

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
SURFACE WATER QUALITY DIVISION
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GLEAS Original

STAFF REPORT

A BIOLOGICAL SURVEY OF STONY CREEK AND AMOS PALMER DRAIN
MONROE COUNTY, MICHIGAN
SEPTEMBER 13, 1995

Staff of the Great Lakes and Environmental Assessment Section (GLEAS) conducted a qualitative biological survey to assess the impact of the effluent discharged by Londontown Inc.-London Sand (MI0051861). The biological survey was conducted according to guidelines of GLEAS Procedure #51 (available upon request). Grab samples of river water and the facility's effluent were collected, preserved when necessary, stored at 4°C and transported to the Michigan Department of Natural Resources (MDNR)-Environmental Laboratory for chemical analysis (MDNR, 1994).

Additional grab samples of the facility's effluent and the receiving stream were collected on December 20, 1995 by staff from the Livonia District Office of the Department of Environmental Quality. These samples were also collected, preserved when necessary and transported following established procedures to the MDNR Environmental Laboratory for chemical analysis.

SUMMARY

1. The location of the biological and water chemistry sampling stations are shown in Figure 1.
2. Fish community, aquatic macroinvertebrate community, habitat evaluations and water chemistry data collected and analyzed in conjunction with the surveys are presented in Tables 1 through 5, respectively.
3. Fish collection efforts were hampered in Stony Creek by stream size in relation to the type of electrofishing gear which was available. The power of the backpack unit was inadequate, making it impossible to collect enough fish to evaluate the overall community. In Amos Palmer Drain, the highly conductive (Table 5) nature of the London Sand effluent created problems with the backpack electrofishing unit and it would not function. Therefore, it would be inappropriate to evaluate and compare the well-being of the fish community at any of the sites.
4. The macroinvertebrate community in Stony Creek, upstream of Amos Palmer Drain (station 1), was rated acceptable tending toward poor (moderately impaired). The degradation was attributed to the available habitat which was also rated acceptable strongly tending toward poor. Bottom substrate at the sampling location consisted

primarily of sand and muck providing limited opportunities for macroinvertebrate colonization. The majority of the macroinvertebrate taxa were associated with woody debris which was relatively abundant in the naturally meandering stream channel.

5. The macroinvertebrate community in Palmer Drain, downstream from London Sand's outfall (station 3), was classified as poor (severely impaired). The impairment was illustrated by the low diversity and dominance of surface dependent organisms that are capable of tolerating degraded water quality conditions. The acceptable habitat rating at station 3 was only one point from a poor rating (severely impaired) but the impairment of the macroinvertebrate community was a product of poor water quality not poor habitat.
6. At station 4, downstream of Amos Palmer Drain, the macroinvertebrate community and habitat were rated acceptable (slightly impaired). Sedimentation was still problematic in this section but the concrete remnants of a bridge were providing riffle habitat that was absent at station 1. The artificial habitat increased the diversity of the macroinvertebrate and fish communities. The improved habitat at station 4, compared to station 1, makes it difficult to determine if London Sand's effluent was impacting the biota of Stony Creek. Station 4 was chosen with the realization that extreme habitat differences would exist between the upstream and downstream sites on Stony Creek. However, after witnessing the devastating impacts to the biota of Amos Palmer Drain, station 4 was chosen to verify the extent of the devastation.
7. Water chemistry results (Tables 4 and 5) reveal that the effluent from London Sand's outfall impacts the water quality of Amos Palmer Drain and Stony Creek. The sampling conducted on September 13, 1995 showed that total dissolved solids, hardness, conductivity, ammonia, total calcium and total magnesium were elevated above background levels for at least 2.5 miles downstream in Stony Creek. Total dissolved solid concentrations downstream from the facility exceeded levels allowed, from controllable sources, by Rule 51 of Michigan's Water Quality Standards.

Sampling by district staff on December 20, 1995 once again showed that the facility was having a measurable impact upon the total dissolved solids and conductivity of Stony Creek. The sampling during December also showed dissolved oxygen and hydrogen sulfide concentrations at the facility's outfall at unacceptably toxic levels. Downstream about one mile in Amos Palmer Drain, dissolved oxygen levels had recovered and sulfide concentrations were significantly reduced. However, the detection of measurable levels of sulfide at the site indicates that aquatic toxicity was still problematic (Rule 57 exceedance). No sulfide was detected downstream in Stony Creek.

8. While conducting the survey in September, a white substance was covering the sediments and clinging to dead aquatic vegetation in Palmer Drain. It was not determined if the substance was bacterial or a precipitate of the high total dissolved solid effluent. A sample was collected and returned to the lab for inspection, but it dissipated overnight. The smell of hydrogen sulfide emanating from Palmer Drain was extremely obnoxious and caused irritation of nasal membranes and nausea while sampling in the bottom of the ditch. The white material was also observed at station 4 drifting in the water column and coating hydropsychidae (caddisfly) nets.

9. This survey and the associated procedures were designed to rapidly assess water quality in the vicinity of the London Sand outfall. The results of the sampling showed that water quality and the macroinvertebrate community in Amos Palmer Drain was extremely impaired. To document the extent of impairment in Stony Creek would require additional sampling at sites upstream and downstream with comparable habitat quality.

REFERENCES

MDNR 1994. Quality Assurance for Water and Sediment Sampling. Environmental Protection Bureau, Lansing, Michigan.

Field Work by: Sylvia Heaton, Aquatic Biologist
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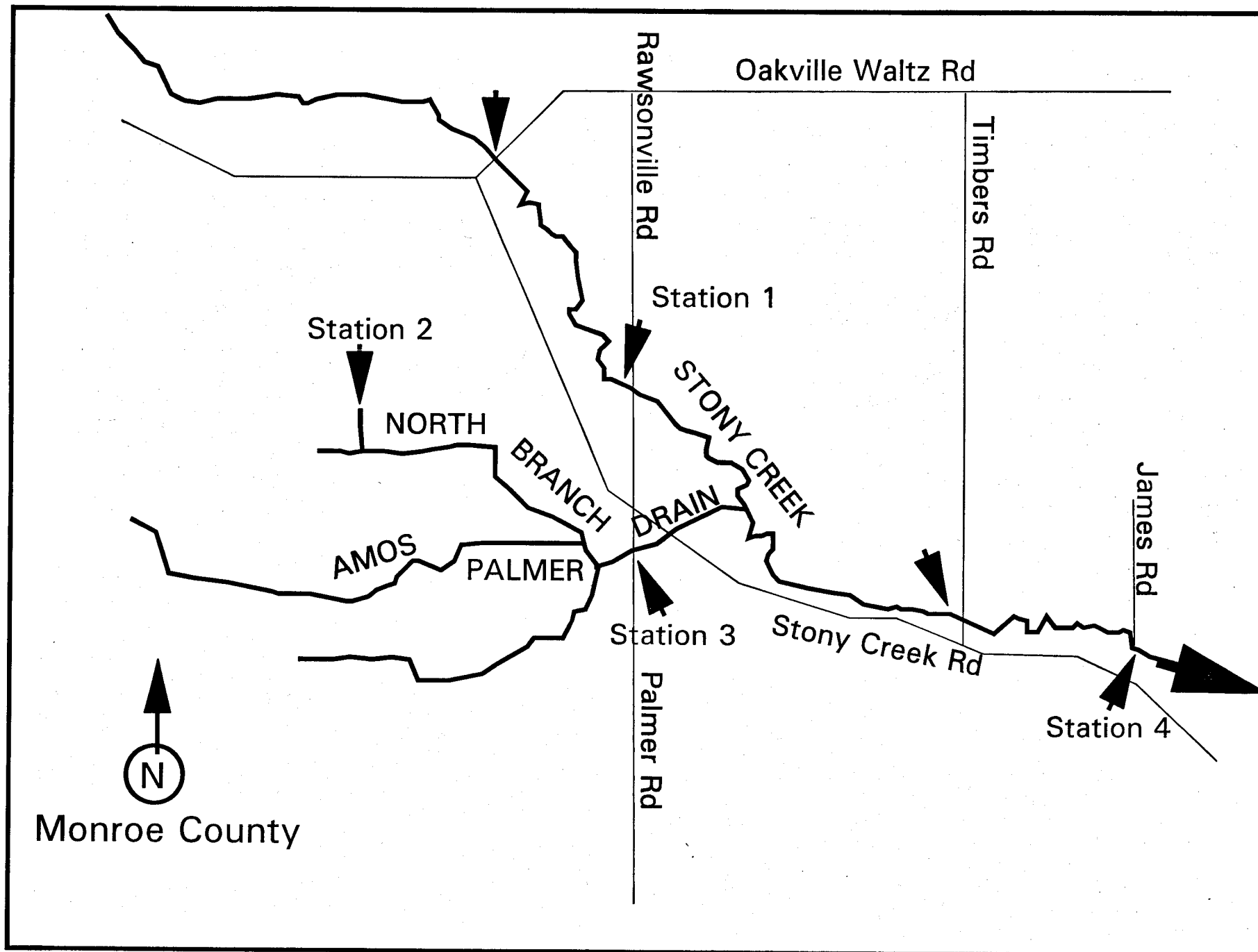


Figure 1. Stony Creek and Amos Palmer Drain Sampling Locations, 9/13/95.

Table 1A. Qualitative fish sampling results for Amos Palmer Drain and Stoney Creek, Monroe County, September 13, 1995.

TAXA	STATION 1	STATION 4
	Stoney Creek Rawsonville Rd	Stoney Creek James Rd
Salmonidae (trouts)		
Umbridae (mudminnows)		
<i>Umbra limi</i> (Central mudminnow)		1
Esocidae (pikes)		
<i>Esox americanus</i> (Grass Pike)		1
<i>Esox lucius</i> (Northern Pike)	1	
Cyprinidae (minnows and carps)		
<i>Cyprinus carpio</i> (Carp)	9	
<i>Semotilus atromaculatus</i> (Creek)		2
Catostomidae (suckers)		
<i>Catostomus commersoni</i> (W. sucker)	2	
<i>Hypentelium nigricans</i> (N. hog s.)	3	6
<i>Moxostoma erythrurum</i> (Golden redh.)		1
Centrarchidae (sunfish)		
<i>Ambloplites rupestris</i> (Rock bass)	1	
<i>Lepomis cyanellus</i> (Green sunfish)	9	6
<i>Lepomis gibbosus</i> (Pumpkinseed)		1
Percidae (perch)		
<i>Etheostoma caeruleum</i> (Rainbow d.)		2
<i>Etheostoma blennioides</i> (Greenside)		8
<i>Etheostoma nigrum</i> (Johnny darter)	1	
<i>Percina caprodes</i> (Logperch)		1
<i>Percina maculata</i> (Blackside d.)	2	1
TOTAL INDIVIDUALS	28	30
Number of hybrid sunfish	0	0
Number of anomalies	0	0
Percent anomalies	0.000	0.000
Percent salmonids	0	0
Density	0.0056566	0.0032
Gear		

Table 1B. Fish metric evaluation of Amos Palmer Drain and Stoney Creek, Monroe County, September 13, 1995.

METRIC	STATION 1		STATION 4	
	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	8		11	
NO. OF DARTER, SCULPIN, MADTOM TA	2		4	
NUMBER OF SUNFISH TAXA	2		2	
NUMBER OF SUCKER TAXA	2		2	
NUMBER OF INTOLERANT TAXA	2		2	
PERCENT TOLERANT	75.00		30.00	
PERCENT OMNIVOROUS TAXA	39.29		10.00	
PERCENT INSECTIVOROUS TAXA	53.57		86.67	
PERCENT PISCIVOROUS TAXA	7.14		3.33	
% SIMPLE LITHOPHILIC SPAWNER TAXA	25.00		36.67	
TOTAL SCORE				
FISH COMMUNITY CATEGORY		Not Rated		Not Rated

Table 2A. Qualitative macroinvertebrate sampling results for Amos Palmer Drain and Stoney Creek, Monroe County, September 13, 1995.

TAXA	STATION 1 Stoney Creek Rawsonville Rd	STATION 3 Palmer Drain Palmer Rd	STATION 4 Stoney Creek James Rd.
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	12		9
Decapoda (crayfish)			3
Isopoda (sowbugs)	24		6
Insecta			
Ephemeroptera (mayflies)			
Baetidae	4		
Ephemerellidae			2
Heptageniidae			2
Odonata			
Anisoptera (dragonflies)			
Aeshnidae	3		2
Zygoptera (damselflies)			
Calopterygidae	17		7
Coenagrionidae		1	3
Hemiptera (true bugs)			
Belostomatidae		1	
Corixidae	10	8	
Gerridae	2	2	
Mesoveliidae	2	1	4
Notonectidae	2	4	
Trichoptera (caddisflies)			
Hydropsychidae	5		18
Lepidostomatidae			1
Limnephilidae			1
Phryganeidae			4
Coleoptera (beetles)			
Dytiscidae (total)	1		
Gyrinidae (adults)		2	
Haliplidae (adults)		2	
Hydrophilidae (total)	2	1	
Elmidae	7		13
Diptera (flies)			
Chironomidae	5	35	4
Culicidae		40	
Dixidae	1		1
Simuliidae	3		9
Tipulidae	1	1	10
MOLLUSCA			
Pelecypoda (bivalves)			
Unionidae (mussels)			1
TOTAL INDIVIDUALS	101	98	100

Table 2B. Macroinvertebrate metric evaluation of Amos Palmer Drain and Stoney Creek, Monroe County, September 13, 1995.

METRIC	STATION 1		STATION 3		STATION 4	
	Stoney Creek		Palmer Drain		Stoney Creek	
	Rawsonville Rd		Palmer Rd		James Rd	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	17	0	12	0	19	0
NUMBER OF MAYFLY TAXA	1	-1	0	-1	2	0
NUMBER OF CADDISFLY TAXA	1	-1	0	-1	4	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	3.96	0	0.00	-1	4.00	0
PERCENT CADDISFLY COMP.	4.95	0	0.00	-1	24.00	0
PERCENT CONTR. DOM. TAXON	23.76	0	40.82	-1	18.00	1
PERCENT ISOPOD, SNAIL, LEECH	23.76	-1	0.00	1	6.00	0
PERCENT SURF. AIR BREATHERS	18.81	0	62.24	-1	4.00	1
TOTAL SCORE		-4		-6		1
MACROINV. COMMUNITY CATEGORY		ACCEPT.		POOR		ACCEPT.

Table 3. Habitat evaluation for Amos Palmer Drain and Stoney Creek, Monroe County, September 13, 1995.

HABITAT METRIC	STATION 1 Stoney Creek Rawsonville Rd	STATION 3 Palmer Drain Palmer Rd	STATION 4 Stoney Creek James Rd.
Bottom Substrate			
Avail. Cover (20):	6	5	11
Embeddedness (20):	2	0	6
Velocity:Depth (20):	6	2	16
Flow Stability (15):	8	3	8
Bottom Depos. (15):	1	1	7
Pools-Riffles- Runs-Bends (15):	8	3	12
Bank Stability (10):	5	7	5
Bank Vegetative Stability (10):	2	9	4
Stream Cover (10):	7	5	7
TOTAL SCORE (135)	45	35	76
HABITAT CONDITION CATEGORY	FAIR (MODERATELY IMPAIRED)	FAIR (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Date:	9/13/95	9/13/95	9/13/95
Stream Type:	Warmwater	Warmwater	Warmwater
Weather:	Cloudy	Partly Cloudy	Partly Cloudy
Ecoregion:	SMNITP	SMNITP	SMNITP
Air Temperature:	71 Deg. F.	72 Deg. F.	72 Deg. F.
Water Temperature:	59 Deg. F.	68 Deg. F.	68 Deg. F.
Ave. Stream Width:	15 Feet	8 Feet	25 Feet
Ave. Stream Depth:	1.3 Feet	1.3 Feet	1.5 Feet
Surface Velocity:	0.75 Ft./Sec.	0.4 Ft./Sec.	0.5 Ft./Sec.
Estimated Flow:	14.625 CFS	4.16 CFS	18.75 CFS
Stream Modifications:			
Nuisance Plants (Y/N):	N	N	N
Basin Code:			
Report Number:			
COMMENTS:			

TABLE 4. Water sampling results for Stony Creek and Palmer Drain, Monroe County, Michigan, September 13, 1995.

PARAMETER	UNITS	STONY CR Oakville Waltz Rd	Station 1 STONY CR Rawsonville RD	Station 2 LONDON SAND Outfall	Station 3 PALMER DR Palmer Rd	STONY CR Timbers Rd	Station 4 STONY CR James Rd
Total Dissolved Solids	mg/l	500	520	1750	1720	1130	1120
Total Suspended Solids	mg/l		8	6	k 4	12	7
Hardness	mg/l		308	1050	1070	725	735
Conductivity	umho/cm		782	1908	1894	1393	1391
Nitrite	mg N/l		0.003	0.002	t .001	0.004	0.004
Nitrate + Nitrite	mg N/l		0.34	t .002	t .003	0.133	0.25
Ammonia	mg N/l		0.013	0.12	0.106	0.047	0.034
Kjeldahl Nitrogen	mg N/l		.34 ht	.56 ht	.51 ht	.39 ht	.39 ht
Ortho Phosphorus	mg P/l		0.009	0.004	0.004	0.004	t .002
Total Phosphorus	mg P/l		.037 ht	.01 ht	.009 ht	.029 ht	.030 ht
Total Silver	ug/l		k 0.5	k 0.5	k 0.5	k 0.5	k 0.5
Total Arsenic	ug/l		1.6	k 1.0	k 1.0	1.8	1.6
Total Barium	ug/l		70	33	35	51	55
Total Calcium	mg/l		84.2	277	289	197	200
Total Cadmium	ug/l		k 0.2	k 0.2	k 0.2	k 0.2	0.2
Total Chromium	ug/l		k 1.0	k 1.0	k 1.0	k 1.0	k 1.0
Total Copper	ug/l		k 1.0	k 1.0	k 1.0	k 1.0	k 1.0
Total Mercury	ug/l		k 0.2	k 0.2	k 0.2	k 0.2	k 0.2
Total Magnesium	ug/l		23.7	86	84	56	57
Total Lead	ug/l		k 1.0	k 1.0	k 1.0	k 1.0	k 1.0
Total Selenium	ug/l		k 1.0	k 1.0	k 1.0	k 1.0	k 1.0
Total Zinc	ug/l		k 4	k 4	k 4	k 4	5

k - not detected at the specified detection level

ht - recommended laboratory holding time exceeded prior to analysis

t - value reported is less than criteria of detection

TABLE 5. Water sampling results for Stony Creek and Palmer Drain, Monroe County, Michigan, December 20, 1995.

PARAMETER	UNITS	Station 1 STONY CR Rawsonville RD	Station 2 LONDON SAND Outfall	Station 3 PALMER DR Palmer Rd	STONY CR Timbers Rd
Total Dissolved Solids	mg/l	590 ht	1790 ht	1630 ht	910 ht
Conductivity	umho/cm	908	1958	1863	1243
Temperature	Degrees F	32	37	37	33
pH		7.70	7.65	7.85	8.04
Dissolved Oxygen	mg/l	14.8	2	6.7	13.4
Sulfide	mg/l	k .02 ht	12 ht	0.23 ht	k .02 ht
Hydrogen sulfide (calculated)	ug/L	ND	3500	45	ND

k - not detected at the specified detection level

ht - recommended laboratory holding time exceeded prior to analysis

t - value reported is less than criteria of detection