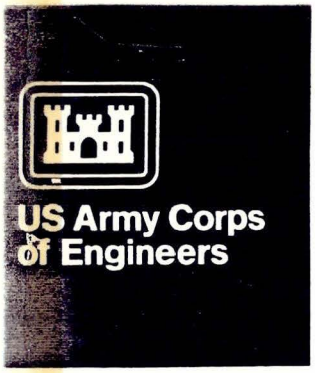

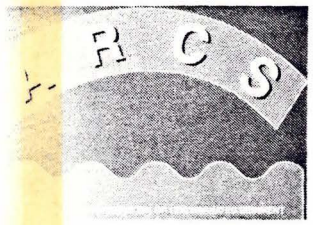

MISCELLANEOUS PAPER EL-91-6

INFORMATION SUMMARY, AREA OF CONCERN: SHEBOYGAN RIVER, WISCONSIN

by

J. G. Skogerboe, C. R. Lee, D. L. Brandon
J. W. Simmers, H. E. Tatem

Environmental Laboratory

DEPARTMENT OF THE ARMY
Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199

March 1991
Final Report

Prepared for US Environmental Protection Agency
Great Lakes National Program Office
Assessment and Remediation of Contaminated Sediment Program
Chicago, Illinois 60604

Monitored by US Army Engineer Division, North Central
Chicago, Illinois 60605-1592

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EXECUTIVE SUMMARY

The Water Quality Act of 1987, Section 118, authorizes the Great Lakes National Program Office (GLNPO) to carry out a 5-year study and demonstration project, Assessment and Remediation of Contaminated Sediment (ARCS), with emphasis on the removal of toxic pollutants from bottom sediments. Information from the ARCS program is to be used to guide the development of Remedial Action Plans (RAPs) for 42 identified Great Lakes Areas of Concern (AOC) as well as Lake-wide Management Plans. The AOCs are areas where serious impairment of beneficial uses of water or biota (drinking, swimming, fishing, navigation, etc.) is known to exist, or where environmental quality criteria are exceeded to the point that such impairment is likely. Priority consideration was given to the following five AOCs: Saginaw Bay, Michigan; Sheboygan Harbor, Wisconsin; Grand Calumet River, Indiana; Ashtabula River, Ohio; and Buffalo River, New York.

The ARCS program is to be completed during the period 1988-1992. The overall objectives of the ARCS program are:

a. To assess the nature and extent of bottom sediment contamination at selected Great Lakes AOC.

b. To evaluate and demonstrate remedial options, including removal, immobilization, and advanced treatment technologies, as well as "No-Action" alternatives.

c. To provide guidance on assessment and remedial action to the various levels of government in the US and Canada in the implementation of RAPs for the areas of concern, as well as direction for future evaluations in other areas.

The Environmental Laboratory (EL) of the US Army Engineer Waterways Experiment Station (WES) was asked to review existing data and information for each of the five priority AOCs. The approach used by WES was to bring together WES scientists who have been conducting research on the various aspects of contaminant mobility in the aquatic environment and develop a list of information (Table 1) required to evaluate the potential for contaminant mobility. All contaminant migration pathways were considered and are shown in Figure 1. A team of WES scientists then visited the RAP coordinator and associated staff for each AOC. Corps Districts responsible for the navigation projects in each AOC were also visited. During these meetings discussions

centered around what information was available for each item on the list of information developed by WES. Sources of additional information were obtained from the discussions.

This report summarizes the information obtained for the Sheboygan River AOC. The report attempts to retrieve information by subject in a quick and easy manner (GLNPO Subject-Reference Matrix). Data and information from numerous reports have been included as figures and tables. Wherever possible, references are given for the included data and information.

PREFACE

This report presents a summary of existing data and information related to the Sheboygan River Area of Concern. The study was conducted by the US Army Engineer Waterways Experiment Station (WES) during the period August 1988 through 15 December 1988 and August 1989 through September 1989. WES personnel included Dr. C. R. Lee, Soil Scientist; Dr. J. W. Simmers, Research Biologist; Dr. H. E. Tatem, Aquatic Biologist, Mr. D. L. Brandon, Statistician; and Mr. J. G. Skogerboe, Physical Scientist, all of the Contaminant Mobility and Regulatory Criteria Group (CMRCG). Work was performed under the supervision of Dr. L. H. Saunders, Chief, CMRCG; Mr. D. L. Robey, Chief, Ecosystem Research and Simulation Division (ERSD); and Dr. J. Harrison, Chief, Environmental Laboratory. The study was initially conducted under the general supervision of Mr. D. Cowgill, NCD, and Mr. T. Kizlauskas, USEPA Great Lakes National Program Office (GLNPO). The study was later conducted under the supervision of Mr. J. Miller, NCD, and Mr. D. Cowgill, USEPA GLNPO.

Generous cooperation and assistance in locating existing data and information were given by Mr. D. Cowgill, USEPA GLNPO; Mr. J. Miller, US Army Engineer District (USAED), Chicago; Messrs. D. Bowman and F. Snitz, Planning Division, USAED, Detroit; and Ms. Lynn Persson and Ms. Linda Talbot, WDNR.

Commanders and Directors of WES during the preparation of this report were COL Dwayne G. Lee, CE, and COL Larry B. Fulton, EN. Technical Director was Dr. Robert W. Whalin.

This report should be cited as follows:

Skogerboe, J. G., Lee, C. R., Brandon, D. L., Simmers, J. W., and Tatem, H. E. 1991. "Information Summary, Area of Concern: Sheboygan River, Wisconsin," Miscellaneous Paper EL-91-6, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

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CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

Multiply	By	To Obtain
acres	0.4047	hectares
cubic yards	0.7646	cubic metres
gallons (US liquid)	3.7854	litres
inches	2.5400	centimetres
miles (US statute)	1.6093	kilometres
pounds (mass)	0.4536	kilograms
square miles	2.5900	square kilometres
tons (2,000 pounds, mass)	907.1847	kilograms

INFORMATION SUMMARY, AREA OF CONCERN: SHEBOYGAN RIVER, WISCONSIN

PART I: INTRODUCTION

Background

The Water Quality Act of 1987, Section 118, authorizes the Great Lakes National Program Office (GLNPO) to carry out a five-year study and demonstration project, Assessment and Remediation of Contaminated Sediment (ARCS), with emphasis on the removal of toxic pollutants from bottom sediments. Information from the ARCS program is to be used to guide the development of Remedial Action Plans (RAPs) for 42 identified Great Lakes Areas of Concern (AOC) as well as Lake-wide Management Plans (Figure 2).

The AOCs are areas where serious impairment of beneficial uses of water or biota (drinking, swimming, fishing, navigation, etc.) is known to exist, or where environmental quality criteria are exceeded to the point that such impairment is likely. Priority consideration was given to the following five AOCs: Saginaw Bay, Michigan; Sheboygan Harbor, Wisconsin; Grand Calumet River, Indiana; Ashtabula River, Ohio; and Buffalo River, New York.

Each state has established RAP coordinators to develop a RAP for each AOC. Most RAP coordinators state that there is a need to develop guidance to interpret the information in a manner that will allow decisions to be made about each AOC. The following summarizes the status of the RAP report for the five priority AOCs:

Area of Concern	Status
Saginaw Bay, MI	Final RAP - September 1988
Grand Calumet River, IN	Draft RAP - January 1988
Sheboygan Harbor, WI	Draft RAP - December 1988
Buffalo River, NY	Final RAP - November 1989
Ashtabula River, OH	Draft RAP - September 1989

Purpose

The purpose of this report is to summarize the information collected during meetings with RAP Coordinators and Corps Districts to find out what information was available on contaminant migration at each of the five priority AOCs.

Scope

Information collected during visits to RAP Coordinators and Corps Districts is summarized. Sources of additional information have been referenced so that these sources could be contacted at a later date. Documents that were mentioned during meetings with RAP coordinators, but were not available at that time, are referenced so that these documents can be obtained, if desired. Retrieval of information by subject in a quick and easy manner was a goal of this report.

Abbreviations

A list of abbreviations used in this report follows:

ABBREVIATIONS

USEPA V - US Environmental Protection Agency Region V.

USEPA II - US Environmental Protection Agency Region II.

USACOE - US Army Corps of Engineers.

USGS - US Geological Survey.

DNR - Department of Natural Resources.

PART II: SUMMARY OF INFORMATION

Considerable information was available on the Sheboygan River AOC, however, most of the information was not available from the RAP coordinator when visited by the WES personnel. The available information was summarized in the Subject-Reference Matrix, where information known to exist but not immediately available was included. In addition numerous potential points of contact (POCs) were identified by the WES during discussions with the RAP coordinator. The POCs have also been tabulated and incorporated into the Subject-Reference Matrix, but no effort has been initiated, at the time of this report, to contact the POCs.

AOC Boundaries

The Sheboygan River Area of Concern (AOC) is generally located on the Wisconsin side of Lake Michigan at the city of Sheboygan, WI (Figure 2). The AOC encompasses the lower Sheboygan River from the Sheboygan Falls Dam to Lake Michigan and includes the nearshore of Lake Michigan (Figure 3). The cities of Sheboygan, Sheboygan Falls, and the village of Kohler are included in the AOC which has a total area of 22 square miles* of land and 13.9 miles of stream (PUBL-WR-211-88).

Contaminants of Concern

Contaminants of concern include polychlorinated biphenyls (PCBs), dioxins, chlorinated furans, polyaromatic hydrocarbons, heavy metals, phosphorus, nitrogen, suspended solids, and fecal coliform bacteria. Toxic substances such as PCBs and heavy metals were of particular concern in the AOC. Several PCB aroclors including 1242, 1248, and 1254 were also important.

Levels of Contaminants

Concentrations of PCBs ranged from 0.07 ppm to 4,500 ppm in river sediment, but 70 percent were less than 20 ppm (Sheboygan River RAP, 1988).

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* A table of factors for converting non-SI units of measurement to SI (metric) units is presented on page 5.

Concentrations in Sheboygan Harbor ranged from less than 0.025 ppm to 220 ppm. Data from riverbank soil was also available and ranged from 0.025 ppm to 71 ppm total PCBs.

Volume of Sediment

No data were available in the information collected from the RAP coordinator concerning volumes of sediment in the AOC. However this information may exist in other literature or might be calculated from existing data.

Sediment Data

Based on the list of references and the Subject-Reference Matrix, considerable sediment data appeared to be generally available, however most of the sediment data were not available from the RAP coordinator when visited by WES personnel. The Sheboygan River Remedial Action Plan (1988) indicated that sediment data were available for PCBs, PAHs, dioxin, furans, heavy metals, and nutrients. Numerous sediment samples have been collected throughout the AOC and when summarized, may provide a clear picture of the distribution of contaminants both laterally and with depth. The Remedial Action Plan concentrated primarily on sediment PCBs, and only listed ranges of PCB concentrations for different reaches in the AOC.

Sediment and surface soil samples were collected in 1987 and 1988 by the USEPA (1988) as part of a remedial investigation, and these data were provided to WES (Table 2). Sediment analysis included PCB isomers, heavy metals, dioxin, furans, particle size, and TOC (Tables 3-7). Samples were collected over the entire AOC, and the results were plotted on large-scale, detailed maps defining the areas of contamination as well as possible remedial action alternatives (Figure 4).

Water Quality Data

As with the sediment data, considerable water quality data appeared to be generally available in the literature, however this information was not available from the RAP coordinator. The Sheboygan River Remedial Action Plan did provide concentration ranges over different AOC reaches, particularly for

PCBs. Several potential sources for additional water quality data are listed in the Subject-Reference Matrix and in the References.

Water column samples were collected in 1987 and 1988 at seven locations (Figure 5) by the USEPA (1988), and these data were provided to WES. Samples were collected during low, moderate, and high flow periods; and chemical analysis included PCB isomers, heavy metals, dioxin, furans, particle size, and TOC (Tables 8-13).

Point Source Discharges

Several point source discharges were identified in the Sheboygan River Remedial Action Plan, particularly with respect to sources of PCBs:

a. City of Sheboygan Wastewater Treatment Plant
b. City of Sheboygan Incinerator
c. Twenty-four WPDES permitted industries within the AOC
d. Kohler Co.

The RAP also indicated the need for further investigation to identify additional point source discharges. Three other potential sources of information were identified, but were not available from the AOC coordinator.

Non-Point Discharges

Only general information on potential sources of non-point source discharge was available in the RAP including agricultural, urban, and home pesticide use. A number of additional sources of information were identified but have not been acquired.

Waterway Hydraulics/Watershed Hydrology Data

Several sources of waterway hydraulics data were identified. Some general information was available from the Sheboygan River RAP (Figures 6 and 7), however, other sources will have to be contacted for more detailed information. The best sources of waterway hydraulics data should be USGS and US Army Corps of Engineers. A USGS gaging station is located 4.2 miles upstream from Sheboygan Harbor from which daily discharge measurements are collected (Sheboygan River RAP, 1988). An example of the data collected in 1988 is presented in Table 14. The mean, maximum, and minimum recorded discharge

reported by the Sheboygan River RAP were 258, 7,680, and 1 cfs, respectively. Additional information regarding the geology and groundwater hydrology were reported in the Draft Kohler Company Landfill RI/FS, 1989 (Figures 8-10 and Table 15).

Air Quality

Air quality data are collected at several locations in the AOC (Baggott et al. 1986) including the cities of Sheboygan, Kewaunee, and Manitowoc. Monitored parameters included sulfur dioxide, total suspended particulates, and ozone, and only ozone exceeded ambient air quality standards in the AOC (Sheboygan River RAP 1988). Actual data were not, however, available from the RAP coordinator.

Potential Hazardous Waste Sites/Superfund Sites

Two Superfund Sites have been designated in the AOC: (a) Kohler Company Landfill Site, and (b) Sheboygan River and Harbor. A draft Remedial Investigation and Feasibility Study report was recently completed for the Kohler Company Landfill Site (Kohler Company 1989). The report includes geologic and groundwater hydrology information as well as soil and groundwater chemical analysis for volatile organics, base neutral and acid extractables, inorganics, and PCBs (Table 16).

Spills

No information or potential sources of information were identified regarding spills.

Adjacent Land Use

A summary of adjacent land use was included in the Sheboygan Township (Table 17).

Bioassay Data

Some bioassay studies were conducted to determine potential animal uptake and bioaccumulation of PCBs. Examples of data collected by McFarland et al. (1985) are presented in Tables 18 - 21.

Biological Data

A number of sources of information for biological data appear to exist; however, most were not available from the RAP coordinator. The Sheboygan River RAP provided a summary of the data particularly for PCB tissue content in fish but no actual data or sample site locations. Additional information exist for fish diversity and quantity, birds, mammals, earthworms, and human content. The Sheboygan River RAP also provided information concerning fish and waterfowl consumption advisories (Figures 11 and 12).

Risk Assessment

No risk assessment studies were identified.

GLNPO SUBJECT-REFERENCE MATRIX

AREA OF CONCERN: Sheboygan River

Subject	Reference (R1, R2)	Point of Contact (P1, P2)
Sediment	R6, R7, R8, R20, R23, R24, R26, R27	P4, P9
Metals	R29, R27	
PCBs	R2, R3, R4, R12, R16, R27, R29	
PAHs	R2, R27, R29	
Pesticides	R2	
TOC	R27, R29	
Others (specify) Dioxin	R2, R29	
Furans	R2, R29	
Misc.	R27	
Particle Size	R27, R29	
Engineering Properties		
Deposition Data	R29	
Transport Data	R29	
Depth Data	R23, R29	
Horizontal Distribution	R29	
Volume To Be Considered	R29	
Water Quality	R5, R7, R24	P5, P8, P9, P10
Physical Data	R27, R29	
Temperature	R27, R29	
DO	R27, R29	
Conductivity	R27	
Hardness	R27	
Total Solids	R27, R29	
Chemical Data	R29	
pH	R27, R29	
TOC		
Metals	R27	
PCBs	R2, R12, R16, R22, R27	
PAHs	R2	
Pesticides	R2	
BOD		

Subject	Reference (R1, R2)	Point of Contact (P1, P2)
Other (specify) Dioxin	R2	
Furans	R2	
Nutrients	R27	
Bacteria	R29	
Waterway Hydraulics	R25	P7, P20
Flow Data	R27, R29	
Water Depth	R27, R29	
Flood Data	R29	
Point Discharges	R19, R24	P4
Concentration Data	R29	
Volume Data	R29	
Waste Load Data	R29	
Non-Point Discharges	R19, R24, R29	P22, P2, P11
Concentration Data	R1	P1
Volume Data		P1
Waste Load Data		P1
Watershed Hydrology	R19, R24, R25, R29	
Rainfall Data	R29	
Acid Rain		
Runoff Data	R29	
Volume	R29	
Solids		
Chemical Data		
(Specify)		
Air		
Air Quality Data	R29	P9
Atmospheric Deposition	R29	P3, P14
Superfund Sites	R13, R29	
Adjacent Land Use	R24, R29	
Contaminant Sources	R29	
Risk Assessment		
Bioassay Data	R24	
Acute		
Chronic		
Bioaccumulation	R15, R18	

Subject	Reference (R1, R2)	Point of Contact (P1, P2)
Biological Data	R24, R29	P9, P12
Fish	R29	P12
Diversity	R29	
Quantity	R29	
Tissue Content	R6, R14, R15, R17, R29	P12, P23
Benthic		
Diversity		
Abundance		
Content		
Birds	R9, R29	P12
Diversity		
Quantity	R29	
Contents	R9, R29	
Plants		
Diversity		
Abundance		
Contents		
Mammals	R29	
Endangered Species		
Other Earthworms	R15	
Humans	R21	

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POINTS OF CONTACT

	Person	Area of Expertise	Location/telephone
P1	Bannerman	Non Point Source Discharges	International Technical Committee
P2	Citizen Group Task Force	Non Point Source Discharges	
P3	Eisinwyk, Steve	Atmospheric Deposition	University of Minnesota
P4	Eleder, Bonny	Sediment and Point Source Discharges	United States Environmental Protection Agency, Region V (312-886-4885)
P5	Holmstron, Barry	Water Quality	United States Geological Survey (608-274-3535)
P6	Information Services Center	General Information	Michigan DNR (517-373-1220)
P7	NOAA/NOS/OMA-Great Lakes Acquisition Unit-Lake Levels	Waterway Hydraulics	
P8	Norman, Vernon	Water Quality	United States Geological Survey (608-274-3535)
P9	Persson, Lynn	RAP Coordinator for Sheboygan River, Wisconsin	Department of Natural Resources (608-266-9267)
P10	Snitz, Frank	Water Quality	United States Army Engineer District, Detroit Detroit, Michigan
P11	Schultz, Paul	Non Point Source Discharges	Plymouth, Wisconsin (414-892-8756)
P12	STORET	Contaminant Concentrations in Fish	United States Environmental Protection Agency
P13	Sullivan, John		Wisconsin Department of Natural Resources (608-267-9753)
P14	Swakhammer, Debra	Atmospheric Deposition	University of Wisconsin

Person	Area of Expertise	Location/telephone
P15 Talbot, Linda	RAP Coordinator for Wisconsin Department of Natural Resources	Wisconsin Department of Natural Resources
P16 Tecumseh Products		Sheboygan, Wisconsin
P17 US Army Engineer District, Chicago	Sediment and Water Quality	Chicago, Illinois
P18 US Army Engineer Waterways Experiment Station		Vicksburg, Mississippi (601-636-3111)
P19 US Environmental Protection Agency, Region V		
P20 US Geological Survey	Water Quality	Madison, Wisconsin
P21 Wilhelm, Gerould	Plants	Morton Arboretum Illinois
P22 Wilford, Wayne	Non Point Source Discharges	EPA-GLNPO Chicago, Illinois
P23 Whitman, Paul	Fish Tissue Content	CENCC-PD-S Chicago District Chicago, Illinois

Table 1. List of Information and Data Required to Evaluate In-Place Contaminated Sediments

1. SEDIMENT DATA
   - Water Content
   - Hydrous Oxides (Manganese, ferrous)
   - Total PAHs
   - Total PCBs (Aroclors and Congeners)
   - TOC
   - Total Solids
   - OM
   - EP Test
   - CEC (plus calcium, magnesium phosphorus, potassium concentration in extractant)
   - Atterberg Limits
   - Specific Gravity Determination
   - Dispersion Coefficients
   - Sediment Particle Density
   - Bulk Density
   - Permeability
   - Particle Size Distribution (hydrometer method); (include sand, fine sand, silt and clay)
   - Wet Sediment pH (1:2 sediment to distilled water solution)
   - Dry Sediment pH (1:2 sediment to distilled water solution)
   - % Base Saturation
   - % Free Calcium Carbonate
   - Potential pH or Lime Requirement (using titration or similar method)
   - Total Carbon Content
   - Total Soluble Heavy Metal Content
   - Total Heavy Metal Content
   - Surface Runoff Suspended Solids
   - Wet Sediment Extractable Heavy Metal Content (DTPA preferred)
   - Dry Sediment Extractable Heavy Metal Content (DTPA preferred)
   - Depth (thickness) of Mixed Top Sediment Layer
   - Depth (thickness) of Contaminated Sediment Layers
   - Sedimentation Rate (possibly through core dating)
   - Sediment Deposition History
   - Suspended Solids Settling Rates (possibly through sediment traps)
   - Consolidation Characteristics
   - Sediment Porosity (mixed layer and deeper layers)
   - Pesticides
   - Priority Pollutants (40 CFR Part 136)
   - Dioxin
   - Reference Site
   - OG
   - EC
   - Redox
   - Sulfides
   - SOD
   - Volatile Solids
   - Salinity
   - NH3

2. POINT DISCHARGES INTO WATERWAY
   - Contaminant Loads Based on Concentration and Volumetric Flow Rates
   - Surface Runoff During Storm Events
   - Combined Sewer Overflow

(Continued)

Table 1. (Continued)

3. NONPOINT DISCHARGES INTO WATERWAY
   - Ground Water: Information on Geohydrology and Ground Water Characteristics
   - Atmospheric Deposition

4. LAND USE OF ADJACENT PROPERTIES

5. CONTAMINATED SITES
   - Hazardous Waste
   - Superfund
   - Spill

6. WATERSHED HYDROLOGY
   - Wetlands

7. WATERWAY HYDRAULICS & FLOW
   - Hydrology or Flows Through the System
   - Area of Bottom Contamination
   - Water Depth at Area of Contamination
   - Contaminant Waste Loads to System
   - Floods

8. WATER QUALITY DATA

DOC	TOC
DO	Hardness
BOD	PH
Metals	Conductivity
PAHs	Temperature
PCBs	Total Solids

   - Total Suspended Solids (distributed in time and space)
   - Best Estimates of Partition Coefficients for Low (water column) and High (bottom sediments) Sediment Concentrations
   - Sediment-Water Contaminant Distribution Coefficients
   - Bacteriological Quality
   - Priority Pollutants
   - Interstitial Water Contaminant Concentration

9. BIOASSAY TEST DATA

   Rapid:
   - microtox
   - *Daphnia*
   - *Ceriodaphnia*
   - *Pontoporeia*
   - Ames Test

   Chronic:
   - *C. tentans*
   - *Daphnia*
   - fathead minnows
   - macroinvertebrate

(Continued)

Table 1. (Concluded)

Plant bioassay data:
- Total PCB Content (aroclor content)
- Specific PCB Congeners
- PAHs
- Heavy Metal Uptake

10. BIOLOGICAL DATA

Fisheries Surveys, including:
- body weight/size
- diet/stomach contents
- feeding type
- lipid content
- phytoplankton
- zooplankton

Benthic Community
- overall benthic "health"
- benthic indicators/low diversity

11. MISCELLANEOUS INFORMATION

Climatological Data
- Air Quality

12. RISK ASSESSMENT
- Human Health
- Ecological

13. WILDLIFE USAGE
- Birds
- Mammals

14. ENDANGERED SPECIES
- Federal
- State

Table 2. Sheboygan River and Harbor Remedial Investigation/ Enhanced Screening Report, Summary of Sample Quantities

Sample Matrix	No. of Locations	No. of Analyses Performed PCBs	Metals	HSL	TCDD/TCDF
1. River Sediments	99	107	107	10	1
2. Harbor Sediments	20	127	127	5	1
3. Soils	20	20	20	0	0
4. Water Column					
a. moderate flow	6	12(2)	12(2)	0	0
b. high flow	6	12(2)	12(2)	0	0
c. low-moderate flow	14(3)	28(2)	28(2)	0	0
d. low flow	7	14(2)	14(2)	7(4)	0
5. Particulates (high flow)	6	6	0	0	0

Notes:

1. This summary includes actual samples only. QA/QC samples are not included.
2. The number of analyses includes a filtered and unfiltered sample at each location.
3. The number of locations indicates seven locations per round, two rounds taken.
4. The low flow water column samples were analyzed for volatile organic compounds only. This was outside the scope of RI activities as outlined in the Work Plan.

Table 3. Sheboygan River and Harbor Remedial Investigation/Enhanced Screening Report, Summary of Harbor Sediment Samples

Boring No.	Completion Date	Water Depth (ft.)	Max. Boring Depth (ft.)	Summary of Analyses Performed (See Key Below) 0-0.5 ft.	0.5-2 ft.	2-4 ft.	4-6 ft.	6-8 ft.	8-12 ft.	12-16 ft.	16-20 ft.
H1	9/14/87	25.7	20.0	O	O	H,T,P	O	O	O*,P	O	O
H2	9/11/87	21.0	14.0	O	O	O,T,P	O*	O	O,P	--	--
H3	9/14/87	20.0	20.0	O	O	O,T,P	O*	O	O	O,P*	O
H4	9/21/87	21.0	12.0	O	O*,T,P	O	O	O	O,P	--	--
H5	9/21/87	16.5	10.0	O,T	O,P	O	O	P	--	--	--
H6	9/22/87	10.0	12.0	O*,T	O,P*	O	O	O,P	O	--	--
H7	9/22/87	15.0	10.0	O,T*	O,P	O	O	O	O*,P	--	--
H8	9/22/87	10.0	10.0	O,T	O,P	O	O	O,P	--	--	--
H9	9/22/87	8.0	12.0	O,T	O,P	O	O	O*	O,P	--	--
H10	9/17/87	25.0	8.0	O	O	H,T,P	O	P	--	--	--
H11	9/10/87	18.0	20.0	O	O	O,T,P	O	O	O	O,P	O
H12	9/17/87	17.0	18.0	O	O*	H,T,P	O	O,D	O*	O	--
H13	9/10/87	16.0	18.0	O	O*	O,T,P	O	O	O	O,P	O
H14	9/16/87	18.0	16.0	O	O	O,T,P	O	O	O*,P	O	--
H15	9/16/87	10.0	16.0	O	O,T,P	H	O	O	O,P	O	--
H16	9/16/87	8.0	12.0	O	O	O	O*,T,P	O	O,P	--	--
H17	9/18/87	11.0	16.0	O	O	O,T,P	O	O*	O,P	O	--
H18	9/18/87	10.0	20.0	O	O	O,T,P	O	O	O	O,P	O*
H19	9/18/87	8.0	14.0	O	O,T,P	O	O	P	O	N	--
H20	9/23/87	6.0	14.0	O	O	H*,P, T*	O	O,P*	O	--	--

Key to Analytical Parameters

O = PCBs, targeted metals
H = PCBs, complete Hazardous Substance List
D = Dioxin (2,3,7,8-TCDD) and furan (2,3,7,8-TCDF)
P = Particle size
T = TOC
N = No analysis performed
-- = No sample collected
* = Indicates parameters selected for QA analysis (matrix spike, duplicate, etc.)

Source: Geraghty & Miller, Inc.

Table 4. Sheboygan River and Harbor Remedial Investigation/Enhanced Screening Report, River Sediment Summary

Sample[1] No.	Sediment Depth[2] (feet)	PCBs (ppm, dry weight)				Metals (ppm, dry weight)							
		1242	1248	1254	Total	As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
R-1/HSL1	2.5/2.0	<0.51	1.2	<0.51	1.2	10.0	1.1	16.1	17.7	17.7	8.2	51.6	0.116
R-2	5.3/3.2	.067	<.026	<.026	.067	10.5	1.1	17.6	17.4	17.8	9.1	51.7	0.157
R-2 (dup)		.027	.020	.019	.046	4.7	2.7	16.3	13.9	20.1	<7.1	56.3	0.178
R-3	1.4/1.1	<.025	<.025	<.025	<.025	3.4	1.5	29.0	57.9	14.6	27.7	25.8	0.069
R-4	0.9/1.0	<250	4300	<250	4300	3.7	<0.7	8.2	4.2	17.8	<5.5	52.0	0.060
R-5	3.0/1.5	45	<2.6	14	59	15.2	1.9	36.6	29.7	28.2	27.8	94.8	0.115
R-6	1.3/1.3	12	<0.5	3.5	15.5	4.6	<0.7	15.7	4.8	18.3	<5.6	35.4	<0.05
R-7	1.1/0.8	4500	<370	<370	4500	15.8	1.0	39.8	26.1	31.9	18.7	87.1	0.162
R-8	3.6/2.3	0.4	<.25	<.25	0.4	3.3	<0.6	6.7	3.3	9.0	6.0	13.5	<0.05
R-9/HSL2	1.2/1.0	16	<10	12	28	2.0	<0.6	6.4	3.6	5.2	5.5	8.5	<0.030
R-10	1.5/0.9	280	<250	<250	280	4.5	0.9	13.5	15.4	18.4	7.8	43.6	0.095
R-11	5.6/3.5	11	<1.5	<1.5	11	5.8	0.9	10.0	5.4	10.8	6.6	17.0	<0.05
R-12	1.2/1.0	120	<10	36	156	4.0	<0.7	8.7	8.0	16.5	<5.4	28.4	<0.05
R-13	1.6/1.2	22	<5.2	<5.2	22	16.3	<1.0	37.5	21.8	27.7	14.4	84.2	0.218
R-14	2.6/2.0	7.6	<2.0	<2.0	7.6	6.9	0.9	81.4	11.9	17.5	6.8	35.3	0.084
R-15	1.2/1.1	7.4	<1.5	4.1	11.5	3.3	0.9	81.4	11.9	11.5	6.8	35.3	0.053
R-16	4.3/2.4	21	<1.5	3.3	24.3	6.6	<0.7	18.3	14.5	22.8	7.4	41.0	0.099
R-17	2.0/1.3	40	<7.5	10	50	7.0	<0.8	15.8	11.7	16.5	8.3	299.0	0.071
R-18	1.8/1.8	1.8	<1.5	<1.5	1.8	1.3	<0.7	8.5	8.8	9.4	6.0	30.7	<0.05
R-19	1.4/1.0	250	<77	<77	250	12.7	1.4	23.1	23.1	30.6	13.7	69.0	0.184
R-20/HSL3	3.2/2.2	2.8	<2.1	<2.1	2.8	7.8	0.9	21.8	18.2	23.6	<7.3	61.8	0.116
R-21	1.9/1.8	<3.0	5.4	<3.0	5.4	9.6	<0.8	22.1	14.8	35.4	9.9	47.3	0.136
R-21 (dup)						4.5	1.0	27.0	13.0	35.1	<6.5	52.0	0.177
R-22	1.7/1.3	92	<.5	0.87	93	8.6	<0.9	20.4	17.2	30.1	14.5	60.6	0.127
R-23	1.0/0.6	890	<300	<300	890	3.1	<0.7	7.1	9.1	25.0	<5.4	20.8	<0.05
R-24	0.5/0.3	<1.5	12.	<1.5	12	1.7	<0.7	4.8	3.4	8.0	<5.3	16.1	<0.05
R-25	1.1/1.0	140	<50	<50	140	4.4	<0.8	4.8	8.9	12.7	8.6	26.3	0.072
R-26	1.4/1.2	8.3	<1.5	3.2	11.5	3.6	<1.0	8.5	14.7	21.7	11.4	40.0	0.082
R-27	1.9/1.0	6.8	<1.0	<1.0	6.8	3.7	<0.7	29.4	18.9	22.5	12.7	49.3	0.138
R-28	0.7/1.2	12	<5.0	5.1	17	4.0	<0.8	10.2	11.9	17.6	7.3	34.8	0.068
R-29	1.0/1.4	2.2	<.25	1.2	3.4	3.2	<0.6	4.0	<3.0	6.6	<4.9	49.3	<0.05
R-30	1.8/1.2	1.4	<1.0	<1.0	1.4	3.8	<0.7	52.3	29.4	81.4	7.9	100.0	0.117
R-31	1.1/1.2	<0.1	<0.1	<0.1	<0.1	4.3	<0.6	9.3	9.0	9.9	9.3	20.8	<0.05
R-32	2.3/2.0	13	<1.5	<1.5	13	2.3	<0.6	5.7	6.6	10.0	6.8	22.2	<0.05
R-33	0.9/1.1	110	<27	<27	110	5.7	<1.3	56.7	35.4	56.2	16.5	109.0	0.179
R-34/HSL11	3.0/1.7	110*	<41	<41	110	4.8	<1.0	62.5	25.0	50.0	<8.3	89.6	0.158
R-36	1.3/1.5	260	<82	<82	260	2.2	<0.7	<1.3	<3.3	5.7	8.2	10.4	<0.05
R-36 (dup)		210	<82	<82	210	2.4	<0.7	1.8	<3.3	3.7	<5.2	10.8	<0.05

* Weathered

Notes:

(1) River sediment samples are, in general, ordered from upstream to downstream.

(2) First value indicates penetrated sediment depth. Second value indicates length of recovered sediments.

Table 5. Sheboygan River and Harbor Remedial Investigation/Enhanced Screening Report, River Sediment - HSL Data Summary

Constituents[1]	Sediment Station Number R54/HSL6 Kohler WWTP	R65/HSL7 S. of Kohler Landfill	R75/HSL8 Halfway from Kohler to Harbor (Lumberyard)	R87/HSL9 Across from Kiwanis Park	R96/HSL10 Between 14th St. & Penn Ave.
a. PCBs. (Total), ppm	8.8	3.6	1.3	4.6	8.9
Aroclor(s) reported	1242	1248/1254	1248/1254	1248/1254	1242/1254
b. Metals, ppm					
Aluminum	12,700	4,550	4,100	7,580	12,200
Antimony	LT 0.8	LT 0.7	LT 0.6	LT 0.8	1.87
Arsenic	7.5	2.1	2.6	5.2	12.0
Barium	84.3	34.7	37.4	56.6	113
Beryllium	LT 0.8	LT 0.7	LT 0.6	LT 0.8	LT 0.9
Cadmium	LT 0.8	LT 0.7	0.62	1.19	3.15
Calcium	76,300	55,100	96,900	88,100	54,260
Chromium	54.2	13.6	15.4	53.7	97.2
Cobalt	LT 8.3	LT 6.9	LT 6.2	LT 8.5	9.81
Copper	59.3	34.9	35.3	41.5	102
Iron	16,700	7,140	7,025	11,200	19,300
Lead	26.8	32.5	26.2	87.3	293
Magnesium	39,500	27,500	49,300	38,600	25,600
Manganese	345	178	205	237	402
Mercury	0.12	0.04	LT 0.03	LT 0.09	0.28
Nickel	6.6	LT 5.5	LT 4.9	32.8	63.8
Potassium	3,680	1,990	3,160	2,780	2,500
Selenium	LT 0.8	LT 0.7	LT 0.6	LT 0.8	LT 0.9
Silver	LT 0.23	0.21	LT 0.12	0.41	0.54
Sodium	LT 833	LT 685	LT 617	LT 847	LT 926
Thallium	2.5	0.75	1.97	1.10	LT 0.9
Vanadium	13.8	LT 6.8	6.6	8.5	9.3
Zinc	73.2	46.0	47.5	121	207
c. Volatile Organics, ppb[2]					
Methylene Chloride	25	LT 10	11	14	29
Acetone	93	73	33	160	130
Chloroform	20	LT 10	LT 10	LT 10	LT 10
Methyl ethyl ketone	LT 10	LT 10	LT 10	16	10
Toluene	LT 10	82	650	LT 10	LT 10
d. Polynuclear Aromatic Hydrocarbons, ppm[3]	LT 0.1	0.2	0.7	2.0	4.0

(Continued)

Table 5. (Concluded)

Constituents[1]	Sediment Station Number R54/HSL6 Kohler WWTP	R65/HSL7 S. of Kohler Landfill	R75/HSL8 Halfway from Kohler to Harbor (Lumberyard)	R87/HSL9 Across from Kiwanis Park	R96/HSL10 Between 14th St. & Penn Ave.
e. Physical Data					
1. Descriptions:					
0-1'	Fine silts & organics --1.0'--	Sandy, silt organics --1.0'--	Sand and gravel --0.8'--	Very fine silt --1.0'--	Fine silt w/organics --1.0'--
1'-2'	Silt --2.0'--	Fine, sandy silt --2.0'--		Fine silt w/organics --2.0'--	Fine organic silt --2.0'--
	Silt & then clay --2.6'--	Silt, sand, some gravel --2.4'--		Fine silt & sand --2.9'--	
2. TOC, percent	1.0	2.3	3.2	2.8	2.7
3. Moisture content, percent	40	27	19	41	46

Notes:

(1) All results reported on a dry weight basis.

(2) Volatile organics quantified at levels below the detection limit (10 ppb) are not shown. See detailed data sheets (Appendix C) for these compounds.

(3) PAHs were estimated by summing individual concentrations of these compounds. In most cases, each compound has an estimated value below the detection limit.

LT = Less Than

Table 6. Sheboygan River and Harbor Remedial Investigation/ Enhanced Screening Report, Total Organic Carbon and Particle Size Data

Sample No.	Total Organic Carbon (TOC)%	Particle Size %		
		Coarse Sand (<2) mm	Fine Sand (0.075-2 mm)	Silt + Clay (<0.075 mm)
H-1, 2'-4'	1.4	0.2	49.2	50.6
8'-12'	NA	<0.1	19.8	80.2
H-2, 2'-4'	2.0	0.2	26.4	73.4
8'-12'	NA	0.2	29.6	70.2
H-3, 2'-4'	2.5	0.2	14.2	85.6
12'-16'	NA	0.6	21.2	78.2
H-4, 0.5'-2'	0.4	0.1	90.2	9.7
8'-12'	NA	0.1	6.4	93.5
H-5, 0'-0.5'	0.2	NA	NA	NA
0.5'-2'	NA	11.1	87.9	1.0
6'-8'	NA	8.6	20.5	70.9
H-6, 0'-0.5'	1.1	NA	NA	NA
0.5'-2'	NA	12.2	86.1	1.7
6'-8'	NA	37.4	55.5	7.1
H-7, 0'-0.5'	1.1	NA	NA	NA
0.5'-2'	NA	0.7	83.4	15.9
6'-8'	NA	<0.1	6.0	94.0
H-8, 0'-0.5'**	1.3	NA	NA	NA
0.5'-2'	NA	2.7	77.6	19.7
6'-8'	NA	2.6	9.8	87.6
H-9, 0.5'-2'	0.9	0.7	94.2	5.1
8'-12'*	NA	0.8	19.5	79.7
H-10, 2'-4'**	3.4	1.5	36.0	62.5
6'-8'	NA	0	0.2	99.8
H-11, 2'-4'	3.2	0.2	13.6	86.1
12'-16'	NA	1.0	10.7	88.3
H-12, 2'-4'	4.2	<0.1	1.8	98.8
8'-12'	NA	1.7	1.7	96.6

See notes on next page.

Table 7. Sheboygan River and Harbor Remedial Investigation/Enhanced Screening Report, Surface Soils Data Summary

Sample(1)	PCBs (ppm, dry weight)				Metals (ppm, dry weight)							
No.	1242	1248	1254	Total	As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
S1	<0.5	3.3	3.0	6.3	2.8	<0.7	5.4	12.2	<13.4	8.8	27.7	0.05
S2	71	<15	<15	71	5.0	<0.8	12.9	10.6	39.2	14.9	43.9	0.08
S3	<10	30	<10	30	4.5	<0.8	67.6	10.5	16.7	9.1	36.2	0.05
S4	<.25	1.25	0.8	2.05	3.4	<0.5	5.9	6.9	19.7	<4.4	18.6	<0.05
S5	<.025	0.09	0.15	0.16	4.3	<0.6	8.2	42.4	19.0	5.6	42.0	<0.05
S6	1.3	<.14	1.1	2.4	10.9	1.2	12.9	43.0	21.4	17.6	164	0.08
S7	<0.91	3.5	5.3	8.8	10.5	3.2	34.6	50.0	58.4	14.1	116	0.26
S8	<0.80	2.6	3.7	6.3	12.6	<0.9	24.8	33.4	34.0	14.7	78.9	0.16
S9	0.61	<.25	0.51	1.1	2.8	<0.6	5.4	29.3	17.2	<4.9	28.4	<0.05
S10	0.084	<.025	0.074	0.16	12.1	0.6	10.3	19.0	8.9	12.0	26.7	<0.05
S10 (dup)	0.10	<.025	.093	0.19	7.1	<0.6	10.8	19.0	8.2	14.7	28.6	<0.05
S11	<1.5	<1.5	5.2	5.2	4.9	<0.6	15.9	29.6	14.2	14.5	45.3	0.07
S12	0.31	<.05	0.26	0.57	1.6	<0.6	1.4	8.4	4.4	5.2	17.1	<0.05
S13	0.87	<0.3	0.80	1.7	3.0	<0.7	8.5	27.0	29.9	7.3	30.1	<0.05
S14	<.025	<.025	<.025	<.025	2.0	<0.5	5.4	12.1	5.6	8.0	42.2	<0.05
S15	1.3	<0.51	1.9	3.2	6.5	<0.9	8.5	43.0	61.4	9.8	77.7	0.06
S16	<.076	1.0	1.0	2.0	2.8	1.4	13.4	26.6	38.0	10.8	41.5	<0.05
S17	0.49	<0.078	0.83	1.32	4.1	3.4	21.4	30.2	32.5	12.7	68.0	0.10
S18	2.0	<0.31	1.5	3.5	5.4	0.9	26.7	44.1	52.8	13.1	82.8	0.13
S18 (dup)	1.9	<0.31	1.2	3.1	5.7	1.7	26.1	40.7	57.8	12.7	82.2	0.10
S19	<.078	1.0	0.96	2.0	4.1	2.1	19.0	31.8	34.5	12.3	64.4	0.05
S20	2.7	<0.32	2.8	5.5	9.6	2.2	40.1	50.7	92.1	30.9	132	0.21

Notes:

(1) All samples were collected between 0 and 3" of depth.

Table 8. Sheboygan River and Harbor Remedial Investigation/Enhanced Screening Report, Moderate Flow: Water Column Field Data

Location	Date	Time	River Width (ft.)	Avg. Depth (ft.)	Avg. Velocity ft. sec.	Calc'd. Flow (cfs)	USGS[1] Flow (cfs)	Depth of Sample Location (ft.)	Conduct. (umho/cm)	pH (su)	Temp. (°C)	DO (mg/l)	Secchi Disc. Depth (ft.)
W1M	5/31/87	12:15 PM	175	4.06	0.213	131	226	5.5	650	8.1	26	--	2.2
W3M	5/31/87	3:10 PM	129	5.1	0.336	211	226	5.1	700	8.3	22	--	1.5
W4M	6/01/87	9:05 AM	127	5.6	0.274	201	221	6.5	700	8.4	23	8.4	1.8
W5M	6/01/87	2:05 PM	94	3.7	0.626	221	221	5.3	690	8.7	25	10.3	1.7
W6M	6/01/87	4:50 PM	167	8.0	0.26	335[3]	221	11.0	600	8.3	24	6.0	1.1
W7M[2]	6/2/87	9:25 AM	--	--	--	--	222	25.5	250	8.1	18	--	2.0

Notes:

(1) Average daily flow at USGS gaging station, based on provisional discharge data supplied by USGS.

(2) Velocity readings were not required for this station.

(3) This measurement is considered erroneously high due to difficulties encountered with measuring velocities at this location.

Table 9. Sheboygan River and Harbor Remedial Investigation/Enhanced Screening Report, Moderate Flow: Water Column Analytical Results

Sample No.	PCBs (ppb)[1]				Metals (ppb)								TSS (mg/l)
	A-1242	A-1248	A-1254	Total	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	
W1M (T)[2]	<0.05	<0.05	<0.05	<0.05	1	<1	<1	5	1	<0.2	<5	25	11
W1M (T), (dup)	<0.05	<0.05	<0.05	<0.05	1	<1	1	3	2	<0.2	<5	24	4
W1M (F)	<0.05	<0.05	<0.05	<0.05	1	<1	<1	4	1	<0.2	<5	39	--
W1M (F), dup	<0.05	<0.05	<0.05	<0.05	1	<1	1	4	<1	<0.2	<5	42	--
W3M (T)	0.267	<0.05	<0.05	0.27	1	<1	1	4	<1	<0.2	<5	22	33
W3M (F)	0.118	<0.05	<0.05	0.12	1	<1	1	4	1	<0.2	<5	41	--
W4M (T)	0.150	<0.05	<0.05	0.15	1	<1	2	4	<1	<0.2	<5	22	4
W4M (F)	0.078	<0.05	<0.05	0.08	1	<1	1	3	6	<0.2	<5	33	--
W5M (T)	0.094	<0.05	<0.05	0.09	2	<1	2	4	2	<0.2	<5	28	9
W5M (F)	0.081	<0.05	<0.05	0.08	1	<1	<1	4	1	<0.2	<5	44	--
W6M (T)	0.108	<0.05	0.051	0.16	1	<1	2	4	3	<0.2	<5	34	23
W6M (F)	0.059	<0.05	<0.05	0.06	1	<1	<1	4	<1	<0.2	<5	50	--
W7M (T)	<0.05	<0.05	<0.05	<0.05	<1	<1	<1	2	<1	<0.2	<5	23	8
W7M (T), (dup)	<0.05	<0.05	<0.05	<0.05	<1	<1	1	2	<1	<0.2	<5	22	12
W7M (F)	<0.05	<0.05	<0.05	<0.05	<1	<1	<1	4	<1	<0.2	<5	40	--
W7M (F), (dup)	<0.05	<0.05	<0.05	<0.05	<1	<1	<1	4	<1	<0.2	<5	42	--
Field blank (T)	<0.05	<0.05	<0.05	<0.05	<1	<1	<1	2	<1	<0.2	<5	24	<1
Field blank (F)	<0.05	<0.05	<0.05	<0.05	<1	<1	<1	<1	<1	<0.2	<5	33	--
Trip blank	<0.05	<0.05	<0.05	<0.05	<1	<1	<1	<1	<1	<0.2	<5	17	<1

Notes:

(1) All other Aroclors (1016, 1221, 1232, 1260) reported as <0.5.
(2) (T) = Total (unfiltered).
(F) = Filtered.

Table 10. Sheboygan River and Harbor Remedial Investigation/ Enhanced Screening Report, Water Column Analytical Results

Sample No.	TKN (mg/l)	Ammonia (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)
W1M (T)	1.5	0.4	343	305
W1M (T), (dup)	1.5	0.2	342	305
W5M (T)	1.5	0.09	343	299
W7M (T)	<1.0	0.06	160	133
Field blank	<1.0	<0.05	<10	1.4
Trip blank	<1.0	0.05	<10	<1.0

See notes on previous page.

Table 11. Sheboygan River and Harbor Remedial Investigation/Enhanced Screening Report, High Flow: Filtration Data

Station Number	Collection Date	Location	Approx. Volume Filtered (liters)	Dry Weight of Collected Particulates (grams)	Approx. TSS (mg/l)	No. of Filters Used	
						Coarse	Fine
W1H	4/12	Sheboygan Falls Dam	70	1.16	17	5	5
W2H	4/13	Onion River	70	1.33	19	5	5
W3H	4/13	River Bend (Kohler) Dam	70	1.40	20	5	5
W3H - Duplicate		" " " "	70	1.31	19	5	5
W4H	4/14	Waelderhaus (Kohler) Dam	80	1.61	20	6	7
W5H	4/14	U.S.G.S. Gaging Station	65	1.58	24	5	5
W6H	4/15	14th Street Bridge	125	1.91	15	7	7
W6H - Matrix Spike		" " "	95	1.69	18	6	6
W6H - Field Blank		" " "	4	0.002	0	1	1

Notes:

(1) These values were calculated from the volume and weight data shown. Since volumes of water in the carboy were visually estimated, the TSS values should be regarded as approximate.

Table 12. Sheboygan River and Harbor Remedial Investigation/ Enhanced Screening Report, High Flow: Particulate Analytical Results

Sample No.	Dry Weight of Particulates	Aroclor 1260[1]		
		(µg)	(µg/kg)[2]	(µg/l)[3]
W1H	1.16	9.4	8.1	0.13
W2H	1.33	10.0	7.5	0.14
W3H	1.40	7.7	5.5	0.11
W3H, dup.	1.31	11.8	9.0	0.17
W4H	1.61	17.7	11.0	0.22
W5H	1.58	7.7	4.9	0.12
W6H	1.91	6.5	3.4	0.052
W6H, MS	1.69	<5.1	<3.0	<0.053
Field Blank	.002	0.23	116	--

Notes:

(1) Only Aroclor 1260 was found. All other aroclors reported below the detection limit.

(2) Based on dry weight of particulates as determined in the field (i.e. at field office).

(3) Based on approximate volume of water which was passed through the filter in the field. Volumes are presented in Tables 4-11.

Table 13. Sheboygan River and Harbor Remedial Investigation/Enhanced Screening Report, Low Flow: Water Column Volatile Organic Analysis (Concentrations in micrograms per liter)

Compound Name[1]	W1L	W2L	W3L	W4L	W4L (dup)	W5L	W6L	W7L	Trip Blank	Field Blank
Chloromethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Vinyl chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Methylene chloride	8B (3J)	12B (3J)	8B (3J)	5B (5)	<5	7B (5)	3,300B (2J)	7B (3J)	8B (3J)	6B (3J)
Acetone	9B (4J)	21B (4J)	13B (4J)	5B (5)	<10	<10	400B (8J)	12B (4J)	12B (4J)	20B (4J)
Carbon disulfide	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trans-1,2-dichloroethene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloroform	2J	2J	2J	<5	<5	<5	80B (2J)	<5	<5	<5
1,2-dichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
2-butanone	<10	140	<10	<5	<5	<5	<5	<5	<5	<5
1,1,1-trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Carbon tetrachloride	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl acetate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,2-dichloropropane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trans-1,3-dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5	<5	<5	<5	4 JX	<5	5 X
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1,2-trichloroethane	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Benzene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
CIS-1,3-dichloropropene	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
2-chloroethylvinyl ether	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4-methyl-2-pentanone	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Table 14. USGS Water Resources Data, Sheboygan River, Water Year 1988

STREAMS TRIBUTARY TO LAKE MICHIGAN

04086000 SHEBOYGAN RIVER AT SHEBOYGAN, WI

LOCATION.--Lat 43°44'25", long 87°45'35", in SE 1/4 NE 1/4 sec. 29, T.15 N., R.23 E., Sheboygan County, Hydrologic Unit 04030101, on left bank 400 ft upstream from bridge on State Highway 141, near west city limits of Sheboygan, and 4.2 mi upstream from mouth.

DRAINAGE AREA.--418 Mi^2.

PERIOD OF RECORD.--June 1916 to September 1924 (published as "near Sheboygan"), October 1950 to current year. Monthly discharge only for some periods, published in WSP 1307, 1727.

REVISED RECORDS.--WSP 1307: 1917(M), 1919(M), 1921(M), 1923(M). WDR WI-79-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 584.00 ft above National Geodetic Vertical Datum of 1929. June 1916 to June 1924, nonrecording gage at site 0.7 mi downstream at different datum. November 1950 to June 1951, nonrecording gage at site 0.3 mi downstream at datum 3.15 ft lower.

REMARKS.--Estimated daily discharges: Ice periods listed in rating table below. Records good except those for ice-affected periods, which are poor. Diurnal fluctuation caused by numerous powerplants above station.

AVERAGE DISCHARGE.--46 years (water years 1917-24, 1951-88), 258 ft^3/s, 8.38 in./yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,680 ft^3/s, Mar. 22, 1975, gage height, 11.64 ft; minimum observed, about 1 ft^3/s, Aug. 27, 1922, gage height, 1.48 ft datum then in use, caused by shutdown of powerplants.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,500 ft^3/s and maximum (*):

DATE	TIME	DISCHARGE (ft^3/s)	GAGE HEIGHT (ft)	DATE	TIME	DISCHARGE (ft^3/s)	GAGE HEIGHT (ft)
Apr. 6	1945	*1,530	*5.75	No other peak greater than base discharge.			

Minimum discharge, 31 ft^3/s, July 9, 10, gage height, 1.61 ft.

RATING TABLE (gage height, in feet, and discharge, in cubic feet per second). (Shifting-control method used Mar. 26 to Apr. 2; stage-discharge relation affected by ice Nov. 21-23, Dec. 4-6, 14-23, and Dec. 26 to Mar. 23.)

1.6	30	3.0	270
1.8	50	4.0	570
2.0	80	5.0	992
2.5	165	6.0	1,540

(Continued)

Table 14. (Concluded)

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1987 TO SEPTEMBER 1988

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	135	170	480	180	1200	170	602	281	66	45	38	50
2	127	230	376	160	1100	190	575	257	64	43	37	46
3	131	237	328	140	940	200	925	239	61	37	38	58
4	115	214	260	130	840	220	959	224	53	35	36	94
5	110	194	230	120	700	240	909	210	50	34	55	103
6	107	174	210	110	560	270	1220	197	48	35	41	95
7	105	161	256	100	430	330	1340	185	48	35	39	78
8	101	166	422	96	360	400	1040	173	43	33	39	62
9	97	175	950	94	320	500	834	175	41	31	40	56
10	95	175	931	90	280	560	738	185	43	47	39	52
11	94	165	802	82	240	600	667	184	44	45	49	48
12	90	159	669	86	210	600	604	165	43	45	54	49
13	90	159	560	84	180	580	536	124	43	43	63	47
14	88	156	470	82	160	520	481	112	44	41	82	47
15	88	149	350	80	150	480	424	143	42	43	65	45
16	92	148	270	94	140	440	372	140	40	71	49	44
17	108	196	260	90	130	400	303	132	41	82	43	44
18	116	243	240	86	140	360	275	123	41	82	159	64
19	113	234	300	84	150	340	246	116	40	68	183	84
20	105	215	500	110	140	330	204	111	40	60	150	102
21	102	160	560	100	130	320	191	105	39	59	106	98
22	101	150	400	96	120	310	187	104	51	57	77	223
23	101	170	360	92	140	340	220	110	47	58	101	693
24	109	209	419	86	130	362	281	105	48	58	103	514
25	107	276	623	82	120	395	293	86	42	56	89	321
26	112	406	450	80	120	493	277	84	40	58	79	207
27	120	353	360	78	120	510	314	83	37	52	65	147
28	173	330	320	80	140	480	363	78	38	50	56	122
29	181	600	270	92	160	543	346	69	44	45	52	103
30	164	612	230	150	---	619	310	58	46	42	45	95
31	125	---	200	800	---	644	---	66	---	39	48	---
TOTAL	3502	6986	13056	3834	9550	12746	16036	4424	1367	1529	2120	3791
MEAN	113	233	421	124	329	411	535	143	45.6	49.3	68.4	126
MAX	181	612	950	800	1200	644	1340	281	66	82	183	693
MIN	88	148	200	78	120	170	187	58	37	31	36	44
CFSM	.27	.56	1.01	.30	.79	.98	1.28	.34	.11	.12	.16	.30
IN.	.31	.62	1.16	.34	.85	1.13	1.43	.39	.12	.14	.19	.34

CAL YR 1987 TOTAL 84468 MEAN 231 MAX 1420 MIN 58 CFSM .55 IN. 7.52
WTR YR 1988 TOTAL 78941 MEAN 216 MAX 1340 MIN 31 CFSM .52 IN. 7.03

Table 15. Permeability Test for Kohler Company Landfill

WEEK NW-13R

TEST 1

Q = 0.305 gal/min = 0.0006795 cfs

h_1 = 5.1042 ft.

h_2 = 12.0 psi = 27.72 ft.

H = 32.8242 ft.

A = 24.30 ft.

r = 0.125 ft.

C_s = 221

K = 0.000000736 ft/s

= 2.243×10^{-5} cm/s

TEST 2

Q = 0.6625 gal/min = 0.0014761 cfs

h_1 = 5.1042 ft.

h_2 = 18.5 psi = 42.735 ft.

H = 47.8392 ft.

A = 24.30 ft.

r = 0.125 ft.

C_s = 221

K = 0.000001097 ft/s

= 3.344×10^{-5} cm/s

Table 16. Summary of VOCs Detected in Monitor Wells at Kohler Company Landfill Site

APPENDIX I SUMMARY OF VOCs DETECTED IN MONITOR WELL SAMPLES COLLECTED IN THE PHASE I RESAMPLING (-02), PHASE II (-03), AND PHASE II RESAMPLING (-04) EVENTS

Sample No.:	KL-GW01B-02/03	KL-GW01C-02/03	KL-GW01D-02/03	KL-GW02-02/03
Date Sampled:	NR/13 Dec 88	22 Aug 88/13 Dec 88	23 Aug 88/15 Dec 88	24 Aug 88/5 Jan 89
Analyte/Concentration:[1]				
Vinyl Chloride	NR/ND	ND/ND	ND/ND	ND/ND
Methylene Chloride	NR/1.000B	0.008B/0.900	0.007B/0.220	0.006B/0.040
Acetone	NR/8.900	0.004JB/6.200	0.002JB/5.400	0.005JB/0.930B
1,1-Dichloroethene	NR/ND	ND/ND	ND/ND	ND/ND
1,1-Dichloroethane	NR/ND	ND/ND	ND/ND	0.001J/ND
1,2-Dichloroethene	NR/ND	ND/ND	ND/ND	0.019/ND
2-Butanone	NR/ND	ND/ND	ND/ND	ND/ND
1,1,1-Trichloroethane	NR/ND	ND/ND	ND/ND	0.001JB/ND
Trichloroethene	NR/ND	ND/ND	ND/ND	ND/ND
Benzene	NR/ND	ND/ND	ND/ND	ND/ND
Toluene	NR/0.380	ND/0.280	ND/ND	ND/ND
Xylene	NR/ND	ND/ND	ND/ND	ND/ND
Chloroethane	ND/ND	ND/ND	ND/ND	ND/ND
Tetrachloroethene	ND/ND	ND/ND	ND/ND	ND/ND

(Continued)

[1]Concentrations are reported in mg/L.

ND = Not detected.

B = Detected in laboratory blank.

J = Detected below method detection limit as reported in the QAPP.

D = Compounds identified at a secondary dilution factor.

E = Concentration exceeds the calibration range of the instrument.

RE = Reanalysis at a secondary dilution factor.

NR = Not requested.

NA = Not analyzed.

Table 16. (Concluded)

Sample No.: Date Sampled:	KL-GW02D-02/03 23 Aug 88/20 Dec 88	KL-GW03-02/03 24 Aug 88/20 Dec 88	KL-GW03D-02/03 24 Aug 88/20 Dec 88	KL-GW03R-03/04 17 Jan 89/8 Mar 89
Analyte/Concentration:[1]				
Vinyl Chloride	ND/0.015	0.140/ND	0.075/0.058	0.340E/0.160
Methylene Chloride	0.110B/0.012	0.036B/0.400B	0.008B/0.012	0.073B/0.006B
Acetone	0.027JB/0.054	0.038B/5.100B	0.002JB/0.020	0.130B/0.010
1,1-Dichloroethene	ND/ND	ND/ND	ND/ND	0.001J/0.005J
1,1-Dichloroethane	ND/ND	ND/ND	ND/ND	0.005/0.190
1,2-Dichloroethene	0.340/0.200	0.074/0.120J	0.032/0.037	0.200/ND
2-Butanone	ND/ND	ND/ND	ND/ND	0.002J/ND
1,1,1-Trichloroethane	ND/ND	ND/0.170J	ND/ND	ND/ND
Trichloroethene	ND/ND	0.003J/ND	ND/ND	ND/ND
Benzene	ND/ND	ND/ND	ND/ND	ND/ND
Toluene	ND/ND	ND/ND	ND/ND	ND/ND
Xylene	ND/ND	ND/ND	ND/ND	ND/ND
Chloroethane	ND/ND	ND/ND	ND/ND	ND/0.005J
Tetrachloroethene	ND/ND	ND/ND	ND/ND	ND/ND

Table 17. Land Uses in Sheboygan Township (1980)

Type	% of Total Acreage	Acreage
Natural	14.6	1255
Residential	35.6	3059
Industrial	11.3	970
Commercial	5.73	493
Agricultural	11.3	968
Transportation	21.6	1854
Total	100	8599

Source: WDNR, 1980b

Table 18. Location, Depth, and PCB Content* of Sheboygan Harbor Sediment Samples**

Sample	Location	Water Depth ft	Dug Down to ft	Sample Taken at ft	Dry Weight PCB, ppm
S-1	Sta 52+00 12 ft south of north revetment	11.3	23.0	23.0-23.5	18, 9, 20, 12
S-2	Sta 52+00 122 ft north of south revetment	16.0	22.0	22.0-24.0	84, 81, 46, 85, 75, 82, 140, 140, 130, 50, 47, 34
S-3	Sta 37+00 90 ft north of south revetment	18.7	24.5	24.5-25.0	34, 33, 37, 25, 9.4, 12, 11 41
S-4	Sta 37+00 25 ft north of south revetment	18.0	24.0	24.0-25.0	23, 30, 48, 24, 24, 26, 32, 52
S-5	Sta 6+00 200 ft north of south breakwater	23.0	Sediment surface	23.0-24.5	1.0, 1.4, 2.3, 1.0

* PCB as total in isomer groups di- through decachlorobiphenyl.
** Gage = 2.5 ft, all depths given without gage.

Table 19. Distribution of Organisms in Treatments

Temperature °C	Treatment	Aquarium No.	Organism[1]
4	Control	16	M, C, K, T
	Reference	15	C, K, T
		18	M, C*
	Low	13	C, K, T
		19	C, F
		21	M, C*
	Medium	14	C, K, T
		17	--[2]
		24	M, C*
	High	20	C, K, T
		22	C, F
		23	M, C*
20	Control	1	M, C, K, T
	Reference	3	C, K, T
		6	M, C*
	Low	4	C, K, T
		7	C, F
		9	M, C*
	Medium	2	C, K, T
		5	C, F
		12	M, C*
	High	8	C, K, T
		10	C, F
		11	M, C*

[1] M = mussels, C = clams (not in contact with sediment), C* = clams (in contact with sediment, K = killifish (medaka), F = fatheads, T = trout.

[2] Insufficient organisms available; treatment excluded.

Table 20. Regressions of Percent Lipid Over Time

Organism	Number of Observations	Regression Test of Significance F	P	Initial Percent Lipid (95 percent Confidence Interval) a*	Mean Percent Lipid (95 percent Confidence Internal) x
Mussels	49	0.040	0.8419	0.26(0.040)	0.26(0.026)
Clams (contact)	40	0.044	0.8345	2.04(0.243)	2.02(0.150)
Clams (no contact)	33	0.033	0.8569	2.09(0.295)	2.07(0.199)
Clams (all)	73	0.069	0.7932	2.06(0.182)	2.04(0.119)
Medaka	31	33.210	0.0001	6.75(0.840)	5.00(0.814)
Fatheads	15	0.062	0.8070	1.04(0.160)	1.05(0.122)
Trout	39	5.674	0.0225	4.29(0.675)	3.76(0.532)

* Initial percent lipid is Y-intercept (a) from regression percent lipid = a + b(day).

Table 21. Calculated Data Using Time-Sequence Sampled Residues and Simple Kinetic Model for Fresh Weight and Dry Weight Dichlorobiphenyls in Organisms Exposed to PCB-Contaminated Sheboygan Harbor Sediments

Temperature, °C	Organism	Treatment*	C_{ss}** $\mu g\ g^{-1}$ Wet Weight	C_{ss}** $\mu g\ g^{-1}$ Dry Weight	C_s $\mu g\ g^{-1}$	Sediment BAF Wet Weight	Sediment BAF Dry Weight
4	Mussels	R	0.0092	0.17	0.016	0.58	10.8
		L	0.024	0.45	0.37	0.065	1.2
		M	0.027	0.51	8.8	0.0031	0.058
	Trout	M	0.28	1.7	8.8	0.032	0.19
		H	0.26	1.6	6.1	0.042	0.26
20	Mussels	R	0.016	0.30	0.016	1.0	18.9
		L	0.072	1.4	0.37	0.19	3.7
		M	0.16	3.0	8.8	0.018	0.34
		H	0.27	5.1	6.1	0.044	0.84
	Clams	L	0.40	2.5	0.37	1.1	6.7
		M	8.1	50.0	8.8	0.92	5.7
		H	1.3	8.1	6.1	0.21	1.3
	Medaka	R	0.17	1.1	0.016	10.6	70.4
		L	0.33	2.2	0.37	0.89	5.9
		M	0.75	5.0	8.8	0.085	0.56
		H	0.48	3.2	6.1	0.079	0.52

* Treatment: Reference, low, medium, high.

** See text p. 36 for explanation of symbols.

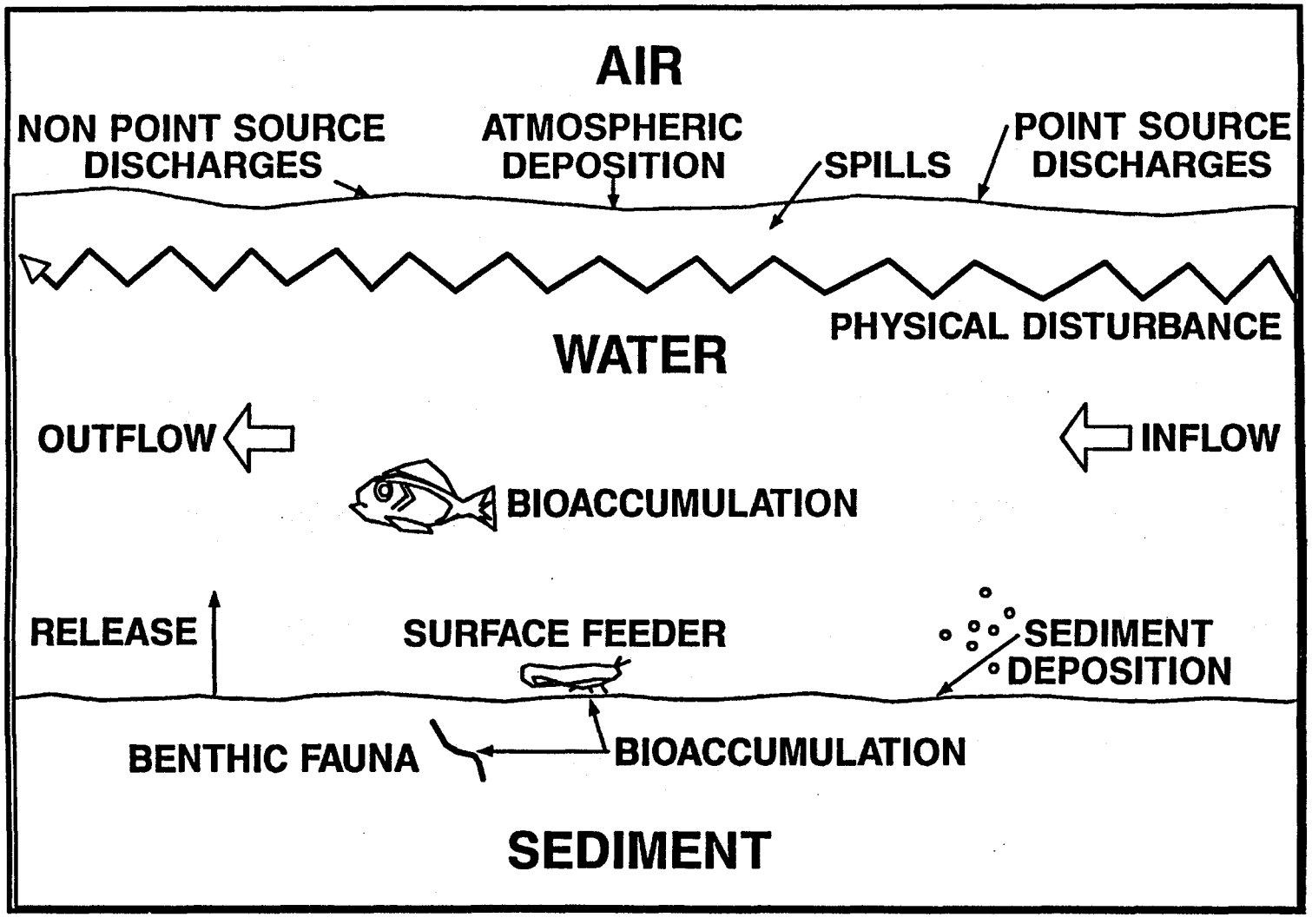


Figure 1. Contaminant migration pathways for evaluation of in-place contaminated sediments

Figure 2. Location of Sheboygan River, Wisconsin

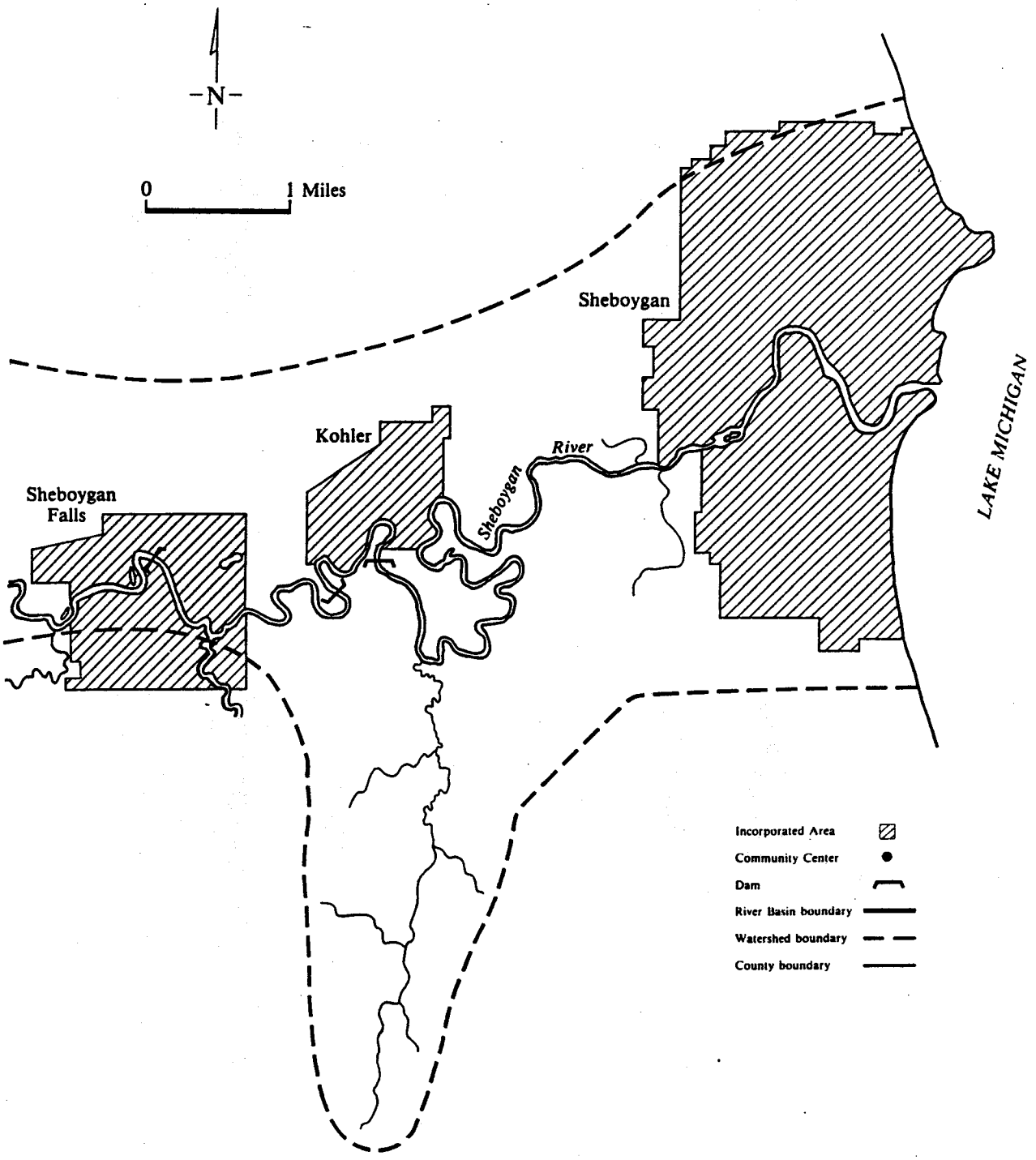


Figure 3. Sheboygan River AOC Boundaries

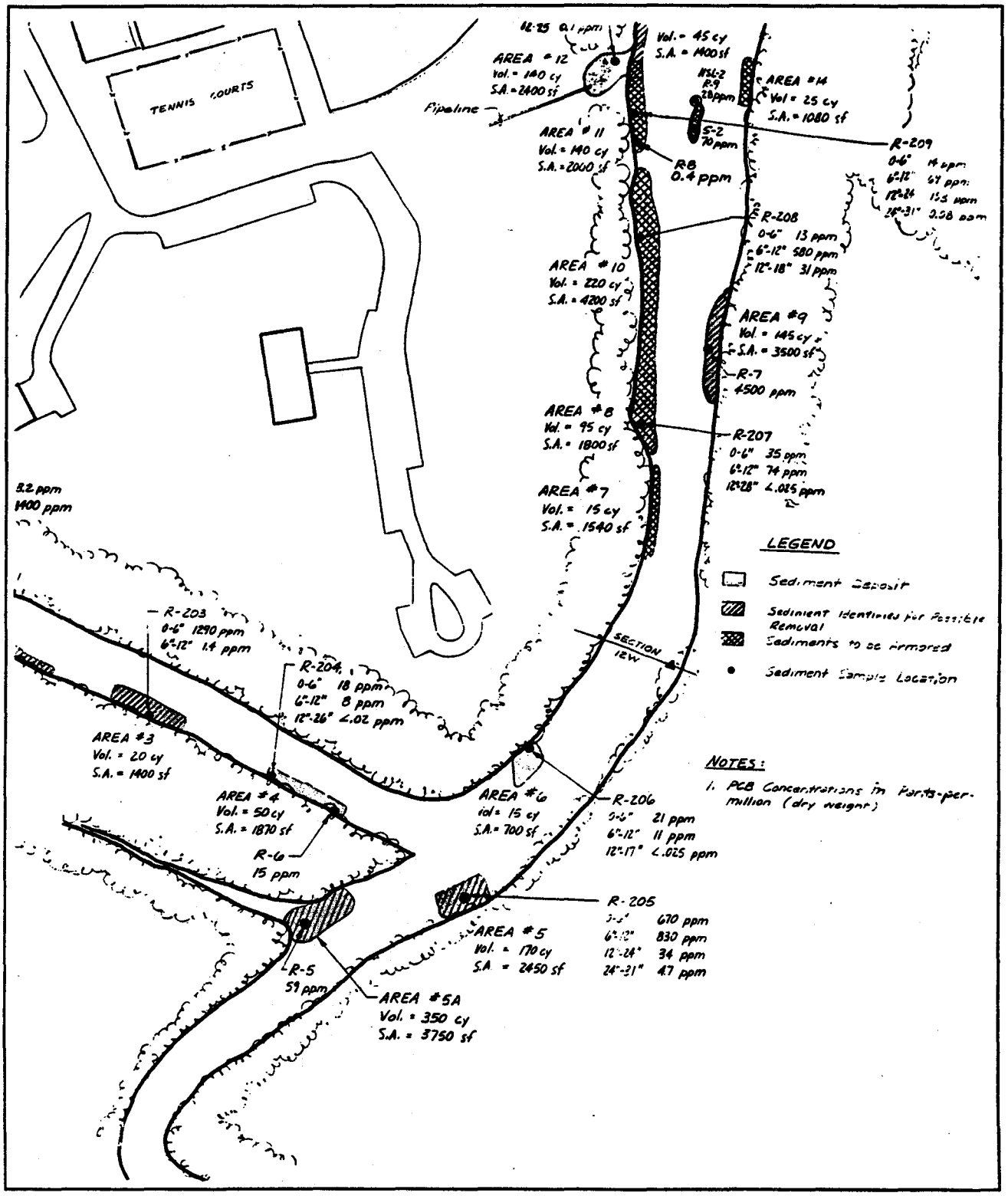


Figure 4. Example of maps identifying areas of PCB contamination in the Sheboygan River AOC

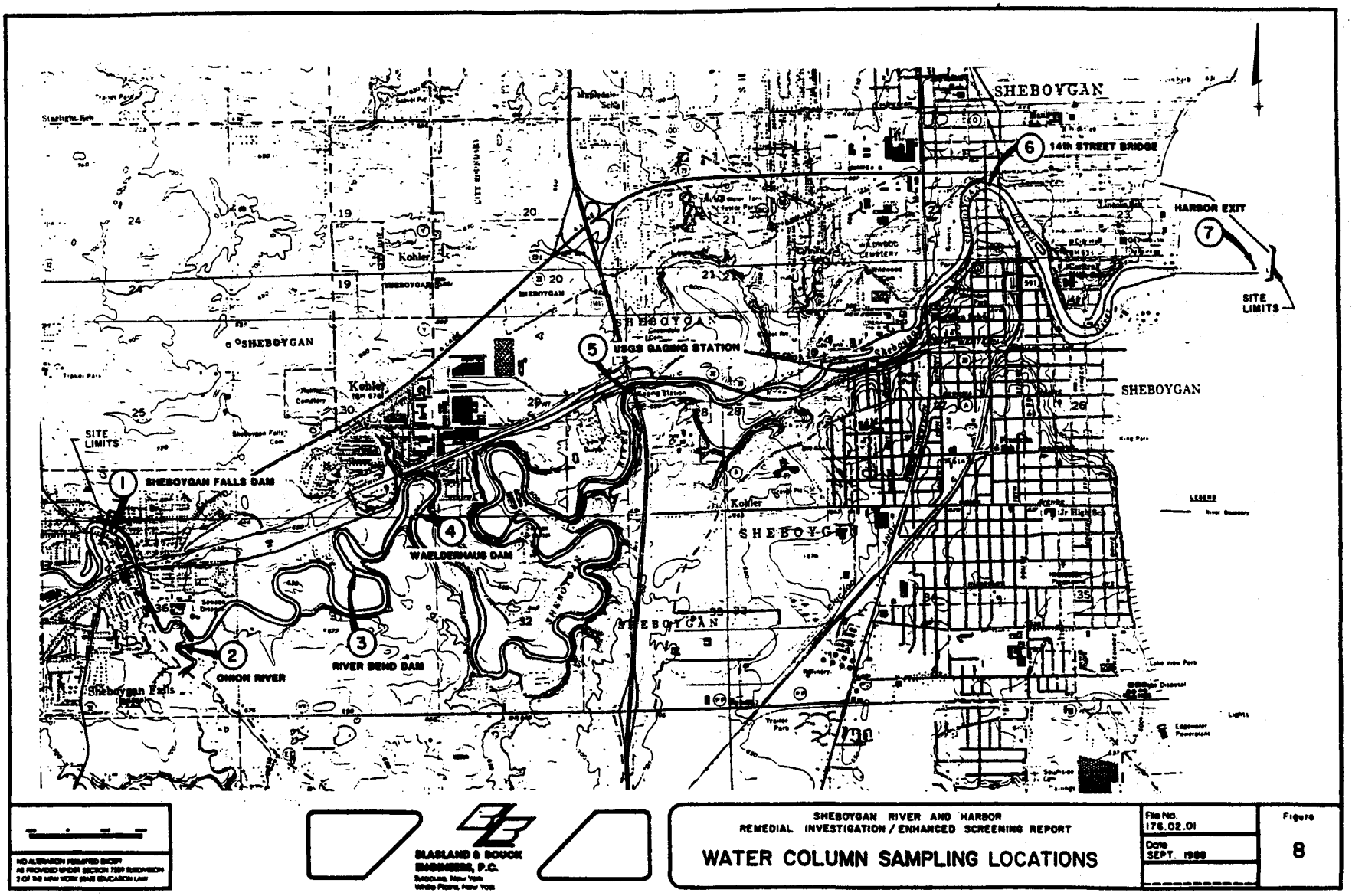


Figure 5. Location of water column sampling locations in Sheboygan River and Harbor

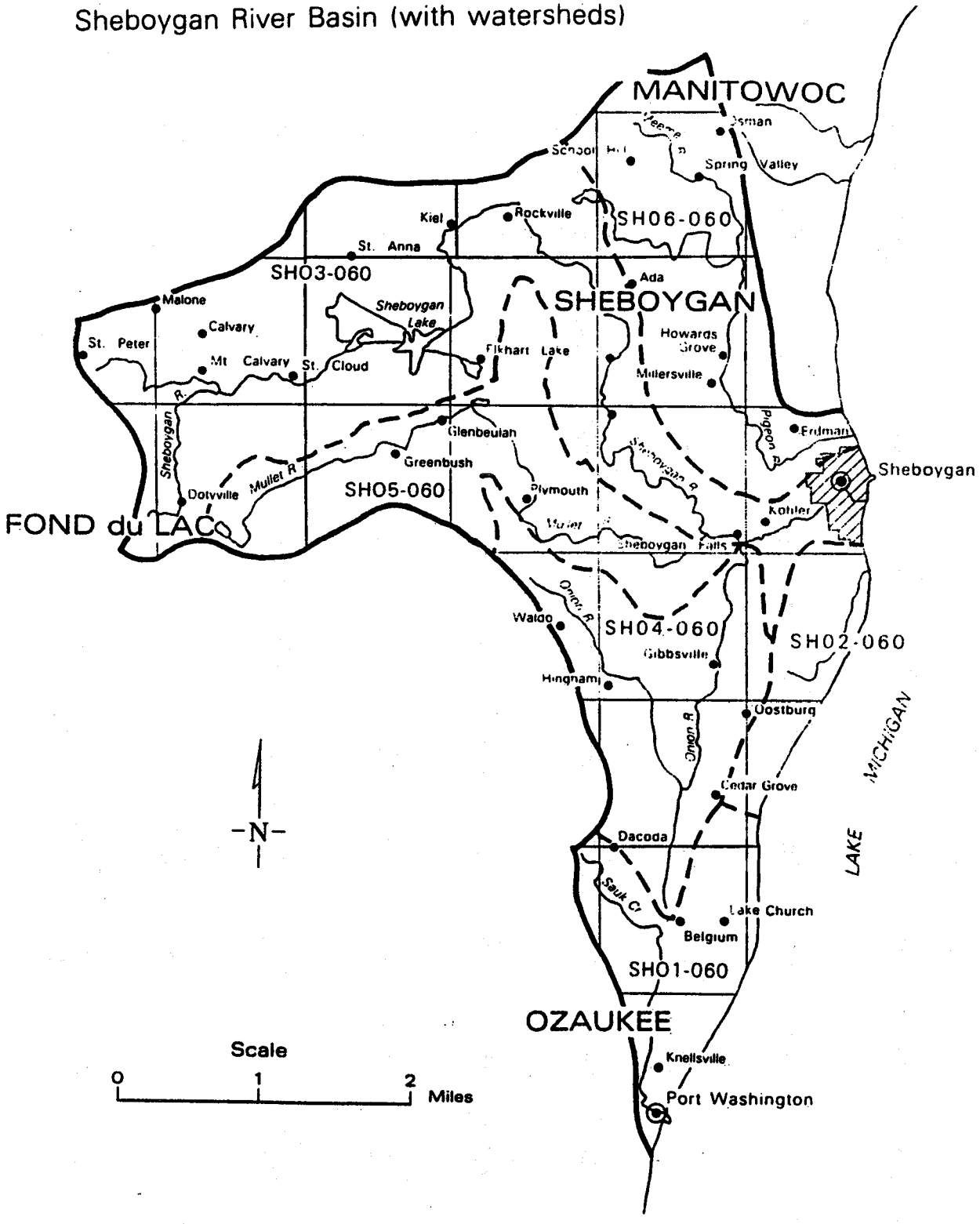


Figure 6. The Sheboygan River Basin

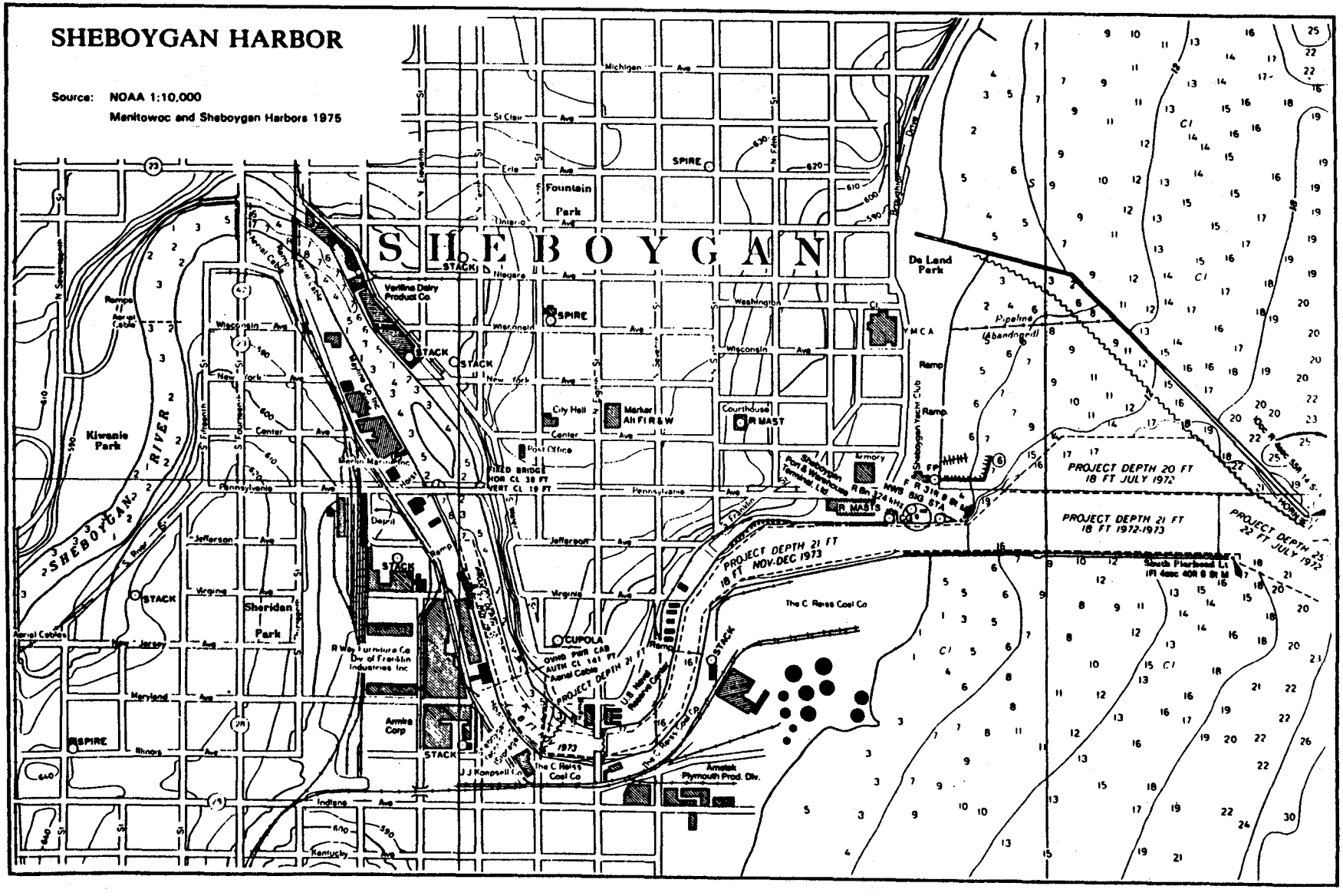


Figure 7. Sheboygan Harbor

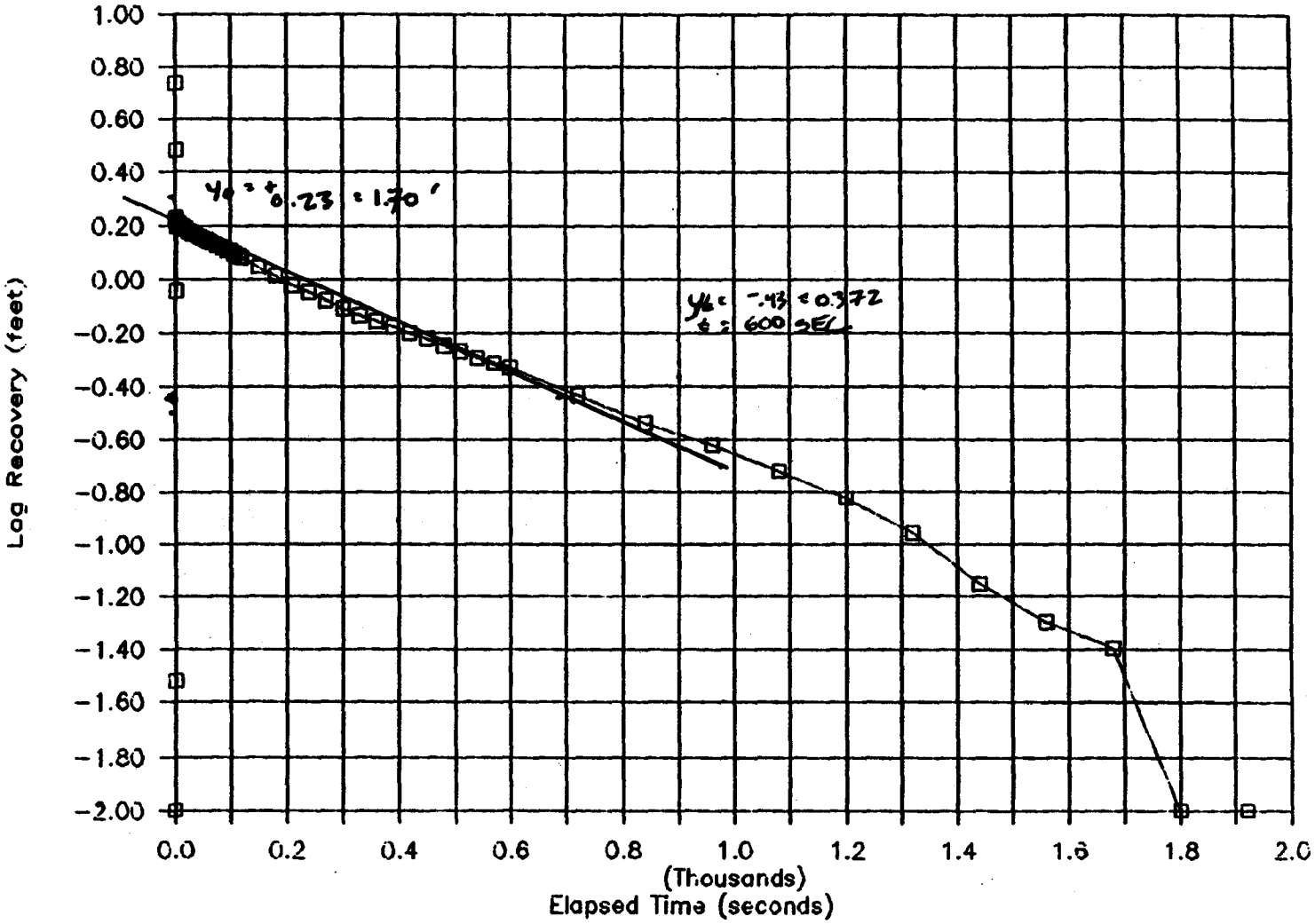


Figure 8. Slug in #2, Well 3R

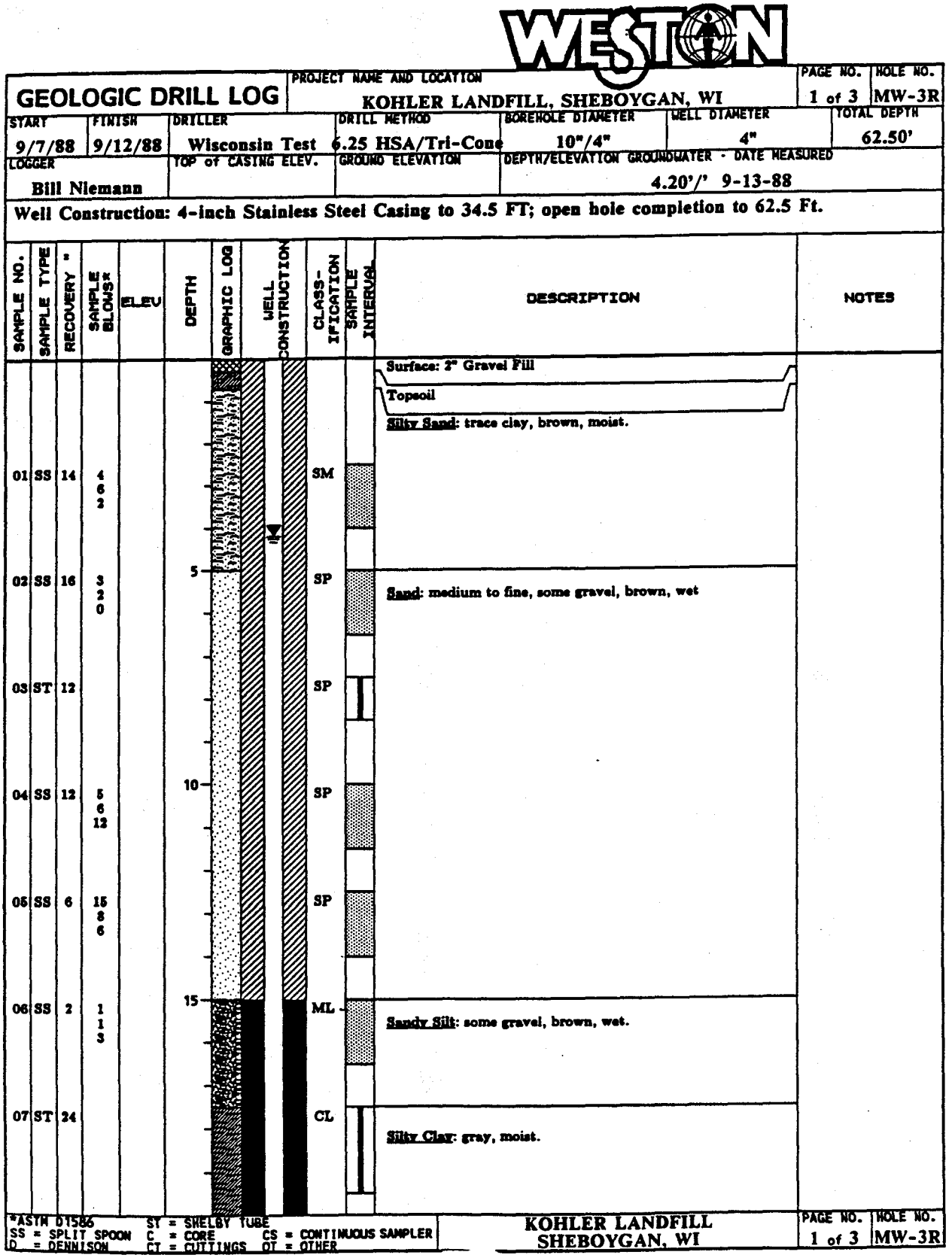
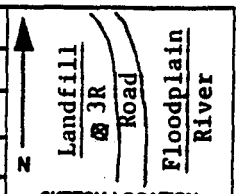


Figure 9. Geologic drill log

RADIAN CORPORATION	LOG OF ROCK CORE	BORING No. 3R PAGE 1 of 2

PROJECT	NAME: Kohler Co. Landfill, Kohler, WI	NUMBER: 250-028	
HYDROGEOLOGIST: Tom Morahan		OFFICE: Austin, TX	
DRILLING CONTRACTOR: Fox Drilling, Itasca, IL		DRILLER: Jerry Hamman	
EQUIPMENT: Mobile-Drill B-61			
DATE	STARTED: 10-6-88	COMPLETED: 10-6-88	
ELEVATION:	DEPTH ROCK: 46.5 ft BGL	TOTAL HOLE DEPTH: 73.0 ft BGL	
BIT	TYPE: Diamond Core / SIZE: NX / DIAMETER: 3 in o.d.	ACCOMPANYING SOIL LOG? Y ☒ N ☐	

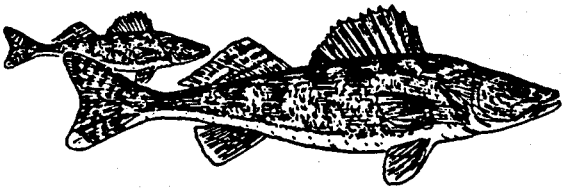


Depth (Ft; BGL)	Fracture Log: Angle (sketch)	Fracture Log: Fit	Fracture Log: Weathering	Description	Core Time (min/ft)	Run Time (min)	Run Length (ft)	Recovery (ft)	RQD	Water Pressure (psi)	Down Pressure (psi)	Run Reference (ft)	Notes
53.0												0	Core started 0842 hrs
					1:05				300 psi	300 psi			
54.0	Broken up	Poor	Very weathered									1	
					1:15				300 psi	300 psi			
55.0												2	Steady return over entire core
					0:35				300 psi	300 psi			
56.0				Friable, weathered to fresh buff to light gray microcrystalline to crystalline moderately bedded DOLOMITE.								3	
					0:05				300 psi	300 psi			
57.0	Drop											4	Rod drop 56.0-58.0 ft.
					0:05			0.3 ft.	300 psi	300 psi			
58.0						17:05	10.0	5.2				5	
					0:45			6%	300 psi	0 psi			
59.0	Broken up	Poor	Very weathered									6	
					0:45				300 psi	0 psi			
60.0												7	
					2:30				300 psi	50 psi			
61.0	Drop											8	Rod drop 60.8-61.0 ft.
	Broken up				4:50				300 psi	250-300 psi			
62.0		Poor	Very weathered									9	Rod drop 62.8-63.0 ft.
					5:10				300 psi	250-300 psi			
63.0	Drop			Run #2 con't on p. 2								10	Core ended 0850 hrs Run #2

Run No. 1

Figure 10. Log of rock core

Health advisory for people who eat sport fish from Wisconsin waters



October 1988

This publication explains which sport fish species in Wisconsin lakes and rivers do not meet health standards for a number of toxic pollutants. It describes health precautions you should consider before you decide to eat fish you've caught from waters where contaminants pose a problem.

It's important to note that this guide features two different sets of health advice: one for fish contaminated with PCBs and pesticides (pages 1 and 2), and another for fish contaminated with mercury (pages 3 through 8). Generally, people who should take the most precautions are children aged 18 or less, women in their child-bearing years, and women who are pregnant or breastfeeding.

PCB and pesticide contamination in fish

	Group 1 These fish pose the lowest health risk.	Group 2 Women and children should not eat these fish.	Group 3 No one should eat these fish.
	See page 2 for specific health advice on each group of fish.		
LAKE MICHIGAN	Lake trout up to 20" Coho salmon up to 26" Chinook salmon up to 21" Brook trout Rainbow trout Pink salmon Smelt Perch	Lake trout 20 to 23" Coho salmon over 26" Chinook salmon 21 to 32" Brown trout up to 23"	Lake trout over 23"* Chinook salmon 32 to 35" Chinook salmon over 35"* Brown trout over 23" Carp Catfish
SHEBOYGAN RIVER in Sheboygan County from the dam at Sheboygan Falls to the Coast Guard station in the City of Sheboygan, including **Greendale and Weedens Creeks**	Coho salmon up to 26" Chinook salmon up to 21"	Rainbow trout Brook trout Coho salmon over 26" Chinook salmon 21 to 32"	Rock bass* Carp* Smallmouth bass* Walleye* Northern pike* Brown trout Catfish* Chinook salmon 32 to 35" Chinook salmon over 35"*
MILWAUKEE RIVER in Milwaukee County (includes **Milwaukee Harbor**) from its mouth up to the North Avenue dam, including the **Kinnickinnic and Menomonee Rivers**	Perch NOTE: Follow Lake Michigan advisory above for trout and salmon.		Crappie Northern pike Carp* Redhorse Smallmouth bass
MILWAUKEE RIVER from the North Avenue dam in Milwaukee County upstream to the Lime Kiln Dam at Grafton (Ozaukee County)	Rock bass up to 8.5" Largemouth bass up to 13"	Redhorse	Northern pike Carp
CEDAR CREEK from the Milwaukee River up to Bridge Road in the Village of Cedarburg			All species*

HEALTH ADVICE for the chart above

GROUP 1: Contaminant levels in 10 percent or less of tested Group 1 fish are higher than one or more health standards. EATING GROUP 1 FISH POSES THE LOWEST HEALTH RISK. Trim fat and skin from Group 1 fish before cooking and eating them.

GROUP 2: Contaminant levels in more than 10 percent but less than 50 percent of tested Group 2 fish are higher than one or more health standards. CHILDREN UNDER 15, NURSING MOTHERS, PREGNANT WOMEN, AND WOMEN WHO ANTICIPATE BEARING CHILDREN SHOULD NOT EAT GROUP 2 FISH. You should also limit your overall consumption of other Group 2 fish, and trim skin and fat from these fish before cooking and eating them. (NOTE: See specific health advice for mercury-contaminated fish in the Petenwell Flowage and Lake Superior elsewhere in this publication.

GROUP 3: Contaminant levels in 50 percent or more of tested Group 3 fish are higher than one or more health standards. NO ONE SHOULD EAT GROUP 3 FISH.

*Ninety percent or more of Group 3 fish marked with an asterisk (*) contain contaminant levels higher than one or more health standards.

U.S. Food & Drug Administration and Wisconsin Division of Health Standards for Contaminants Commonly Found in Sport Fish

PCBs	2 parts per million (ppm)
DDT	5 ppm
Toxaphene	5 ppm
Chlordane	0.3 ppm
Dieldrin	0.3 ppm
Mercury	0.5 ppm
Dioxin	50 parts per trillion

SOURCE: Wisconsin Division of Health and Wisconsin Department of Natural Resources October 1988

Figure 11. The Fish consumption advisory for the Sheboygan AOC

WISCONSIN WATERFOWL CONSUMPTION ADVISORY

Wisconsin Division of Health
Wisconsin Department of Natural Resources
June, 1987

Location	Health advice
LOWER FOX RIVER from Lake Winnebago at Neenah and Menasha downstream, including Little Lake Butte des Morts, to the northeast city limits of Kaukauna	Remove all skin and visible fat before cooking mallard ducks using these waters. Discard drippings or stuffing because they may retain fat that contains PCBs.
LOWER FOX RIVER from the De Pere Dam to the river's mouth at Green Bay, and lower GREEN BAY south of a line from Point Sauble west to the west shore of Green Bay	
SHEBOYGAN RIVER from Sheboygan Falls downstream to the river's mouth at Lake Michigan	No one should eat mallard ducks using this water.
SHEBOYGAN HARBOR	No one should eat lesser scaup (bluebills) using this water.
MILWAUKEE RIVER from Highway 167 (Thiensville) upstream to Lime Kiln Dam at Grafton and CEDAR CREEK from the Milwaukee River up to Bridge Road in the Village of Cedarburg	No one should eat mallard ducks using these waters.
MILWAUKEE HARBOR	No one should eat black ducks using this water.

NOTE: The U.S. Food and Drug Administration standard for PCBs (polychlorinated biphenyls) in poultry is 3 parts per million calculated on a fat basis.

Figure 12. The wildlife consumption advisory for the Sheboygan AOC