

Bioassays of

Morton Plant Health System

Clearwater, Pinellas County, Florida

NPDES #FL0168831

Sampled 8/15/00

December 2000

Biology Section

Division of Resource Assessment & Management

Comprehensive Quality Assurance Plan #870346G

Bioassays of

Morton Plant Health System

Clearwater, Pinellas County, Florida

NPDES #FL0168831

Biology Section
Bureau of Laboratories
December 2000

Introduction

Morton Plant Health System, South Fort Harrison Ave. & Pinellas, Clearwater, Pinellas County, Florida, NPDES #FL0168831, tests performed on 16 to 18 August 2000.

This health care facility, serving Pinella County and surrounding counties, has an average flow of 12,321 GPD. Wastewater consists of non-contact cooling tower blow-down water from ten cooling towers. Wastewater treatment includes the addition of sulfuric acid for pH adjustment: the addition of chlorine and bromine for disinfection, and the addition of a scale inhibitor to minimize mineral deposits in the cooling system. The treated wastewater is discharged via Outfall 001 to a storm sewer to Clearwater Harbor, a marine Outstanding Florida Water (OFW). The facility has had permit violations for dissolved oxygen, pH, oil and grease, bromine, chlorine, and toxicity requirements within the past year. A warning notice has been drafted for this facility addressing the permit violations and is now being processed (facility summary provided by Eddie Hughes, FDEP, Tampa).

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 the Morton Plant Health System. Two additional bioassays were performed on a dechlorinated aliquot of sample. The aliquot was dechlorinated by the addition of 0.68 mL of 0.025N sodium thiosulfate per liter of sample. The same ratio of sodium thiosulfate was added to the controls for the dechlorinated tests. The test species used for these bioassays were the water flea, *Ceriodaphnia dubia*, and the bannerfin shiner, *Cyprinella leedsi*. The test results indicated that the 100% sample was not toxic to the *C. leedsi*, but showed acute toxicity to the *C. dubia*, producing 40% mortality at 48 hours. The dechlorinated sample tests did not show toxicity to either test species at 48 hours (Table 1)

The total residual chlorine concentration of the sample collected from the NPDES outfall 001 was 0.69 mg/L in the field and 0.62 mg/L in the laboratory. An additional chlorine and bromine measurement was made in the field at the harbor discharge site. The chlorine (0.06 mg/L) and bromine (0.34 mg/L) concentrations in the effluent at the harbor discharge site both exceeded their respective permit limitations of 0.01 mg/L and 0.1 mg/L. Total ammonia was not detected in the sample. Further chemical analyses were performed on the sample and several metals and chloride were identified in the sample. Outstanding Florida Waters are highly protected, allowing no discharge into the waters that would cause degradation of water quality with few exceptions referenced in Chapter 62-302.700 (Table 2). Total residual chlorine levels as low as 0.028 mg/L have been found to be acutely toxic to some freshwater fish and invertebrates (EPA *Quality Criteria for Water* 1986, EPA 44015-86-001, 1986). The acute toxicity of the *C. dubia* might be attributable to the chlorine in the sample since a lack in mortality was observed in the dechlorinated sample. However, the dechlorination process used in the lab can also remove other toxins, and the pattern of toxicity in the tests suggests that other causes of the observed toxicity are possible.

Conclusion

The sample of effluent collected from this facility on August 15, 2000, did not show toxicity to *C. leedsi*, but showed acute toxicity to *C. dubia*. The toxicity to *C. dubia* may be attributed to the chlorine in the sample, but other toxins may be responsible for the toxicity.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Morton Plant Health System,South Fort Harrison Ave. & Pinellas, Clearwater, Pinellas County, Florida, NPDES# FL0168831, performed on 16 to 18 August 2000.

Facility:	**Morton Plant Health System**			**NPDES #**	**FL0168831**	Facility Type:	**Wastewater**
Location:	South Fort Harrison Ave. & Pinellas			Contact/District:	Herron/Kovach/SW-District		**Treatment Facility**
County:	Pinellas			Test type:	static acute screen		
Sample Collection Date:	8/15/00	Time:	0740	# tests:	2	Receiving Water:	Clearwater Harbor
Test Beginning Date:	8/16/00	Time:	1345	Chlorination Type:	Chlorinated		
Test Ending Date:	8/18/00	Time:	1330				**Page 1 of 2**

Total Residual CL2	mg/L	Method
Field:	0.69	DR-700
Lab:	0.62	DR-100

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

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	138	141
20% Dilute Mineral Water (cladocerans):	74	90
100% Sample:	88	692

Salinity[C]	(ppt)
Control Water:	<1
100% Sample:	<1

[C] Salinity based on conductivity and temperature measurements.

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	7.6	-	8.2	24.6	-	24.2	7.7	-	7.9	180	210
Control B	0/20	5	5	5	-	-	8.3	-	-	24.0	-	-	7.9	-	190
Control C	0/20	5	5	5	-	-	8.3	-	-	24.0	-	-	7.9	-	190
Control D	0/20	5	5	5	-	-	8.3	-	-	24.1	-	-	7.9	-	200
100% A	20/0	5	5	3	7.9	-	8.2	24.4	-	24.2	8.1	-	7.4	1470	1725
100% B	20/0	5	5	2	-	-	8.2	-	-	24.2	-	-	7.3	-	1795
100% C	20/0	5	5	4	-	-	8.2	-	-	24.0	-	-	7.5	-	1840
100% D	20/0	5	5	3	-	-	8.2	-	-	24.1	-	-	7.2	-	1950
Dechlorinated 100% A	20/0	5	5	5	8.1	-	8.3	24.5	-	24.4	8.2	-	7.7	1590	1730
Dechlorinated 100% B	20/0	5	5	5	-	-	8.3	-	-	24.3	-	-	7.7	-	1760
Dechlorinated 100% C	20/0	5	5	5	-	-	8.3	-	-	24.3	-	-	7.7	-	1810
Dechlorinated 100% D	20/0	5	5	5	-	-	8.3	-	-	24.3	-	-	7.6	-	1900
$Na_2S_2O_3$ Ctrl A	0/20	5	5	5	8.3	-	8.3	24.9	-	24.6	7.7	-	7.7	160	190
$Na_2S_2O_3$ Ctrl B	0/20	5	5	5	-	-	8.3	-	-	24.7	-	-	7.6	-	170
$Na_2S_2O_3$ Ctrl C	0/20	5	5	5	-	-	8.3	-	-	24.6	-	-	7.6	-	180
$Na_2S_2O_3$ Ctrl D	0/20	5	5	5	-	-	8.3	-	-	24.5	-	-	7.7	-	195

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 25.0-26.0°C.
Incubator #2 temperature range for the test period was 25.0-25.5°C.

Continued

Table 1. concluded

Data recorded during the 48-hour acute screening bioassays of a sample of effluent from the Morton Plant Health System, South Fort Harrison Ave. & Pinellas, Clearwater, Pinellas County, Florida, NPDES# FL0168831, performed on 16 to 18 August 2000.

Facility:	**Morton Plant Health System**		**NPDES #**	**FL0168831**	Facility Type:	**Wastewater**	
Location:	South Fort Harrison Ave. & Pinellas		Contact/District:	Herron/Kovah/SW-District		**Treatment Facility**	
County:	Pinellas		Test type:	static acute screen			
Sample Collection Date:	8/15/00	Time: 0740	# tests:	2	Receiving Water:	Clearwater Harbor	
Test Beginning Date:	8/16/00	Time: 1345	Chlorination Type:	Chlorinated			
Test Ending Date:	8/18/00	Time: 1330					**Page 2 of 2**

Total Residual CL2	mg/L	Method
Field:	0.69	DR-700
Lab:	0.62	DR-100

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

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control Water (fish):	138	141
20% Dilute Mineral Water (cladocerans):	74	90
100% Sample:	88	692

Salinity[C]	(ppt)
Control Water:	<1
100% Sample:	<1

[C] Salinity based on conductivity and temperature measurements.

Organism: *Cyprinella leedsi* Life stage: 11 days

	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	0/500	5	5	5	8.4	8.2	8.4	24.1	24.3	25.8	7.8	7.6	7.4	245	295
Control B	0/500	5	5	5	8.4	8.3	8.4	23.7	23.8	24.6	7.9	7.7	7.7	245	270
Control C	0/500	5	5	5	8.3	8.2	8.4	23.4	23.9	24.4	7.8	7.6	7.7	245	280
Control D	0/500	5	5	5	8.3	8.3	8.4	23.1	24.9	25.2	7.9	7.7	7.4	245	265
100% A	500/0	5	5	5	8.1	8.1	8.1	23.2	24.5	24.5	8.5	7.6	7.6	1470	1650
100% B	500/0	5	5	5	8.1	8.1	8.1	23.5	23.9	24.1	8.5	7.7	7.7	1570	1650
100% C	500/0	5	5	5	8.1	8.1	8.1	23.4	24.0	24.1	8.4	7.8	7.7	1565	1665
100% D	500/0	5	5	5	8.2	8.1	8.1	23.1	24.0	24.3	8.5	7.7	7.6	1560	1685
Dechlorinated 100% A	500/0	5	5	5	8.2	8.1	8.1	23.2	24.3	24.1	8.7	7.6	7.7	1595	1665
Dechlorinated 100% B	500/0	5	5	5	8.2	8.1	8.1	23.6	23.8	25.1	8.5	7.6	7.3	1610	1695
Dechlorinated 100% C	500/0	5	5	5	8.1	8.1	8.1	23.8	23.7	24.7	8.5	7.7	7.4	1610	1675
Dechlorinated 100% D	500/0	5	5	5	8.2	8.1	8.1	23.8	23.8	24.0	8.4	7.7	7.6	1600	1675
$Na_2S_2O_3$ Ctrl A	0/500	5	5	5	8.3	8.3	8.4	24.2	24.2	24.2	8.3	7.7	7.6	270	305
$Na_2S_2O_3$ Ctrl B	0/500	5	5	5	8.1	8.3	8.4	24.6	23.9	24.8	7.9	7.7	7.4	260	285
$Na_2S_2O_3$ Ctrl C	0/500	5	5	5	8.1	8.3	8.4	24.7	23.9	24.4	7.7	7.7	7.6	255	280
$Na_2S_2O_3$ Ctrl D	0/500	5	5	5	8.1	8.3	8.4	24.7	24.9	24.2	7.8	7.6	7.6	255	280

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 25.0-26.0°C.
Incubator #3 temperature range for the test period was 23.0-25.0°C.

Table 2. Results of chemical analyses on the effluent from Morton Plant Health System sampled on August 15, 2000.

Metals

Aluminum	77	µg/L	[1]
Arsenic	19.7	µg/L	
Calcium	231	mg/L	
Chromium	1.2	µg/L	[1]
Copper	61.8	µg/L	
Iron	492	µg/L	
Lead	1.2	µg/L	
Magnesium	22	mg/L	
Zinc	8.2	µg/L	[1]

Pesticides and Herbicides

None detected

Base, Neutral, & Acid Extractable Organics

None detected

Chloride

Chloride	180	mg/L

[1] Value reported is less than the minimum quantitation limit and greater than or equal to the minimum detection limit.

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Morton Plant
County: Pinellas
Contact / District: J. Herron / C. Kovach / SW-DIST
NPDES Permit #: ~~FL00~~ FL0168831
LIMS Sample #: 473480 **LIMS Job #:** RH2000-08-16-15-01
sample log 8-15-00 mf
Test Type: ~~Screening~~ | Definitive
(Static) | Static Renewal | Flow-through
Test Number: 1 of 2

Sample Collection: Date 8/15/00 Time 07:40
Test Beginning: Date 8/16/00 Time 1345
Test Ending: Date 8/18/00 Time 1345
Organism Batch #: 44 **Diluent Batch #:** 24
Organism Age: 24 hrs. SRT toxicant batch #: —
Test organism: C. dubia

Remarks: 8/16/00 DPH An aliquot of 2500ml was addit dechlorinated using 1.7 ml of Sodium Thiosulfate. An^ control using the same amount of Sodium Thiosulfate was prepared.

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
CNTL. A	A	5	5	5	7.6	—	8.2	24.6	—	24.2	7.7	—	7.9	180	—	210
B	B	5	5	5	—	—	8.3	—	—	24.6	—	—	7.9	—	—	190
C	C	5	5	5	—	—	8.3	—	—	24.0	—	—	7.9	—	—	190
D	D	5	5	5	—	—	8.3	—	—	24.1	—	—	7.9	—	—	200
100% A	A	5	5	3 20	7.9	—	8.2	24.4	—	24.2	8.1	—	7.4	1470	—	1725
B	B	5	5	2 30	—	—	8.2	—	—	24.2	—	—	7.3	—	—	1795
C	C	5	5	4 10	—	—	8.2	—	—	24.0	—	—	7.5	—	—	1840
D	D	5	5	3 20	—	—	8.2	—	—	24.1	—	—	7.2	—	—	1950
100% A	A	5	5	5	8.1	—	8.3	24.5	—	24.4	8.2	—	7.7	1590	—	~~1730~~
B	B	5	5	5	—	—	8.3	—	—	24.3	—	—	7.7	—	—	1760
C	C	5	5	5	—	—	8.3	—	—	24.3	—	—	7.7	—	—	1810
D	D	5	5	5	—	—	8.3	—	—	24.3	—	—	7.16	—	—	1975
CNTL. A	A	5	5	5	8.3	—	8.3	24.9	—	24.6	7.7	—	7.7	160	—	190
B	B	5	5	5	—	—	8.3	—	—	24.7	—	—	7.6	—	—	170
C	C	5	5	5	—	—	8.3	—	—	24.6	—	—	7.6	—	—	180
D	D	5	5	5	—	—	8.3	—	—	24.5	—	—	7.7	—	—	195
measured by:		JA	SG	JA	JA	SG	SG	JA	SG	SG	JA	JA	SG	JA	SG	SG
recorded by:		DPH	SG	JA	DPH	JA	SA	DPH	JA	SA	DPH	JA	SA	DPH	SA	SA

+ NaThio. Dechlorinated

Investigators' Signatures
Shannon Gerards
Joshua Cruz
Della Parker Hewson
Marshall Faircloth

AJ Wolfe
reviewer

form updated 3/3/99

Temperature Range °C
Incubator # 2 25.0°-25.5°C
Room 24 25.0°-26.0°C

(A) wrong place DPH 8/16/00
(B) wrong place DPH 8/16/00

	Salt Water: Well Water	20% Min Water	Water Quality Parameters: Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):	[redacted]		0.09 ~~N/A~~	~~N/A~~	NA	SG
Lab Total Residual Cl2 (mg/L):	<0.013		0.62	~~0.62~~	DPH	DPH
Alkalinity (mg/L as $CaCO_3$):	~~88~~ (A) 138	74	88	HACH	SG	JH
Hardness (mg/L as $CaCO_3$):	692 (B) MH	90	692	HACH	SG	JH
Total ammonia (mg/L as N):	<0.017		<0.017	Denver	DPH	DPH
Salinity:	<1		~~<0.017~~ <1	~~Denver~~ YSI	DPH	DPH

DI 20% Min Water DPH

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* DR-100 DPH 8/16/00
(C) Wrong Place DPH 8/16/00

FDEP Biology Section — Acute Bioassay Bench Sheet

Sample Source: Morton Plant
County: Pinellas
Contact / District: J. Herron / C. Kovach / SW-DIST
NPDES Permit #: FL00 FL0168831
LIMS Sample #: 473480 LIMS Job #: TLH2000-08-16-15-01
sample log 8-25-00 mf

Sample Collection: Date 8/15/00 Time 0740
Test Beginning: Date 8/16/00 Time 1345
Test Ending: Date 8/17/00 Time 1330
Organism Batch #: 63 - 18 DPH Diluent Batch #: Well
Organism Age: 11 days SRT toxicant batch #: —

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

Test organism: C. dubia
Remarks: 8/16/00 DPH. An aliquot of the sample (2500 ml) was dechlorinated using 1.7 ml of Sodium Thiosulfate. An additional control was prepared using the same ratio of Sodium Thiosulfate.

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) Cond. (µmhos/cm) 0 hr	24 h	48 h
CNTL. A	E1	5	5	5	8.4	8.2	8.4	24.1	24.3	25.8	7.8	7.6	7.4	245	290	295
B	E2	5	5	5	8.4	8.3	8.4	23.7	23.8	24.6	7.9	7.7	7.7	245	270	270
C	E3	5	5	5	8.3	8.2	8.4	23.9	23.9	24.4	7.8	7.6	7.7	245	270	280
D	E4	5	5	5	8.3	8.3	8.4	23.1	24.9	25.2	7.9	7.7	7.4	245	260	265
100% A	E5	5	5	5	8.1	8.1	8.1	23.2	24.5	24.5	7.5	7.6	7.6	1470	1670	1650
B	E6	5	5	5	8.1	8.1	8.1	23.5	23.9	24.1	8.5	7.7	7.7	1570	1625	1650
C	E7	5	5	5	8.1	8.1	8.1	23.4	24.0	24.1	8.4	7.8	7.7	1565	1655	1665
D	E8	5	5	5	8.2	8.1	8.1	23.1	24.0	24.3	8.5	7.7	7.6	1560	1630	1685
100% A (Dechlorinated)	E9	5	5	5	8.2	8.1	8.1	23.2	24.3	24.1	8.7	7.6	7.7	1695	1620	1665
B	E10	5	5	5	8.2	8.1	8.1	23.6	23.8	25.1	8.5	7.6	7.3	1610	1635	1695
C	E11	5	5	5	8.1	8.1	8.1	23.8	23.7	24.7	8.5	7.7	7.4	1610	1625	1675
D	E12	5	5	5	8.2	8.1	8.1	23.8	23.8	24.0	8.4	7.7	7.6	1600	1620	1675
CNTL. A (+ Na Thiosulfate)	E13	5	5	5	8.3	8.3	8.4	24.2	24.2	24.2	8.3	7.7	7.6	270	285	305
B	E14	5	5	5	8.1	8.3	8.4	24.6	23.9	24.8	7.9	7.7	7.4	260	270	285
C	E15	5	5	5	8.1	8.3	8.4	24.7	23.9	24.4	7.7	7.7	7.6	255	285	280
D	E16	5	5	5	8.1	8.3	8.4	24.7	24.9	24.2	7.8	7.6	7.6	255	280	280
measured by:		YMK	SG	SG	DPH	SG	SG	DPH	SG	SG	DPH	SG	SG	DPH	SG	SG
recorded by:		DPH	SG	SG	DPH	JA	JA	DPH	JA	JA	DPH	JA	JA	DPH	JA	JA

(A) 1610 DPH 8/16/00 (C) Unsure place DPH 8/16/00
(B) Unsure place DPH 8/16/00

Investigators' Signatures
Shannon Grandi
Della Faber Horne
John Cyrus
Marshall Faircloth
Kathleen Kostka
Andy Wolfe
reviewer

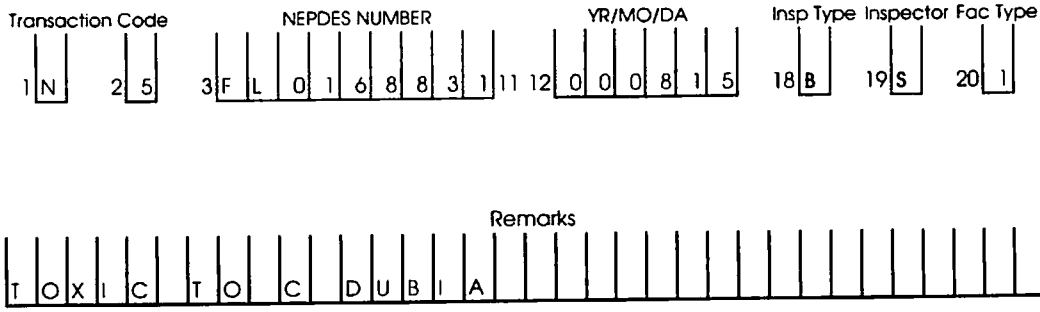
Temperature Range °C
Incubator # 3 23.0° - 25.0°C
Room B246 25.0° - 26.0°C

Water Quality Parameters	Salt Water: Well Water	Salt Water: 20% Min Water	Sample	Method	Measured by	Verified by
Field Total Residual Cl2 (mg/L):			~~0.69~~ NA	NA	NA	SG
Lab Total Residual Cl2 (mg/L):	<0.017		0.62	DR100	DPH	JH
Alkalinity (mg/L as $CaCO_3$):	~~80~~ 74 (B)	138 DPH	88	HACH	SG	JA
Hardness (mg/L as $CaCO_3$):	69 ~~90~~ (C)	141	92	HACH	SG	JA
Total ammonia (mg/L as N):	<0.017		<0.017	Denver	DPH	DPH
Salinity:	<1		<1	YSI	DPH	DPH

form updated 3/3/99

The Bioassay of Morton Plant Health System effluent sampled on August 15, 2000, NPDES #FL0168831.

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



The Priority Pollutants Analysis for Bioassay of Morton Plant Health System effluent sampled on August 15, 2000, NPDES #FL0168831.

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

