Progress Report I

Lake Michigan Pesticide Investigations

WARF Institute, Inc.

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DSW 030469

STLCOPCB4014431

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Lake Michigan Pesticide Investigations

The WARF Institute study was designed to support other monitoring work being conducted or planned by various State and Federal agencies. It included one-time mid-summer sampling of stream water (IW), stream sediment (SED), stream plankton (IP), off-shore water (OW) and off-shore plankton (OP) at over 60 sites along the Lake Michigan shoreline. Fish samples were collected at 18 locations and water and sediment samples were obtained at sites of obvious municipal and industrial outfalls. In addition, 25 samples of water were collected at sites of industrial input into stream water and sewers in the cities of Racine and Kenosha. Other miscellaneous water samples were obtained and analyzed.

All samples were analyzed by the electron capture gas chromatographic method (FDA Pesticide Analytical Manual, 1968). Modifications were employed as required for each type of sample: sample size, method of preparation, method of extraction and cleanup. A number of samples were also analyzed after hydrolysis (dehydro chlorination). All injections were made into gas chromatographs with columns packed with 5% DC-200 on Cromport XXX, 80-90 mesh.

The results of the analyses of these samples will be compared to the results of fish water, invertebrate, clam and soil analyses by the State and Federal agencies. Some conclusions can then, perhaps, be drawn concerning the value of each of the different types of sampling and the degree to which Lake Michigan is being or has been possible contaminated with chlorinated hydrocarbon insecticide residues.

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From the results reported to date by various agencies and our own findings, it would appear that any possible contamination consists of low levels of apparent DDT and metabolites, very low levels of apparent dieldrin and very little occurrence of any other chlorinated hydrocarbon insecticide. Of great concern to us, however, is the finding of apparent polychlorinated biphenyls in many samples of water, plankton, sediment and fish, particularly at locations in the southern end of the lake. Also of great concern to us is the occurrence in many samples of other G. C. peaks which may not be insecticides but could easily be considered to be such. These peaks, as in the case of the apparent PCB type compounds, interfere with the interpretation of results for DDT, DDD and DDE. The identity, toxic potential, and metabolic fate in fish of these interfering compounds is not yet known. We are recommending extensive analytical and biological studies to determine these facts.

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SECTION I

SAMPLES COLLECTED

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July, 1969 Sampling of Lake Michigan Basin

A. Samples Related to Clam and Major Tributary Monitoring of Lake Michigan Interstate Pesticides Committee

	SED	IW	IP	OW	OP	Fish	
July 8							
1 East River	X	X	X				E. Shore Green Bay
1 X Little Sturgeon Bay	X	X	X	X	X		
2 X GB Dumping Ground	X			X	X		
3 X Fox River	X	X	X				
4 X Northern Paper Outfield		X					
July 9							
2 Big Suamico River	X	X	X	X	X		W. Shore Green Bay
3 Little Suamico River	X	X	X	X			
4 Pensaukee River	X	X	X	X		X	
5 Oconto River	X	X	X	X	X		
6 Peshtigo River	X	X	X	X			
7 Menominee River	X	X	X	X			
July 10							
8 Mud Lake Creek	X	X	X	X			E. Shore Door Peninsula
9 Clark Lake Creek	X	X	X	X	X		
10 N. Jacksonport Creek	X	X	X	X			
11 Kangaroo Lake Creek	X	X	X	X	X		
12 Moonlight Bay		X	X				
July 11							
13 Stony Creek	X	X	X	X			Sturgeon Bay to Two Rivers
14 Ahnapee River	X	X	X	X	X	X	
15 Kewaunee River	X	X	X	X		X	
6 X Molash Creek	X	X	X				
16 East Twin River	X	X	X	X	X		
17 West Twin River	X	X					
7 X Outfall at Two Rivers Sewage Disposal	X	X					
July 12							
18 Manitowoc River	X	X	X	X		X	Two Rivers to Port Washington
19 Silver Creek	X	X	X	X			
20 Calvin Creek	X	X	X	X		X	
21 Pine Creek	X	X	X	X	X		
22 Point Creek	X	X	X	X			
23 Fisher Creek	X	X	X	X	X		
24 Centerville Creek		X	X	X			

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July 12 (continued)	SED	IW	IP	OW	OP	Fish	
25 Seven Mile Creek	X	X	X	X		X	Two Rivers to Port Washington
26 Pigeon River	X	X	X	X	X	X	
27 Sheboygan River	X	X	X	X	X	X	
28 Black River	X	X	X	X			
July 13							
29 Sauk Creek	X	X	X	X		X	Port Washington to Milwaukee
30 Milwaukee				X	X		
9 X Kinn. R. Effluent		X					
July 15							
30 Kinnickinnic River	X	X	X				Milwaukee to Racine
31 Menominee River	X	X		X			
32 Oak Creek				X	X		
33 Root Creek	X	X	X	X	X		
July 16							
10 X So. of Racine	X	X	X				Racine to Chicago
11 X No. of Kenosha	X	X	X				
34 Pike River	X	X	X	X	X		
35 Barnes Creek	X	X		X			
12 X Dead River	X	X	X			X	
13 X Waukegan Harbor				X	X		
14 X Willmette				X			
July 17							
15 X No. Branch of Chicago River		X					Chicago to Michigan City
16 X So. Chicago	X			X	X	X	
17 X Outfall Calumet City		X					
18 X Calumet River at East Chicago	X	X	X				
36 Calumet River at Calumet City	X	X	X	X	X	X	
19 X Gary Harbor	X	X	X			X	
20 X Outfall No. G.H.		X					
21 X Outfall in G.H.		X					
37 Burns Ditch	X	X	X	X	X	X	
38 Trail Creek	X	X	X	X	X		
July 18							
39 Galien River	X	X	X	X	X		Michigan City to Saugatuck
40 Drain at Sawyer	X	X		X	X		
41 St. Joseph River	X					X	
42 Paw Paw River	X	X	X	X	X		
43 Black River	X	X	X	X	X	X	
44 Kalamazoo River	X	X	X	X	X	X	

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FORM 1

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July 19	SED	IW	IP	OW	OP	Fish	
X 22 Pine Creek	X	X	X				Saugatuck to Whitehal
45 Black River		X	X	X	X		
46 Pigeon River	X	X	X	X	X		
47 Grand River	X	X	X	X	X		
48 Muskegon River at mouth into Musk. Lake	X	X	X	X	X		
X 23 Muskegon River at Lake Michigan		X	X				
49 WhiteRiver	X	X	X	X	X		
July 20							
50 Pentwater River	X	X	X	X	X		Whitehall to Manistee
51 Pere Marquette River	X	X	X	X	X		
52 Manistee River	X	X	X	X	X	X	
July 21							
53 Betsie River	X	X	X	X	X		Manistee to Leland
54 Platte River	X	X		X	X		
55 Crystal River				X	X		
56 Leelanan Lake	X	X		X	X	X	
July 22							
57 Boardman River	X	X	X	X	X		Leland to Traverse City
July 23							
58 Elk River	X	X	X	X	X		Traverse City to
59 Lake Charlevoix Outlet	X	X	X	X	X		Harbor Springs
60 Bear River, Petoskey	X	X	X	X	X		
July 24							Harbor Springs to Leland
July 25							
X 24 Mid Lake Michigan				X			Leland, Michigan to Sturgeon Bay, Wis.

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FORM 1

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July 28 and 29	SED	IW	IP	OW	OP	Fish	
61 Millecoquins Creek	X	X	X	X	X		Upper Michigan Peninsula Shore
62 Manistique River	X	X	X	X	X		
63 Sturgeon River	X	X	X	X	X		
64 Whitefish River	X	X	X				
65 Escanaba River	X	X	X	X			
66 Ford River	X	X	X	X			
Totals: Regular	60	62	56	60	40	17	295
Extra X	13	18	9	6	4	3	53
Total	73	80	65	66	44	20	348
B. Investigative		X					25

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FORM 1

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SECTION II

Methods of Preparation and Analysis

1. Stream water and outfall samples.
2. Offshore water samples.
3. Stream and offshore plankton samples.
4. Sediment samples.
5. Fish samples.
6. Hydrolysis (dehydro chlorination)

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1. Stream water and outfall samples

The sample was mixed well before sampling. 1,800 mls. was measured into a graduate. The sample was placed in a clean empty nanograde solvent bottle. 100 mls. of ethyl ether and 200 mls. of hexane was added and the sample placed on a magnetic stirrer for 3 hours at medium to high speed. The sample was transferred to a 2 liter separatory funnel and allowed to separate. The lower layer was drained back into the extraction bottle. The hexane layer was rinsed twice with 100 mls. of de-ionized water, discarding the wash layer each time. The hexane layer was dried with 10-15 grams of $NaSO^4$ and transferred to a 1 liter flask using 50-60 mls. of hexane tc transfer with. The sample was placed on a steam bath and evaporated to 2-3 mls. The hexane was transferred to a florisil column (1.5 cm. x 10 inches) packed with 3.5 grams of pre-standardized florisil and eluted with 15 mls. of 5% ether-pet ether and then 15 mls. of 15% ether - pet ether. The resulting solutions were concentrated under nitrogen to dryness and taken back up in 2 ml. of hexane. The sample was injected into gas chromatograph.

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2. Offshore water samples.

The sample was mixed well before sampling. Four 2,000 ml. portions were measured and placed in four clean nanograde solvent bottles. 200 mls. of hexane was added to each bottle. The bottles were placed in a case and put on a shaker for 5 minutes. The bottles were removed from the case and shaken by hand for three minutes. The bottles were allowed to stand for four hours and the above method of shaking was repeated. The samples were then transferred to 2,000 ml. separatory funnels and the layers allowed to separate. After separation the lower layer was drained back into the extractor bottles. The hexane layers were combined, and dried with Na_2SO_4. The hexane was transferred to a 2 liter flask. The hexane was concentrated to 2-3 ml. on a steam bath and then transferred to a florisil column and eluted the same as the I.W. samples. The elutions were evaporated and made to 2 ml. and injected into a gas chromatograph.

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3. Stream and offshore plankton samples.

The samples were filtered through a Buchner funnel using a glass fiber filter pad. The pad was weighed and then the sample was filtered. The pad was placed in an oven at 40°C and re-weighed and the dry weight obtained. The samples were ground with 10-20 grams of Na_2SO^4 and extracted on Goldfisch extractor for 4 hours using 50 mls. of ethyl ether. The ether was evaporated and the sample run through a small florisil column as with the I. W. Blanks showed little or no interfering peaks. The samples were made to 2 mls. and injected on a gas chromatograph after florisil.

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4. Sediment samples.

The samples were mixed and two 25 gram samples were weighed into two 150 ml. beakers. One beaker was placed in an air oven at 100°C and dried for 2-3 days and the moisture was determined. The other sample was transferred to a Waring blender jar (1 qt.) and blended for 2 minutes with 200 ml. of acetonitrile. The acetonitrile was filtered through a plug of glass wool into a 1 liter separatory funnel containing about 500 ml. of top water. The sample was then blended for about ½ minute with an additional 50 ml. of acetonitrile and then filtered into the separatory funnel. 200 ml. of petroleum ether was added to the separatory funnel and shaken for 2 minutes. The layers were allowed to separate and the bottom layer was drawn off. The petroleum ether extract was washed two more times with about 600 mls. of tap water, discording the water layer both times. 10 grams of Na_2SO_4 was added to the petroleum ether extract and the sample was filtered into a 300 ml. erlenmeyer flask (rinse separatory funnel with about 70 ml. of petroleum ether). The sample was then taken down to about 5 ml. on a steam bath. The sample was then run through a Florisil column using 20 grams. of florisil and 150 ml. of 5% ether in petroleum ether and 250 ml. of 15% ether in petroleum ether. The column elutions were made up to 25 mls. with hexane. 10 microliters or less of the cleaned up extract was injected into a gas chromatograph.

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5. Fish samples.

The total weight of the fish was obtained and each fish was measured. The average weight and average length were reported. The fish was then ground in a model 84181D Hobart until homogeneous. A portion of the sample was placed in an 8 ounce bottle and frozen until analysis was preformed.

Extraction and Cleanup.

1. The samples are removed from freezer and thawed and mixed.
2. 20 grams of sample were weighed into a 150 ml. beaker.
3. The sample is transferred to a Waring blendor jar (1 qt.) and blended for 2 minutes with acetonitrile.
4. The acetonitrile is filtered through a plug of glass wool into a 1 liter sep. funnel containing about 500 ml. of tap H_2O.
5. The sample is then blended for about 1/2 minute with 50 additional mls. of acetonitrile and then filtered into the sep funnel.
6. 200 mls of Pet-Ether is added to the sep funnel and then shaken for 2 minutes.
7. The layers are allowed to separate and the bottom layer is drawn off.
8. The Pet-Ether extract is washed an additional two times with about 600 mls of tap H_2O (discarding H_2O layer both times).
9. 10 grams $NaSO_4$ is added to the Pet-Ether extract and the sample is filtered into a 300 ml erlenmeyer flask. (Rinse sep. funnel with about 70 mls of Pet-Ether).
10. The sample is then taken down to about 5 mls. on a steam bath and made to 25 mls. with Pet-Ether.
11. A 5l ml. aliquot is taken and an acetonitrile partition run. (equivalent to 12.0 grams). Pesticide Manual Vol. 1, p. 2-3 section 2.21A.
12. The sample is then run through a florsil column (Pesticide Manual Vol. 1, p. 3 section 2.21A).
13. The elutions are made to 25 mls. with Hexane.

Injection.

10 ml or less of the cleaned up extract is injected into Gas Chromatograph and the peaks measured and the ppm. recorded.

Gas Chromatograph conditions.

A. Column: 1/4" x 4' glass

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B. Packed with 5% D.C. 200 on cromport XXX (80-90 mesh)
C. Column Temp.: 195°C.
D. Injector Temp.: 250°C.
E. Dectector Temp.: 240°C.
F. Carrier gas: N_2 - 100 ml. per minute or so that p,p' - DDT has retention time of 8-10 minutes.

Gas chromatograph-Barber Coleman Pesticide Analyzer Model 5360 equipped with a Sr-90 detector.

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6. Hydrolysis.

A 10 ml aliquot of the first elution from the florsil is placed in a 125 ml erlenmeyer. Evaporate to small volume (2-5 mls) on a steam bath and then to just dryness using nitrogen. 20 mls of 2% alcoholic KoH is added. The sample allowed to reflux for 30 minutes using a water conclensor. The sample is transferred to a 125 ml separatory funnel by rinsing flask with 3-10 ml portions of Petroleum Ether. 20 ml of distilled water is added. Shake vigorously for 1 minute. The aqueous layer is drained into a second 125 ml separatory funnel containing 20 mls of Petroleum Ether. Shake vigorously for 1 minute. The H_2O layer is discarded and the Petroleum Ether layer is added to the first separatory funnel. The Petroleum ether extracts are washed with 3 x 20 mls portions of distilled water. The extract is dried with about 10 grams of Na_2SO_4 and transferred to a 125 ml erlenmeyer using 15-20 mls to rinse separatory funnel. The sample is concentrated to 2-3 mls on a steam bath and made to 10 mls with Hexane and injected into the gas chromatograph.

Discussion of Hydrolysis.

Hydrolysis will dehydrochlorinate p,p'-DDT to p,p'-DDE and p,p'-DDD to p,p'-DDD olefine. PCB's will not be affected by the Hydrolysis. To determine the amount of p,p'-DDD and p,p'-DDT present in a sample in which there are apparent PCB's would be accomplished in the following manner. The original extract would be injected, DDE, DDD, and DDT calculated. The hydrolized extract would be injected and the DDE, DDD, and DDT values calculated. The Est. PCB's are also calculated,

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using the peaks between DDD and DDT and the peak at DDT. The value obtained from DDD original minus the value obtained from the DDD for the hydrolysis would equal the P.P.M. of the actual DDD present. The same is true for DDT. The total DDT and metabolites present in the sample can therefore be calculated two ways: (1) DDE (original non hydrolized) plus the actual DDD, plus the actual DDT, or (2) the DDE (hydrolized) plus the actual DDD.

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SECTION III

RESULTS

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LAKE MICHIGAN STUDY:

Results: Section III

Definitions:

$x.xx^{L}$	=	Retention time late
$x.xx^{E}$	=	Retention time early
N.C.	=	Not calculated
Block	=	Peak is masked by some other peak of known retention time or unknown time making quantitation impossible
Off scale	=	Peak was off scale of std.
SED	=	Sediment
IW	=	Inshore water
OW	=	Outshore water
IP	=	Inshore Plankton
OP	=	Outshore Plankton
PPM	=	Parts per million
PPT	=	Parts per trillion

Calculation:

Est. PCb. on all samples except fish PCb is est. from peak that falls between DDD & DDT on a DC-200. The fish Est. PCb are taken from Hydrolized samples and the peak between DDD & DDT and the peak at DDT are measured and compared to a standard.

Results:

O.P. & I.P. on a dry basis, SED on a wet basis, Fish - as is basis (wet)

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A. Stream Water, Stream Plankton, Sediment, Offshore Water and Offshore Plankton.

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCb
1	SED	PPM	68.0	0.018	0.048[E]	0.041[L]	<0.001	--	0.50
	IW	PPT		<10.0	<10.0	<10.0	<10.0	N.C.	N.C.
	IP	PPM	Wet	0.010	0.057	0.023[L]	--	--	N.C.
2	SED	PPM	44.00	<0.001	<0.001	<0.001	<0.001	--	<0.01
	IW	PPT		<10.0	<10.0	<10.0	--	N.C.	N.C.
	IP	Wet		0.042	0.069	0.061[L]	--	N.C.	N.C.
	OW								
	OP	PPM	Dry	0.32	0.12	0.21[L]	0.080	0.014	0.79
3	SED	PPM	19.44	0.001	0.002	0.003[L]	<0.001	--	0.02
	IW	PPT		<10.0	<10.0	<10.0	--	N.C.	N.C.
	IP	PPM	Dry	0.17	0.099	0.18[L]	0.049	0.099	0.37
	OW								
4	SED	PPM	21.55	0.010	0.007	0.006[L]	<0.001	--	0.05
	IW	PPT		<10.0	<10.0	<10.0	<10.0	N.C.	N.C.
	IP	PPM	Dry	1.00	0.34	Block	0.025	Block	Off scale
	OW								
	Fish	PPM	as is	2.60	0.51	0.60	0.12	0.030	1.98
5	SED	PPM	18.90	<0.001	<0.001	<0.002	<0.001	--	<0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	N.C.	N.C.
	IP	PPM	Dry	0.060	0.030	Block	0.015	0.058	Off scale
	OW	PPT		4.8	2.3	5.6	1.3	50.3	--
	OP	PPM	Dry	0.11	0.060	0.20	0.040	--	0.46
6	SED	PPM	17.53	<0.001	0.001	0.001[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	73.5	N.C.
	IP	PPM	Dry	0.096	0.032	0.088[L]	0.010	0.051	0.20
	OW								
7	SED	PPM	18.04	<0.001	0.001	<0.002	<0.001	--	<0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	128.0	N.C.
	IP	PPM	Dry	0.049	0.060	0.13[L]	0.006	0.22	0.63
	OW								
8	SED	PPM	9.24	<0.001	<0.001	0.001[L]	<0.001	--	<0.01
	IW	PPT		<10.0	<10.0	<10.0	--	16.0	N.C.
	IP	PPM	Dry	0.079	0.047	0.16[L]	0.007	0.12	0.28
	OW								
9	SED	PPM	14.99	0.003	0.003	0.005[L]	--	--	0.028
	IW	PPT		300[E]	300[E]	<10.0	<10.0	17.8	N.C.
	IP	PPM	Dry	0.098	0.063	0.17[L]	0.008	0.092	0.65
	OW	PPT		<1.0	1.1	2.4	1.5	13.7	9.0
	OP	PPM	Dry	0.017	0.006	0.036[L]	0.001	0.033	--
10	SED	PPM	27.29	0.001	0.002	<0.002[L]	<0.001	--	<0.01
	IW	PPT		<10.0	<10.0	<10.0	--	43.3	N.C.
	IP	PPM	Dry	0.10	0.040	0.10[L]	0.020	0.050	0.23
	OW								

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCb
11	SED	PPM	20.45	0.003	0.009	0.003[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	14.4[L]	<10.0	52.2	N.C.
	IP	PPM	Dry	0.060	0.055	Block	0.011	0.006	Off scale
	OW	PPT		<1.0	<1.0	Block	1.7	8.0	Off scale
	OP	PPM	Dry	0.049	0.033	0.11[L]	0.008	0.051	0.24
12	SED			No data					
	IW	PPT		<10.0	<10.0	<10.0	<10.0	27.2	N.C.
	IP	PPM	Dry	0.092	0.063	0.14[L]	0.017	0.11	0.48
13	SED	PPM	18.01	0.005	0.007	0.007[L]	<0.001	--	0.03
	IW	PPT		<10.0	<10.0	<10.0	<10.0	35.3	N.C.
	IP	PPM	Dry	0.12	0.070	0.20[L]	0.030	0.040	3.09
	OW								
14	SED	PPM	75.74	0.074	0.12[E]	0.016[L]	0.001	--	1.10
	IW	PPT		180[E]	180[E]	<10.0	<10.0	72.2	N.C.
	IP	PPM	Dry	0.20	0.28	0.38[L]	0.056	0.22	2.79
	OW	PPT		1.9	5.6	8.9[L]	1.0	23.3	50.8
	OP	PPM	Dry	0.27	0.091	0.22[L]	0.009	0.44	0.73
	Fish	PPM	as is	0.78	0.27	0.70	0.11	0.015	1.50
15	SED	PPM	72.68	0.008	0.010	0.015[L]	<0.001	--	0.035
	IW	PPT		<10.0	<10.0	<10.0	<10.0	13.3	N.C.
	IP	PPM	Dry	0.13	0.12	0.15[L]	0.040	0.080	6.40
	OW	PPT		<1.0	<1.0	<1.0	1.1	8.5	--
	Fish	PPM	as is (Chub)	2.08	0.35	1.07	0.12	0.021	1.35
16	SED	PPM	50.49	0.023	0.028[E]	0.028[L]	<0.001	--	0.21
	IW	PPT		<10.0	<10.0	<10.0	<10.0	50.0	N.C.
	IP	PPM	Dry	0.22	0.13	Block	0.030	0.18	>7.25
	OW	PPT		1.5	2.8	4.5	2.2	20.0	19.5
	OP	PPM	Dry	0.059	0.047	0.14[L]	--	0.070	0.32
17	SED	PPM	56.47	0.008	0.012	0.015[L]	0.001	--	0.052
	IW	PPT		4.8	10.0	12.8	<10.0	14.4	
18	SED	PPM	62.05	0.008	0.013[E]	0.016[L]	0.001	--	0.12
	IW	PPT		<10.0	<10.0	<10.0	<10.0	66.7	N.C.
	IP	PPM	Dry	0.20	0.15	0.27[L]	0.16	0.060	0.97
	OW								
	OP			No data					
	Fish	PPM	as is (Chub)	2.34	0.51	1.31	0.17	0.021	0.87
19	SED	PPM	14.23	0.006	0.005	0.005[L]	--		0.01
	IW	PPT		<10.0	<10.0	10.8	<10.0	34.4	N.C.
	IP	PPM	Dry	0.050	0.036	0.093[L]	0.005	0.020	0.20
	OW								

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O FORM 1

STLCOPCB4014453

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCb
20	SED	PPM	48.53	0.060	0.11	0.11	0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.11	0.060	0.12[L]	0.030	0.020	0.77
	OW								
	Fish	PPM	as is	0.93	0.57	--	0.030	0.031	2.34
21	SED	PPM	15.28	0.002	0.002	0.004[L]	--	--	0.033
	IW	PPT		280[E]	280[E]	14.0[L]	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.058	0.055	0.13[L]	--	0.020	0.52
	OW	PPT		5,3	25,9	Block	2.6	7.5	Off scale
	OP	PPM	Dry	0.098	0.040	0.11[L]	0.011	0.049	0.18
22	SED	PPM	44.54	0.008	0.011	0.007[L]	<0.001	--	0.015
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.080	0.050	0.090[L]	0.020	0.037	0.17
	OW								
23	SED	PPM	51.88	0.012	0.015	0.015[L]	<0.001	--	0.021
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.14	0.081	0.13[L]	0.074	0.017	0.47
	OW								
	OP	PPM	Dry	0.52	0.15	0.37[L]	1.73	0.030	10.4
24	SED			No data					
	IW	PPT		<10.0	<10.0	<10.0	<10.0	174.0	N.C.
	IP	PPM	Dry	0.15	0.10	0.21[L]	0.016	0.030	0.55
	OW								
25	SED	PPM	30.31	0.020	0.030	0.017	<0.001	--	--
	IW	PPT		20.0[L]	94.0[E]	116.0[L]	<10.0	20.8	
	IP	PPM	Dry	0.43	0.25	Block	0.35	0.18	Off scale
	OW								
	Fish	PPM	as is	0.40	0.057	0.14	0.040	0.015	0.77
26	SED	PPM	42.04	0.013	0.028	0.012[L]	--	--	0.036
	IW	PPT		<10.0	<10.0	<10.0[L]	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.36	0.10	0.24	0.032	0.060	0.80
	OW								
	OP	PPM	Dry	0.18	0.080	0.16[L]	0.040	0.050	0.42
	Fish	PPM	as is	1.75	0.18	0.49	0.049	0.023	3.05
27	SED	PPM	64.87	0.55[L]	0.80	0.38[L]	<0.001	--	7.2
	IW	PPT		100.0[L]	120[E]	40.0[L]	<10.0	5.2	Very pos-
	IP	PPM	Dry	2.00	3.63	Block	0.035	0.61	Off scale.
	OW	PPT		--	--	--	<1.0	--	--
	OP	PPM	Dry	0.20	0.27	0.23[L]	1.37	0.020	1.36
	Fish	PPM	as is	3.63	1.25	1.73	0.13	0.060	3.32

DSW 030492

STLCOPCB4014454

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCB
28	SED	PPM	17.42	0.002[L]	0.003	0.006[L]	--	--	0.052
	IW	PPT		15.5	43.2[E]	38.7[L]	<10.0	18.4	V.Pos.Pres.
	IP	PPM	Dry	0.27	0.41	0.28[L]	0.054	0.061	2.00
	OW								
29	SED	PPM	23.97	0.035	0.13	0.19[L]	<0.001	--	0.065
	IW	PPT		<10.0	10.2	19.6[L]	<10.0	19.5	Possibly
	IP	PPM	Dry	0.28	0.16	0.47[L]	0.040	0.090	1.02
	OW								
	Fish	PPM	as is (Chub)	2.99	0.52	2.14	0.26	0.065	2.60
30	SED	PPM	55.08	0.17[L]	0.41	0.24[L]	0.040	--	3.20
	IW	PPT		8.8	18.0	16.0[L]	28.8	44.0	Possible
	IP	PPM	Dry	0.93	1.63	1.44[L]	0.050	--	7.04
	OW	PPT		1.1	1.4	3.0	2.2	8.0	9.5
	OP	PPM	Dry	0.62	0.35	0.71[L]	0.050	0.24	4.58
31	SED	PPM	69.28	0.35[L]	0.52	0.27[L]	0.040	--	4.4
	IW	PPT		17.6[L]	22.0	14.2[L]	14.0	84.0	Possible
	OW	PPT		2.2	3.6	6.2	1.1	20.2	15.0
32	OW	PPT		1.1	2.6	7.1	3.3	22.8	27.2
	OP	PPM	Dry	0.23	0.23	0.33[L]	0.050	0.022	1.55
33	SED	PPM	70.24	0.012	0.035	0.022[L]	0.004	--	0.075
	IW	PPT		<10.0	10.0	<10.0	<10.0	64.0	Possible
	IP	PPM	Dry	0.24	0.21	0.41[L]	1.30	0.13	1.30
	OW	PPT		1.7	1.5	2.7	4.5	110.0	5.5
	OP	PPM	Dry	0.38	0.19	0.48[L]	0.060	0.11	1.33
34	SED	PPM	54.73	0.028[L]	0.078	0.031[L]	0.002	--	0.20
	IW	PPT		10.0[E]	19.1[E]	20.0[L]	<10.0	10.4	Possible
	IP	PPM	Dry	0.27	0.19	0.28[L]	0.090	0.020	1.19
	OW	PPT		<1.0	<1.0	2.1	3.1	27.8	--
	OP	PPM	Dry	0.45	0.090	0.35[L]	0.060	0.090	0.47
35	SED	PPM	18.07	0.003[L]	0.004[L]	0.003[L]	--		0.013
	IW	PPT		16.2[E]	28.2[E]	31.1[L]	<10.0	<10.0	Possible
	OW	PPT		2.2	1.0	1.8	1.9	9.0	--
36	SED	PPM	41.03	0.038[L]	0.13[E]	0.12[L]	0.004	--	1.25
	IW	PPT		7.2	14.8	28.0[L]	<10.0	40.4	
	IP	PPM	Dry	0.25	0.70	0.79[L]	0.050	Block	6.67
	OW	PPT		1.1	1.6	1.4	2.1	7.8	55.9
	OP	PPM	Dry	0.20	0.15	0.26[L]	0.040	0.080	1.72
	Fish	PPM	as is	1.43	1.43	0.23	0.18	0.065	2.02

DSW 030493

FORM 1

STLCOPCB4014455

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCb
37	SED	PPM	23.64	0.004	0.007	0.006[L]	<0.001	--	0.021
	IW	PPT		<10.0	<10.0	<10.0	<10.0	17.9	N.C.
	IP	PPM	Dry	0.14	0.11	Block	0.050	0.10	>22.7
	OW	PPT		1.4	1.5	1.8	2.3	8.3	9.3
	OP	PPM	Dry	0.25	0.18	0.38[L]	0.050	0.040	1.82
	Fish	PPM	as is	1.56	1.64	0.13	0.14	0.030	2.33
38	SED	PPM	63.96	0.075	0.38	0.030[L]	0.002		--
	IW	PPT		24.4[E]	27.4[E]	41.8[L]	<10.0	47.0	Possible
	IP	PPM	Dry	0.71	2.16	0.84[L]	0.070	0.15	4.47
	OW	PPT		<1.0	1.5	2.0	2.1	1.5	6.5
	OP	PPM	Dry	0.33	0.27	0.84[L]	0.040	0.10	2.00
39	SED	PPM	46.49	0.007	0.011	0.006[L]	0.002	--	0.060
	IW	PPT		15.1[E]	19.6[E]	22.2[L]	<10.0	14.0	Possible
	IP	PPM	Dry	0.23	0.13	0.41[L]	0.10	0.11	0.77
	OW	PPT		2.1	2.0	6.0	3.4	4.5	15.0
	OP	PPM	Dry	0.37	0.20	0.51[L]	0.050	0.11	3.33
40	SED	PPM	18.88	0.002	0.004[E]	0.003[L]	--	--	0.037
	IW	PPT		4.0	6.0	6.0	<10.0	40.0	
	OW	PPT		<1.0	<1.0	1.5	1.9	7.4	--
	OP	PPM	Dry	0.39	0.19	0.52[L]	0.070	0.080	1.82
41	SED	PPM	20.72	0.008	0.011	0.010[L]	<0.001	--	0.032
	IW								
	Fish	PPM	as is	1.42	0.97	0.06	0.13	0.046	1.67
42	SED	PPM	29.63	0.012	0.011	0.012[L]	0.001	--	0.08
	IW	PPT		12.0	6.0	18.0[L]	45.2	7.2	
	IP	PPM	Dry	0.10	0.19	0.30[L]	0.030	0.080	0.93
	OW	PPT		5.6	2.5	3.0[L]	3.0	34.3	28.3
	OP	PPM	Dry	0.32	0.25	0.50[L]	0.14	0.073	1.50
43	SED	PPM	73.43	0.011	0.023	0.010[L]	0.005	--	0.11
	IW	PPT		40.0[E]	30.5[E]	11.7[L]	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.46	0.31	0.52[L]	0.050	0.16	>9.26
	OW								
	OP	PPM	Dry	0.30	0.18	0.44[L]	0.003	0.012	0.80
	Fish	PPM	as is (chub)	2.41	0.54	0.92	0.17	0.046	3.96
	Fish	PPM	as is (trout)	1.93	1.20	1.13	0.21	0.034	4.02

DSW 030494

STLCOPCB4014456

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCb
44	SED	PPM	23.55	0.017	0.018	0.018[L]	<0.001	--	0.043
	IW	PPT		<10.0	<10.0	<10.0	<10.0	33.0	N.C.
	IP	PPM	Dry	0.19	0.30	0.25[L]	0.030	0.12	1.79
	OW								
	OP	PPM	Dry	0.21	0.12	0.32[L]	0.010	0.030	0.45
	Fish	PPM	as is	1.56	0.47	0.01	0.090	0.044	2.66
45	SED			No data					
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
	IP	PPM	Dry	0.47	0.47	0.45[L]	0.050	0.060	2.40
	OW								
	OP	PPM	Dry	0.24	0.22	0.42[L]	0.020	0.050	1.34
46	SED	PPM	84.64	0.008	0.013	0.009[L]	<0.001	--	0.018
	IW	PPT		<10.0	<10.0	<10.0	<10.0	10.0	N.C.
	IP	PPM	Dry	0.40	0.14	0.31[L]	0.053	0.050	1.23
	OW								
	OP	PPM	Dry	0.18	0.13	0.26[L]	0.033	<0.005	0.77
47	SED	PPM	69.64	0.010	0.026	0.025[L]	0.002	--	0.17
	IW	PPT		<10.0	<10.0	11.4[L]	<10.0	<10.0	Possible
	IP	PPM	Dry	0.53	0.37	0.30[L]	0.080	0.14	1.83
	OW								
	OP	PPM	Dry	0.22	0.32	0.53	0.030	0.050	2.22
48	SED	PPM	85.68	0.002	0.004	<0.001	<0.001	0.056	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.12	0.12	0.24[L]	0.030	0.13	0.73
	OW								
	OP	PPM	Dry	0.33	0.32	0.49[L]	0.050	0.050	2.06
49	SED	PPM	74.21	0.002	0.004	0.002[L]	0.003	--	0.02
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.30	0.20	0.28[L]	0.10	0.012	2.35
	OW								
	OP	PPM	Dry	0.27	0.16	0.30[L]	0.045	0.070	0.89
50	SED	PPM	20.27	0.001	<0.001	<0.001	<0.001	-	<0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
	IP	PPM	Dry	0.54	0.20	0.33[L]	0.080	0.20	2.04
	OW	PPT		<1.0	1.5	3.5	2.7	5.8	12.5
	OP	PPM	Dry	0.29	0.080	0.27[L]	0.040	0.090	0.42
51	SED	PPM	58.91	0.002	0.003	0.002[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	20.0	N.C.
	IP	PPM	Dry	0.65	0.15	0.36[L]	0.060	0.020	1.55
	OW								
	OP	PPM	Dry	0.11	0.050	0.10[L]	0.020	0.012	0.29

DSW 030495

FORM I

STLCOPCB4014457

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCB
52	SED	PPM	22.98	<0.001	<0.001	<0.001	<0.001	--	<0.01
	IW	PPT		<10.0	13.3	11.1[L]	<10.0	<10.0	Possible
	IP	PPM	Dry	0.070	0.020	0.040[L]	0.008	0.070	0.13
	OW								
	OP	PPM	Dry	0.83	0.30	0.70[L]	0.090	0.12	2.33
	Fish	PPM	LH as is	2.90	1.17	1.31	0.14	0.034	4.37
53	SED	PPM	78.71	0.004	0.005	0.003[L]	<0.001	--	<0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.67	0.47	1.19[L]	0.066	0.090	4.76
	OW	PPT		<1.0	<1.0	1.3[L]	1.2	6.2	--
	OP	PPM	Dry	0.23	0.18	0.31[L]	0.025	0.040	0.51
54	SED	PPM	17.74	0.003	0.003	0.005[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	OW								
	OP	PPM	Dry	0.21	0.11	0.35[L]	0.040	0.10	0.77
55	OW								
	OP	PPM	Dry	0.32	0.070	0.27[L]	0.070	0.040	0.27
56	SED	pPM	35.60	0.001	0.002	0.002[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	NC
	IP			No data					
	OW								
	OP	PPM	Dry	0.37	0.13	0.35[L]	0.055	0.080	0.51
	Fish	PPM	as is	3.59	0.15	0.25	0.21	0.054	1.91
57	SED	PPM	24.12	0.002	0.004	0.002[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	Interfer.	N.C.
	IP	PPM	Dry	0.70	0.20	0.63[L]	0.080	0.14	2.00
	OW								
	OP	PPM	Dry	0.64	0.090	0.25[L]	0.12	0.15	0.55
59	SED	PPM	36.99	0.002	0.003	0.003[L]	<0.001	--	0.01
	IW	PPT		>300[E]	>300[E]	N.C.	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.12	0.060	0.15[L]	0.022	0.034	0.31
	OW								
	OP	PPM	Dry	0.20	0.060	0.16[L]	0.040	0.020	0.35
60	SED	PPM	17.01	0.001	0.002	0.003[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	N.C.	N.C.
	IP	PPM	Dry	1.00	0.20	0.57[L]	0.13	0.28	1.33
	OW	PPT		<1.0	<1.0	1.5	1.3	2.1	--
	OP	PPM	Dry	0.50	0.12	0.30[L]	0.080	0.23	1.00
61	SED	PPM	24.91	0.001	0.001	<0.002[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	N.C.	N.C.
	IP	PPM	Dry	0.38	0.11	0.19[L]	0.050	0.12	4.79
	OW								
	OP	PPM	Dry	0.58	0.21	0.35[L]	0.090	0.13	2.08

DSW 030496

STLCOPCB4014458

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCB
62	SED	PPM	48.99	0.036	0.053	0.025[L]	<0.001	--	0.80
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.44	0.28	0.54[L]	0.060	0.16	2.22
	OW	PPT		3.0	3.2	4.9	1.6	6.5	--
	OP	PPM	Dry	0.83	0.18	0.38[L]	0.080	0.11	1.25
63	SED	PPM	19.44	<0.001	0.001	0.002[L]	<0.001	--	0.01
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.13	0.070	0.40[L]	0.020	0.030	0.42
	OW								
	OP	PPM	Dry	0.58	0.14	0.29[L]	0.32	0.060	0.89
64	SED	PPM	26.39	0.002	0.003[E]	0.002[L]	--		0.04
	IW	PPT		1.110[E]	945[E]	29.0[L]	<10.0	N.C.	N.C.
	IP	PPM	Dry	0.13	0.12	Block	0.011	0.006	Off scale
65	SED	PPM	49.73	0.037	0.14	0.18[L]	0.001	--	1.46
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	1.63	0.40	1.33[L]	0.16	0.67	2.67
	OW								
66	SED	PPM	20.82	0.001	0.003	0.003[L]	<0.001	--	0.03
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.51	0.13	0.41[L]	0.10	0.16	0.77
	OW								

DSW 030497

FORM 1

STLCOPCB4014459

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCb
X1	SED	PPM	44.25	0.002[L]	0.002	0.002[L]	<0.001		0.01
	IW	PPT		<10.0	<10.0	<10.0	10.0	83.0	N.C.
	IP	PPM	Dry	0.11	0.080	0.22[L]	--	0.049	0.50
	OW								
	OP	PPM	Dry	0.097	0.077	0.097[L]	0.037	--	0.42
X2	SED	PPM	65.91	0.009	0.008	0.007[L]	0.001		0.11
	OW								
	OP	PPM	Dry	0.13	0.16	0.080[L]	0.020	0.13	0.87
X3	SED	PPM	36.95	0.024	0.029	0.010[L]	<0.001		0.25
	IW								
	IP	PPM	Dry	0.19	0.25	0.13[L]	0.016	0.048	1.43
X4	IW								
	SED	PPM	15.68	0.001	0.002	0.002[L]	<0.001		<0.01
X6	SED	PPM	17.61	0.002	0.003	0.003[L]	<0.001		0.020
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.080	0.030	0.099[L]	0.007	0.040	0.092
X7	SED	PPM	26.02	0.002	0.003	0.005[L]	<0.001		0.030
	IW	PPT		<10.0	<10.0	<10.0	<10.0	10.0	N.C.
X9	IW	PPT		43.0	32.0	50.0[L]	<20.0	46.7	150
X10	SED	PPM	76.06	0.25	0.069	0.098[L]	0.007		0.84
	IW								
X11	SED	PPM	19.87	0.012[L]	0.014[L]	0.016[L]	0.002		0.060
	IW								
	IP	PPM	Dry	0.21	0.22	0.22[L]	0.040	0.040	0.39
X12	SED	PPM	20.26	0.001	0.002	0.002[L]	<0.001		0.020
	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	
	IP	PPM	Dry	0.13	0.11	0.23[L]	0.024	0.029	0.56
	Fish	PPM	as is	4.73	0.57	1.02	0.18	0.060	4.87
X13	OW								
	OP	PPM	Dry	0.52	1.00	0.76[L]	0.060	0.30	5.17
X14	OW								
X15	IW	PPT		<20.0	<20.0	<20.0	30.0	64.0	220
X16	SED	PPM	24.20	0.002	0.005	0.040	<0.001		0.070
	OW								
	OP	PPM	Dry	0.24	0.30	0.41[L]	0.060	0.080	>4.63
	Fish	PPM	as is	0.94	0.74	0.27	0.12	0.03	1.46
X8	IW								

DSW 030498

FORM 1

STLCOPCB4014460

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Sample No.	Type	Values in	% H_2O	DDE	DDD	DDT	Dieldrin	BHC	Est PCb
17	IW	PPT		46.6	132.0[E]	150[L]	10.0	69.0	1,222.0
X18	SED	PPM	58.45	0.060	0.095	0.23[L]	0.018		0.73
	IW	PPT		<10.0	12.1	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.73	1.01	1.01[L]	0.098	0.45	6.70
	Fish								
19	SED	PPM	31.68	0.002	0.003	0.003[L]	0.001		0.02
	IW	PPT		<10.0	<10.0	<10.0	16.5	<10	20.0
	IP	PPM	Dry	0.15	0.14	0.43[L]	0.020	0.15	0.77
	Fish	PPM	as is	0.77	0.30	0.02	0.050	0.013	1.20
X20	IW								
21	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	
X22	SED	PPM	77.42	0.003	0.010	0.007[L]	<0.001		0.050
	IW	PPT		<10.0	<10.0	12.2[L]	<10.0	21.0	N.C.
	IP	PPM	Dry	0.48	0.48	0.45[L]	0.050	0.090	2.99
X23	IW	PPT		<10.0	<10.0	<10.0	<10.0	<10.0	N.C.
	IP	PPM	Dry	0.10	0.050	0.090[L]	0.020	0.050	0.31
X24	OW	PPT		3.0	3.5	1.0	3.2	1.5	29.0

DSW 030499

FORM 1

STLCOPCB4014461

I.W.

Ranges (P.P.T.)

DDE, DDD, DDT:

L = 0.00 - 10.0 N.C. = Not calculated

M = 10 - 50

H = 50 & up

O = odd peaks Early peak >100

B = Blocked

X = Probable presence of

Dieldrin

L = <10

M = >10

BHC

L = 0 - 10

M = 10 - 50

H = 50 & up

N.C. = Not calculated

I = Interference

DSW 030500

STLCOPCB4014462

Sample No.	IW DDE	DDD	DDT	Diel.	BHC	PCb
1	L	L	L	L	N.C.	
2	L	L	L	L	N.C.	
3	L	L	L	L	N.C.	
4	L	L	L	L	N.C.	
5	L	L	L	L	N.C.	
6	L	L	L	L	H	
7	L	L	L	L	H	
8	L	L	L	L	M	
9	0	0	L	L	M	
10	L	L	L	L	M	
11	L	L	M	L	H	
12	L	L	L	L	M	
13	L	L	L	L	M	
14	0	0	L	L	H	
15	L	L	L	L	M	
16	L	L	L	L	M	
17*	L	L	M	L	M	
17	0	0	L	L	M	X
18	L	L	L	L	H	
19	L	L	M	L	M	
20	L	L	L	L	L	
21	0	0	M	L	L	
22	L	L	L	L	L	
23	L	L	L	L	L	
24	L	L	L	L	H	
25*	M	H	H	L	M	
25	0	0	M	L	M	X
26	L	L	L	L	L	
27*	H	H	M	L	L	X
27	M	H	M	L	M	X
28	M	M	M	L	M	X
29*	L					
29	L	M	M	L	M	X
30*	L	M	M	M	M	X
30	H	H	M	L	M	X
31	M	M	M	M	H	X
32						
33	L	M	L	L	H	X

Sample No.	IW DDE	DDD	DDT	Diel.	BHC	PCb
34	M	M	M	L	M	X
35	M	M	M	L	L	X
36	L	M	M	L	M	X
36	0	0	H	L	M	X
37	L	L	L	L	M	
38	M	M	M	L	M	X
39	M	M	M	L	M	X
40	L	L	L	L	M	
40	0	0	M	L	L	
41	No data					
42	M	L	M	M	L	
42	0	0	M	M	M	X
43	M	M	M	L	L	
44	L	L	L	L	M	
45	L	L	L	L	L	
46	L	L	L	L	L	
47	L	L	M	L	L	X
48	L	L	L	L	L	
49	L	L	L	L	L	
50	L	L	L	L	L	
51	L	L	L	L	M	
52	L	M	M	L	L	X
53	L	L	L	L	L	
54	L	L	L	L	L	
55						
56	L	L	L	L	L	
57	L	L	L	L	I	
58						
59	0	0	N.C.	L	L	
60	L	L	L	L	N.C.	
61	L	L	L	L	N.C.	
62	L	L	L	L	L	
63	L	L	L	L	L	
64	0	0	M	L	N.C.	
65	L	L	L	L	L	
66	L	L	L	L	L	

DSW 030501

STLCOPCB4014463

Sample No.	IW					
	DDE	DDD	DDT	Diel.	BHC	Est. PCB
X1	L	L	L	L	H	
X2						
X3						
X4						
X5						
X6	L	L	L	L	L	
X7	L	L	L	L	L	
X8						
X9	M	M	M	L	M	X
X10						
X11						
X12	L	L	L	L	L	N.C.
X13						
X14						
X15	M	M	M	M	H	X
X16						
X17	M	H	H	L	H	X
X18	L	M	L	L	L	
X19	L	L	L	M	L	
X20						
X21	L	L	L	L	L	
X22	L	L	M	L	M	
X23	L	L	L	L	L	
X24						

DSW 030502

STLCOPCB4014464

SED

Ranges: (P.P.M.)

DDE, DDD, DDT:

L = <0.001 - 0.020

M = 0.020 - 0.10

H = 0.10 & up

Dieldrin:

L = <0.001 - 0.005

M = 0.005 - 0.010

H = 0.010 & up

PCB

L = <0.01 = 0.10

M = 0.10 - 0.70

H = 0.70 & up

DSW 030503

STLCOPCB4014465

Sample No.	SED DDE	DDD	DDT	Diel.	BHC	Est. PCB	Sample No.	SED DDE	DDD	DDT	Diel.	BHC	Est. PCB
1	L	M	M	L	-	M	34	M	M	M	L	-	M
2	L	L	L	L	-	L	35	L	L	L	L	-	L
3	L	L	L	L	-	L	36	M	H	H	L	-	H
4	L	L	L	L	-	L	37	L	L	L	L	-	L
5	L	L	L	L	-	L	38	M	H	M	L	-	L
6	L	L	L	L	-	L	39	L	L	L	L	-	L
7	L	L	L	L	-	L	40	L	L	L	L	-	L
8	L	L	L	L	-	L	41	L	L	L	L	-	L
9	L	L	L	L	-	L	42	L	L	L	L	-	L
10	L	L	L	L	-	L	43	L	M	M	M	-	M
11	L	L	L	L	-	L	44	L	L	L	L	-	L
12	No data						45	No data					
13	L	L	L	L	-	L	46	L	L	L	L	-	L
14	M	H	L	L	-	H	47	L	M	M	L	-	M
15	L	L	L	L	-	L	48	L	L	L	L	-	L
16	M	M	M	L	-	M	49	L	L	L	L	-	L
17	L	L	L	L	-	L	50	L	L	L	L	-	L
18	L	L	L	L	-	M	51	L	L	L	L	-	L
19	L	L	L	L	-	L	52	L	L	L	L	-	L
20	M	H	H	L	-	L	53	L	L	L	L	-	L
21	L	L	L	L	-	L	54	L	L	L	L	-	L
22	L	L	L	L	-	L	55					-	
23	L	L	L	L	-	L	56	L	L	L	L	-	L
24	No data						57	L	L	L	L		L
25	M	M	L	L		L	58						
26	L	M	L	L	-	L	59	L	L	L	L	-	L
27	H	H	H	L	-	H	60	L	L	L	L	-	L
28	L	L	L	L	-	L	61	L	L	L	L		L
29	M	H	H	L	-	L	62	M	M	M	L	-	H
30	H	H	H	H	-	H	63	L	L	L	L	-	L
31	H	H	H	H	-	H	64	L	L	L	L	-	L
32	No data						65	M	H	H	L		H
33	L	M	M	L	-	L	66	L	L	L	L	-	L

DSW 030504

FORM 1

STLCOPCB4014466

Sample No.	SED					
	DDE	DDD	DDT	Diel.	BHC	Est. PCB
X1	L	L	L	L		L
X2	L	L	L	L		M
X3	M	M	L	L		M
X4	L	L	L	L		L
X5						
X6	L	L	L	L		L
X7	L	L	L	L		L
X8						
X9						
X10	H	M	M	M		H
X11	L	L	L	L		L
X12	L	L	L	L		L
X13						
X14						
X15						
X16	L	L	M	L		L
X17						
X18	M	M	H	H		H
X19	L	L	L	L		L
X20						
X21						
X22	L	L	L	L		L
X23						
X24						

DSW 030505

STLCOPCB4014467

IP, & O.P.

Range (P.P.M.)

DDE, DDD, DDT, Dieldrin, BHC

L = 0.0 = 0.10

M = 0.11 - 0.40

H = 0.40 & up

B = Block

O.S. = Off scale

PCB

L = 0.00 - 0.50

M = 0.50 - 2.00

H = 2.00 & up

O.S. = Off scale

DSW 030506

STLCOPCB4014468

Sample No.	O.P. DDE	DDD	DDT	Diel.	BHC	PCB
1						
2	M	M	M	L	L	M
3						
4						
5	M	L	M	L	L	L
6						
7						
8						
9	L	L	L	L	L	L
10						
11	L	L	M	L	L	L
12						
13						
14	M	L	M	L	H	M
15						
16	L	L	M	L	L	L
17						
18						
19						
20						
21	L	L	M	L	L	L
22						
23	H	M	M	H	L	H
24						
25						
26	M	L	M	L	L	L
27	M	M	M	H	L	M
28						
29						
30	H	M	H	L	M	H
31						
32	M	M	M	L	L	M

Sample No.	O.P. DDE	DDD	DDT	Diel.	BHC	PCB
33	M	M	H	L	M	M
34	H	L	M	L	L	L
35						
36	M	M	M	L	L	M
37	M	M	M	L	L	M
38	M	M	H	L	L	H
39	M	M	H	L	M	H
40	M	M	H	L	L	M
41						
42	M	M	H	M	L	M
43	M	M	H	L	L	M
44	M	M	M	L	L	L
45	M	M	H	L	L	M
46	M	M	M	L	L	M
47	M	M	H	L	L	H
48	M	M	H	L	L	H
49	M	M	M	L	L	M
50	M	L	M	L	L	L
51	M	L	L	L	L	L
52	H	M	H	L	L	H
53	M	M	M	L	L	M
54	M	M	M	L	L	M
55	M	L	M	L	L	L
56	M	M	M	L	L	M
57	H	L	M	M	M	M
58						
59	M	L	M	L	L	L
60	H	M	M	L	M	M
61	H	M	M	L	M	H
62	H	M	M	L	M	M
63	H	M	M	M	L	M
64						
65						
66						

DSW 030507

FORM 1

Sample No.	IP DDE	DDD	DDT	Diel.	BHC	PCB
1						
2						
3	M	L	M	L	L	L
4	H	M	B	L	B	O.S.
5	L	L	B	L	L	O.S.
6	L	L	L	L	L	L
7	L	L	M	L	M	M
8	L	L	M	L	M	L
9	L	L	M	L	L	M
10	L	L	L	L	L	L
11	L	L	B	L	L	O.S.
12	L	L	M	L	M	L
13	M	L	M	L	L	H
14	M	M	M	L	M	H
15	M	M	M	L	L	H
16	M	M	B	L	M	H
17						
18	M	M	M	M	L	M
19	L	L	L	L	L	L
20	M	L	M	L	L	M
21	L	L	M	L	L	M
22	L	L	L	L	L	L
23	M	L	M	L	L	L
24	M	L	M	L	L	M
25	H	M	B	M	M	O.S.
26	M	L	M	L	L	M
27	H	H	B	L	H	O.S.
28	M	H	M	L	L	H
29	M	M	H	L	L	M
30	H	H	H	L	L	H
31						
32						
33	M	M	H	H	M	M

Sample No.	IP DDE	DDD	DDT	Diel.	BHC	PCB
34	M	M	M	L	L	M
35						
36	M	H	H	L	B	H
37	M	M	B	L	L	H
38	H	H	H	L	M	H
39	M	M	H	L	M	M
40						
41						
42	M	M	M	L	L	M
43	H	M	H	L	M	H
44	M	M	M	L	M	M
45	H	H	H	L	L	H
46	M	M	M	L	L	M
47	H	M	M	L	M	M
48	M	M	M	L	M	M
49	M	M	M	L	L	H
50	H	M	M	L	M	H
51	H	M	M	L	L	M
52	L	L	L	L	L	L
53	H	H	H	L	L	H
54						
55						
56						
57	H	M	H	L	I	H
58						
59	M	L	M	L	L	M
60	H	M	H	M	M	M
61	M	M	M	L	M	H
62	H	M	H	L	M	H
63	M	L	M	L	L	L
64	M	M	B	L	L	O.S.
65	H	M	H	M	H	H
66	H	M	H	L	M	M

DSW 030508

STLCOPCB4014470

Sample No.	IP						Sample No.	O.P.					
	DDE	DDD	DDT	Diel.	BHC	Est. PCB		DDE	DDD	DDT	Diel.	BHC	Est. PCB
X1	M	L	M	L	L	L	X1	L	L	L	L	L	L
X2							X2	M	M	L	L	M	M
X3	M	M	M	L	L	M	X3						
X4							X4						
X5							X5						
X6	L	L	L	L	L	L	X6						
X7							X7						
X8							X8						
X9							X9						
X10							X10						
X11	M	M	M	L	L	L	X11						
X12	M	M	M	L	L	M	X12						
X13							X13	H	H	H	L	M	H
X14							X14						
X15							X15						
X16							X16	M	M	H	L	L	H
X17							X17						
X18	H	H	H	L	H	H	X18						
X19	M	M	H	L	M	M	X19						
X20							X20						
X21							X21						
X22	H	H	H	L	L	H	X22						
X23	L	L	L	L	L	L	X23						
X24							X24						

DSW 030509

FORM 1

STLCOPCB4014471

SECTION V

B. FISH

DSW 030510

Lake Michigan Study

Fish Data:

DDE = DDE from non hydrolyzed

DDD = (DDD from non hydrolyzed) - (DDD from hydrolyzed)

DDT = (DDT from non hydrolyzed) - (DDT from hydrolyzed)

Est PCB = Peaks between DDD & DDT and peaks at DDT from hydrolyzed sample

DSW 030511

STLCOPCB4014473

Sample No.: 4

Location: Pensaukee River

Type: Alewife

Ave. Weight: 38.25 grams

Ave. Length: 6.58 inches

No. of fish: 20

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.030	0.030
Dieldrin	0.12	0.12
DDE	2.60	2.60
DDD	0.51	0.76
DDT	0.60	0.84
Est PCB	1.98	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	3.71	4.20

% of Total:

DDE	70.1%
DDD	13.7%
DDT	16.2%

Total of DDE hydrolyzed & actual DDD in P.P.M.

3.20

DSW 030512

FORM 1

STLCOPCB4014474

Sample No.: 14

Location: Ahnopee River

Type: Alewife

Ave. Weight: 26.75 grams

Ave. Length: 5.39 inches

No. of fish: 4

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.015	0.015
Dieldrin	0.11	0.11
DDE	0.78	0.78
DDD	0.27	0.47
DDT	0.70	0.90
Est PCB	1.50	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	1.75	2.15

% of Total:

DDE	44.6%
DDD	15.4%
DDT	40.0%

Total of DDE hydrolyzed & actual DDD in P.P.M.

1.90

DSW 030513

STLCOPCB4014475

Sample No.: 15

Location: Kewaunee River

Type: Chubs (cleaned)

Ave. Weight: 143.3 grams

Ave. Length: 9.6 inches

No. of fish: 5

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.021	0.021
Dieldrin	0.12	0.12
DDE	2.08	2.08
DDD	0.35	0.48
DDT	1.07	1.23
Est PCB	1.35	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	3.50	3.79

% of Total:

DDE	59.4%
DDD	10.0%
DDT	30.6%

Total of DDE hydrolyzed & actual DDD in P.P.M.

2.88

DSW 030514

FORM 1

STLCOPCB4014476

Sample No.: 18

Location: Manitowoc River

Type: Chubs

Ave. Weight: 142.2 grams

Ave. Length: 8.41 inches

No. of fish: 6

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.021	0.021
Dieldrin	0.17	0.17
DDE	2.34	2.34
DDD	0.51	0.60
DDT	1.31	1.41
Est PCB	0.87	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	4.16	4.35

% of Total:

DDE	56.3%
DDD	12.3%
DDT	31.5%

Total of DDE hydrolyzed & actual DDD in P.P.M.

3.48

DSW 030515

FORM 1

STLCOPCB4014477

Sample No.: 25

Location: Seven Mile Creek

Type: Alewife

Ave. Weight: 19.42 grams

Ave. Length: 5.05 inches

No. of fish: 5

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.015	0.015
Dieldrin	0.040	0.040
DDE	0.40	0.40
DDD	0.057	0.13
DDT	0.14	0.23
Est PCB	0.77	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	0.63	0.76

% of Total:

DDE	63.5%
DDD	14.3%
DDT	22.2%

Total of DDE hydrolyzed & actual DDD in P.P.M.

0.92

DSW 030516

STLCOPCB4014478

Sample No.: 26

Location: Pigeon River

Type: Alewife

Ave. Weight: 30.23 grams

Ave. Length: 6.38 inches

No. of fish: 4

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.023	0.023
Dieldrin	0.049	0.049
DDE	1.75	1.75
DDD	0.18	0.59
DDT	0.49	0.83
Est PCB	3.05	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	2.42	3.17

% of Total:

DDE	72.3%
DDD	7.4%
DDT	20.2%

Total of DDE hydrolyzed & actual DDD in P.P.M.

2.90

DSW 030517

FORM 1

STLCOPCB4014479

Sample No.: 27

Location: Sheboygan River

Type: Alewife

Ave. Weight: 15.76 grams

Ave. Length: 4.85 inches

No. of fish: 7

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.060	0.060
Dieldrin	0.13	0.13
DDE	3.63	3.63
DDD	1.25	1.69
DDT	1.73	2.10
Est PCB	3.32	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	6.61	7.42

% of Total:

DDE	54.9%
DDD	18.9%
DDT	26.2%

Total of DDE hydrolyzed & actual DDD in P.P.M.

6.57

DSW 030518

FORM 1

STLCOPCB4014480

Sample No.: 29

Location: Sauk Creek

Type: Chubs (cleaned)

Ave. Weight: 214.8 grams

Ave. Length: 10.7 inches

No. of fish: 5

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.065	0.065
Dieldrin	0.26	0.26
DDE	2.99	2.99
DDD	0.52	0.91
DDT	2.14	2.41
Est PCB	2.60	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	5.65	6.31

% of Total:

DDE	52.9%
DDD	9.2%
DDT	37.9%

Total of DDE hydrolyzed & actual DDD in P.P.M.

5.48

DSW 030519

FORM 1

STLCOPCB4014481

Sample No.: 37

Location: Burns Ditch

Type: Alewife & Perch (?)

Ave. Weight: 127.55 grams

Ave. Length: 7.50 inches

No. of fish: 2

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.030	0.030
Dieldrin	0.14	0.14
DDE	1.56	1.56
DDD	1.64	1.95
DDT	0.13	0.48
Est PCB	2.33	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	3.33	3.99

% of Total:

DDE	46.8%
DDD	49.2%
DDT	3.9%

Total of DDE hydrolyzed & actual DDD in P.P.M.

3.07

DSW 030520

STLCOPCB4014482

Sample No.: 41

Location: St. Joseph River

Type: Alewife

Ave. Weight: 35.3 grams

Ave. Length: 6.50 inches

No. of fish: 2

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.046	0.046
Dieldrin	0.13	0.13
DDE	1.42	1.42
DDD	0.97	1.15
DDT	0.06	0.44
Est PCB	1.67	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	2.45	3.01

% of Total:

DDE	58.0%
DDD	39.6%
DDT	2.4%

Total of DDE hydrolyzed & actual DDD in P.P.M.

2.58

DSW 030521

STLCOPCB4014483

Sample No.: 43

Location: Black River

Type: Chubs

Ave. Weight: 177.9 grams

Ave. Length: 10.33 inches

No. of fish: 6

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.046	0.046
Dieldrin	0.17	0.17
DDE	2.41	2.41
DDD	0.54	0.94
DDT	0.92	1.37
Est PCB	3.96	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	3.87	4.72

% of Total:

DDE	62.3%
DDD	13.9%
DDT	23.8%

Total of DDE hydrolyzed & actual DDD in P.P.M.

4.14

DSW 030522

STLCOPCB4014484

Sample No.: 43

Location: Black River

Type: Trout

Ave. Weight: 405.8 grams

Ave. Length: 12.5 inches

No. of fish: 2

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.034	0.034
Dieldrin	0.21	0.21
DDE	1.93	1.93
DDD	1.20	1.60
DDT	1.13	1.63
Est PCB	4.02	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	4.26	5.16

% of Total:

DDE	45.3%
DDD	28.2%
DDT	26.5%

Total of DDE hydrolyzed & actual DDD in P.P.M.

3.84

DSW 030523

FORM 1

STLCOPCB4014485

Sample No.: 44

Location: Kalamazoo River

Type: Alewife

Ave. Weight: 38.7 grams

Ave. Length: 6.20 inches

No. of fish: 5

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.044	0.044
Dieldrin	0.090	0.090
DDE	1.56	1.56
DDD	0.47	0.90
DDT	0.01	0.32
Test PCB	2.66	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	2.04	2.78

% of Total:

DDE	76.5%
DDD	23.0%
DDT	0.5%

Total of DDE hydrolyzed & actual DDD in P.P.M.

2.03

DSW 030524

STLCOPCB4014486

Wisconsin Alumni Research Foundation • Madison, Wisconsin

Sample No.: 52

Location: Manistee River, Manistee Mich.

Type: Lake Herring

Ave. Weight: 394.6 grams

Ave. Length: 12.6 inches

No. of fish: 4

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.034	0.034
Dieldrin	0.14	0.14
DDE	2.90	2.90
DDD	1.17	1.65
DDT	1.31	1.83
Est PCB	4.37	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	5.38	6.38

% of Total:

DDE	53.9%
DDD	21.7%
DDT	24.3%

Total of DDE hydrolyzed & actual DDD in P.P.M.

4.22

DSW 030525

STLCOPCB4014487

Sample No.: X12

Location: Dead River

Type: Alewife

Ave. Weight: 21.3 grams

Ave. Length: 5.70 inches

No. of fish: 5

Pesticide	Corrected P.P.M.	Not Corrected P.P.M
BHC	0.060	0.060
Dieldrin	0.18	0.18
DDE	4.73	4.73
DDD	0.57	1.26
DDT	1.02	1.56
Est PCB	4.87	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	6.32	7.55

% of Total:

DDE	74.8%
DDD	9.0%
DDT	16.1%

Total of DDE hydrolyzed & actual DDD in P.P.M.

5.95

DSW 030526

FORM 1

STLCOPCB4014488

Sample No.: X16

Location: Off South Chicago

Type: Alewife

Ave. Weight: 14.9 grams

Ave. Length: 4.30 inches

No. of fish: 3

Pesticide	Corrected P.P.M.	Not Corrected P.P.M
BHC	0.031	0.031
Dieldrin	0.12	0.12
DDE	0.94	0.94
DDD	0.74	0.87
DDT	0.27	0.46
Est PCB	1.46	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	1.95	2.27

% of Total:

DDE	48.2%
DDD	37.9%
DDT	13.8%

Total of DDE hydrolyzed & actual DDD in P.P.M.

1.68

DSW 030527

FORM 1

STLCOPCB4014489

Sample No.: X19

Location: Gary Harbor

Type: Alewife

Ave. Weight: 25.2 grams

Ave. Length: 5.50 inches

No. of fish: 5

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.013	0.013
Dieldrin	0.050	0.050
DDE	0.77	0.77
DDD	0.30	0.50
DDT	0.02	0.18
Est PCB	1.20	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	1.09	1.45

% of Total:

DDE	70.6%
DDD	27.5%
DDT	1.8%

Total of DDE hydrolyzed & actual DDD in P.P.M.

1.17

DSW 030528

Sample No.: 20

Location: Gary

Type: Alewife

Ave. Weight: 36.14 grams

Ave. Length: 5.85 inches

No. of fish: 7

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.031	0.031
Dieldrin	0.030	0.030
DDE	0.93	0.93
DDD	0.57	0.85
DDT	--	0.26
Est PCB	2.34	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	1.50	2.04

% of Total:

DDE	62.0%
DDD	38.0%
DDT	0.0%

Total of DDE hydrolyzed & actual DDD in P.P.M.

1.45

DSW 030529

STLCOPCB4014491

Sample No.: 36

Location: Grand Calumet River

Type: Alewife

Ave. Weight: 33.68 grams

Ave. Length: 6.33 inches

No. of fish: 9

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.065	0.065
Dieldrin	0.18	0.18
DDE	3.02	3.02
DDD	1.43	1.69
DDT	0.23	0.48
Est PCB	2.02	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	4.68	5.19

% of Total:

DDE	64.5%
DDD	30.6%
DDT	4.9%

Total of DDE hydrolyzed & actual DDD in P.P.M.

3.81

DSW 030530

STLCOPCB4014492

Sample No.: 56

Location: Lerlanua Lake, Leland Mich.

Type: Chubs

Ave. Weight: 160.3 grams

Ave. Length: 10.0 inches

No. of fish: 3

Pesticide	Corrected P.P.M.	Not Corrected P.P.M.
BHC	0.054	0.054
Dieldrin	0.21	0.21
DDE	3.59	3.59
DDD	0.15	0.29
DDT	0.25	0.44
Est PCB	1.91	--

Total DDE, DDD, DDT	P.P.M.	P.P.M.
	3.94	4.32

% of Total:

DDE	88.8%
DDD	4.8%
DDT	6.4%

Total of DDE hydrolyzed & actual DDD in P.P.M.

3.78

DSW 030531

STLCOPCB4014493

Fish

	DDE	DDD	DDT	Dieldrin	BHC	Est PCB
4)	2.60 H	0.51 M	0.60 M	0.12 M	0.030 L	1.98 M
14)	0.78 L	0.27 L	0.70 M	0.11 M	0.015 L	1.50 M
15)	2.08 H	0.35 L	1.07 H	0.12 M	0.021 L	1.35 M
18)	2.34 H	0.51 M	1.31 H	0.17 M	0.021 L	0.87 L
25)	0.40 L	0.057 L	0.14 L	0.040 L	0.015 L	0.77 L
26)	1.75 M	0.18 L	0.49 L	0.049 L	0.023 L	3.05 H
27)	3.63 H	1.25 H	1.73 H	0.13 M	0.060 M	3.32 H
29	2.99 H	0.52 M	2.14 H	0.26 H	0.065 M	2.60 H
37	1.56 M	1.64 H	0.13 L	0.14 M	0.030 L	2.33 H
41)	1.42 M	0.97 M	0.06 L	0.13 M	0.046 L	1.67 M
43)	2.41 H	0.54 M	0.92 M	0.17 M	0.046 L	3.96 H
43)	1.93 M	1.20 H	1.13 H	0.21 H	0.034 L	4.02 H
44)	1.56 M	0.47 L	0.01 L	0.090 M	0.044 L	2.66 H
52	2.90 H	1.17 H	1.31 H	0.14 M	0.034 L	4.37 H

Ranges (P.P.M.)

0-1.00=L	0-0.50=L	0.-0.500	0.0-0.05	0.0-0.005	0-1.00
1.00-2.00=M	0.50-1.00=M	0.50-1.00	0.05-0.20	0.05-0.10	1.00-2.00
2.00&up=H	1.00&up=H	1.00&up	0.20&up		2.00-

X12)	4.73 H	0.57 M	1.02 H	0.18 M	0.060 M	4.87 H
X16)	0.94 L	0.74 M	0.27 L	0.12 M	0.03 L	1.46 M
X19)	0.77 L	0.30 L	0.02 L	0.050 L	0.013 L	1.20 M
20)	0.93 L	0.57 M	- L	0.030 L	0.031 L	2.34 M
56)	3.59 H	0.15 L	0.25 L	0.21 H	0.054 M	1.91 M
36)	1.43 M	0.43 M	0.23 L	0.18 M	0.065 M	2.02 H

DSW 030532

FORM 1

STLCOPCB4014494

C. Investigative Samples

Racine and Kenosha

DSW 030533

Wisconsin Alumni Research Foundation • Madison, Wisconsin

Analysis for: Pesticide Residue

Description of Sample: Kenosha, Wisc. Samples

Submitted by: G. E. Schmoleski
Warf Institute Inc.

Sample No.	Description of Sample	PPb Pesticide					
		DDE	DDD	DDT	Dieldrin	Est PCB	BHC
1	Dry Cleaning -						
	Werner's Cleaning	<0.100	<0.100	<0.100	<0.100	<0.100	0.160
2	One Hour Martinizing	0.200	0.750[E]	0.250[L]	0.700	25.0	Blocked
3	Apyan Rug Co.	<0.100	0.170	0.100	<0.100	0.300	Blocked
1	Industial						
	Snap On Tools Corp.	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
2	Anaconda Copper	<0.100	<0.100	<0.100	<0.100	0.100	0.600
3	Forest Park Auto Wash	<0.100	<0.100	<0.100	<0.100	0.120	0.218
4	Kelsey Welding						
	LeBlanc Mfg.	<0.100	<0.100	<0.100	<0.100	<0.100	0.400
5	AMC Paint & Body Pl.	<0.100	<0.100	<0.100	<0.100	0.120	0.470
6	Mac Whyte Mfg.	<0.100	<0.100	<0.100	<0.100	<0.100	1.310
7	Eaton Mfg.	<0.100	<0.100	<0.100	<0.550	<0.100	0.440
1	Overflow Sewer Mains						
	Outflow						
	Anaconda, etc.	Masked	Masked	Masked	<0.100	Masked	Masked
2	Overflow (AMC, etc.)	<0.100	<0.100	<0.100	<0.100	0.100	0.385
3	Storm Sewer	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
1	Municipal Dump						
	Drainage ditch	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
2	From pond at above dump	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100

PCB est. on peak between DDD & DDT

DSW 030534

FORM 1

STLCOPCB4014496

Wisconsin Alumni Research Foundation • Madison, Wisconsin

Analysis for: Pesticide Residue

Description of Sample: Racine, Wisc. Samples

Submitted by: G.E. Schmoleski
Warf Institue Inc.

Sample No.	Description of Sample	PPb Pesticide DDE	DDD	DDT	Dieldrin	Est PCB	BHC
	Dry Cleaning						
1	One Hour Martinizing	<0.100	<0.100	<0.100	0.135	0.100	0.930
2	Paris Royal	<0.100	<0.100	<0.100	0.237	--	--
3	Independent Cleaners Courtesy Cleaners	<0.100	0.375[E]	0.725[L]	0.405	6.25	0.320
	Industrial						
1	Walker Mfg.	0.175[E]	0.250[E]	0.295[L]	--	2.80	<0.100
2	S.C. Johnson Gordon Mfg., Case Trans P.D.I., Inc.	Masked	Masked	0.300	1,771.0	--	0.250
	Printing & Devel.Co.	<0.100	<0.100	<0.100	0.463	--	<0.100
	Overflow Sewer Main -						
1	Storm Sewer	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
2	English St. (from resident.) North Shore beach into lake	<0.100	<0.100	0.107	<0.100	<0.100	<0.100
3	From West Racine residential into Root River & then lake drainage ditch on Oaks Rd.	Masked	Masked	Masked	0.250	Masked	Masked
1	Municipal Dump - leading from dump area.	<0.100	<0.100	<0.100	0.312	0.100	<0.100

PCB est. on peak between DDD & DDT

DSW 030535

C FORM 1

STLCOPCB4014497

D. Miscellaneous Samples

DSW 030536

WISCONSIN ALUMNI RESEARCH FOUNDATION

LABORATORIES

Madison, Wisconsin

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ASSAY REPORT

Analysis for: Pesticide Residue

Description of Sample: Additional samples from Ahnapee River

Date Received: 9-5-69 Control Number

Submitted by: John J. Birdsall
WARF Institute Inc.

Claimed Content

Results

Sample #	Location	PPT Pesticide DDE	DDD	DDT	Dieldrin	BHC	Est.PCB
4-1X	At river mouth	140.0	<20.0	<20.0	<20.0	Interfer 280	--
14-2X	At sewage disposal plant outlet	<20	Blocked	Blocked	<20.0	< 20	Blocked
4-3X	100 yds. dnstrm. from major ind. at fork of N. & W. branches	40	<20.0	<20.0	<20.0	Blocked	140.0
4-4X	West branch upstream from major industries	<20	Blocked	Blocked	<20.0	Blocked	Blocked
14-5X	North Branch	80	<20.0	<20.0	< 20.0	Blocked	200

Remarks

Signed _____

by and for the WISCONSIN ALUMNI RESEARCH FOUNDATION

Date

W. A. R. F. No. DSW 030537

FORM 2

STLCOPCB4014499

Analysis for Pesticide Residue

Sample Description - Fish Pellets

Date Received - May 12, 1969

WARF No. 9051223 PPM Insecticide

DDE	DDD	DDT	Dieldrin
0.055	0.029	0.054	<0.005

DSW 030538

STLCOPCB4014500

WISCONSIN ALUMNI RESEARCH FOUNDATION

LABORATORIES
Madison, Wisconsin

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ASSAY REPORT

Analysis for: Pesticide residue

Description of Sample: Water (Berrien County)

Date Received: 11-6-69 Control Number

Submitted by: State of Michigan
Dept. of Natural Resources
Lansing, Michigan
Carlos Fetterolf

Claimed Content

Results

		DDE PPT	DDD PPT	DDT PPT	Dieldrin PTT	BHC PPT	Est. PCB PPT
Station 3	10-22-69	Blocked	<20	<20	200.0	194.0	--
Station 5	10-22-69	Blocked	<20	20.0	62.7	23.1	--
Station 3	11-3-69	Blocked	<20	<20	150.0	20	--
Station 5	11-3-69	Blocked	<20	<20	243.0	83.8	--

Method

Remarks

Signed _____

by and for the WISCONSIN ALUMNI RESEARCH FOUNDATION

Date

W. A. R. F. No. DSW 030539

FORM 2

WISCONSIN ALUMNI RESEARCH FOUNDATION

LABORATORIES

Madison, Wisconsin

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ASSAY REPORT

Analysis for: Pesticide Residue

Description of Sample: Water

Date Received: 10-21-69 Control Number

Submitted by: Gary Sanitary District
Gary, Indiana

Claimed Content

Results

PPT Pesticide				
DDE	DDD	DDT	Dieldrin	BHC
97.0	194.0	117.0	<10	140

Method

Remarks

Signed

by and for the WISCONSIN ALUMNI RESEARCH FOUNDATION

Date

W. A. R. F. No.

DSW 030540

FORM 2

STLCOPCB4014502

WISCONSIN ALUMNI RESEARCH FOUNDATION

LABORATORIES

Madison, Wisconsin

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ASSAY REPORT

Analysis for: Pesticide Residue

Description of Sample: Water-Black River-So. Haven,Mich.

Date Received: 10-8-69 Control Number

Submitted by:

Board of Public Utilities
529 Phoenix St.
Box 152
South Haven, Mich. 49090

Claimed Content

Results

	PPT Pesticide					
	DDE	DDD	DDT	Dieldrin	BHC	Est. PCB
Sample No. 3	<10	<10	<10	<10	351	--

Method

Remarks

Signed

by and for the WISCONSIN ALUMNI RESEARCH FOUNDATION

Date

W. A. R. F. No. DSW 030541

FORM 2

STLCOPCB4014503

WISCONSIN ALUMNI RESEARCH FOUNDATION

LABORATORIES
Madison, Wisconsin

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ASSAY REPORT

Analysis for Pesticide Residue

Description of Sample Water

Date Received 10-10 69 Control Number

Submitted by

Claimed Content

Results

Sample No.		PPT Pesticide DDE	DDD	DDT	Dieldrin	BHC	Est. PCB
2	Grand River -Oct. 8, 1969 8:30 A.M. Railroad Bridge, Right & Left Banks downstream from Grand Rapids waste treatment plant.	<10	<10	<10	<10	26.9	--

Method

Remarks

Signed _____

by and for the WISCONSIN ALUMNI RESEARCH FOUNDATION

Date

W. A. R. F. No.

DSW 030542

STLCOPCB4014504

WISCONSIN ALUMNI RESEARCH FOUNDATION

LABORATORIES
Madison, Wisconsin

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ASSAY REPORT

Analysis for: Pesticide Residue

Description of Sample: Water

Date Received: 9-15-69 Control Number

Submitted by:
Mr. James B. Gifford, Supt.
Sewage Treatment Plant
532 Franklin St.
Michigan City, Indiana 46360

Claimed Content

Results

PPT Pesticide

DDE	<10
DDD	<10
DDT	<10
Dieldrin	34.0
Est.PCB	Blocked
BHC	19.2

Method

Remarks

Signed

by and for the WISCONSIN ALUMNI RESEARCH FOUNDATION

Date

W. A. R. F. No. DSW 030543

FORM 2

STLCOPCB4014505

SECTION IV

Discussion

DSW 030544

Figure 1 has been prepared to graphically portray the interference caused by apparent polychlorinated biphenylo and other other unknown hexane soluble electron capturing compounds. Other workers have encountered similar interference recently (References 1-9). The presence of these non-pesticide interfering compounds causes extreme difficulty in interpreting results. If, because of peak similarities, it is suspected that there may be PCB's present, hydrolysis of the sample is necessary to enable a calculation to estimate the amounts and to thereby adjust downward the amounts of DDT and its metabolites. Estimates may be made without hydrolysis, but they are not very accurate.

All fish samples and many of the other samples contained apparent PCB's. More frequent incidence was in samples from the southern part of the lake and in samples from cleaning establishment outlets. The average of five chub samples for DDT and metabolites was 4.70 ppm without adjustment for apparent PCB's. The only chub sample in excess of 5 ppm was from the southern part of the lake (Sauk Creek, 6.31 ppm). The average for 13 alewive samples for DDT and metabolites was 3.54 ppm without adjustment for apparent PCB's. The two alewive samples in excess of five ppm were from the southern part of the lake (Sheboygan River, 7.42 and Dead River, 7.55). Adjustment of the DDT and metabolite results for apparent PCB's would result in a 4 to 27% reduction.

DSW 030545

STLCOPCB4014507

pattern is evident, indicating that plankton may circulate widely around the lake. This may relate to the fish results discussed previously.

The presence of apparent BHC in many samples is difficult to understand since so little BHC and lindane have been in use in recent years. It is likely that this is also an artifact.

Many additional analyses are needed to determine the identity of the artifacts found. Meanwhile, care must be exercised so as not to confuse them with actual pesticide chemicals.

STLCOPCB4014508

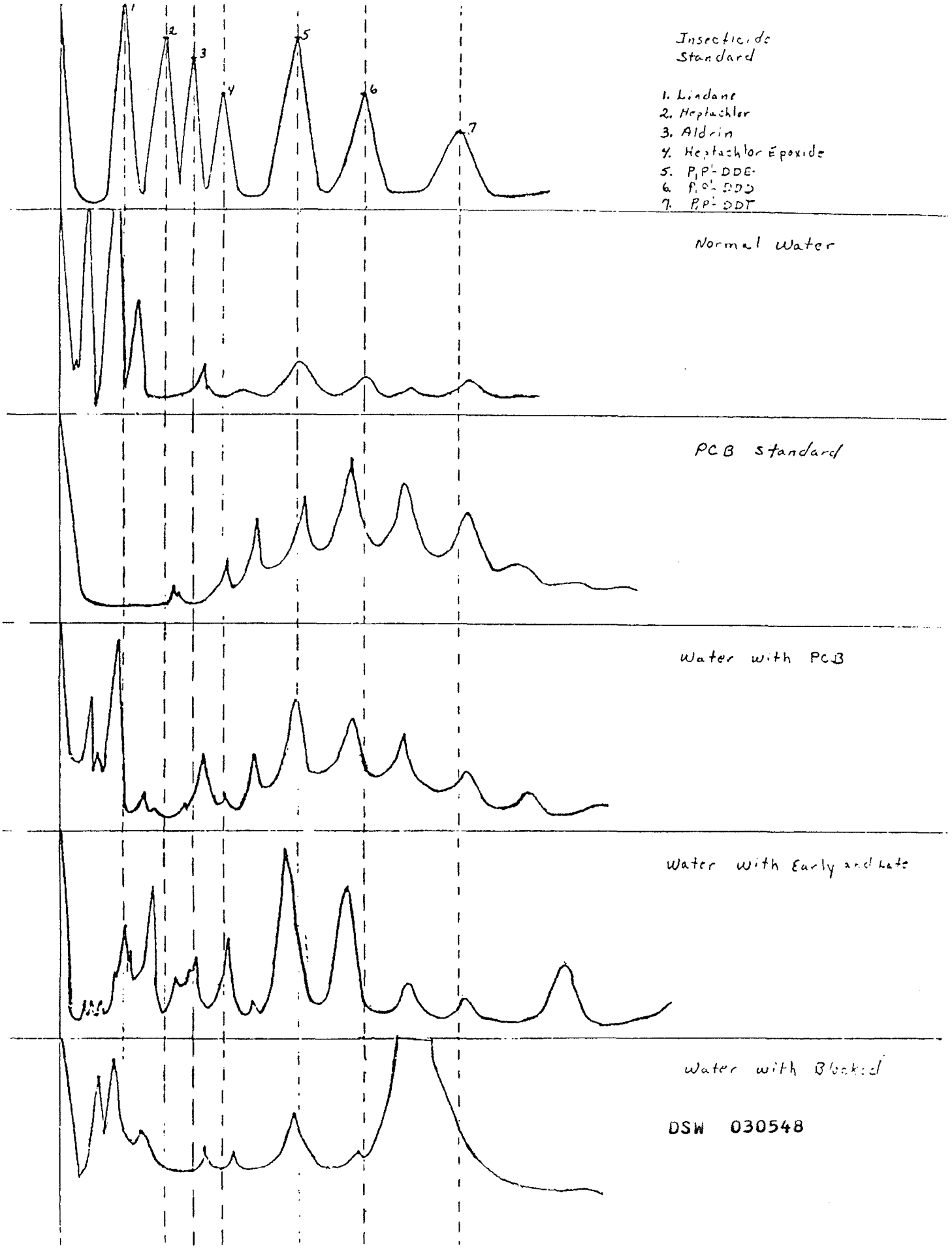
The other unknown hexane-soluble electron-capturing compounds are perhaps more disconcerting than the apparent PCB's. Since the identity of these compounds is not as yet known, no adjustments can be made. Yet they occur as early and late peaks near the retention times of DDT, DDD and DDE. They may or may not be eliminated from contention by the use of second or third G. C. columns or by use of thin layer chromatography. Although they do not occur to any extent in fish samples, their extensive occurrence in water, sediment and plankton samples is cause for concern: (a) they may be part of peaks being identified and quantified as pesticides and (b) they may have toxic properties of presently unknown significance.

If the apparent PCB's and other unknown hexane soluble electron-capturing compounds can be ignored, the occurrence of chlorinated hydrocarbon insecticides in Lake Michigan is at low levels. Most stream waters contained less than 10 ppt of DDT, DDD, DDE and Dieldrin. Higher levels of apparent BHC were found in stream waters (10-50 ppt) but it is extremely doubtful that this is truly BHC.

Stream sediments follow a similar pattern as stream waters but no BHC was detected. Levels of DDT, DDD, DDE and Dieldrin were generally less than 0.02 ppm except in the southern part of the lake.

Stream and off-shore plankton varied widely but contained low levels of Dieldrin (0.10 ppm or less) and somewhat higher levels of DDT, DDD, DDE and BHC (o.11-0.40 ppm). No geographical

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Insecticide Standard
1. Lindane
2. Heptachlor
3. Aldrin
4. Heptachlor Epoxide
5. P,P'-DDE
6. P,P'-DDD
7. P,P'-DDT
Normal Water
PCB standard
Water with PCB
Water with Early and Late
Water with Blocked
DSW 030548

References

1. Holmes, D. C., J. H. Simmons and J. O. G. Tatton. 1967. Nature 216, 227.

2. Jensen, S. 1966. New Scientist 32, 612.

3. Harrison, R. B. 1966. J. Sci. Fd. Agric. 17, 10.

4. Holden, A. V. and Marsden, K., 1967. Nature 216, 1274.

5. Widmark, G., 1967. J.A.O.A.C., 50, 1069.

6. Koeman, J. H., et al. 1967. Med. Rijksfaculteit. Landbouwwetenschappen Gent. 32, 3.

7. Risebrough, R. W., et al. 1968. Nature 220, 1098.

8. Koeman, J. H., M. C. Ten Noever de Brauw and L. H. deVos 1969. Nature 221, 1126.

9. S. Jensen, A. G. Johnels, M. Olsson and G. Otterlind. 1969. Nature 224, 247.

DSW 030549

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