

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
SURFACE WATER QUALITY DIVISION  
JANUARY 1998

STAFF REPORT

CHRONIC TOXICITY ASSESSMENT OF MUSKEGON CO-WWMS METRO WWTP  
OUTFALLS 101 AND 002 EFFLUENTS

MUSKEGON COUNTY, MICHIGAN  
SEPTEMBER 12-18, 1997 AND NOVEMBER 14-20, 1997  
NPDES PERMIT NO. MI027391

Staff of the Great Lakes and Environmental Assessment Section (GLEAS) performed chronic *Ceriodaphnia dubia* toxicity evaluations on the Muskegon Co WWMS Metro WWTP from September 12-18, 1997 and November 14-20, 1997. We tested outfall 002 effluent on both dates, and also tested outfall 101 effluent during the November evaluation. The facility was operating normally when the samples were collected.

Toxicity testing was performed according to GLEAS Procedure #54 (procedure available upon request). Because we did not detect residual chlorine in the effluent samples, dechlorination was not necessary.

The facility discharges treated municipal wastewater through outfall 101 to the Muskegon River (28% receiving water concentration, RWC) and through outfall 002 to the Black River (RWC = 94%).

SUMMARY

1. Test water quality parameters met minimum test acceptability criteria (data available upon request).
2. For the 002 effluent, the chronic portion of the September test failed to yield a usable endpoint. Control reproduction (9.5 young/female) did not meet the minimum test acceptability requirement for reproduction ( $\geq 15$  young/female). However, the effluent was not acutely toxic to *Ceriodaphnia dubia* (0 TUa; Table 1).

The 002 effluent was not acutely or chronically toxic to *C. dubia* in November (Table 2).

The results of the 002 effluent tests suggest that the effluent was meeting the aquatic toxicity-related requirements of Rule 1219 of the Natural Resources and Environmental Protection Act. No excessive toxicity was detected.

3. The results of the 101 effluent test suggest that the effluent was meeting the aquatic toxicity-related requirements of Rule 1219 of the Natural Resources and Environmental Protection Act. The 101 effluent was not acutely or chronically toxic to *C. dubia* during the November test (Table 3).
4. Consistent with the results of the toxicity tests, chemical analyses of the 002 effluent samples collected in September did not reveal the presence of levels of toxic chemicals predicted to be toxic to aquatic life (Attachment A).

Test and Report by: Bill Dimond  
Water Quality Appraisal Unit North  
Great Lakes and Environmental Assessment Section

Table 1. Mean reproduction and percent survival of *Ceriodaphnia dubia* exposed to select concentrations of Muskegon Co-WWMS Metro WWTP outfall 002 effluent from September 12-18, 1997.

Percent Effluent	Average Young/Adult	Percent Survival		
		Day 1	Day 2	Day 7
Control*	9.5	100	100	100
6	2.1	100	100	100
12	5.7	100	100	100
25	7.9	100	100	100
50	5.8	100	100	100
100	5.4	100	100	100

\*Control was moderately hard dilute mineral water.

\*\*Significantly less than the control ( $p \leq 0.05$ )

Table 2. Mean reproduction and percent survival of *Ceriodaphnia dubia* exposed to select concentrations of Muskegon Co-WWMS Metro WWTP outfall 002 effluent from November 14-20, 1997.

Percent Effluent	Average Young/Adult	Percent Survival		
		Day 1	Day 2	Day 7
Control*	31.7	100	100	100
6	30.4	100	100	100
12	25.5	100	100	100
25	30.2	100	100	100
50	38.6	100	100	100
100	34.3	100	100	100

\*Control was moderately hard dilute mineral water.

Table 3. Mean reproduction and percent survival of *Ceriodaphnia dubia* exposed to select concentrations of Muskegon Co-WWMS Metro WWTP outfall 101 effluent from November 14-20, 1997.

Percent Effluent	Average Young/Adult	Percent Survival		
		Day 1	Day 2	Day 7
Control*	31.7	100	100	100
6	31.6	100	100	100
12	32.3	100	100	100
25	31.2	100	100	100
50	33.6	100	100	100
100	33.7	100	100	100

\*Control was moderately hard dilute mineral water.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
ENVIRONMENTAL LABORATORY

REPORT Surface Water Quality Div.  
TO FILLEY LAB  
815 FILLEY ST.  
LANSING, MI 48906  
ATTN DIANNA BUTLER

LABORATORY WORK ORDER # 97-09-151  
WORK ID MUSKEGON CO.  
P.O. # \*\* COST \$ 330.40  
RECEIVED 09/17/97 CLIENT SWQ FILLEY  
REPORTED \_\_\_\_\_ NUMBER OF SAMPLES 2  
LAB CONTACT OR IN MATRIX WATER

TEST	UNITS	MUSK <u>Muskegon Co Metro outfall 002 effluent</u> <u>Outfall 002, collected 9/13/97</u>
Silver by Furnace	ug/l	K 0.5
Arsenic by Furnace	ug/l	1.1
Barium in Water	ug/l	113
Cadmium by Furnace	ug/l	K 0.2
Chromium by Furnace	ug/l	1.1
Copper by Furnace	ug/l	2.1
Mercury in Water	ug/l	K .2 HT
Lead by Furnace	ug/l	K 1.0
Selenium in Water	ug/l	K 1.0
Zinc in Water	ug/l	4

Report prepared By: Louis C. Utters 11/13/97

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DEQ Laboratory REPORT  
Results by Sample

Work Order # 97-09-151

SAMPLE ID MUSK 4 FRACTION 02A TEST CODE SC3 NAME Scan 3 Water  
Date & Time Collected 09/15/97 Category \_\_\_\_\_

*Composite 9/14-15/97*

ANALYST SONNENBE  
ANALYZED 10/02/97  
DILUTION 1

CAS#	COMPOUND	UNITS <u>ug/L ppb</u>	RESULT	REMARK	REPORTED DETECTION LIMIT
67-72-1	Hexachloroethane		ND		0.011
108-70-3	1,3,5-Trichlorobenzene		ND		0.011
120-82-1	1,2,4-Trichlorobenzene		ND		0.011
87-61-6	1,2,3-Trichlorobenzene		ND		0.022
87-68-3	Hexachlorobutadiene		ND		0.011
95-94-3	1,2,4,5-Tetrachlorobenzene		ND		0.011
77-47-4	Hexachlorocyclopentadiene		ND		0.011
91-58-7	2-Chloronaphthalene		ND		0.22
634-66-2	1,2,3,4-Tetrachlorobenzene		ND		0.011
608-68-8	Pentachlorobenzene		ND		0.011
319-84-6	a-BHC		ND		0.011
118-74-1	Hexachlorobenzene		ND		0.011
319-85-7	b-BHC		ND		0.011
58-89-9	g-BHC (lindane)		ND		0.011
82-68-8	Pentachloronitrobenzene		ND		0.011
319-86-8	d-BHC		ND		0.011
76-44-8	Heptachlor		ND		0.011
309-00-2	Aldrin		ND		0.011
1024-57-3	Heptachlor epoxide		ND		0.011
5103-74-2	g-Chlordane		ND		0.011
959-98-8	*Endosulfan I		ND		0.011
5103-71-9	a-Chlordane		ND		0.011
72-55-9	4,4'-DDE		ND		0.011
72-20-8	Endrin		ND		0.011
60-57-1	Dieldrin		ND		0.011
72-54-8	4,4'-DDD		ND		0.055
50-29-3	4,4'-DDT		ND		0.011
79-34-5	Hexabromobenzene		ND		0.011
72-43-5	Methoxychlor		ND		0.055
2385-85-5	Mirex		ND		0.011
53469-21-9	Aroclor 1242 (PCB)		ND		0.11
11097-69-1	Aroclor 1254 (PCB)		ND		0.11
11096-82-5	Aroclor 1260 (PCB)		ND		0.11
12674-11-1	*Aroclor 1016 (PCB)		ND		0.11
11104-28-2	*Aroclor 1221 (PCB)		ND		0.11
11141-16-5	*Aroclor 1232 (PCB)		ND		0.11
12672-29-6	*Aroclor 1248 (PCB)		ND		0.11
- -	*Aroclor 1262 (PCB)		ND		0.11
11100-14-4	*Aroclor 1268 (PCB)		ND		0.11
37324-23-5	BP-6 (PBB)		ND		0.055
8001-35-2	*Toxaphene		ND		0.11

COMMENTS UnID PEAKS

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DEQ Laboratory      REPORT  
Results by Sample

Work Order # 97-09-151  
Continued From Above

SAMPLE ID MUSK 4      FRACTION 02A    TEST CODE SC3    NAME Scan 3 Water  
Date & Time Collected 09/15/97      Category \_\_\_\_\_

*Composite 9/14-15/97*

ND = not detected at the specified detection limit.  
\* Results and Det. Limit reported semi-quantitatively \*



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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
ENVIRONMENTAL LABORATORY

REPORT Surface Water Quality Div.  
TO FILLEY LAB  
815 FILLEY ST.  
LANSING, MI 48906  
ATTN: ~~FILLEY LAB~~

LABORATORY WORK ORDER # 97-11-125  
WORK ID MUSKEGON CO  
P.O. # \*\* COST \$ 237.50  
RECEIVED 11/21/97 CLIENT SWQ FILLEY  
REPORTED \_\_\_\_\_ NUMBER OF SAMPLES 1  
LAB CONTACT OR MATRIX WATER

TEST	UNITS	
		<u>MUSK 4</u>
		<u>Muskegon Co Metro outfall 002 effluent</u>
		<u>Collected 9/14-15/97</u>
<u>GC/MS Library Search</u>		<u>12/12/97</u>

RESUBMITTED FROM 97-09-151 FOR LIB SEARCH ON SC3 TEST.

Report prepared By: *Cherly* 12/30/97

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DEQ Laboratory REPORT  
Results by Sample

Work Order # 97-11-125

SAMPLE ID MUSK 4 FRACTION 01A TEST CODE BN NAME Base Neutral in Water  
Date & Time Collected 09/15/97 Category \_\_\_\_\_

ANALYST JRS  
ANALYZED 12/12/97  
DILUTION 1

CAS#	COMPOUND	UNITS <u>ug/L</u> <u>ppb</u>	RESULT	REMARK	REPORTED DETECTION LIMIT
111-44-4	bis(2-Chloroethyl) ether		ND		1.0
541-73-1	1,3-Dichlorobenzene		ND		1.0
106-46-7	1,4-Dichlorobenzene		ND		1.0
95-50-1	1,2-Dichlorobenzene		ND		1.0
108-60-1	bis(2-Chloroisopropyl) ether		ND		1.0
821-64-7	N-Nitroso-di-n-propyl amine		ND		2.0
108-70-3	Hexachloroethane		ND		1.0
98-95-3	Nitrobenzene		ND		2.0
78-59-1	Isophorone		ND		1.0
111-91-1	bis(2-Chloroethoxy) methane		ND		2.0
120-82-1	1,2,4-Trichlorobenzene		ND		2.0
91-20-3	Naphthalene		ND		1.0
87-68-3	Hexachlorobutadiene		ND		2.0
77-47-4	Hexachlorocyclopentadiene		ND		2.0
91-58-7	2-Chloronaphthalene		ND		2.0
131-11-3	Dimethyl phthalate		ND		2.0
208-96-8	Acenaphthylene		ND		1.0
606-20-2	2,6-Dinitrotoluene		ND		5.0
83-32-9	Acenaphthene		ND		1.0
121-14-2	2,4-Dinitrotoluene		ND		5.0
86-73-7	Fluorene		ND		1.0
84-66-2	Diethyl phthalate		ND		1.0
7005-72-3	4-Chlorodiphenyl ether		ND		1.0
86-30-6	N-Nitrosodiphenyl amine		ND		5.0
122-66-7	1,2-Diphenylhydrazine		ND		2.0
101-55-3	4-Bromodiphenyl ether		ND		2.0
118-74-1	Hexachlorobenzene		ND		1.0
85-01-8	Phenanthrene		ND		1.0
120-12-7	Anthracene		ND		1.0
84-74-2	Di-n-butyl phthalate		ND		1.0
206-44-0	Fluoranthene		ND		1.0
129-00-0	Pyrene		ND		1.0
85-68-7	Butyl benzyl phthalate		ND		1.0
56-55-3	Benzo (a) anthracene		ND		1.0
218-01-9	Chrysene		ND		1.0
117-81-7	bis(2-ethylhexyl) phthalate		3.8		2.0
117-84-0	Di-n-octyl phthalate		ND		2.0
205-99-2	Benzo (b) fluoranthene		ND		2.0
207-08-9	Benzo (k) fluoranthene		ND		2.0
50-32-8	Benzo (a) pyrene		ND		2.0
193-39-5	Indeno (1,2,3-c,d) pyrene		ND		5.0
53-70-3	Dibenzo (a,h) anthracene		ND		5.0
191-24-2	Benzo (g,h,i) perylene		ND		5.0

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DEQ Laboratory  
Results by Sample

REPORT

Work Order # 97-11-125  
Continued From Above

SAMPLE ID MUSK 4 FRACTION Q1A TEST CODE BN NAME Base Neutral in Water  
Date & Time Collected 09/15/97 Category \_\_\_\_\_

ND = not detected at the specified detection limit.

COMMENTS \_\_\_\_\_  
\_\_\_\_\_

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DEQ Laboratory  
12/29/97 16:31:20

REPORT

Work Order # 97-11-125

Surface Water Quality Div.

GC/MS Semivolatile library search results for work order number 9711125-01.

\*\*\*\*\* NO SIGNIFICANT HITS WERE FOUND \*\*\*\*\*

**Subject: Laboratory Result Remark Codes**

- A value reported is the mean of two or more determinations.
- C value calculated from other independent parameters.
- J estimated value or value not accurate.
- K actual value is known to be less than the value given, i.e. substance, if present, is below detection limit.
- L actual value is known to be greater than the value given.
- T value reported is less than criteria of detection.
- W value observed is less than lowest value reportable under "T" code.
- DL sample analyzed using a dilution(s).
- DM dilution required due to matrix problems.
- HT recommended laboratory holding time was exceeded before analysis.
- LH Q. C. indicated possible low recovery. Actual level may be higher.
- LL Q. C. indicated possible high recovery. Actual level may be lower.
- MM analytical method or matrix is not within SOP of this laboratory.
- NC no confirmation by a second technique.
- NH non-homogeneous sample made analysis of a representative sample questionable.
- PI possible interference may have affected the accuracy of the laboratory result.
- QC quality control problems exists.
- RB Reagent Blank. The level of reagent blank contamination is reported in the comment column and may be subtracted from the analyte value by the user.
- ST recommended sample collection/preservation technique not used.
- ACC laboratory accident resulted in no obtainable value.
- FCN free cyanide was not analyzed due to low level of total cyanide.
- INT interference encountered during analysis resulted in no obtainable value.
- IST Improper sample collection/preservation. Sample not suitable for analysis.
- NAV requested analysis not available.
- QNS quantity not sufficient to perform requested analysis.
- STR settleable residue was not analyzed due to low suspended solids.

Approved by: George Su  
George Su, Lab Section Chief

10/17/95  
Date

