussed in this report were performed in accordance with methods described by Weber, 1991, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th Edition (EPA/600/4-90/027).

Results and Discussion

The FDER Biology Section performed two static acute toxic
bioassays on a sample of combined effluent from this facility.
organisms used were the mysid shrimp, *Mysidopsis bahia*, a
shiner, *Notropis leedsi*. The control water for both tests was a
of 6 ppt using an artificial sea salt mixture (Forty Fathoms®).
was also 6 ppt and was unaltered.

The test results indicated that the sample was toxic to *M. bahia*, producing a 24-hr $LC_{50} < 100\%$ since all the mysids died in the 100% test concentration within 24 hours. The results of the *N. leedsi* test did not indicate toxicity to the shiners.

Total residual chlorine and total ammonia were not detected in the sample. Additional chemical analyses performed on the sample detected copper (11 µg/L) and iron (292 µg/L). The surface water quality criterion for copper is ≤ 2.9 µg/L for Class III marine waters, while copper levels as low as 5.6 µg/L have been found to be acutely toxic to some saltwater organisms (EPA *Quality Criteria for Water, 1986*). Tentative identification was made of aliphatic compounds with an estimated concentration of 2 µg/L. Chlorinated pesticides were not detected.

Conclusion

The sample of combined effluent from this facility, which was collected on 2 June, 1992, was toxic to *Mysidopsis bahia*. The concentration of copper detected may have contributed to the toxicity indicated by *M. bahia*.

Table 1. Concentration Series and Volumes Used for the Static Acute Screening Bioassays of the Cape Coral R/O Plant, performed on 3 to 5 June, 1992.

Mysidopsis bahia (mysid shrimp)

Concentration	Dilution Water	Sample	Total Volume
Control	500 mL	0 mL	500 mL
100%	0 mL	500 mL	500 mL

Notropis leedsi (bannerfin shiner)

Concentration	Dilution Water	Sample	Total Volume
Control	500 mL	0 mL	500 mL
100%	0 mL	500 mL	500 mL

Table 2. Results of chemical analyses on the combined effluent from the Cape Coral R/O Plant, Lee County, sampled on 2 June, 1992.

Base Neutral and Acid Extractables

Tentative identification	*Estimated concentration*
Aliphatic compound	2 µg/L

Metals

Copper	11 µg/L
Iron	292 µg/L

Pesticides

none detected

Table 3. Data recorded during the static acute screening bioassay of a sample of effluent from the Cape Coral R/O Plant, Cape Coral, Lee County, Florida, NPDES# FL0034932 & FL0040088, on 3 to 5 June, 1992.

Facility:	**Cape Coral Reverse Osmosis Plant**	NPDES #	**FL0034932, FL0040088**	Facility Type:	**Reverse Osmosis**
Location:	SW 20th Avenue, Cape Coral	Contact/District:	G. Millington / South		Drinking Water Treatment
County:	Lee	Test type:	static screening		
Sample Collection Date:	6/2/92 Time: 1155	# tests:	1	Receiving Water:	Lake Finastere to
Test Beginning Date:	6/3/92 Time: 1400	Chlorination Type:	**not chlorinated**		Caloosahatchee River
Test Ending Date:	6/4/92 Time: 1400	Dechlor Method:	-		**Page 1 of 1**

Organism: ***Mysidopsis Bahia*** Age: 1-3 Days
LC50: <100% *Mysid test terminated at 24 hours due to 100% mortality in the 100% test concentration.*

	SURVIVAL			pH			Temperature			Dissolved Oxygen			Conductivity	
Concentrations	# at 0 hr	Live at 24 hr	Live at 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	5	5	-	8.6	7.8	-	23.8	23.3	-	7.6	7.7	-	-	-
Control	5	5	-	8.6	7.8	-	-	-	-	7.6	7.7	-	10,540	10,840
100%	5	0	-	7.0	7.9	-	23.9	23.3	-	7.9	7.5	-	-	-
100%	5	0	-	7.0	7.9	-	-	-	-	7.9	7.5	-	10,600	10,760

Organism: ***Notropis leedsi*** Age: 12 Days
LC50: -

	SURVIVAL			pH			Temperature			Dissolved Oxygen			Conductivity	
Concentrations	# at 0 hr	Live at 24 hr	Live at 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	5	5	5	8.6	8.0	7.7	23.7	23.3	23.5	7.3	7.9	7.9	-	-
Control	5	5	5	8.6	8.0	7.7	-	-	-	7.3	7.9	8.0	10,570	10,540
100%	5	5	5	7.0	7.9	8.3	23.9	23.3	23.5	7.8	7.7	7.9	-	-
100%	5	5	5	7.0	7.9	8.3	-	-	-	7.8	7.7	7.9	10,570	10,570

Total Residual Cl2	mg/l	Method
Field:		not measured
Lab:	0	Hach

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water: (fish & mysids)	0	0
100% Sample:	0	0

Salinity (ppt)	
Control Water: (fish & mysids)	6.1
100% Sample:	6.1

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water: (fish & mysids)	120	-
100% Sample:	325	-

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Cape Coral R/O Plant
Address/City:
County: LEE
Contact/District: Cary Millington / South
NPDES Permit #: FL0034932 + 40088 Outfall #: COMBINED

Sample Collection: Date 6/2/92 Time 1155
Test Beginning: Date 6/3/92 Time 1400
Test Ending: Date 6/5/92 Time 1400
Test Organism: N. Incerta
Life Stage/Age: 12 days

Test Number: 2 of 2 Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

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Remarks:
Control adjusted to ~6 ppt salinity with forty fathoms sea salts.
SALINITY OF SAMPLE NOT ALTERED

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7, 10@10	8.5@24	24.0@24.2	1380@23.8 o 1376
24 hr	7@7, 10@10	8.4@25°C	24.2@24.3	1376 @ 24.2
48 hr	7@7, 10@10	8.7@23°	23.1@23.2	1360 @ 23.6

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	30	5	5	5	8.6	8.0	7.7	23.7	23.3	23.5	7.3	7.9	7.9			
Control	10	5	5	5	8.6	8.0	7.7				23	7.9	8.0	10570	10340	10540
100%	53	5	5	5	7.0	7.9	8.3	23.9	23.3	23.5	7.8	7.7	7.9			
100%	38	5	5	5	7.0	7.9	8.3				7.8	7.7	7.9	10570	10390	10570
Measured/Loaded by:		MF	MF	KP	MF	MF	KP	MF	MF	KP	MF	MF	KP	MF	MF	KP
Recorded by:		MF	MF	KP	MF	MF	KP	MF	MF	KP	MF	MF	KP	MF	MF	KP

Investigators' Signatures
Marshall Faircloth
Kim Pearce

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:		120	325	Hach	DK
Hardness:					
Total Ammonia:		0.0	0.0	Hach	DK

Ammonia Meter Slope: _____
Ammonia Blank: 0.0
Salinity Sample: 6.1 ppt

DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: CAPE CORAL R/O REJECT
Address/City: _____
County: LEE
Contact/District: GARY MILLINGTON / SOUTH
NPDES Permit #: FL0034932+40088 Outfall #: COMBINED

Sample Collection: Date 6-2-92 Time 1155
Test Beginning: Date 6-3-92 Time 1400
Test Ending: Date 6-4-92 Time 1400
Test Organism: Mysidopsis bahia
Life Stage/Age: 2 days

Test Number: 1 of 2 Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

92 Jun-03-06 35196

Remarks: SALINITY OF SAMPLE NOT ALTERED, Control adjusted to ~6 ppT salinity with forty fathoms seasalts, TEST TERMINATED AT 24 HRS

Instrument Calibrations:

	pH	DO	Temp	Cond
0 hr	7@7; 10@10	8.5@24	24.0@24.2	1380@23.8
24 hr	7@7; 10@10	8.4@25°C	24.2@24.3	1374@24.2
48 hr	7@7; 10@10	8.7@23°	23.1@23.2	1360@23.6

Conc.	Chamber #	Number Live 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	DO (mg/L) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	8	5	5		8.6	7.8		23.8	23.3		7.6	7.7				
Control	61	5	5		8.6	7.8					7.6	7.7		10540	10840	
100%	74	5	0		7.0	7.9		23.9	23.3		7.9	7.5				
100%	57	5	0		7.0	7.9					7.9	7.5		10660	10760	
Measured/Loaded by:		MF	MF		MF	MF		MF	MF		MF	MF		MF	MF	
Recorded by:		MF	MF		MF	MF		MF	MF		MF	MF		MF	MF	

Investigators' Signatures

Kim Pearce
Marshall Faircloth

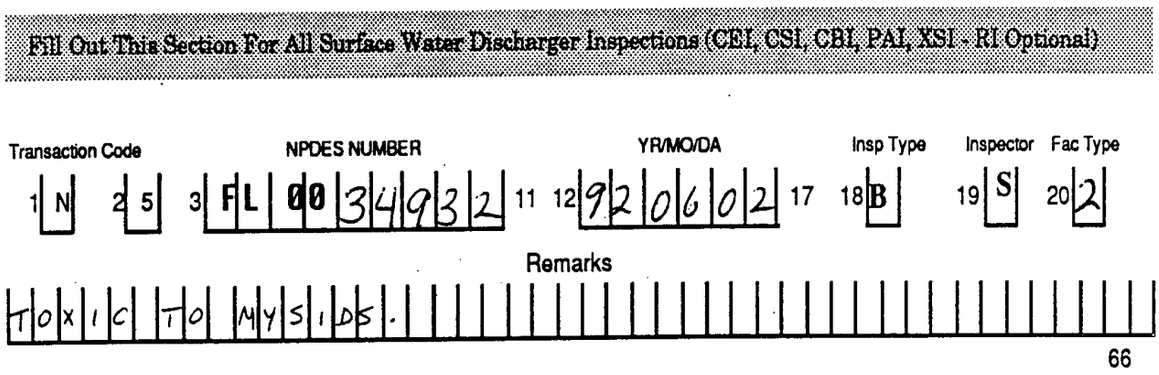
Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:		120	325	Hach	DK
Hardness:					
Total Ammonia:		0.0	0.0	Hach	DK

Ammonia Meter Slope: _____
Ammonia Blank: 0.0
Salinity Sample: 6.1 ppt

The Bioassay of the Cape Coral R/O Plant, NPDES# FL0034932, effluent sampled on June 2, 1992.



The Priority Pollutants Analysis for the Bioassay of the Cape Coral R/O Plant, NPDES# FL0034932, effluent sampled on June 2, 1992.

