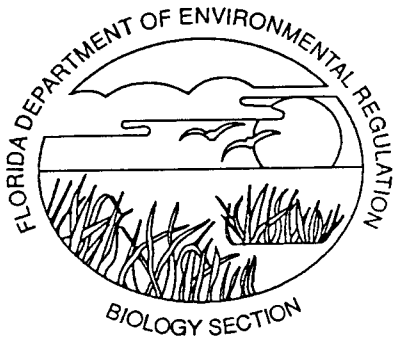


Bioassays of

Boca Raton Wastewater Treatment Plant

Boca Raton, Palm Beach County, Florida

NPDES #FL0026344

Sampled 12/19/88

August 7, 1989

Biology Section
Division of Administrative and Technical Services

Bioassays of

Boca Raton Wastewater Treatment Plant

Boca Raton, Palm Beach County, Florida

NPDES #FL0026344

Biology Section
Bureau of Laboratories
August 7, 1989

Introduction

Boca Raton Wastewater Treatment Plant, Boca Raton, Palm Beach County, Florida, NPDES #FL0026344, on 20 to 22 December, 1988.

The Boca Raton WWTP is located at 1501 West Glades Road, in Boca Raton, Palm Beach County, Florida. The facility serves a population of approximately 150,000. The recovered water is chlorinated and piped several miles to the Atlantic Ocean where it is discharged through a 30" pipe one mile from shore in approximately 100' of water. The facility uses an activated sludge process to treat domestic wastes and light industrial waste. The design flow is 10 MGD and the volume treated approaches this amount.

The toxicity tests discussed in this report were performed in accordance with methods described by Peltier and Weber, 1985, *Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms*, 3rd Edition and by the FDER Biology Section, 1985, *Quality Assurance Manual for Performing Acute Toxicity Tests* 2nd Edition.

Results and Discussion

The chlorinated sample of discharge from the Boca Raton WWTP was toxic to the bioassay test organism, *Ceriodaphnia dubia*, producing a LC_{50} of < 100% (Table 5). The chlorinated sample adversely affected the Microtox® assay organism, *Photobacterium phosphoreum*, producing an EC_{50} of 79% sample (Table 4). The chlorinated sample was not toxic to the bioassay test organisms, *Daphnia pulex* and *Notropis leedsi*. The dechlorinated sample of discharge was toxic to the bioassay test organism, *C. dubia*, producing a LC_{50} of 47%. The dechlorinated sample adversely affected the Microtox® assay organism, *P. phosphoreum*, producing a EC_{50} of 176%. The dechlorinated sample was not toxic to the bioassay test organisms *D. pulex* and *N. leedsi*.

Chemical analyses performed on the sample detected the pesticides, diazinon and g-BHC, and the metals, silver and zinc (Table 6). The total residual chlorine concentration was 0.3 mg/l (Hach) and the total ammonia concentration was 1.50 mg/l (Table 2).

The toxicity in the chlorinated sample was attributed in part to the total residual chlorine. The toxicity in the dechlorinated sample was attributed to the 1.16 µg/l diazinon concentration, as the diazinon LC_{50} is known to be as low as 0.35 µg/l for the test organism, *C. dubia*.

Conclusions

The chlorinated and dechlorinated samples of discharge from the Boca Raton WWTP were toxic on 19 December, 1988. The toxicity was primarily attributed to the pesticide, diazinon, and partly to the total residual chlorine found in the sample. This facility is in violation of State toxicity standards unless moderating factors (e.g., permit variance) apply.

Table 1. Concentration Series and Volumes Used for These Static Bioassays.

Ceriodaphnia dubia (water flea)

Control	15.0 ml	0.0 ml	15 ml
10.0%	13.5 ml	1.5 ml	15 ml
30.0%	10.5 ml	4.5 ml	15 ml
50.0%	7.5 ml	7.5 ml	15 ml
70.0%	4.5 ml	10.5 ml	15 ml
85.0%	2.25 ml	12.75 ml	15 ml
100.0%	0.0 ml	15.0 ml	15 ml

Daphnia pulex (water flea)

Concentration	Dilution Water	Sample	Total Volume
Control	15.0 ml	0.0ml	15 ml
100.0%	0.0 ml	15.0 ml	15 ml

Notropis leedsi (bannerfin shiner)

Concentration	Dilution Water	Sample	Total Volume
Control	500 ml	0 ml	500 ml
10.0%	450 ml	50 ml	500 ml
30.0%	350 ml	150 ml	500 ml
50.0%	250 ml	250 ml	500 ml
70.0%	150 ml	350 ml	500 ml
85.0%	75 ml	425 ml	500 ml
100.0%	0 ml	500 ml	500 ml

Table 2. Data recorded during the 48 hour static definitive bioassay of a dechlorinated sample of discharge from the Boca Raton Wastewater Treatment Plant, NPDES #FL0026344, Boca Raton, Palm Beach County, Florida, on 20 to 22 December, 1988.

Facility: **Boca Raton WWTP** NPDES # **FL0026344** Facility Type: **Sewage Treatment**
Location: 1501 Glades Road, Boca Raton Contact/District: P Strauss
County: Palm Beach Test type: definitive
Sample Collection Date: **12/19/88** Time: 1345 # tests: 6 Receiving Water: Atlantic Ocean
Test Beginning Date: 12/20/88 Time: 1130 Chlorination Type: **dechlorinated**
Test Ending Date: 12/22/88 Time: 1100 **Page 1 of 2**

Organism: ***Ceriodaphnia dubia*** Life stage: neonate
LC50: 46.96% Binomial: 46.9% Moving Average: - Probit: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			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	4	3	8.6	-	8.3	8.3	-	8.3	20.5	-	21.8	-	-
Control	5	5	5	8.7	-	8.4	8.3	-	8.4	-	-	-	-	-
Control	5	5	5	8.8	-	8.4	8.3	-	8.4	-	-	-	-	-
Control	5	5	5	8.8	-	8.4	8.3	-	8.4	-	-	-	215	230
10%	5	5	5	8.6	-	8.0	8.2	-	8.4	20.5	-	21.0	-	-
10%	5	5	5	8.6	-	8.1	8.2	-	8.3	-	-	-	-	-
10%	5	5	5	8.6	-	8.1	8.2	-	8.4	-	-	-	-	-
10%	5	5	5	8.7	-	8.1	8.2	-	8.4	-	-	-	230	250
30%	5	5	5	8.4	-	8.1	7.9	-	8.3	20.7	-	21.0	-	-
30%	5	5	5	8.5	-	8.1	7.9	-	8.3	-	-	-	-	-
30%	5	5	5	8.5	-	8.0	7.9	-	8.2	-	-	-	-	-
30%	5	5	5	8.6	-	8.1	7.9	-	8.2	-	-	-	300	310
50%	5	5	2	8.4	-	8.2	7.7	-	8.2	20.9	-	21.0	-	-
50%	5	5	2	8.3	-	8.1	7.7	-	8.2	-	-	-	-	-
50%	5	4	1	8.4	-	8.1	7.7	-	8.2	-	-	-	-	-
50%	5	5	3	8.4	-	8.0	7.7	-	8.2	-	-	-	360	360
70%	5	4	0	8.2	-	8.1	7.5	-	8.1	20.9	-	20.9	-	-
70%	5	2	0	8.2	-	8.1	7.5	-	8.1	-	-	-	-	-
70%	5	2	0	8.2	-	8.0	7.5	-	8.1	-	-	-	-	-
70%	5	3	0	8.4	-	8.0	7.6	-	8.1	-	-	-	420	410
85%	5	0	0	8.1	8.3	8.1	7.4	8.0	-	20.8	22.3	-	-	-
85%	5	0	0	8.1	8.4	-	7.4	8.0	-	-	-	-	-	-
85%	5	0	0	8.3	8.4	-	7.5	8.0	-	-	-	-	-	-
85%	5	0	0	8.4	8.5	-	7.5	8.0	-	-	-	-	465	485
100%	5	0	0	7.9	8.3	-	7.3	7.9	-	21.1	22.1	-	-	-
100%	5	0	0	7.9	8.3	-	7.3	7.9	-	-	-	-	-	-
100%	5	0	0	7.9	8.2	-	7.3	7.9	-	-	-	-	-	-
100%	5	0	0	8.0	8.3	-	7.3	7.9	-	-	-	-	515	530

Total Residual Cl2	mg/l	Method
Field:	0.3	Hach
Lab:	0.3	Hach
Lab:	0.4	Iodometric

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.00	0.00
100% Sample:	1.50	0.02

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	115	120
Cond. Control Water (daphnids):	125	125
100% Sample:	85	110

Salinity (ppt)	
Control Water:	0
100% Sample:	0

Table 2. Continued.

Facility: **Boca Raton WWTP** | NPDES # **FL0026344** | Facility Type: **Sewage Treatment**
Location: 1501 Glades Road, Boca Raton | Contact/District: P Strauss
County: Palm Beach | Test type: definitive
Sample Collection Date: **12/19/88** Time: 1345 | # tests: 6 | Receiving Water: Atlantic Ocean
Test Beginning Date: 12/20/88 Time: 1130 | Chlorination Type: **dechlorinated**
Test Ending Date: 12/22/88 Time: 1100 | **Page 2 of 2**

Total Residual Cl2	mg/l	Method
Field:	0.3	Hach
Lab:	0.3	Hach
Lab:	0.4	Iodometric

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.00	0.00
100% Sample:	1.50	0.02

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	115	120
Cond. Control Water (daphnids):	125	125
100% Sample:	85	110

Salinity (ppt)	
Control Water:	0
100% Sample:	0

Organism: ***Daphnia pulex*** Life stage: neonate
LC50: - Binomial: - Moving Average: - Probit: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			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	8.8	-	8.0	8.2	-	8.2	20.7	-	21.0	-	-
Control	5	5	5	8.7	-	8.0	8.2	-	8.3	-	-	-	-	-
Control	5	5	5	8.8	-	8.1	8.2	-	8.3	-	-	-	-	-
Control	5	5	5	8.9	-	8.3	8.2	-	8.3	-	-	-	215	205
100.0%	5	5	5	8.2	-	7.9	7.3	-	8.0	21.1	-	21.2	-	-
100.0%	5	5	5	8.2	-	7.9	7.3	-	8.0	-	-	-	-	-
100.0%	5	4	4	8.3	-	8.0	7.4	-	8.0	-	-	-	-	-
100.0%	5	5	5	8.3	-	8.1	7.4	-	8.0	-	-	-	510	445

Organism: ***Notropis leedsi*** Age: 18 days
LC50: - Binomial: - Moving Average: - Probit: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			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	8.4	8.5	8.0	7.7	8.0	7.9	21.7	21.2	20.1	-	-
Control	5	5	5	8.4	8.4	8.1	7.7	8.0	7.9	-	-	-	230	221
10%	5	5	5	8.3	8.2	8.2	7.6	7.9	7.8	21.6	20.9	19.9	-	-
10%	5	4	4	8.3	8.2	7.5	7.6	7.9	7.8	-	-	-	260	251
30%	5	5	5	8.2	7.7	7.6	7.5	7.8	7.7	21.8	20.8	19.7	-	-
30%	5	5	5	8.3	7.7	7.5	7.5	7.8	7.7	-	-	-	325	305
50%	5	5	5	7.7	7.2	7.4	7.3	7.6	7.6	22.2	20.8	19.7	-	-
50%	5	5	5	7.9	7.3	7.4	7.3	7.6	7.6	-	-	-	390	365
70%	5	5	5	7.3	6.8	7.4	7.2	7.5	7.5	22.7	20.9	19.6	-	-
70%	5	5	5	7.3	6.9	7.4	7.2	7.5	7.5	-	-	-	455	420
85%	5	5	5	6.9	6.6	6.8	7.1	7.4	7.4	23.0	20.8	19.6	-	-
85%	5	5	5	69.0	6.5	6.8	7.1	7.4	7.4	-	-	-	510	470
100%	5	5	5	6.5	6.4	6.7	7.0	7.3	7.3	23.2	20.7	19.5	-	-
100%	5	5	5	6.6	6.4	6.6	7.0	7.3	7.3	-	-	-	560	517

Table 3. Data recorded during the 48 hour static screening bioassay of a sample of chlorinated discharge from the Boca Raton Wastewater Treatment Plant, NPDES #FL0026344, Boca Raton, Palm Beach County, Florida, on 20 to 22 December, 1988.

Facility: **Boca Raton WWTP** | NPDES # **FL0026344** | Facility Type: **Sewage Treatment**
Location: 1501 Glades Road, Boca Raton | Contact/District: P Strauss
County: Palm Beach | Test type: Static Screen
Sample Collection Date: **12/19/88** Time: 1345 | # tests: 6 | Receiving Water: Atlantic Ocean
Test Beginning Date: 12/20/88 Time: 1130 | Chlorination Type: **Chlorinated**
Test Ending Date: 12/22/88 Time: 1100 | **Page 1 of 1**

Total Residual Cl2	mg/l	Method
Field:	0.3	Hach
Lab:	0.3	Hach
Lab:	0.4	Iodometric

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.00	0.00
100% Sample:	1.50	0.02

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	115	120
Cond. Control Water (daphnids):	125	125
100% Sample:	85	110

Salinity (ppt)	
Control Water:	0
100% Sample:	0

Organism: ***Ceriodaphnia dubia*** Life stage: neonate
LC50: <100%

	SURVIVAL			Dissolved Oxygen			pH			Temperature			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	-	8.7	8.3	-	8.2	8.2	-	20.9	21.8	-	-	-
Control	5	5	-	8.7	8.4	-	8.2	8.2	-	-	-	-	-	-
Control	5	5	-	8.7	8.4	-	8.2	8.2	-	-	-	-	-	-
Control	5	5	-	8.8	8.4	-	8.2	8.2	-	-	-	-	215	230
100%	5	0	-	7.7	8.1	-	7.1	7.9	-	21.2	21.8	-	-	-
100%	5	0	-	7.7	8.2	-	7.1	7.8	-	-	-	-	-	-
100%	5	0	-	7.7	8.2	-	7.1	7.8	-	-	-	-	-	-
100%	5	0	-	7.7	8.2	-	7.1	7.8	-	-	-	-	540	530

Organism: ***Daphnia pulex*** Life stage: neonate
LC50: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			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	8.7	-	7.8	8.2	-	8.2	21.2	-	21.0	-	-
Control	5	5	5	8.7	-	7.8	8.2	-	8.3	-	-	-	-	-
Control	5	5	5	8.7	-	8.1	8.2	-	8.3	-	-	-	-	-
Control	5	5	5	8.7	-	8.1	8.2	-	8.3	-	-	-	220	220
100%	5	5	5	7.7	-	7.9	7.1	-	7.9	21.1	-	21.1	-	-
100%	5	5	5	7.7	-	7.8	7.1	-	7.9	-	-	-	-	-
100%	5	5	4	7.7	-	7.9	7.1	-	7.9	-	-	-	-	-
100%	5	5	5	7.7	-	8.0	7.1	-	7.9	-	-	-	505	455

Organism: ***Notropis leedsi*** Age: 18 days
LC50: -

	SURVIVAL			Dissolved Oxygen			pH			Temperature			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	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Control	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100%	5	5	5	6.8	6.3	6.7	7.0	7.3	7.3	22.7	20.7	19.5	-	-
100%	5	5	4	6.8	6.5	6.5	7.0	7.3	7.3	-	-	-	540	505

* Control for chlorinated test same as dechlorinated N. leedsi control

Table 4. **Microtox test results, Boca Raton STP, Palm Beach County, NPDES #FL0026344, on 20 December, 1989.**

Microtox Test Culture Lot # M-606

% Sample	Final Reclaimed Water			
	Chlorinated		Dechlorinated	
	5-min	15-min	5-min	15-min
0	99	65	93	57
0	95	61	93	58
0	91	62	89	55
12.38	85	60	88	55
12.38	85	59	86	54
12.38	90	62	92	57
24.75	80	56	82	52
24.75	78	55	84	52
24.75	82	58	87	53
49.5	60	45	75	47
49.5	61	45	74	46
49.5	63	45	76	49
99	23	24	65	40
99	22	22	67	41
99	26	25	67	41

EC_{50} Chlorinated (15 minute, 15 °C) = 78.73% sample
EC_{50} Dechlorinated (15 minute, 15 °C) = 175.90% sample

EC_{50} (15 minute, 15 °C) is calculated using the Data Reduction Computer Program developed by Microbics Corporation for the Sharp Model EL-5100 (Microbics) Systems Operating Manual, 1982.

Table 5. LC_{50} Data for Bioassay of the Boca Raton sewage treatment plant, NPDES #FL0026344, Boca Raton, Palm Beach County, Florida.

Organism	Method of Data Analysis	48 Hour LC_{50} (95% Confidence Intervals)
Chlorinated discharge		
Ceriodaphnia dubia	noncalculated	<100% [a]
Daphnia pulex		not toxic
Notropis leedsi		not toxic
Dechlorinated discharge		
Ceriodaphnia dubia	Binomial	46.92% (30.00%,70.00%)
	Moving Average	[b]
	Probit	[b]
Daphnia pulex		not toxic
Notropis leedsi		not toxic

a The LC_{50} is < 100% since all the organisms died in the lowest test concentration (100%).

b Due to an insufficient number of dead organisms, or to the irregular distribution of mortality, an LC_{50} value cannot be calculated using this method of statistical analysis.

Table 6. Results of chemical analyses on the sample of discharge from the Boca Raton STP, Palm Beach County, Florida.

Organics

Acid Extractables	Several organic acids and other naturally occurring compounds
Base Neutral Extractables	None detected
Pesticide Extractables	g-BHC 0.01 µg/l
	Diazinon 1.16 µg/l
	Several unidentified components sensitive to ECD and NPD

Metals

Lead	*
Silver	1.0 µg/l
Zinc	22.0 µg/l

*The analysis for lead was invalidated due to blank contamination.

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: Boca Raton STP
Address/City: 1501 Glades Rd
County: Palm Bch
Contact/District: Paul Strauss
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 12-19-88 Time 0945
Test Beginning: Date 12-20-88 Time 1130
Test Ending: Date 12-22-88 Time 1100
Test Organism: Ceriodaphnia dubia
Life Stage/Age: neonate

Test Number: 1 of 6 Test Type: Screening | (Definitive)
(Static) | Static Renewal | Flow-through

Remarks: deCl2

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7@7.9@9	8.7@23.0°C	1333@1343 @22.6°	23.3° 23.5°C
24 hr	7@7.9@9	8.7@23°C	1342@1356	23.0° 21.5° 21.0°C
48 hr	7@7.9@9	8.8@22°C	1318@1321	21.8° 19.6° 19.6°C

Conc.	Chamber #	Number Live 0	24	48	DO (mg/l) 0	24	48	pH 0	24	48	Temp. (°C) 0	24	48	Cond. (µmhos/cm) 0	24	48
Control	1	5	4	3	8.6		8.3	8.3		8.3	20.5		21.8			
"	2	5	5	5	8.7		8.4	8.3		8.4						
"	3	5	5	5	8.8		8.4	8.3		8.4						
"	4	5	5	5	8.8		8.4	8.3		8.4			24hr	215		230
10%	5	5	5	5	8.6		8.0	8.2		8.4	20.5		21.0			
"	6	5	5	5	8.6		8.1	8.2		8.3						
"	7	5	5	5	8.6		8.1	8.2		8.4						
"	8	5	5	5	8.7		8.1	8.2		8.4				230		250
30%	9	5	5	5	8.4		8.1	7.9		8.3	20.7		21.0			
"	10	5	5	5	8.5		8.0	7.9		8.3						
"	11	5	5	5	8.5		8.1	7.9		8.2						
"	12	5	5	5	8.6		8.2	7.9		8.2				300		310
50%	13	5	5	2	8.4		8.1	7.7		8.2	20.9		21.0			
"	14	5	5	2	8.3		8.1	7.7		8.2						
"	15	5	4	1	8.4		8.0	7.7		8.2						
"	16	5	5	3	8.4		8.1	7.7		8.2				360		360
70%	17	5	4	0	8.2		8.1	7.5		8.1	20.9		20.9			
"	18	5	2	0	8.2		8.0	7.5		8.1						
"	19	5	2	0	8.2		8.0	7.5		8.1						
"	20	5	3	0	8.4		8.1	7.6		8.1				420		410
85%	21	5	0		8.1	8.3		7.4	8.0		20.8	22.3				
"	22	5	0		8.1	8.4		7.4	8.0							
"	23	5	0		8.3	8.4		7.5	8.0							
"	24	5	0		8.4	8.5		7.5	8.0					465	485	
100%	25	5	0		7.9	8.3		7.3	7.9		21.1	22.1				
"	26	5	0		7.9	8.3		7.3	7.9							
"	27	5	0		7.9	8.2		7.3	7.9							
"	28	5	0		8.0	8.3		7.3	7.9					515	530	
Measured by:			MF	RBF	SHW	JMF	RBF	SHW	JMF	RBF	SHW	JMF	RBF	SHW	JMF	RBF
Recorded by:		MF	MF	RBF	KML	SHW	MF	KML	SHW	MF	KML	SHW	MF	KML	SHW	MF

Investigators' Signatures

Russel Frydenborg
Al Lurding
Steven P Wolfe
Marshall Faircloth

Reviewer

Water-quality Parameters

see test #2 p/b

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			0.3	Hach	PS
Lab Tot. Resid. Cl2:			0.3	Hach	JMF
Alkalinity:	115	125 / 85	0.4	Indamthic	JMF Interference
Hardness:	120	125	110		
Total Ammonia:	0.0	0.0	1.50		JMF

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: Boca Raton STP
Address/City: _____
County: _____
Contact/District: _____
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 12-19-88 Time 0945
Test Beginning: Date 12-20-88 Time 1130
Test Ending: Date 12-22-88 Time 1100
Test Organism: Daphnia pulex
Life Stage/Age: neonate

Test Number: 2 of 6 Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Remarks: de Cl2

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

		Number Live			DO (mg/l)			pH			Temp. (°C)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
Control	29	5	5	5	8.8		8.0	8.2		8.2	20.7		21.0			
"	30	5	5	5	8.7		8.0	8.2		8.3						
"	31	5	5	5	8.8		8.1	8.2		8.3						
"	32	5	5	5	8.9		8.3	8.2		8.3				215		205
100%	33	5	5	5	8.2		7.9	7.3		8.0	21.1		21.2			
"	34	5	5	5	8.2		7.9	7.3		8.0						
"	35	5	~~5~~	4	8.3		8.0	7.4		8.0						
"	36	5	5	5	8.3		8.1	7.4		8.0				510		495
										KML						
Measured by:		MF	MF	RBF	SHW		RBF	SHW		~~RBF~~	SHW		RBF	SHW		RBF
Recorded by:		MF	MF	RBF	KML		MF	KML		MF	KML		MF	KML		MF

Investigators' Signatures

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			0.3		PS Thomas
Lab Tot. Resid. Cl2:			0.3/0.4	Hach/Colorimetric	JMF
Alkalinity:	115	125	85	Hach	JMF
Hardness:	120	125	110	Hach	JMF
Total Ammonia:	0.00	0.00	1.50	Orion 4 part Orion 90L	JMF

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: Boca Raton STP
Address/City: _____
County: _____
Contact/District: _____
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 12-19-88 Time 0945
Test Beginning: Date 12-20-88 Time 1130
Test Ending: Date 12-22-88 Time 1100
Test Organism: Notropis leedsi
Life Stage/Age: 18 days

Test Number: 3 of 6 Test Type: Screening (Definitive)
(Static) | Static Renewal | Flow-through

Remarks: deCl2

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

		Number Live			DO (mg/l)			pH			Temp. (°C)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
Control	27	5	5	5	8.4	8.5	8.0	7.7	8.0	7.9	21.7	21.2	20.1			
"	16	5	5	5	8.4	8.4	8.1	7.7	8.0	7.9				230		221
10%	271	5	5	5	8.3	8.2	8.2	7.6	7.9	7.8	21.6	20.9	19.9			
"	228	5	4	4	8.3	8.2	7.5	7.6	7.9	7.8				260		251
30%	58	5	5	5	8.2	7.7	7.6	7.5	7.8	7.7	21.8	20.8	19.7			
"	22	5	5	5	8.3	7.7	7.5	7.5	7.8	7.7				325		305
50%	68	5	5	5	7.7	7.2	7.4	7.3	7.6	7.6	22.2	20.8	19.7			
"	6	5	5	5	7.9	7.3	7.4	7.3	7.6	7.6				390		365
70%	234	5	5	5	7.3	6.8	7.4	7.2	7.5	7.5	22.7	20.9	19.6			
"	3	5	5	5	7.3	6.9	7.4	7.2	7.5	7.5				455		420
85%	38	5	5	5	6.9	6.6	6.8	7.1	7.4	7.4	23.0	20.8	19.6			
"	71	5	5	5	6.9	6.5	6.8	7.1	7.4	7.4				510		470
100%	17	5	5	5	6.5	6.4	6.7	7.0	7.3	7.3	23.2	20.7	19.5			
"	18	5	4 AF	5	6.6	6.4	6.6	7.0	7.3	7.3				560		517
Measured by:		MF	MF	MF	SHW	JMF	MF	SHW	JMF	KML	SHW	JMF	KML	SHW		MF
Recorded by:		MF	MF	MF	KML	SHW	MF	KML	SHW	MF	KML	SHW	MF	KML		MF

Investigators' Signatures

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:					
Hardness:					
Total Ammonia:					

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: Boca Raton STP
Address/City: _____
County: _____
Contact/District: _____
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 12-19-88 Time 0945
Test Beginning: Date 12-20-88 Time 1130
Test Ending: Date 12-22-88 Time 1100
Test Organism: C dubia
Life Stage/Age: neonate

Test Number: 4 of 6 Test Type: (Screening) Definitive
(Static) | Static Renewal | Flow-through

Remarks: Cl2

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

		Number Live			DO (mg/l)			pH			Temp. (°C)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
Control	37	5	5		8.7	8.3		8.2	8.2		20.9	21.8				
"	38	5	5		8.7	8.4		8.2	8.2							
"	39	5	5		8.7	8.4		8.2	8.2							
"	40	5	5		8.8	8.4		8.2	8.2					215	230	
100%	41	5	0		7.7	8.1		7.1	7.9		21.2	21.8				
"	42	5	0		7.7	8.2		7.1	7.8							
"	43	5	0		7.7	8.2		7.1	7.8					KML		
"	44	5	0		7.7	8.2		7.1	7.8					~~505~~ 540	530	
Measured by:			mn		SHW	JMF		SHW	JMF		SHW	JMF		SHW	JMF	
Recorded by:		mf	mf		KML	SHW		KML	SHW		KML	SHW		KML	SHW	

Investigators' Signatures

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:					
Hardness:					
Total Ammonia:					

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: Boca Raton STP
Address/City: _____
County: _____
Contact/District: _____
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 12-19-88 Time 0945
Test Beginning: Date 12-20-88 Time 1130
Test Ending: Date 12-22-88 Time 1100
Test Organism: D. pulex
Life Stage/Age: neonate

Test Number: 5 of 6 Test Type: ~~Screening~~ | Definitive
(Static) | Static Renewal | Flow-through

Remarks: Cl2

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

		Number Live			DO (mg/l)			pH			Temp. (°C)			Cond. (µmhos/cm)		
Conc.	Chamber #	0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
Control	45	5	5	5	8.7		7.8	8.2		8.2	21.2		21.0			
"	46	5	5	5	8.7		7.8	8.2		8.3						
"	47	5	5	5	8.7		8.1	8.2		8.3						
"	48	5	5	5	8.7		8.1	8.2		8.3				220		320
100%	49	5	5	5	7.7		7.9	7.1		7.9	21.1		21.1			
"	50	5	5	5	7.7		7.8	7.1		7.9						
"	51	5	5	4	7.7		7.9	7.1		7.9						
"	52	5	5	5	7.7		8.0	7.1		7.9				505		455
Measured by:		MF	MF	RBF	SHW		RBF	SHW		KHL	SHW	SHW	RBF	SHW		RBF
Recorded by:		MF	MF	RBF	KHL		MF	KHL		MF	KHL	KHL	MF	KHL		MF

Investigators' Signatures

Russel Frydenborg
K H Lording
Steven W Wolfe
Marshall Faircloth
_____
Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:					
Hardness:					
Total Ammonia:					

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: Boca Raton STP
Address/City: _____
County: _____
Contact/District: _____
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 12-1988 Time 0945
Test Beginning: Date 12-20-88 Time 1130
Test Ending: Date 12-22-88 Time 1100
Test Organism: N. leedsi
Life Stage/Age: 18 days

Test Number: 6 of 6 Test Type: (Screening) | Definitive
(Static) | Static Renewal | Flow-through

Remarks: d2

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr				
24 hr				
48 hr				

Conc.	Chamber #	Number Live			DO (mg/l)			pH			Temp. (°C)			Cond. (µmhos/cm)		
		0	24	48	0	24	48	0	24	48	0	24	48	0	24	48
~~Control~~																
100%	9	5	5	5	6.8	6.3	6.7	7.0	7.3	7.3	22.7	20.7	19.5			
100%	18	5	4	4	6.8	6.5	6.5	7.0	7.3	7.3				540		525
Measured by:		MF	MF	MF	SHW	JMF	RBF	SHW	JMF	KML	SHW	JMF		SHW		RBF
Recorded by:		MF	MF	MF	KML	SHW	MF	KML	SHW	MF	KML	SHW		KML		MF

Investigators' Signatures

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:					
Lab Tot. Resid. Cl2:					
Alkalinity:					
Hardness:					
Total Ammonia:					

MICROTOX™ Data Reduction Sheet

SOURCE: Boca Raton

GRAPH CALC EC 50 (15 MIN, 15 °C) = 78.73 (%SAMPLE) mg/L

SAMPLE DATA:

SAMPLE TYPE (EFFLUENT, LEACHATE, ETC.): effluent Cl2

DATE ASSAYED: 12-20-88 TIME: 9:00AM

VISUAL COLOR: none CORRECTION REQUIRED: YES (NO)

VISUAL TURBIDITY: none SEPARATION REQUIRED: YES (NO)

INITIAL pH: pH ADJUSTED TO: WITH:

OSMOTICALLY ADJUSTED WITH: MOAS (DRY NaCl) OTHER

PRIMARY DILUTION OF SAMPLE:

OPERATOR: [illegible] REAGENT VIAL LOT NO. M-606

REMARKS:

MICROTOX™ 99% TEST

SAMPLE CUVETTE	% SAMPLE	READINGS 5 MIN	READINGS 15 MIN	Γ5	Γ15	NOTES
A1	0	99	65	X	X	
B1		95	61			
C1		91	62			
A2	12.38	85	60	.096	.039	
B2		85	59			
C2		90	62			
A3	24.75	80	56	.188	.112	
B3		78	55			
C3		82	58			
A4	49.5	60	45	.549	.393	
B4		61	45			
C4		63	45			
A5	99	23	24	3.014	1.648	
B5		22	22			
C5		26	25			
EC_{50} (MIN, °C)				38.40	78.73	

REVIEWED BY: [signature]

DATE: 8/1/89

MICROTOX™ Data Reduction Sheet

SOURCE: Boca Raton

GRAPH CALC EC 50 (15 MIN, 15 °C) = 175.9 (%SAMPLE) mg/L

SAMPLE DATA:

SAMPLE TYPE (EFFLUENT, LEACHATE, ETC.): de Cl_2 effluent

DATE ASSAYED: TIME:

VISUAL COLOR: CORRECTION REQUIRED: YES NO

VISUAL TURBIDITY: SEPARATION REQUIRED: YES NO

INITIAL pH: pH ADJUSTED TO: WITH:

OSMOTICALLY ADJUSTED WITH: MOAS DRY NaCl OTHER

PRIMARY DILUTION OF SAMPLE:

OPERATOR: LAW REAGENT VIAL LOT NO. M-

REMARKS:

MICROTOX™ 99% TEST

SAMPLE CUVETTE	% SAMPLE	READINGS 5 MIN	READINGS 15 MIN	Γ5	Γ15	NOTES
A1	0	93	57	X	X	
B1		93	58			
C1		89	55			
A2	12.38	88	55	.034	.024	
B2		86	54			
C2		92	57			
A3	24.75	82	52	.087	.083	
B3		84	52			
C3		87	53			
A4	49.5	75	47	.222	.197	
B4		74	46			
C4		76	49			
A5	99	65	40	.382	.393	
B5		67	41			
C5		67	41			
EC_{50} (MIN, °C)				197.2	175.9	

REVIEWED BY:
DATE: 5/17/99

Facility: **Boca Raton WWTP** | NPDES # **FL0026344** | Facility Type: **Sewage Treatment**

Location: 1501 Glades Road, Boca Raton | Contact/District: P Strauss

County: Palm Beach | Test type: definitive

Sample Collection Date: **12/19/88** Time: 1345 | # tests: 6 | Receiving Water: Atlantic Ocean

Test Beginning Date: 12/20/88 Time: 1130 | Chlorination Type: **dechlorinated**

Test Ending Date: 12/22/88 Time: 1100

Organism: ***Ceriodaphnia dubia*** Life stage: neonate

LC50: 46.96% Binomial: 46.9% Moving Average: - Probit: -

SURVIVAL				Dissolved Oxygen			pH			Temperature			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	4	3	8.6	-	8.3	8.3	-	8.3	20.5	-	21.8	-	-
Control	5	5	5	8.7	-	8.4	8.3	-	8.4	-	-	-	-	-
Control	5	5	5	8.8	-	8.4	8.3	-	8.4	-	-	-	-	-
Control	5	5	5	8.8	-	8.4	8.3	-	8.4	-	-	-	215	230
10%	5	5	5	8.6	-	8.0	8.2	-	8.4	20.5	-	21.0	-	-
10%	5	5	5	8.6	-	8.1	8.2	-	8.3	-	-	-	-	-
10%	5	5	5	8.6	-	8.1	8.2	-	8.4	-	-	-	-	-
10%	5	5	5	8.7	-	8.1	8.2	-	8.4	-	-	-	230	250
30%	5	5	5	8.4	-	8.1	7.9	-	8.3	20.7	-	21.0	-	-
30%	5	5	5	8.5	-	8.1	7.9	-	8.3	-	-	-	-	-
30%	5	5	5	8.5	-	8.0	7.9	-	8.2	-	-	-	-	-
30%	5	5	5	8.6	-	8.1	7.9	-	8.2	-	-	-	300	310
50%	5	5	2	8.4	-	8.2	7.7	-	8.2	20.9	-	21.0	-	-
50%	5	5	2	8.3	-	8.1	7.7	-	8.2	-	-	-	-	-
50%	5	4	1	8.4	-	8.1	7.7	-	8.2	-	-	-	-	-
50%	5	5	3	8.4	-	8.0	7.7	-	8.2	-	-	-	360	360
70%	5	4	0	8.2	-	8.1	7.5	-	8.1	20.9	-	20.9	-	-
70%	5	2	0	8.2	-	8.1	7.5	-	8.1	-	-	-	-	-
70%	5	2	0	8.2	-	8.0	7.5	-	8.1	-	-	-	-	-
70%	5	3	0	8.4	-	8.0	7.6	-	8.1	-	-	-	420	410
85%	5	0	0	8.1	8.3	8.1	7.4	8.0	-	20.8	22.3	-	-	-
85%	5	0	0	8.1	8.4	-	7.4	8.0	-	-	-	-	-	-
85%	5	0	0	8.3	8.4	-	7.5	8.0	-	-	-	-	-	-
85%	5	0	0	8.4	8.5	-	7.5	8.0	-	-	-	-	465	485
100%	5	0	0	7.9	8.3	-	7.3	7.9	-	21.1	22.1	-	-	-
100%	5	0	0	7.9	8.3	-	7.3	7.9	-	-	-	-	-	-
100%	5	0	0	7.9	8.2	-	7.3	7.9	-	-	-	-	-	-
100%	5	0	0	8.0	8.3	-	7.3	7.9	-	-	-	-	515	530

Total Residual Cl2	mg/l	Method
Field:	0.3	Hach
Lab:	0.3	Hach
Lab:	0.4	Iodometric

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.00	0.00
100% Sample:	1.50	0.02

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	115	120
Cond. Control Water (daphnids):	125	125
100% Sample:	85	110

Salinity (ppt)	
Control Water:	0
100% Sample:	0