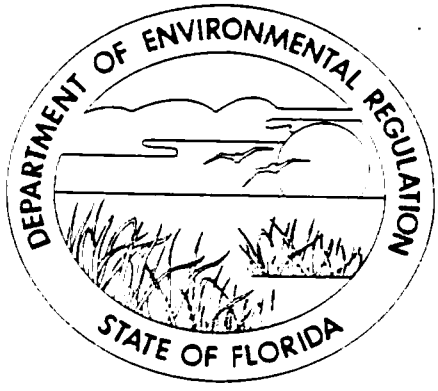


BIOASSAY OF SCM CORPORATION, ORGANIC CHEMICALS DIVISION,

DUVAL COUNTY, FLORIDA

NPDES #FL0000884

Biological Section
Bureau of Water Analysis
28 May 1980

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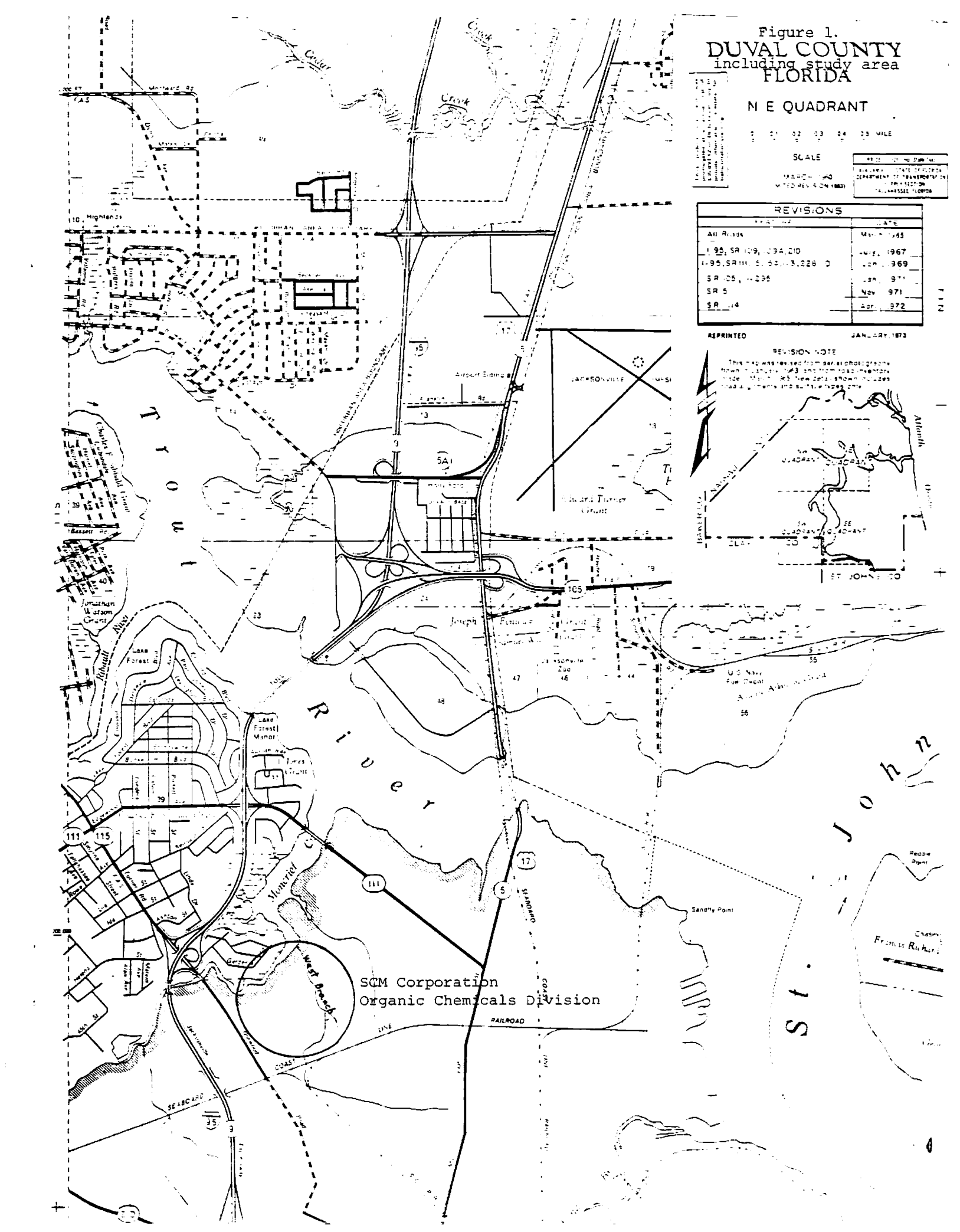
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INTRODUCTION

SCM Corporation, Organic Chemicals Division (formerly Glidden-Durkee Division) is located at the foot of West 61st Street in Jacksonville, Florida (Figure 1). The company manufactures crude sulfate turpentine and synthetic pine oil by distillation, extraction, oxidation and rearrangement of organic chemicals.

Wastewater generated at this facility includes: process water, sanitary wastes and cooling water. Separate drainage is provided so that process wastewater is routed to the Buckman Street Sewage Treatment Plant. Sewage generated at the plant is treated on-site in a septic tank. Currently the plant discharges an average of 1.5 MGD (outfall #001) condenser and noncontact cooling water to the West Branch tributary of Moncrief Creek. Moncrief Creek flows into the Trout River, a tributary of the St. Johns River (Figure 1).

On 28 May, 1980, the Biological Section obtained effluent samples from SCM Corporation, Organic Chemicals Division (outfall #001) at the West Branch of Moncrief Creek and performed a static bioassay to determine the existence and extent of toxicity to aquatic organisms. Potentially toxic components of the plant's effluent may include chromium, zinc, mercury, chlorine, sulfide, ammonia and sulfate turpentine.


Figure 1.
DUVAL COUNTY
including study area
FLORIDA
N E QUADRANT
SCALE
REVISIONS
REVISION NOTE
Trout River
St. Johns
SCM Corporation
Organic Chemicals Division

METHODS AND MATERIALS

Test methods used for conducting this static bioassay are extensively described by Peltier (1978). The organism selected for this study is among those recommended by Peltier (1978) and the U.S. EPA (1978). The life history of this test organism and maintenance procedures used to culture it are detailed below.

History and Maintenance of Bioassay Organisms

Daphnia pulex (water flea)

A breeding culture of *Daphnia pulex* was obtained from the EPA laboratory in Athens, Georgia, on 9 March, 1979. This culture has been maintained since its arrival, in 2½ gallon all glass aquaria using a 16:8 hour light-dark cycle. Organisms have been fed a liquified blend of Purina Trout Chow® and Cerophyl® twice daily. *Daphnia* used in this bioassay were siphoned into a large culture dish through a series of nested stainless steel screens to isolate the proper size and age organisms (neonates). These neonates were then pipetted individually from the culture dish and placed into the test chambers at the beginning of the test.

Test Methods

A 48 hour static bioassay was conducted from 1020 hours 28 May to 1020 hours 30 May, 1980, on a grab sample of effluent from outfall #001. The sample was collected by Mr. Lee Banks of the DER St. Johns River Subdistrict Office at 1530 hours on 27 May, 1980, using standard wastewater sampling procedures. Separate samples were obtained for chemical and biological testing. Samples for metal analysis were preserved with HNO_3 (2ml/liter). Samples for organic chemical analysis and the bioassays were unpreserved. The samples were iced and transported to the DER laboratory in Tallahassee within 24 hours of collection.

Freshwater for dilution of the effluent sample was obtained from the same City of Tallahassee well that is used to culture the test organisms. The concentration series selected for this study are those recommended by APHA (1976) (Table 1).

Two replicates, each with six concentrations and a control, were used to test with *Daphnia pulex*. Flint glass jars of 250 ml capacity were used as test chambers and 200 ml of the appropriate test concentration was placed in each chamber. *Daphnia* were transferred individually by glass pipette and were loaded 10 per chamber, resulting in 20 per test concentration.

Dissolved oxygen, pH, and the number of live organisms were recorded for each test chamber at 0 hours, 24 hours, and 48 hours. Total alkalinity, total hardness, and conductivity were recorded at the beginning of the test for the controls and the 100% effluent concentration. The values were recorded on the bioassay data form and are presented in Table 2. The organisms were not fed during this test.

Table 1.

Concentration Series and Volumes used for this Static Bioassay

Water Flea (Daphnia pulex)

CONCENTRATION	DILUTION WATER	EFFLUENT	TOTAL VOLUME
Control	200 ml	-	200 ml
5.6%	188.8 ml	11.2 ml	200 ml
10.0%	180 ml	20 ml	200 ml
18.0%	164 ml	36 ml	200 ml
32.0%	136 ml	64 ml	200 ml
56.0%	88 ml	112 ml	200 ml
100 %	-	200 ml	200 ml

Table 2 . Data recorded during 48 hour, Daphnia pulex, static acute toxicity bioassay of SCM Corporation, Organic Chemicals Division, Duval County, Florida, at 10:20 hours on 28 May, to 10:20 hours on 30 May, 1980. NPDES permit #FL0000884.

Conc. or %	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Total Alkalinity (mg/l as $CaCO_3$)					Total Hardness (mg/l as $CaCO_3$)					Conductivity (Umhos/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Control	A	10	9	9			8.3	8.7	8.7			7.5	7.8	7.9			130					127					280				
Control	B	10	10	8*			8.4	8.7*	8.7			7.6	7.9	8.0													270				
5.6%	A	10	9	9			8.4	8.6	8.7			7.7	7.9	7.9																	
5.6%	B	10	10	12*			8.3	8.6	8.7			7.7	7.9	8.0																	
10.0%	A	10	10	10			8.4	8.6	8.7			7.9	7.9	8.0																	
10.0%	B	10	10	10			8.3	8.6	8.7			7.9	7.9	8.0																	
18.0%	A	10	10	10			7.9	8.6	8.5			7.9	8.0	7.9																	
18.0%	B	10	7	7			8.0	8.6	8.6			8.0	8.0	8.0																	
32.0%	A	10	9	9			8.0	8.4	8.4			8.1	8.0	8.0																	
32.0%	B	10	10	10			7.8	8.4	8.5			8.1	8.0	8.0																	
56.0%	A	10	9	8**			6.7	8.2	8.4			8.2	8.0	8.0																	
56.0%	B	10	10	10**			6.5	8.2	8.3			8.3	8.1	8.0																	
100%	A	10	9	9**			4.6	7.7	8.1			8.4	8.1	8.0													1300				
100%	B	10	9	9**			4.5	7.9	8.1			8.4	8.2	8.0			150					265					1250				

Remarks:
1. Test temperature range 21.0° to 22.0°C.
2. Total chlorine residual of 100% effluent 0.00 mg/l.
3. Field pH of effluent 8.7.

* Two Daphnia may have been accidentally transferred to the next higher concentration on the pH or D.O. probes.

** Oily surface film observed, this film was not noted at 0 and 24 hours.

RESULTS AND DISCUSSION

This grab sample of effluent from SCM Corporation, Organic Chemicals Division, was not sufficiently toxic to Daphnia pulex for the determination of an LC_{50}. Although some mortality was noted in the higher test concentrations (Table 2), a several fold concentration of this effluent sample would have to be tested before a statisically sound LC_{50} could be determined.

Results of chemical analysis of the effluent indicated that it contained 117 µg/l zinc and 323 µg/l total chromium. The toxicity of these metals to aquatic organisms is dependent on pH, temperature, dissolved oxygen, hardness, and the oxidative state of chromium (U. S. EPA 1977). Under the test conditions, zinc alone was not present in sufficient concentrations to result on toxicity. Hexavelant chromium, however, has an LC_{50} of 50 µg/l for Daphnids, while trivalent chromium is substantially less toxic (U. S. EPA 1977). It is therefore possible that the hexavalent fraction of the total chromium in the sample may have resulted in the mortality noted in Table 2.

LITERATURE CITED

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