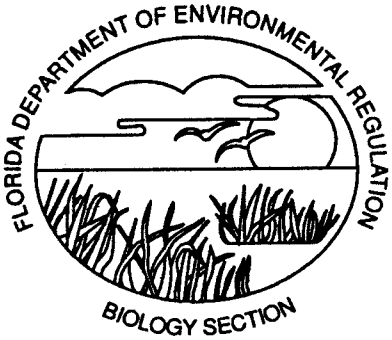


Bioassays of

Cape Canaveral Sewage Treatment Plant

Cape Canaveral, Brevard County, Florida

NPDES #FL0020541

Sampled 8/21/89

October 26, 1989

Biology Section
Division of Administrative and Technical Services

Bioassays of

Cape Canaveral Sewage Treatment Plant

Cape Canaveral, Brevard County, Florida

NPDES #FL0020541

Biology Section
Bureau of Laboratories
October 26, 1989

Introduction

City of Cape Canaveral STP, Cape Canaveral, Brevard County, Florida, NPDES #FL0020541, on 22 to 24 August, 1989.

This facility is located south of Central Boulevard and west of State Road A1A in Cape Canaveral. The plant is a 1.8 MGD design capacity advanced waste treatment facility. The average flow from the plant is 0.9 MGD. Preliminary treatment consists of comminution (or screening) and grit removal. Principal treatment is accomplished in an oxic/anoxic reactor (for BOD reduction, nitrification, and partial denitrification) followed by settling tanks, chlorine disinfection, and addition of sulfur dioxide for elimination of residual chlorine prior to discharge. Phosphorus reduction is accomplished by alum addition prior to settling. Sludge processing consists of aerobic digestion, gravity thickening, and sand bed drying. Final sludge disposal is by distribution to local citizens for soil conditioning purposes (NPDES files). Discharge of reclaimed water is to the Banana River.

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 sample of plant dechlorinated discharge from this facility was not toxic to the bioassay test organisms, the water flea, *Daphnia pulex,* and the fish, *Notropis leedsi*. The sample was toxic to the bioassay test organism, the water flea, *Ceriodaphnia dubia*, producing five deaths in the 100% test. An LC_{50} could not be calculated on this sample.

No total residual chlorine was detected in the sample. The total ammonia concentration was 0.073 mg/l. The calculated unionized ammonia concentration was 0.00 mg/l. Technically the *C. dubia* test was invalided due to control mortality, however, the cause of the control mortality (pH probe contamination) was known and thus the test result in and of itself is valid but should only be used for informational and not enforcement purposes.

Conclusion

The sample of dechlorinated discharge from this facility exhibited toxicity to the bioassay test organism, *C. dubia*. The Biology Section recommends additional testing of the discharge from this facility.

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

Ceriodaphnia dubia (water flea)

Concentration	Dilution Water	Sample	Total Volume
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 sample of dechlorinated discharge from the City of Cape Canaveral Sewage Treatment Plant, Cape Canaveral, Brevard County, Florida, NPDES #FL00020541, on 22 to 24 August, 1989.

Facility:	City of Cape Canaveral STP	NPDES #	FL0020541	Facility Type:	Sewage Treatment
Location:	S. of Central Blvd. / W. of SR A1A Cape Canaveral	Contact/District:	L. LEY / C		
County:	Brevard	Test type:	static definitive		
Sample Collection Date:	8/21/89 Time: 1300	# tests:	3	Receiving Water:	Banana River
Test Beginning Date:	8/22/89 Time: 1130	Chlorination Type:	dechlorinated		
Test Ending Date:	8/24/89 Time: 1130	Dechlor Method:	Plant dechlorination unit	Page 1 of 2	

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

Concentrations	SURVIVAL # at 0 hr	Live at 24 hr	Live at 48 hr	Dissolved Oxygen 0 hour	24 hour	48 hour	pH 0 hour	24 hour	48 hour	Temperature 0 hour	24 hour	48 hour	Conductivity 0 hour	48 hour
Control	5	0*	0*	8.4	-	8.5	8.4	-	8.4	21.7	-	21.9	-	-
Control	5	4	4	8.5	-	8.6	8.4	-	8.4	-	-	-	-	-
Control	5	5	5	8.4	-	8.6	8.4	-	8.4	-	-	-	-	-
Control	5	5	5	8.5	-	8.6	8.4	-	8.4	-	-	-	220	245
10%	5	5	5	8.3	-	8.6	8.3	-	8.4	21.8	-	21.8	-	-
10%	5	5	5	8.3	-	8.6	8.3	-	8.4	-	-	-	-	-
10%	5	5	5	8.3	-	8.6	8.3	-	8.4	-	-	-	-	-
10%	5	5	4	8.4	-	8.6	8.3	-	8.4	-	-	-	305	310
30%	5	5	5	8.2	-	8.5	8.1	-	8.4	21.9	-	21.8	-	-
30%	5	5	5	8.3	-	8.5	8.1	-	8.4	-	-	-	-	-
30%	5	5	5	8.3	-	8.6	8.1	-	8.4	-	-	-	-	-
30%	5	5	5	8.3	-	8.6	8.1	-	8.4	-	-	-	470	490
50%	5	5	5	8.2	-	8.5	7.9	-	8.3	22.0	-	21.8	-	-
50%	5	5	5	8.2	-	8.5	7.9	-	8.3	-	-	-	-	-
50%	5	5	5	8.3	-	8.3	7.9	-	8.3	-	-	-	-	-
50%	5	5	5	8.3	-	8.5	7.9	-	8.3	-	-	-	640	665
70%	5	5	5	8.2	-	8.4	7.7	-	8.3	22.0	-	21.8	-	-
70%	5	4	4	8.2	-	8.4	7.7	-	8.3	-	-	-	-	-
70%	5	5	5	8.2	-	8.5	7.7	-	8.3	-	-	-	-	-
70%	5	5	5	8.2	-	8.5	7.7	-	8.3	-	-	-	810	850
85%	5	4	3	8.2	-	8.4	7.5	-	8.2	22.0	-	21.8	-	-
85%	5	6	6	8.2	-	8.4	7.5	-	8.2	-	-	-	-	-
85%	5	5	5	8.2	-	8.4	7.5	-	8.2	-	-	-	-	-
85%	5	5	4	8.2	-	8.4	7.5	-	8.2	-	-	-	935	990
100%	5	4	3	8.1	-	8.4	7.3	-	8.2	21.8	-	21.9	-	-
100%	5	4	4	8.2	-	8.4	7.3	-	8.2	-	-	-	-	-
100%	5	5	4	8.2	-	8.4	7.3	-	8.2	-	-	-	-	-
100%	5	5	4	8.2	-	8.4	7.3	-	8.2	-	-	-	1060	1120

*lab accident, ph probe contamination

Total Residual Cl2	mg/l	Method
Field:	-	-
Lab:	0.0	Hach
Lab:	-	-

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.00	0.00
100% Sample:	0.073	0.00

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	123	118
Cond. Control Water (daphnids):	125	114
100% Sample:	62	195

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

Table 2. Continued.

Facility:	City of Cape Canaveral STP		NPDES #	FL0020541	Facility Type: Sewage Treatment
Location:	S. of Central Blvd. / W. of SR A1A, Cape Canaveral		Contact/District:	L. LEY / C	
County:	Brevard		Test type:	static definitive	
Sample Collection Date:	8/21/89	Time: 1300	# tests:	3	Receiving Water: Banana River
Test Beginning Date:	8/22/89	Time: 1130	Chlorination Type:	dechlorinated	
Test Ending Date:	8/24/89	Time: 1130	Dechlor Method:	Plant dechlorination unit	Page 2 of 2

Total Residual Cl2	mg/l	Method
Field:	-	-
Lab:	0.0	Hach
Lab:	-	-

Ammonia	Total (mg/l)	Unionized (mg/l)
Control Water (fish):	0.00	0.00
Cond. Control Water (daphnids):	0.00	0.00
100% Sample:	0.07	0.00

Alk & Hardness	Alkalinity (mg/l)	Hardness (mg/l)
Control Water (fish):	123	118
Cond. Control Water (daphnids):	125	114
100% Sample:	62	195

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	8.1	-	8.3	8.3	-	8.4	21.6	-	21.9	-	-
Control	5	5	5	8.1	-	8.3	8.3	-	8.4	-	-	-	-	-
Control	5	5	5	8.1	-	8.3	8.3	-	8.4	-	-	-	-	-
Control	5	5	5	8.1	-	8.3	8.3	-	8.4	-	-	-	220	240
100.0%	5	5	5	8.1	-	8.3	7.3	-	8.1	21.3	-	21.6	-	-
100.0%	5	5	5	8.1	-	8.3	7.3	-	8.1	-	-	-	-	-
100.0%	5	5	5	8.1	-	8.3	7.3	-	8.1	-	-	-	-	-
100.0%	5	5	5	8.1	-	8.3	7.3	-	8.1	-	-	-	1050	1128

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	8.0	9.0	8.0	7.8	8.1	8.2	22.8	20.5	20.8	-	-
Control	5	5	5	8.0	9.0	8.0	7.8	8.1	8.2	-	-	-	235	230
10%	5	5	5	8.0	8.9	8.0	7.7	8.0	8.2	22.8	20.3	20.7	-	-
10%	5	5	5	8.0	8.9	8.0	7.7	8.0	8.2	-	-	-	320	310
30%	5	5	5	7.9	8.8	7.9	7.6	8.0	8.1	22.5	20.2	20.6	-	-
30%	5	5	5	8.0	8.8	7.9	7.6	7.9	8.1	-	-	-	500	485
50%	6	6	6	8.0	8.7	7.8	7.5	7.8	8.0	55.0	20.2	20.6	-	-
50%	5	5	5	8.0	8.6	7.8	7.5	7.8	8.0	-	-	-	670	660
70%	5	5	5	7.9	8.5	7.8	7.4	7.8	7.9	21.7	20.2	20.5	-	-
70%	5	5	5	7.9	8.6	7.9	7.4	7.8	7.9	-	-	-	840	830
85%	5	5	5	7.9	8.5	7.8	7.2	7.7	7.9	21.6	20.2	20.6	-	-
85%	5	5	5	7.9	8.5	7.8	7.2	7.7	7.9	-	-	-	955	950
100%	5	5	5	7.7	8.3	7.9	7.1	7.6	7.8	21.4	20.3	20.5	-	-
100%	5	5	5	7.8	8.3	7.9	7.1	7.6	7.8	-	-	-	1075	1075

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: City of Cape Canaveral STP
Address/City: Cape Canaveral, Fl,
County: Brevard
Contact/District: Lewis Ley / Central
NPDES Permit #: FL0020541 Outfall #: 001

Sample Collection: Date 8-21-89 Time 1300
Test Beginning: Date 8-22-89 Time 1130
Test Ending: Date 8-24-89 Time 1130
Test Organism: Ceriodaphnia Dubia
Life Stage/Age: Neonate

Test Number: 1 of 3 Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

Remarks: through O2 membrane after boil at plant

Instrument Calibrations:

	pH	DO	Cond	Temp
0 hr	7.0 7.09	8.2@23°C	1320 1362	23.0@23.1
24 hr	7.0 7.09	8.8@22°C	1358@	22.0@22.1
48 hr	7.0 7.09	8.5@22.0°	1359@23.1@89	22.3@22.3

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	0	-	8.4		8.5	8.4		8.4	21.7		21.8			
Control	2	5	4	4	8.5		8.6	8.4		8.4						
Control	3	5	5	5	8.4		8.6	8.4		8.4						
Control	4	5	5	5	8.5		8.6	8.4		8.4				220		245
10%	5	5	5	5	8.3		8.6	8.3		8.4	21.8		21.8			
10%	6	5	5	5	8.3		8.6	8.3		8.4						
10%	7	5	5	5	8.3		8.6	8.3		8.4						
10%	8	5	5	4	8.4		8.6	8.3		8.4						
30%	9	5	5	5	8.2		8.5	8.1		8.4	21.9		21.8	305		310
30%	10	5	5	5	8.3		8.5	8.1		8.4						
30%	11	5	5	5	8.3		8.6	8.1		8.4						
30%	12	5	5	5	8.3		8.6	8.1		8.4						
50%	13	5	5	5	8.2		8.5	7.9		8.3	22.0		21.8	470		490
50%	14	5	5	5	8.2		8.5	7.9		8.3						
50%	15	5	5	5	8.3		8.5	7.9		8.3						
50%	16	5	5	5	8.3		8.5	7.9		8.3						
70%	17	5	5	5	8.2		8.4	7.7		8.3	22.0		21.8	640		665
70%	18	5	4	4	8.2		8.4	7.7		8.3						
70%	19	5	5	5	8.2		8.5	7.7		8.3						
70%	20	5	5	5	8.2		8.5	7.7		8.3						
85%	21	5	4	3	8.2		8.4	7.5		8.2	22.0		21.8	810		850
85%	22	5	6	6	8.2		8.4	7.5		8.2						
85%	23	5	5	5	8.2		8.4	7.5		8.2						
85%	24	5	5	4	8.2		8.4	7.5		8.2						
100%	25	5	4	3	8.1		8.4	7.3		8.2	21.8		21.9	935		990
100%	26	5	4	4	8.2		8.4	7.3		8.2						
100%	27	5	5	4	8.2		8.4	7.3		8.2						
100%	28	5	5	4	8.2		8.4	7.3		8.2						
Measured by:		mf	mf	MW	SHW		MW	SHW		SHW	SHW		MW	1040		1120
Recorded by:		MW	mf	MW	mf		MW	mf		mf	mf		MW	mf		

Investigators' Signatures

Marshall Faircloth

Arthur Lucyk

Reviewer

Water-quality Parameters

	Well Water	Cond. Water	Sample	Method	Measured by
Field Tot. Resid. Cl2:			—	—	—
Lab Tot. Resid. Cl2:			0	Hach	mf *
Alkalinity:	123	135	62	titration	MW
Hardness:	118	114	195	Hach	MW
Total Ammonia:	0.0	0.0	0.073	ion probe	MW

* sample taken after dechlorination

DER Biology Section — Acute-bioassay Bench Sheet

Sample Source: City of Cape Coral STP
Address/City: _____
County: _____
Contact/District: _____
NPDES Permit #: _____ Outfall #: _____

Sample Collection: Date 8-21-89 Time 1300
Test Beginning: Date 8-22-89 Time 1130
Test Ending: Date 8-24-89 Time 1130
Test Organism: Daphnia pulex
Life Stage/Age: neonate

Test Number: 2 of 3 Test Type: Screening | Definitive
Static | Static Renewal | Flow-through

Remarks: del @ plant

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	8.1		8.3	8.3	8.1	8.4	21.6		21.9			
Control	30	5	5	5	8.1		8.3	8.3	8.1	8.4						
Control	31	5	5	5	8.1		8.3	8.3	8.	8.4						
Control	32	5	5	5	8.1		8.3	8.3		8.4				220		240
100	33	5	5	5	8.1		8.3	7.3		8.1	21.3		21.6			
100	34	5	5	5	8.1		8.3	7.3		8.1						
100	35	5	5	5	8.1		8.3	7.3		8.1						
100	36	5	5	5	8.1		8.3	7.3		8.1				1050		1125
Measured by:		MF	MF	HW	SHW		HW	SHW	MF	SHW	SHW		HW	SHW		
Recorded by:		GM	MF	HW	MF		HW	MF	HW	MF	MF		HW	MF		

Investigators' Signatures

Marshall Faircloth

Reviewer

Water-quality Paramoters

	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: Cape Coral STP (City of) Sample Collection: Date 8-21-89 Time 1300
Address/City: _____ Test Beginning: Date 8-22-89 Time 1130
County: _____ Test Ending: Date 8-24-89 Time 1130
Contact/District: _____ Test Organism: Artemia Nauplii
NPDES Permit #: FL0020541 Outfall #: 001 Life Stage/Age: 18 hrs

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

Remarks: Peddler at plant

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	68	5	5	5	8.0	9.0	8.0	7.8	8.1	8.2	22.4	20.5	20.5			
Control	174	5	5	5	8.0	9.0	8.0	7.8	8.1	8.2		dw		235		230
10%	87	5	5	5	8.0	8.9	8.0	7.7	8.0	8.2	22.8	20.3	20.7			
10%	19	5	5	5	8.0	8.9	8.0	7.7	8.0	8.2		dw		320		310
30%	76	5	5	5	7.9	8.8	7.9	7.6	7.9	8.1	22.5	20.2	20.6			
30%	66	5	5	5	8.0	8.8	7.9	7.6	7.9	8.1				500		485
50%	160	6	6	6	8.0	8.7	7.8	7.5	7.8	8.0	22.0	20.2	20.6			
50%	2	5	5	5	8.0	8.6	7.8	7.5	7.9	8.0				670		660
70%	18	5	5	5	7.9	8.5	7.8	7.4	7.8	7.9	21.7	20.2	20.5			
70%	3	5	5	5	7.9	8.6	7.9	7.4	7.8	7.9				840		830
85%	164	5	5	5	7.9	8.5	7.8	7.2	7.7	7.9	21.6	20.2	20.6			
85%	43	5	5	5	7.9	8.5	7.8	7.2	7.7	7.9				955		950
100%	186	5	5	5	7.7	8.3	7.9	7.1	7.6	7.8	21.4	20.3	20.5			
100%	16	5	5	5	7.8	8.3	7.9	7.1	7.6	7.8				1015		1075
Measured by:		MF	MF	AHW	SHW	JMF	AHW	SHW	JMF	SHW	SHW	JMF	AHW	SHW		AHW
Recorded by:		MF	MF	AHW	MF	AHW	AHW	MF	AHW	MF	MF	AHW	AHW	MF		AHW

Investigators' Signatures

Marshall Faircloth

Steven H Walker

Reviewer

Water-quality Parameters

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