United States
Environmental Protection
Agency

Region 5
230 South Dearborn Street
Chicago, Illinois 60604

May, 1983

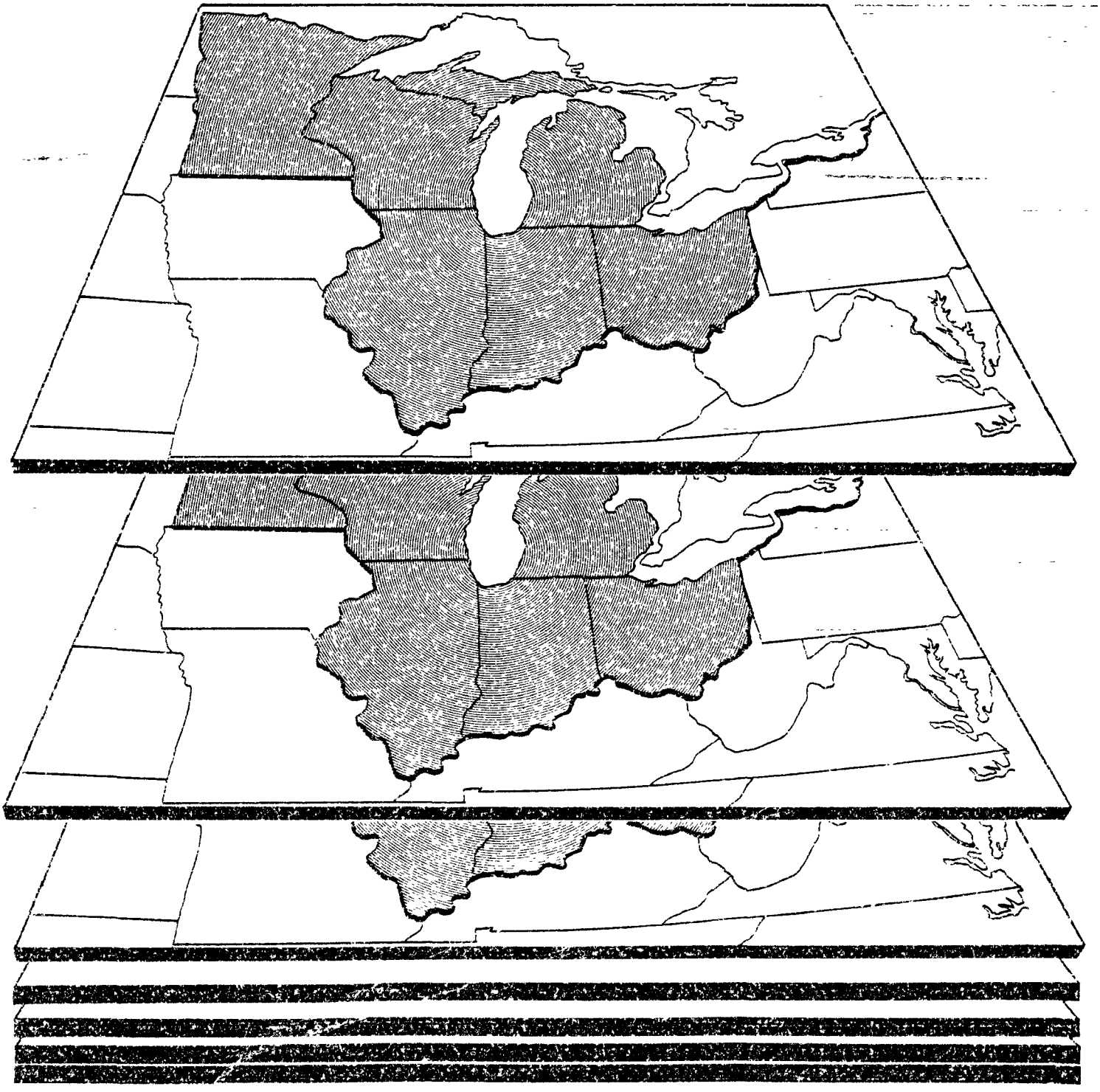
5752E

EPA

Environmental Management Report

Attachment B

Valdas V. Adamkus, Regional Administrator



REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT B

DETAILED PROBLEM ANALYSES

TABLE OF CONTENTS

REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT B

AIR

Air Quality

The areas of highest concern to Region V from the standpoint of air pollution include:

- Ozone in the Chicago Region (NE Illinois, NW Indiana, and SE Wisconsin)
- Ozone in Detroit (Michigan)
- Ozone in Milwaukee (Wisconsin)
- TSP in the Chicago Region (Chicago and NW Indiana)
- TSP in Detroit (Michigan)
- TSP in Cleveland (Ohio)

Analysis 1: Chicago Region Ozone (NE Illinois, NW Indiana, and SE Wisconsin)

Because of the difficulty imposed by the transport of oxidant precursors from the Chicago and NW Indiana area to Milwaukee, it is not a simple matter to specify a problem area. For this analysis emissions data were obtained for NE Illinois and NW Indiana while air quality data also included Kenosha and Racine Counties in Wisconsin. The problem area is represented in Figure A-9. The population subjected to the high ozone levels of this area total approximately eight million people. Figure A-10 summarizes the distribution of precursor sources in this area. Also shown is the compliance status of each source. Note the heavy concentration of sources in NW Lake County, Indiana and West Central Cook County, Illinois. From this figure, it can be seen that approximately 48% of the major sources in Illinois are not in final compliance; whereas, only 12% of the Indiana major sources are also designated as not being in final compliance. But, there is a higher proportion of major sources in Indiana than in Illinois where the compliance status is unknown (35% in Indiana as compared to 14% in Illinois). The number of days showing violations of the standards at each monitor site are demonstrated in Figure A-11. In 1982 there were a total of 13 ozone site days of violations (4 days in Cook, 1 day in Lake, 1 day in McHenry, 1 day in Will, 3 days in Lake (IN), 2 days in Porter, 1 day in Racine, zero days in DuPage, Kane and Kenosha Counties). Note that the number of excursions, because of the northward transport of precursors, are higher in the northern part of the problem area. Figure A-12 demonstrates the trend in ambient ozone levels. Though there seems to be a small decrease in the ambient levels, the ozone levels fluctuate too widely to be able to accurately determine the true trend. In any case, the levels are still substantially above the standard. Figure A-13 shows that total precursor source emissions have decreased in magnitude and that the mobile source contribution to the loading is dropping. Figure A-14 shows expected emission reductions along with a range of control requirements. The lower end of this range is based on air quality data solely from Northeast Illinois, and the upper end of the range is based on air quality from the entire area including Southeast Wisconsin. The exact control percentage needed to attain the standard is still uncertain because USEPA and Illinois EPA (IEPA) disagree about procedures for estimating emission reduction requirments. The control requirements shown on this figure are based on the upper end of the ranges modeled by IEPA but with certain of Illinois' model adjustments removed. Depending on how closely the control requirements shown here reflect actual emission reduction needs, it is possible that the Chicago, NW Indiana, and SE Wisconsin area may not reach attainment by 1987.

This analysis demonstrates that while precursor levels are dropping, the ozone problem may not yet be under control. A major factor for the future resolution of this problem is the high percentage of sources, especially in Indiana, where the compliance status is unknown.

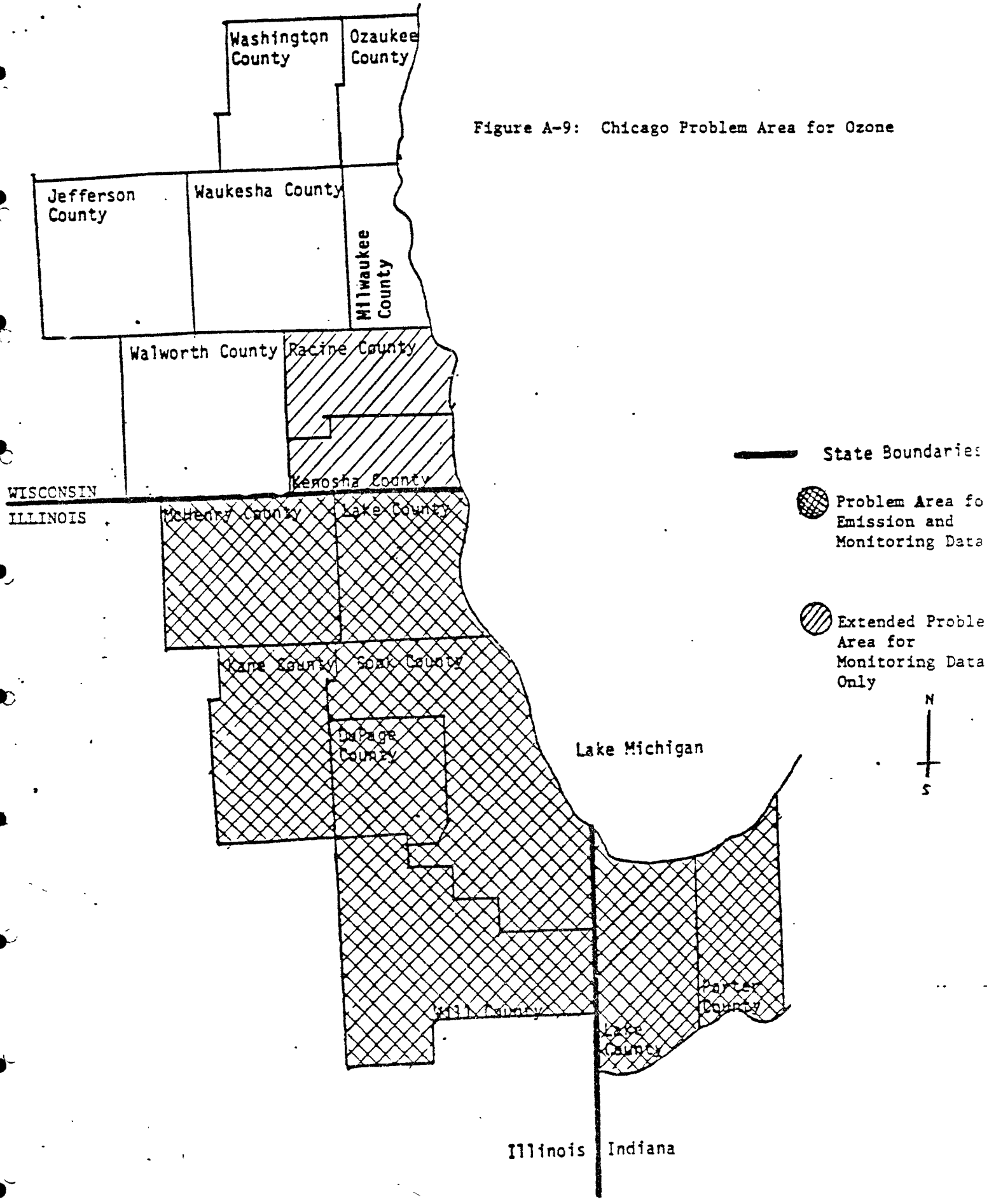
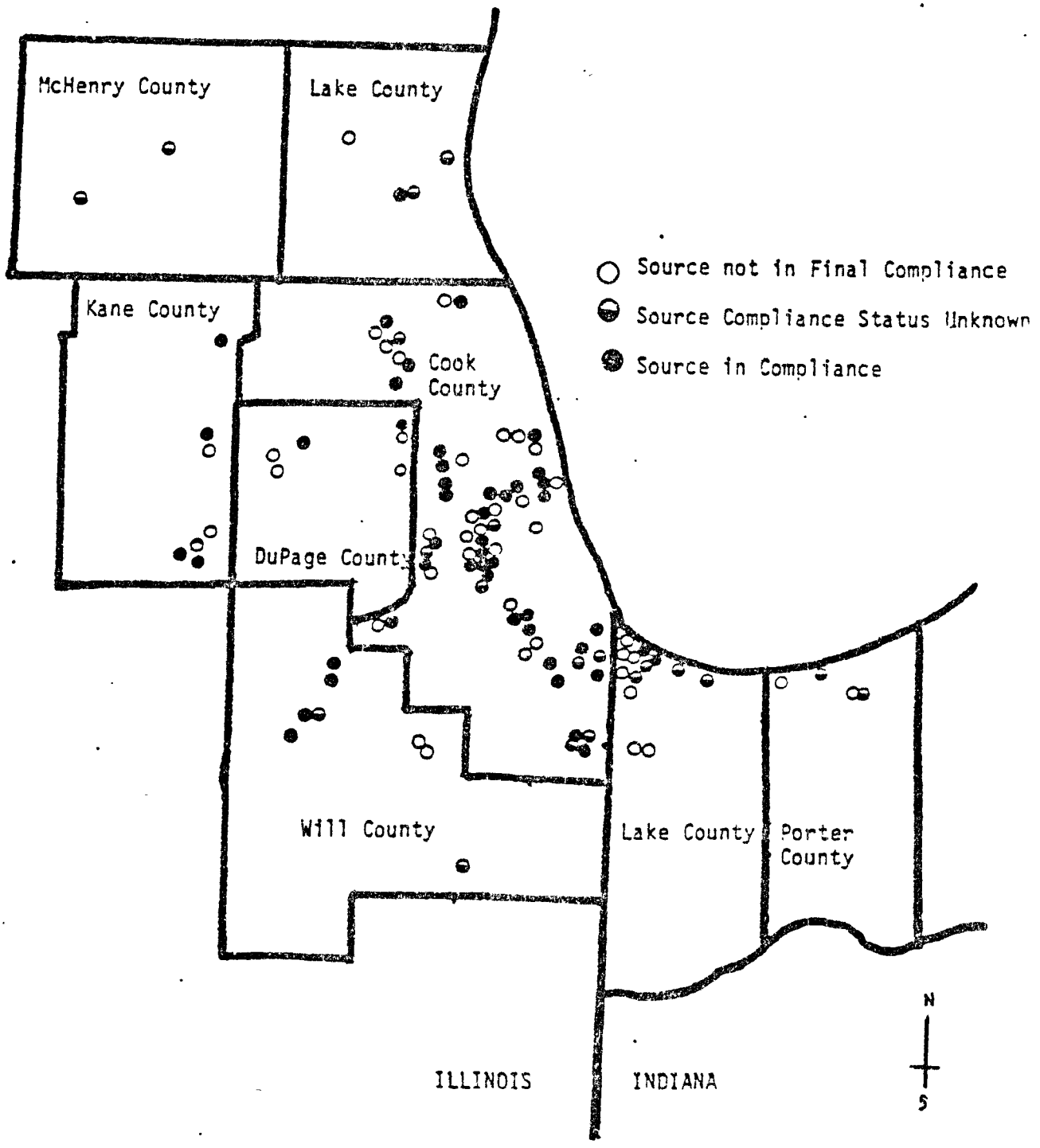


Figure A-9: Chicago Problem Area for Ozone

Figure A-10: Chicago Area Major Hydrocarbon Sources



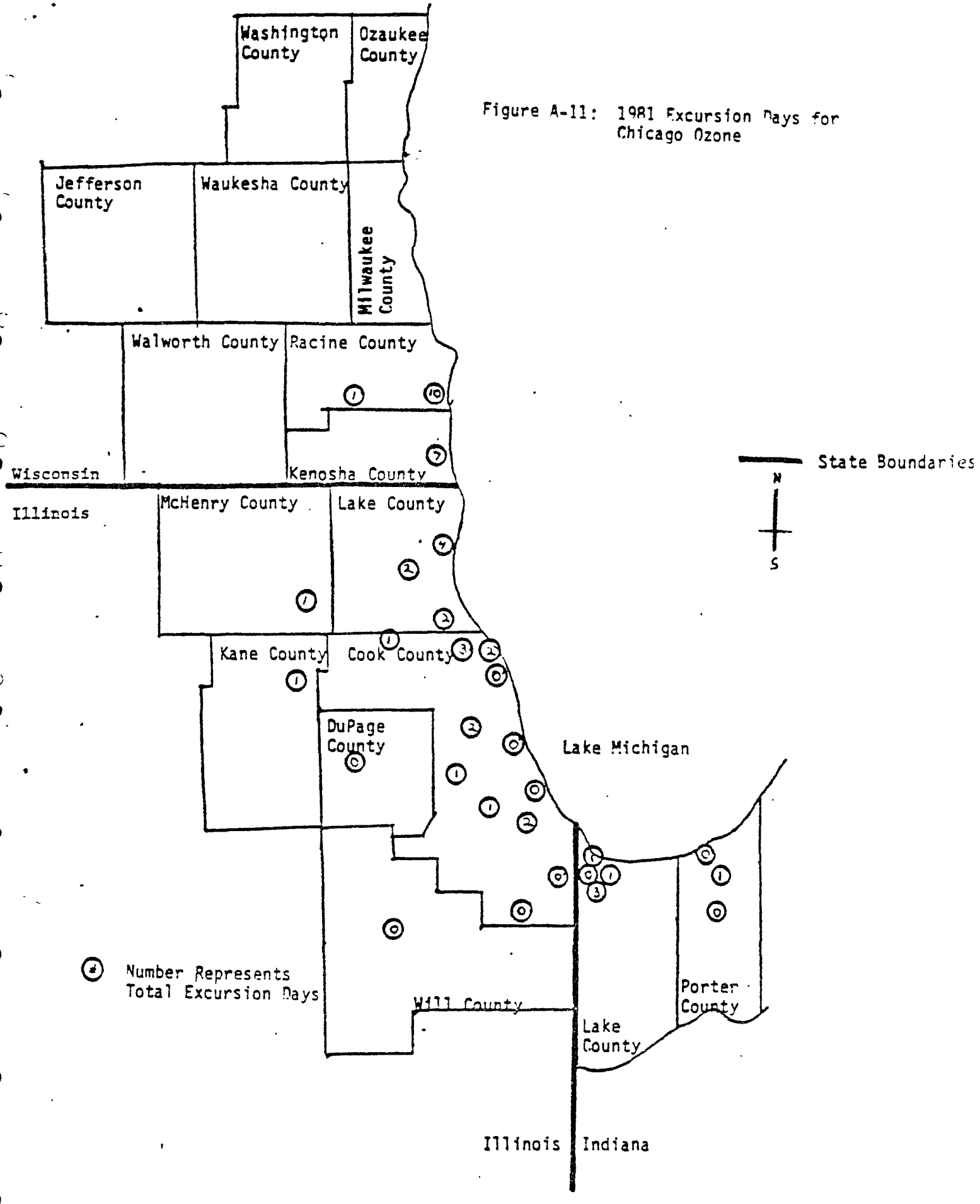


Figure A-11: 1981 Excursion Days for Chicago Ozone

FIGURE A-12:

OZONE TREND FOR CHICAGO/NW INDIANA/SE WISCONSIN
(Worst Case for Second High Values)

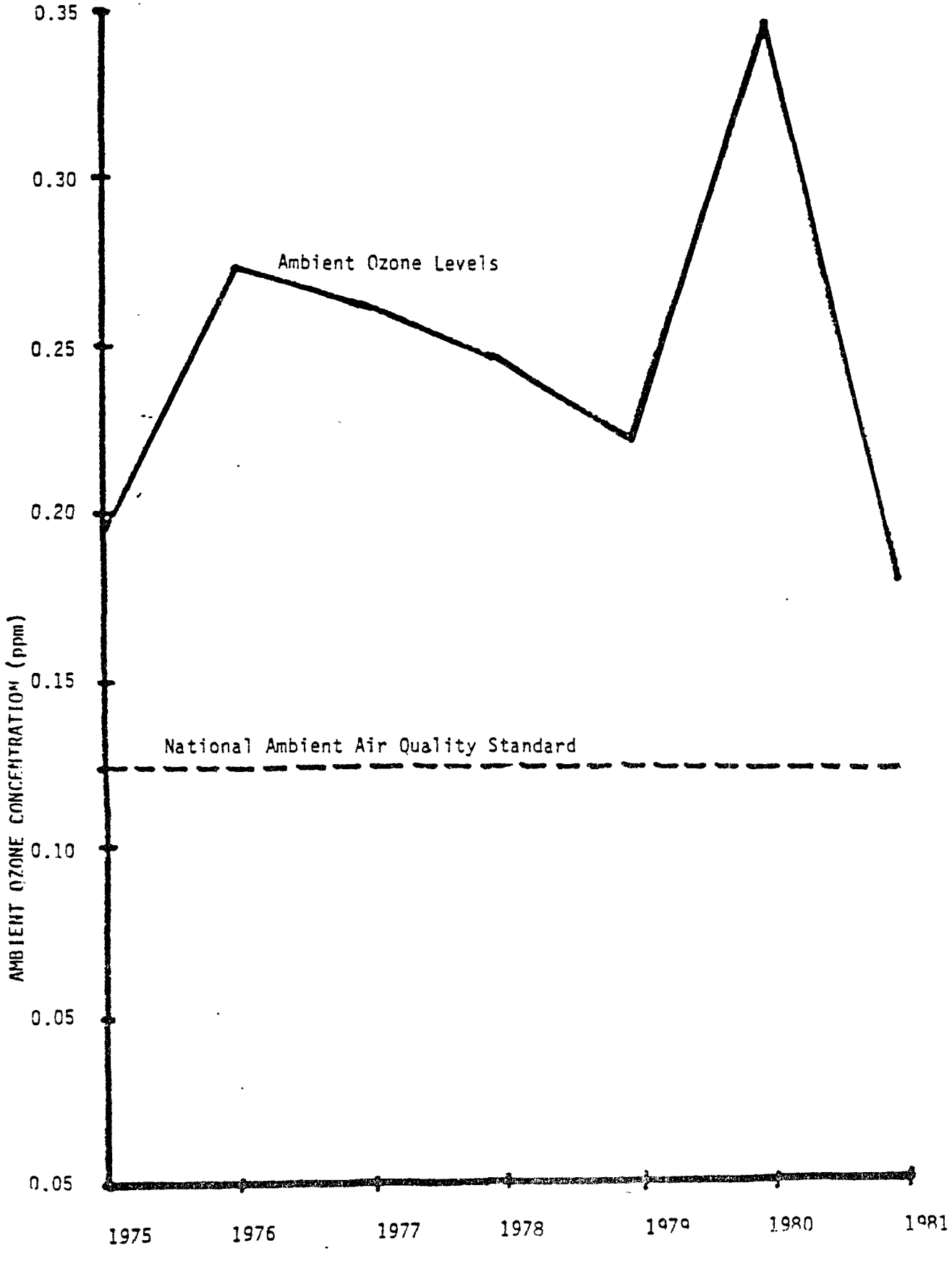
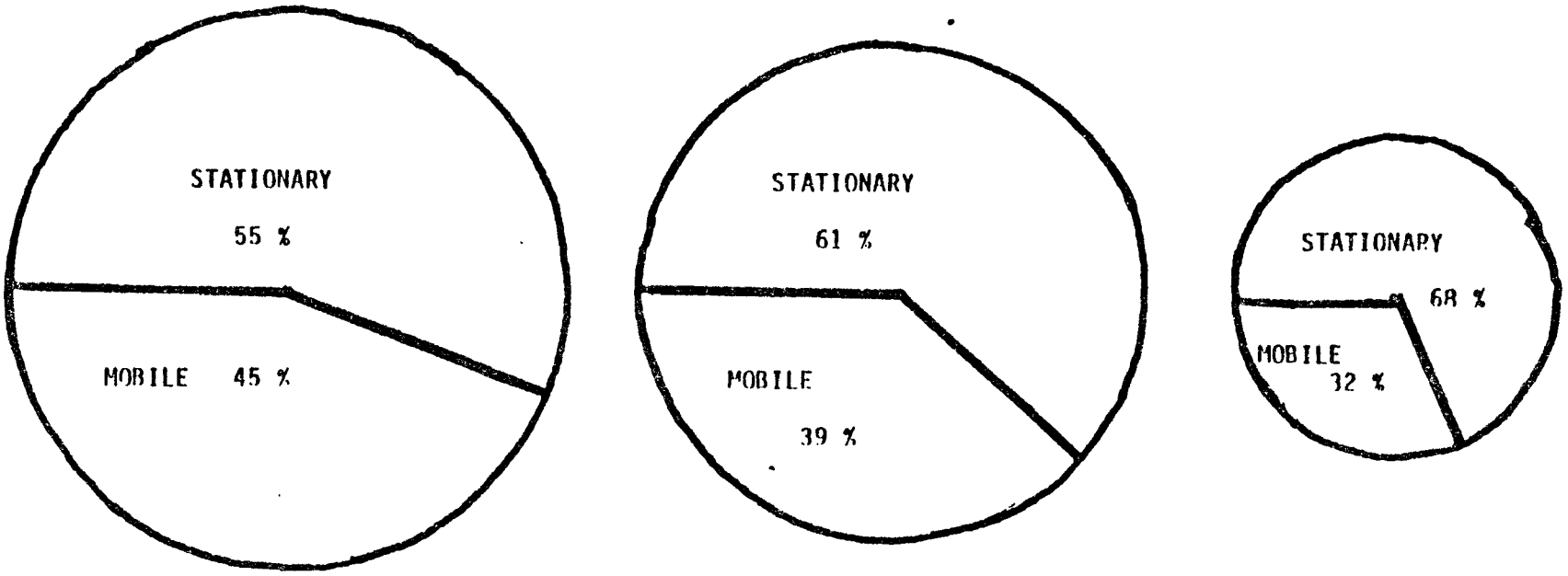


Figure A-13· VOC Source Distribution for Chicago Area and Northwest Indiana



1669 tons/day

1977

1418 tons/day

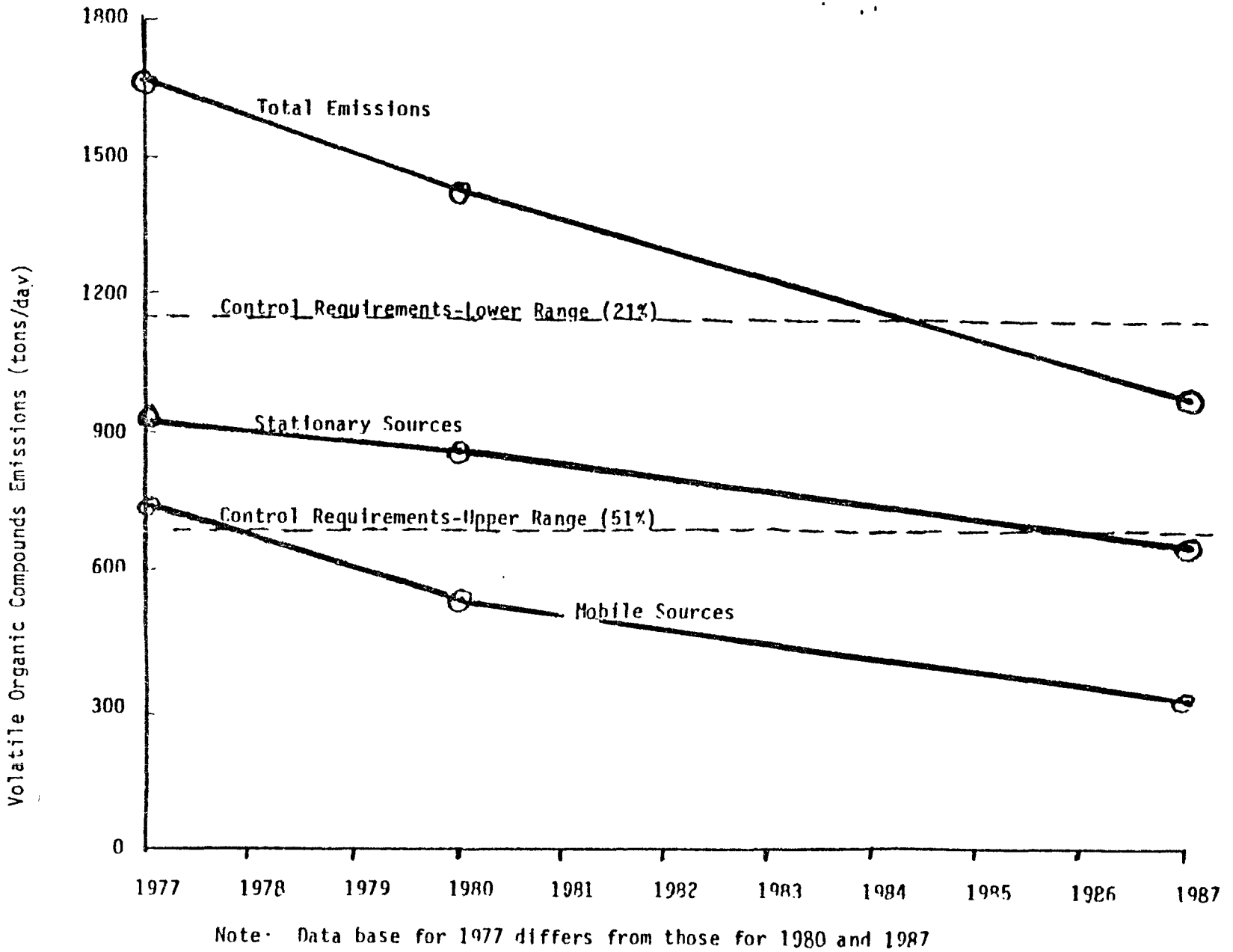
1980

975 tons/day

1987

Note: data base for 1977 differs from those for 1980 and 1987

FIGURE A-14: REASONABLE FURTHER PROGRESS-CHICAGO AND NW INDIANA



Note: Data base for 1977 differs from those for 1980 and 1987

Analysis 2: Detroit Ozone

The Detroit Ozone problem is located in the tri-county area (Wayne, Macomb, and Oakland Counties) depicted in Figure A-15 with an affected population of approximately four million. But, because of the proximity of this area to Ontario, Canada, the ozone problem in Detroit may also adversely affect a substantial number of people in the bordering Canadian counties. Figure A-16 locates major precursor sources and their final compliance status. Note that of 144 major sources, only two have been designated as not being in final compliance (eight of these 144 sources have an unknown compliance status). Figure A-17 shows the 1981 monitoring sites as well as the number of days that the ozone level was measured as being over the U.S. standard. In 1982 there were 4 days of ozone violations in Wayne County and none in Macomb, and Oakland Counties. Figure Figure A-18 graphically depicts the ozone concentration trends for both U.S. and Canadian data. There is a very strong indication of a downward trend with both the U.S. and Canadian Ozone levels approaching the U.S. standard. However, note that there is little evidence in this figure of the Canadian levels ever reaching the Canadian Ozone standard of 0.08 ppm. Figure A-19 exhibits the source contribution for three selected years. This figure demonstrates that the greater contribution of VOC is now from stationary sources rather than mobile sources as in the past. As can be seen in Figure A-20, attainment can be expected in late 1985, well before the 1987 deadline.

The ozone problem in Detroit is improving; however, ambient levels are still above the National Standards. Also of concern is that because of possible U.S. influence the ozone levels in the neighboring Canadian counties may not decrease to the Canadian levels.

FIGURE A-15:

OZONE

Non-Attainment Area for Michigan

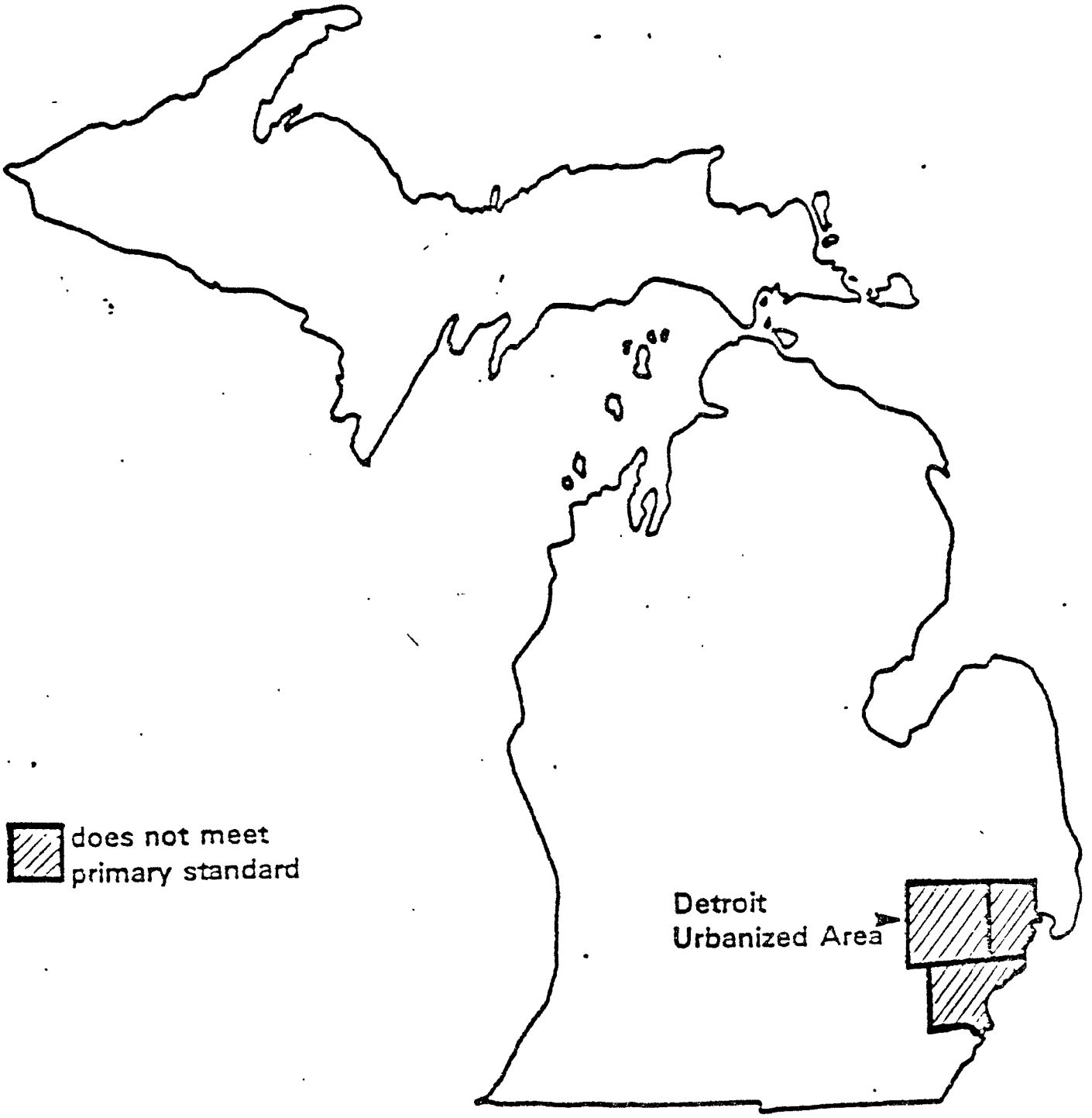


Figure A-16: Detroit Area Major Hydrocarbon Sources

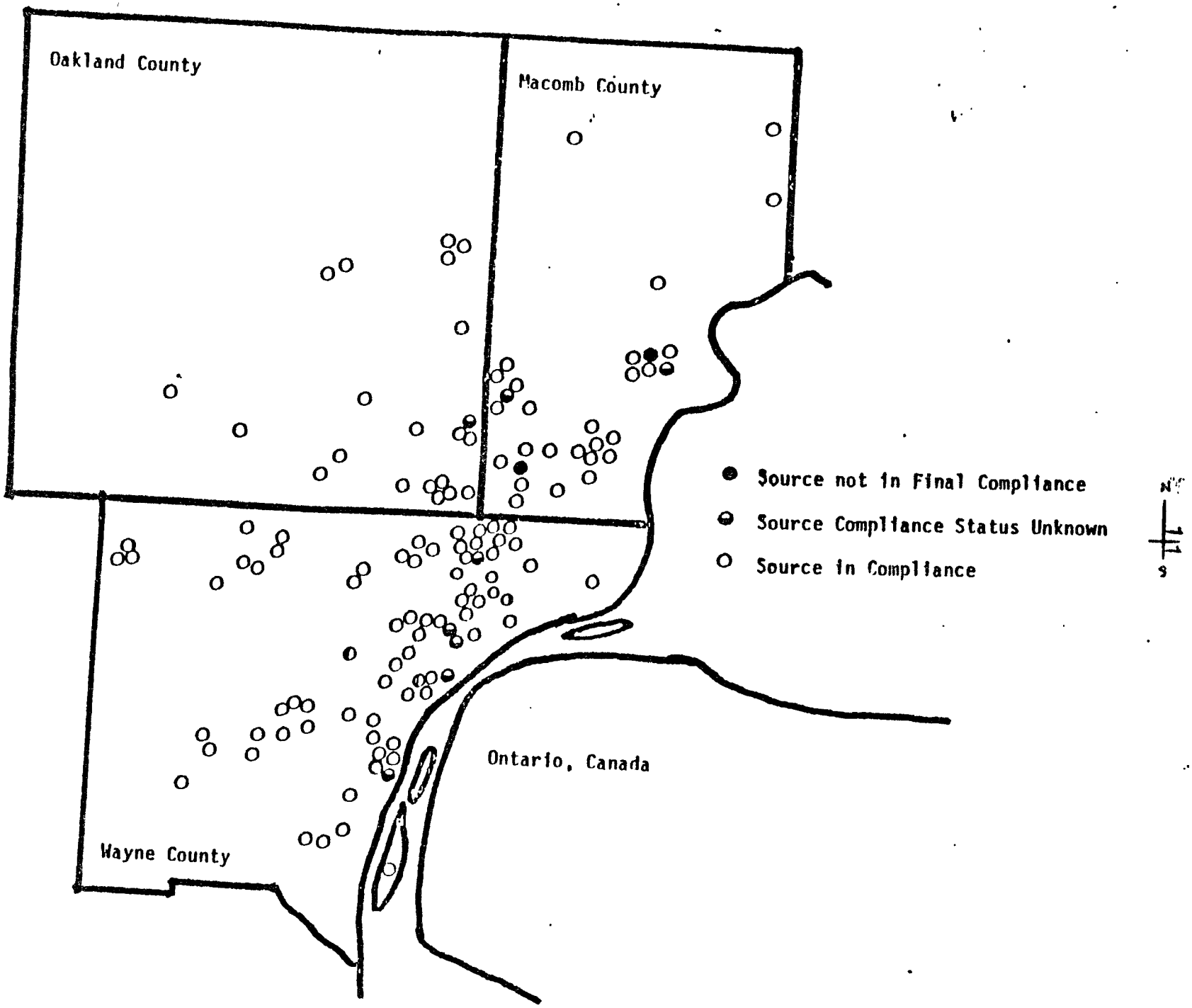


FIGURE A-17: CURRENT OZONE MONITORING SITES AND 1981 EXCURSION DAYS

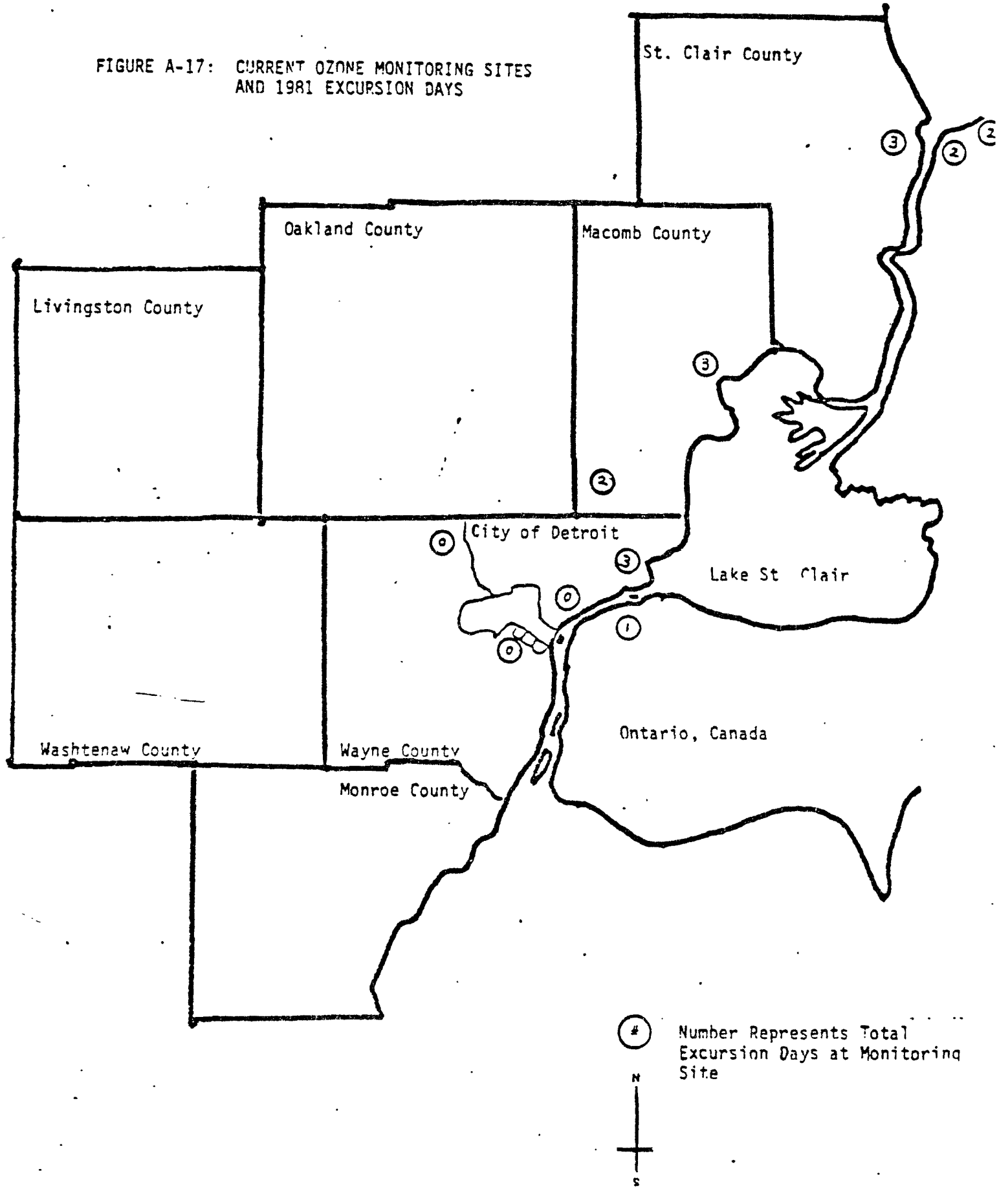


FIGURE A-18:

OZONE TREND FOR DETROIT AREA (MACOMB, OAKLAND, AND WAYNE COUNTIES AND ADJACENT CANADIAN MONITORS)

(Worst Case for Second High Values)

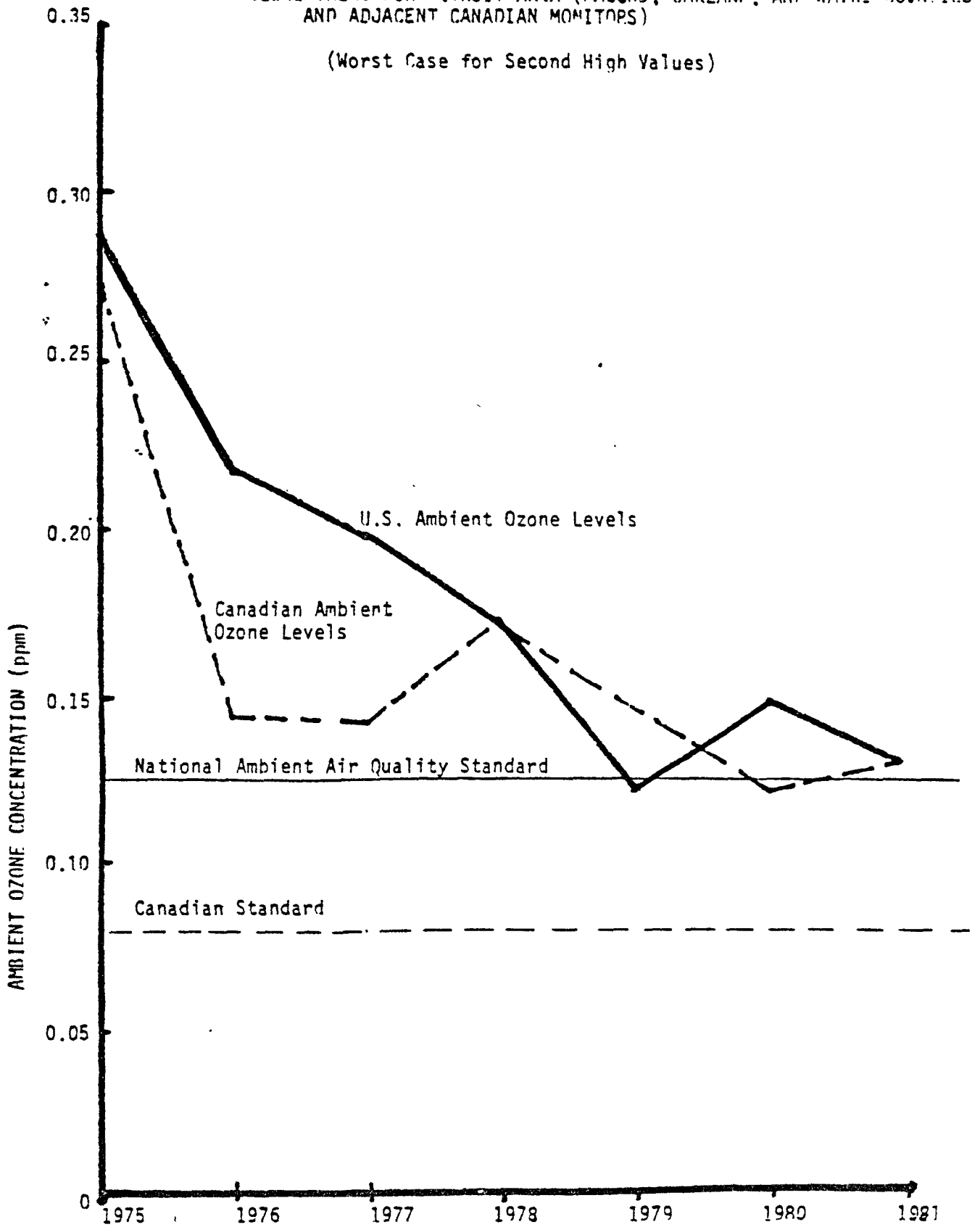
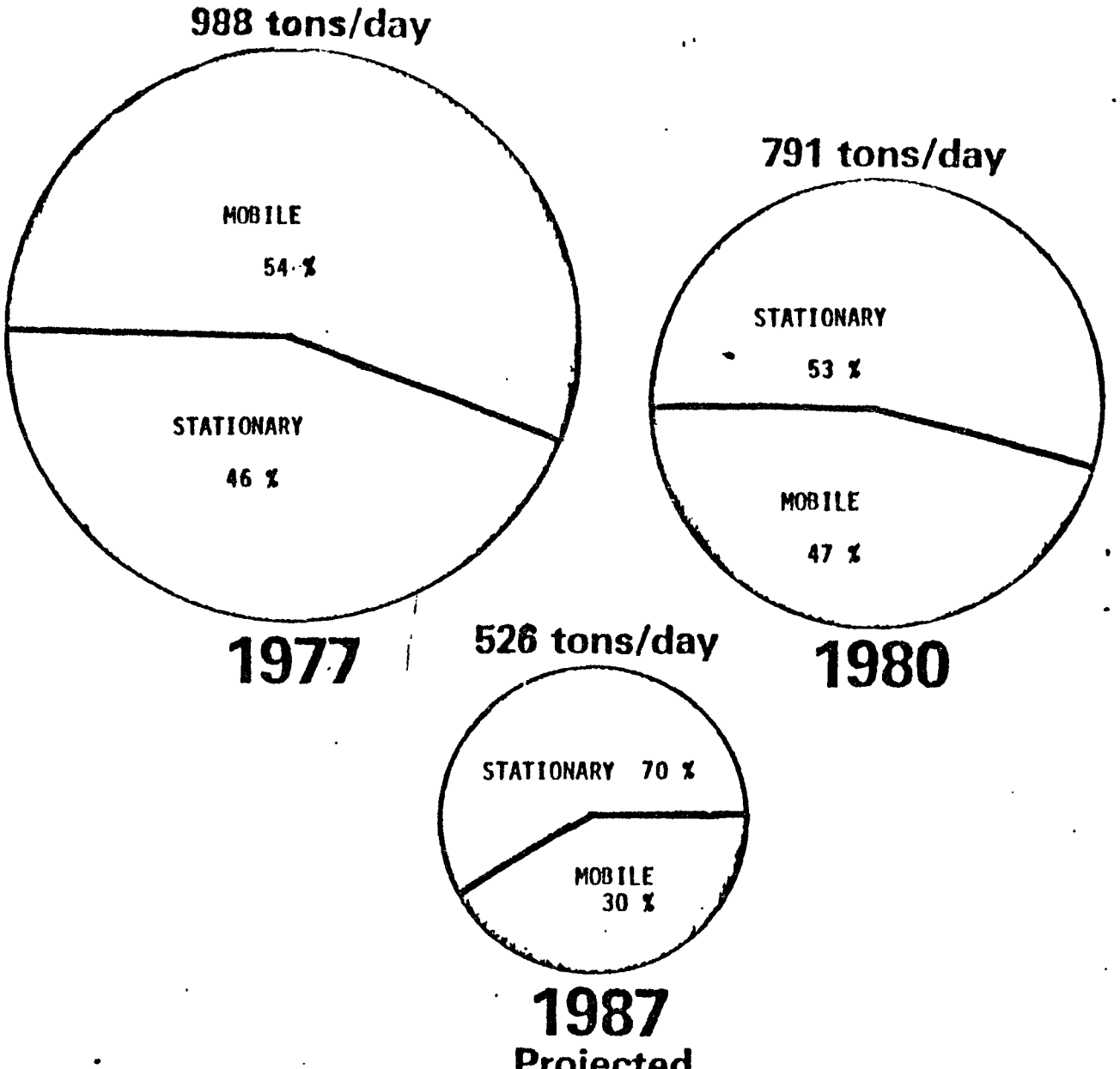


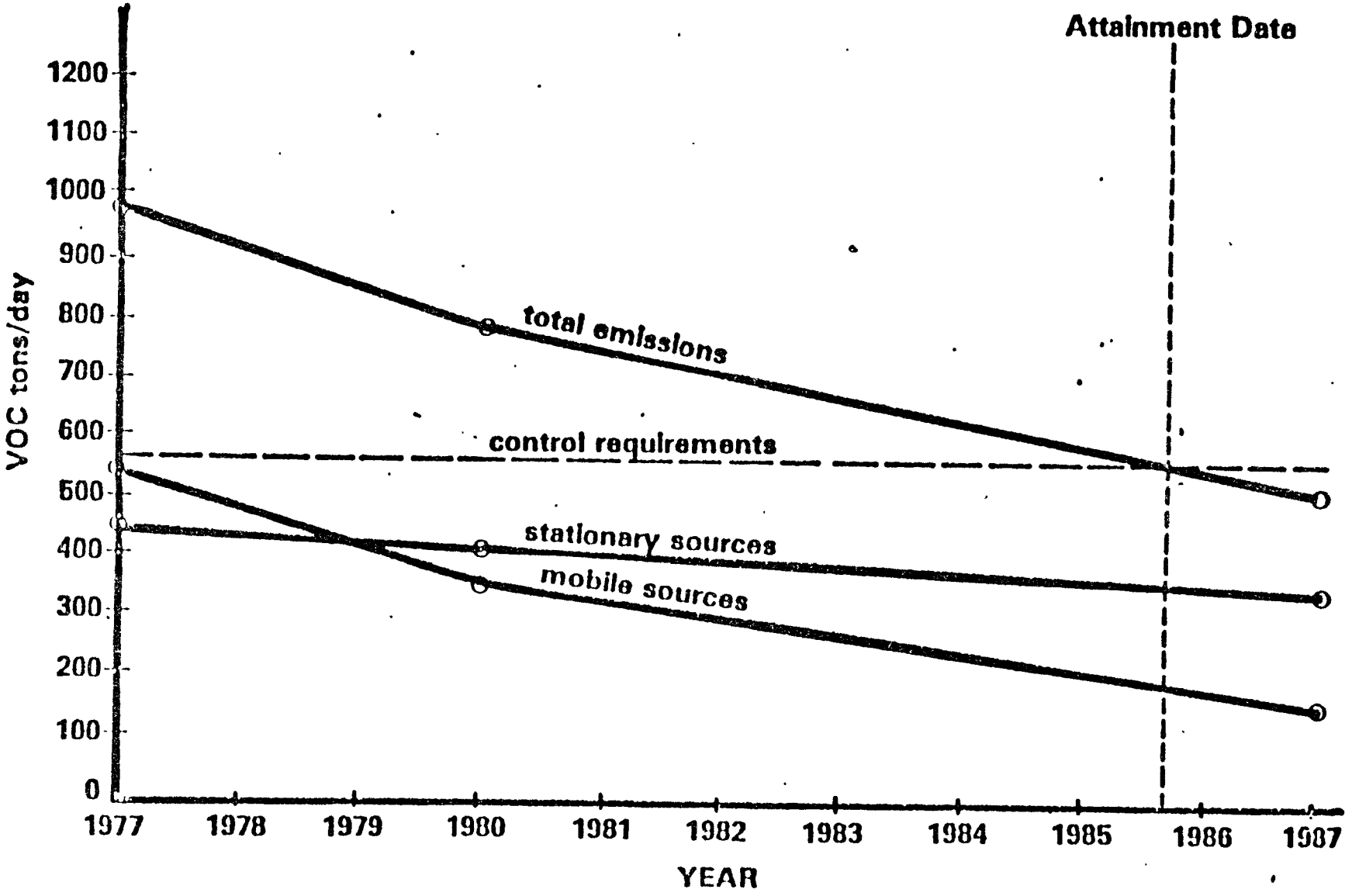
Figure A-19:

3-COUNTY TOTAL EMISSIONS VOC



Note: Data base for 1977 differs from data base for 1980 and 1987

Figure A-20: **REASONABLE FURTHER PROGRESS**
(U.S. Only)



Note: Data base for 1977 differs from the data base for 1980 and 1987

Analysis 3: Milwaukee Ozone

The Milwaukee ozone problem area is shown in Figure A-21. The base area is composed of four counties with Kensoha and Racine Counties in southern Wisconsin being included for emissions data only. The exposed population in these four counties totals to approximately one million people. The air quality data for Kenosha and Racine Counties are included with the Chicago Ozone analysis. Major ozone precursor sources and their final compliance status are shown in Figure A-22. Note the heavy concentration of sources within the City of Milwaukee. In fact, 57% of the 56 sources in the six county area are located in the City. Only 11% of these sources are considered not in final compliance; however, 41 sources (73%) have no known compliance status. Monitor location and the number of days in 1981 in which exceedances at each monitor were noted are depicted in Figure A-23. In 1982 there were a total of 10 site-days of violations in the Milwaukee ozone problem area (5 days in Milwaukee, 1 day in Ozaukee, 1 day in Washington and 3 days in Waukesha Counties). Again, these data for Kenosha and Racine Counties were included in the Chicago Area Ozone analysis. Figure A-24 shows that while there has been an almost continuous decrease in ambient ozone levels, the most recent values are still substantially above the standard. The precursor source contributions, depicted in Figure A-25, shows that stationary sources comprise an increasing portion of the total emissions. Attainment is expected in mid 1986, as is shown in Figure A-26. This is well before the 1987 deadline.

Ambient ozone levels are improving. However, the proximity of Chicago and NW Indiana can affect the air quality in the Milwaukee area.

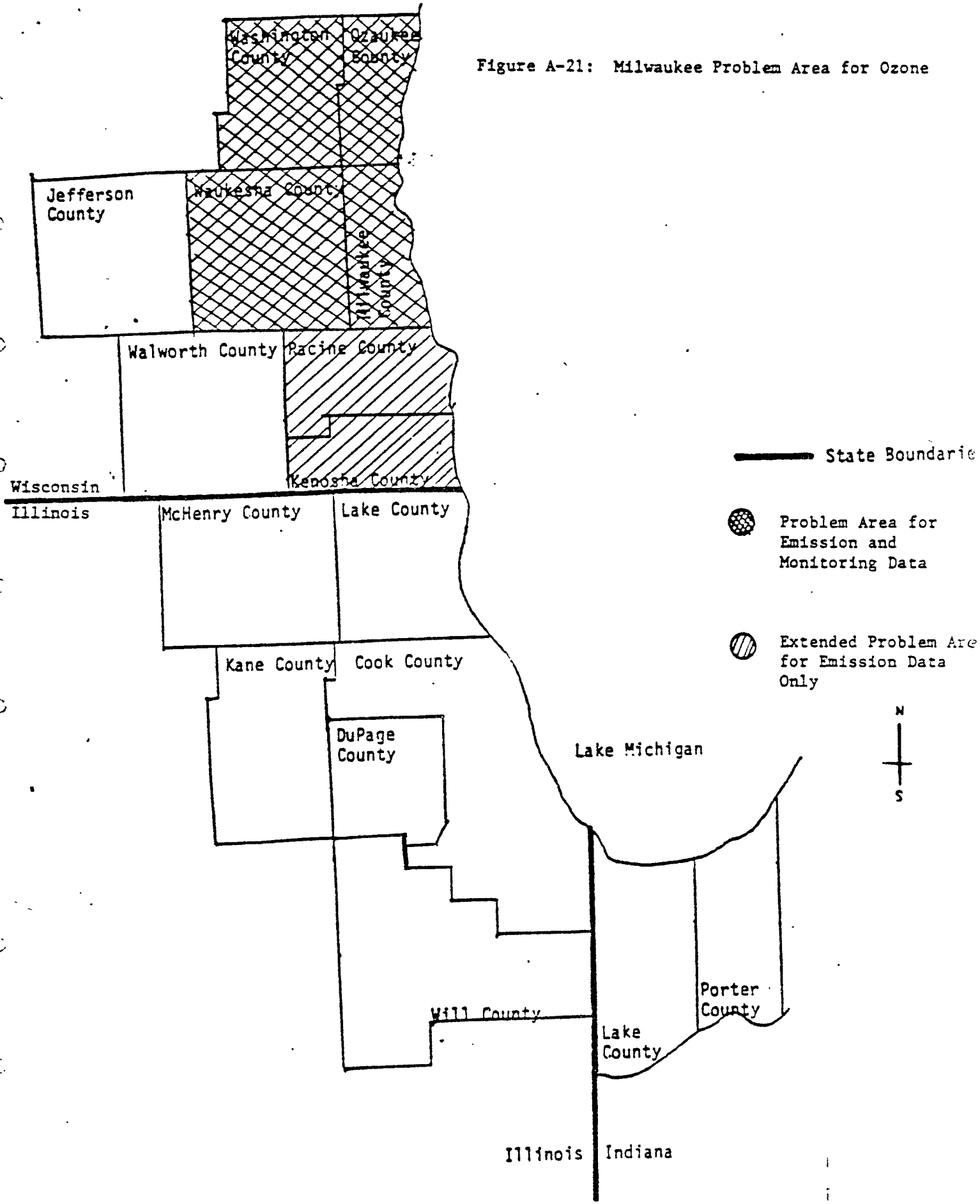


Figure A-21: Milwaukee Problem Area for Ozone

Figure A-22. Milwaukee Area Major Hydrocarbon Sources

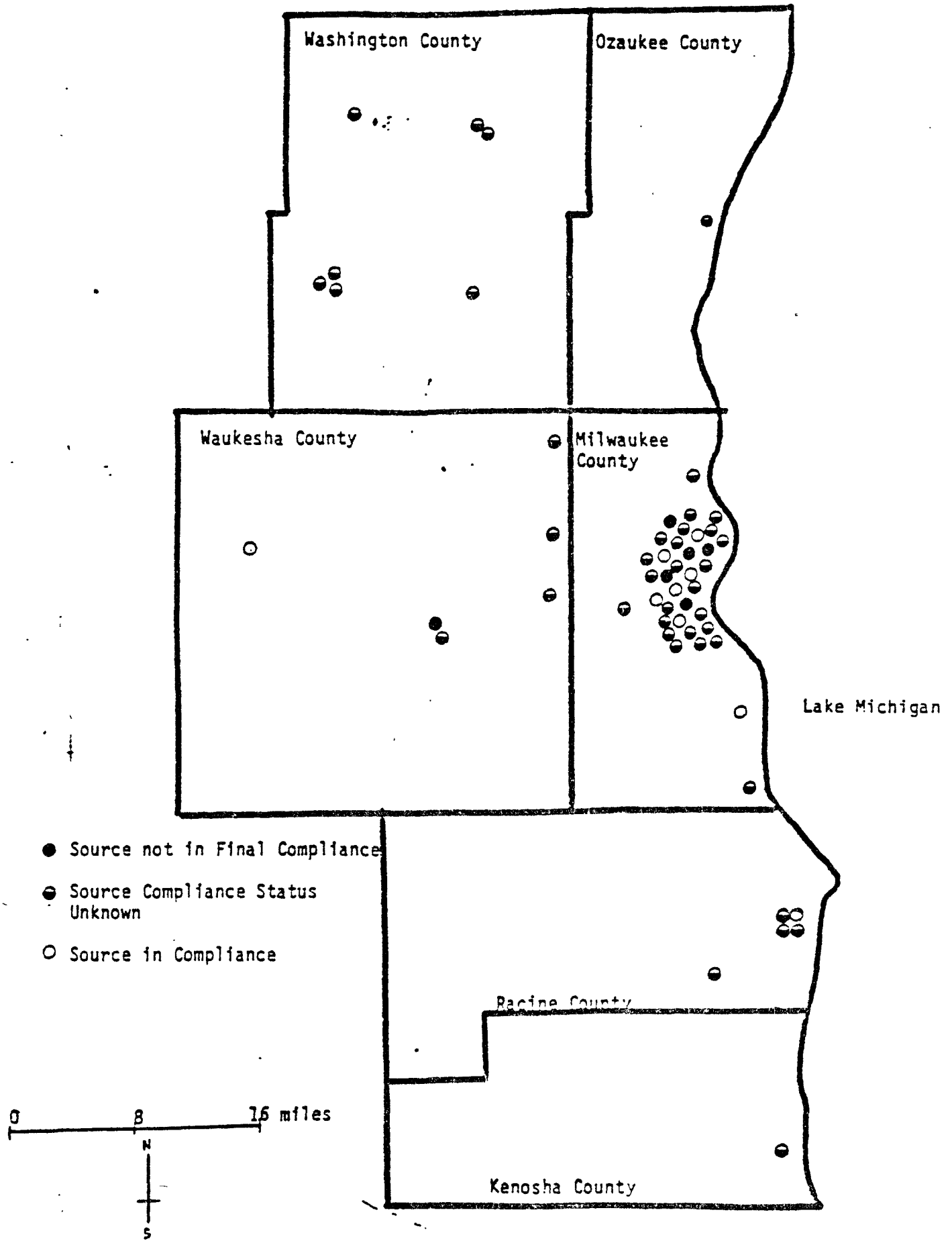


Figure A-23: 1981 Excursion Days for Milwaukee Ozone

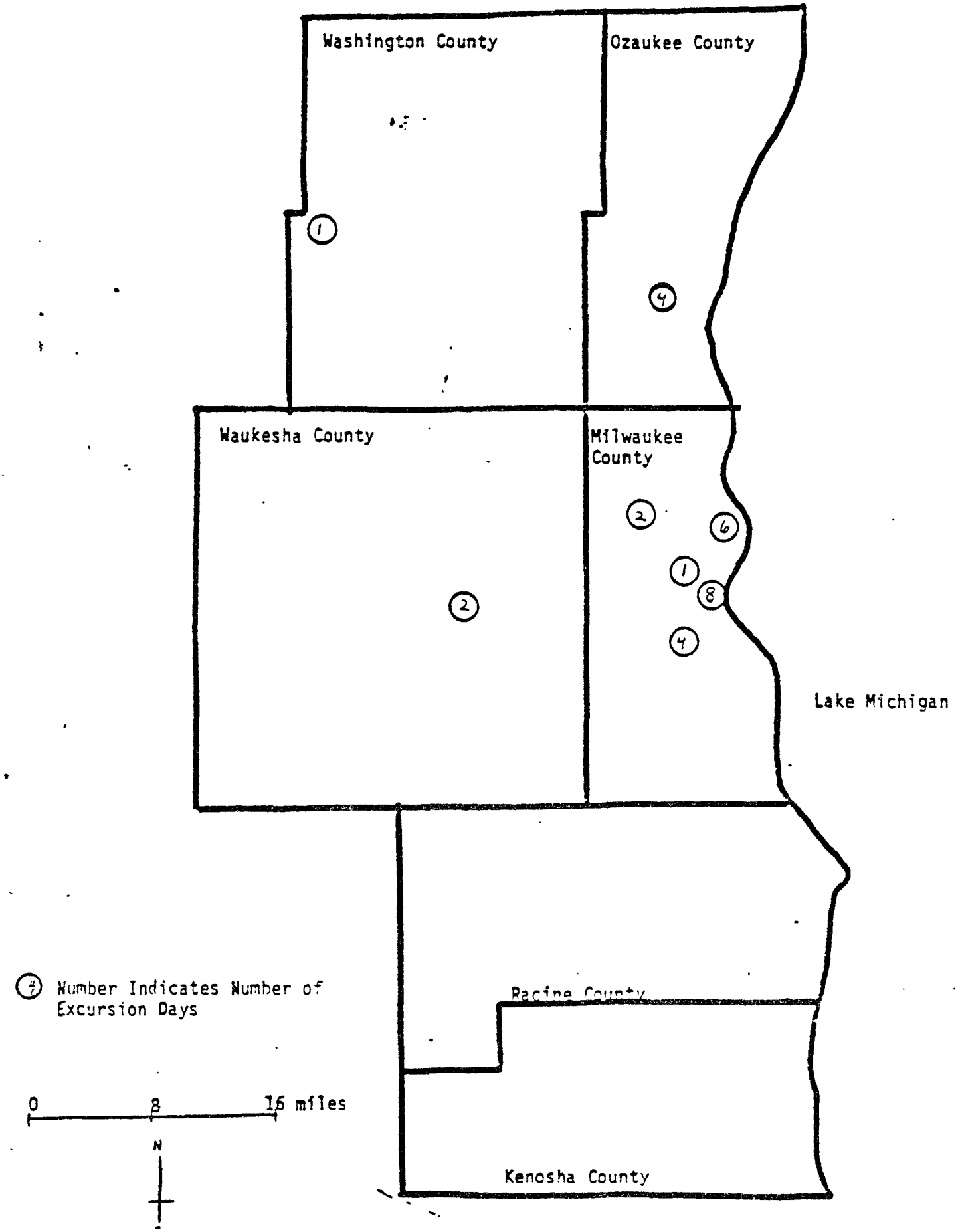


FIGURE A-24:
OZONE TREND FOR MILWAUKEE
(Worst Case for Second High Values)

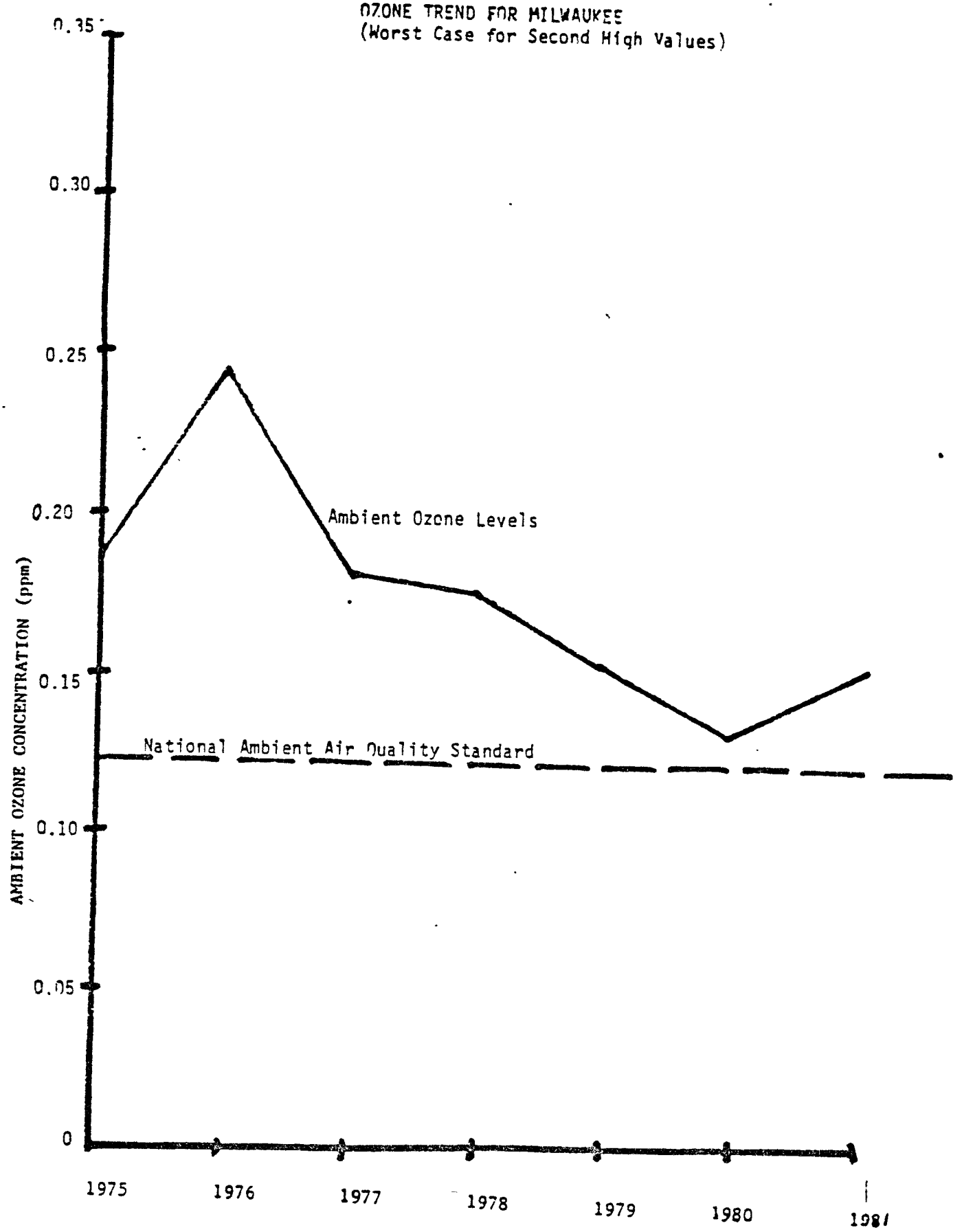
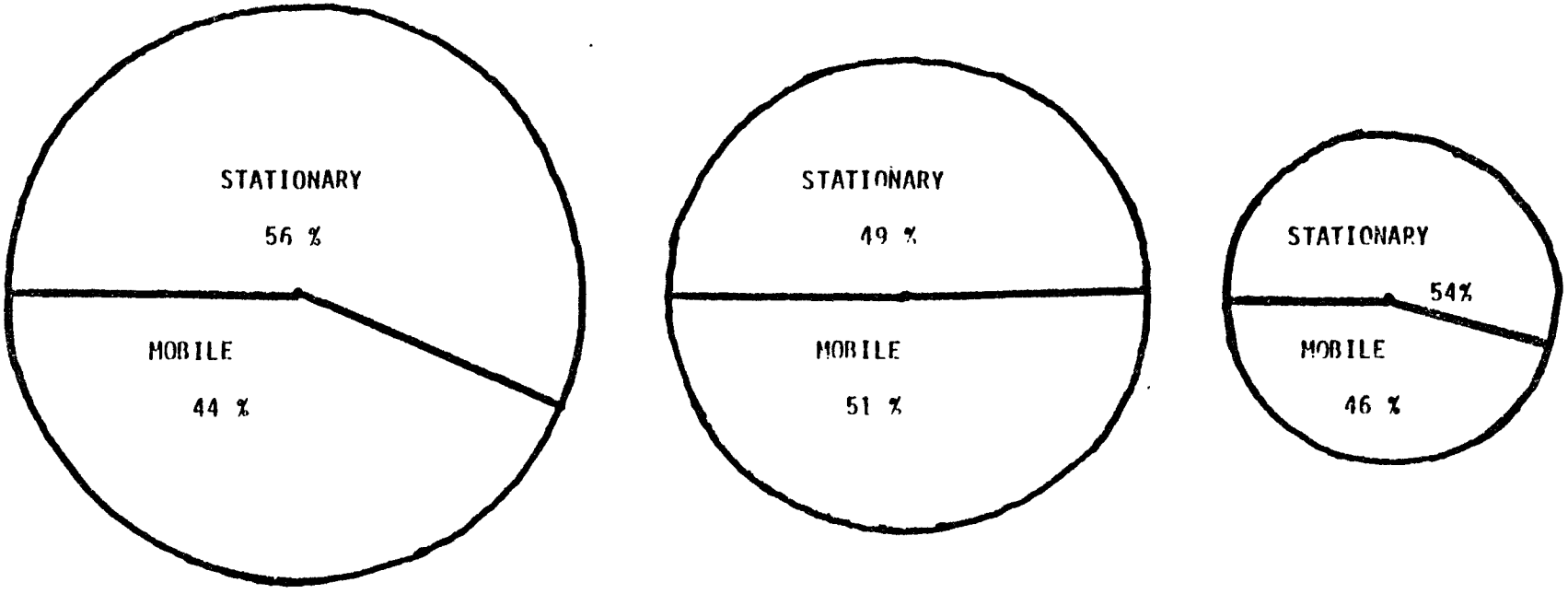


Figure A-25. VOC Source Distribution for Milwaukee, Wisconsin



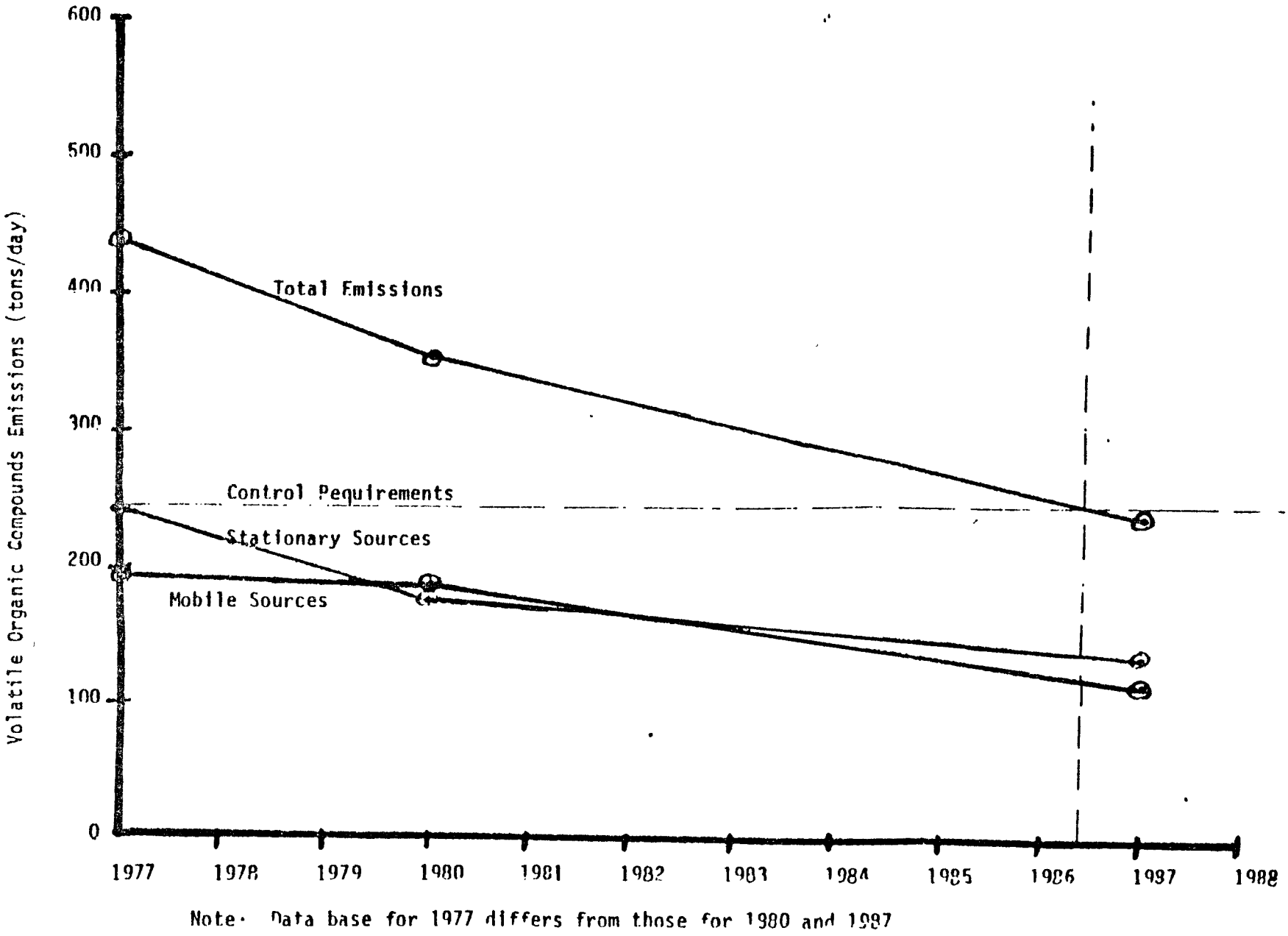
435 tons/day
1977

353 tons/day
1980

240 tons/day
1987 (Projected)

Note: data base for 1977 differs from those for 1980 and 1987

FIGURE A-26· REASONABLE FURTHER PROGRESS-MILWAUKEE



Note· Data base for 1977 differs from those for 1980 and 1987

Analysis 4: Chicago Region TSP (NE Illinois and NW Indiana)

The Chicago particulate problem area is sectioned into two parts, as is shown in Figure A-27: one section includes the steel area around Southern Cook County, Illinois and Northwest Lake County, Indiana and the other section includes Burns Harbor in Porter County, Indiana. The Burns Harbor section has only recently been designated as a primary nonattainment area. Figure A-28 shows that the population exposed has decreased in the Illinois portion of the problem areas but has stayed relatively constant in Lake County, Indiana. The major sources and the compliance status of these sources are shown in Figure A-29. Though the Illinois portion has a higher percentage of sources not in final compliance (73%) than Indiana (41%), Indiana has the two largest sources of the area: U.S. Steel and Inland Steel. Figure A-30 indicates the monitor location and the violation status of each monitor. The heaviest concentration of violating monitors occur in the East Chicago and Gary area of the problem area, near the large steel facilities in the Chicago area. The violating monitors in Burns Harbor are all on site at the Bethlehem Steel facility. As is shown in Figure A-31, the average geometric mean of particulates in the problem areas has stayed relatively constant and above the primary annual standard. Also, note that while the maximum geometric mean is decreasing the minimum mean is rising, suggesting that air quality may be deteriorating in the cleaner areas. The isopleths displayed in Figure A-32 and A-33 show that the area exceeding the primary standards has decreased primarily in the northwestern portion of the problem area. However, there has been little decrease in the overall extent of the area exceeding the primary standard. In fact, there still remain four areas of particulate levels over 100 ug/m^3. These areas are located around steel and agricultural centers. Figure A-34 shows that area sources account for about 69% of the particulate emissions, mainly through reentrainment of dust from transportation sources. However, over 75% of the point source emissions are attributable to industrial processes which generally contain the very fine inhalable particles that can enter the lungs and cause respiratory problems.

The only solid evidence showing an improvement in the Chicago area particulate problem is the decrease in the number of people exposed. Other evidence which also demonstrates improvement include the decrease in the size of the area exceeding 100 ug/m^3. However, there remain several areas with harmfully high ambient levels. These areas seem to be associated with the steel industrial areas, a significant source of unhealthy inhalable particulates.

FIGURE A-27. CHICAGO/NW INDIANA TOTAL SUSPENDED PARTICULATE PROBLEM AREAS

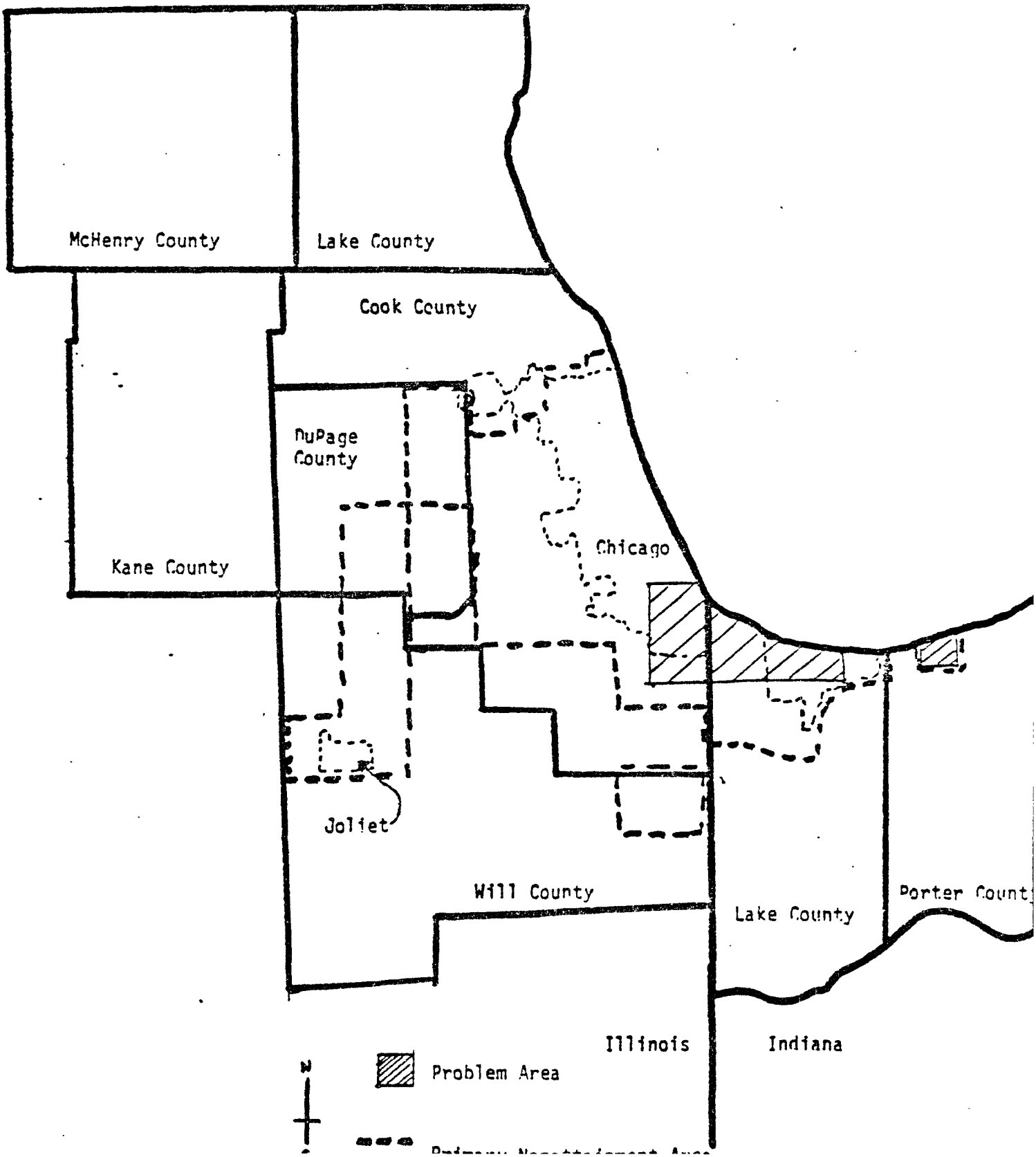


Figure A-28: Population Exposed to TSP Levels Exceeding Annual Standard in the Problem Area

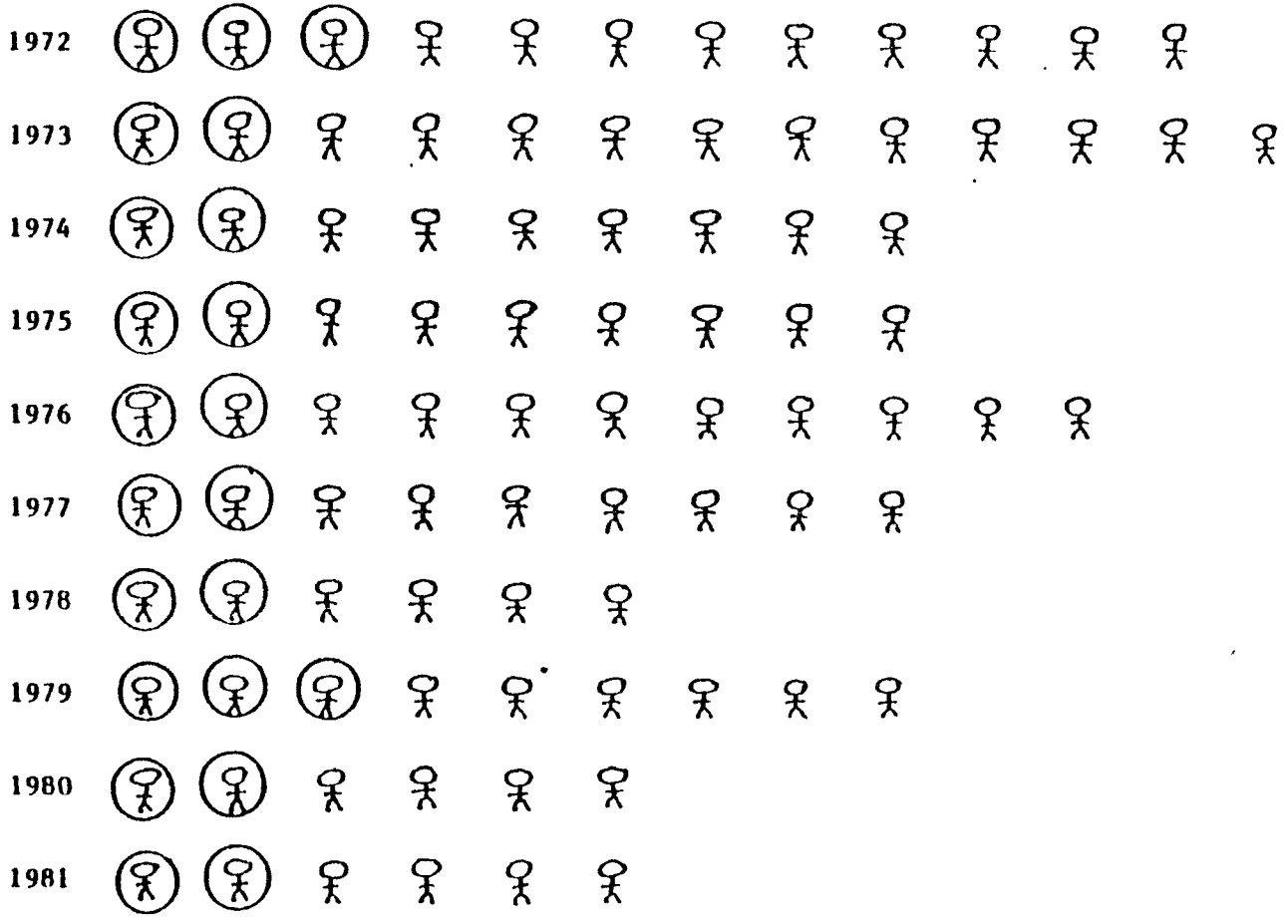
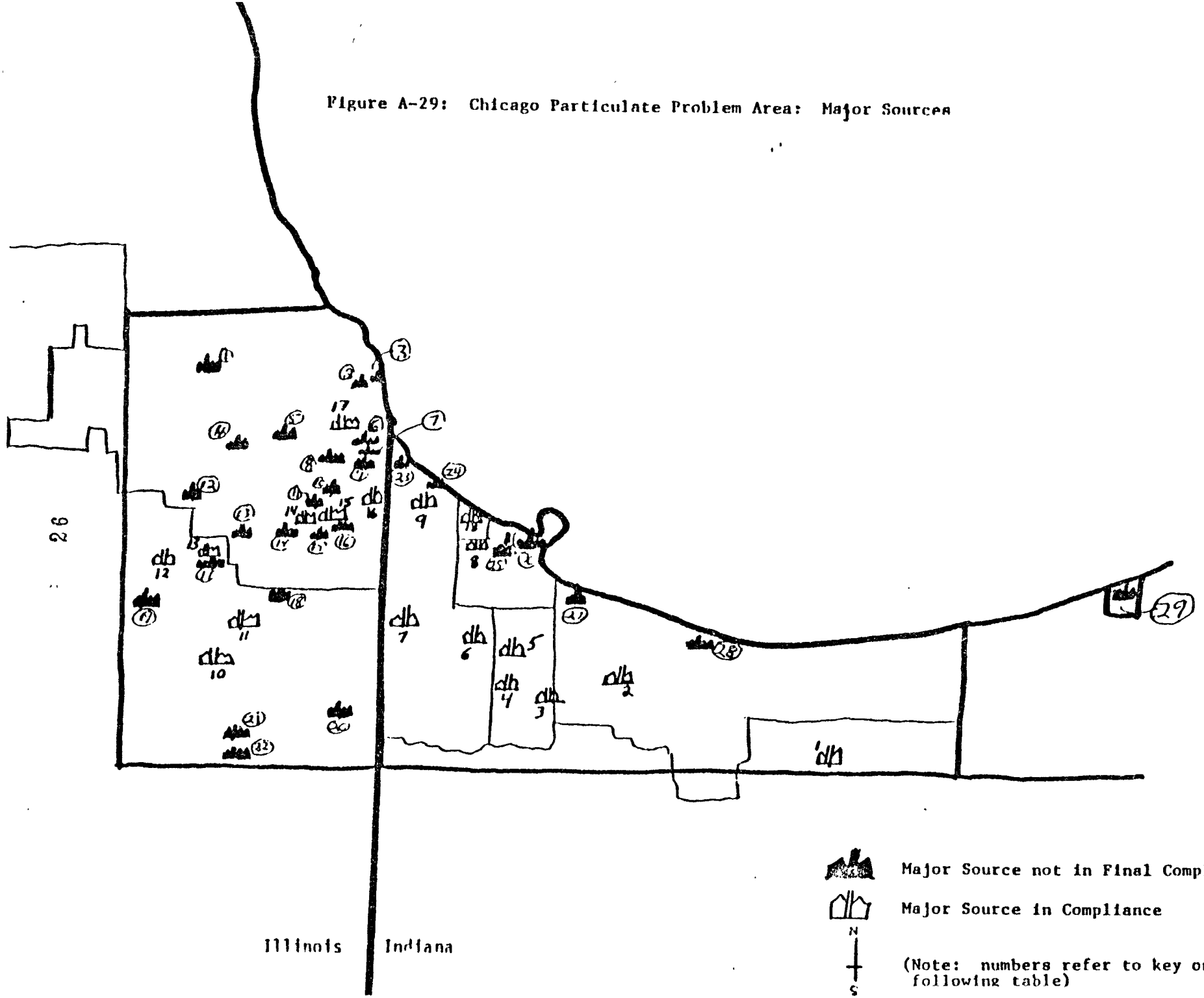


Figure A-29: Chicago Particulate Problem Area: Major Sources



Chicago Problem Area-Major Sources

Sources not in Final Compliance

1. Carey Grain
2. U.S. Steel-South Works
3. Lakeside Slag
4. Valley Mold and Iron
5. Calumet Incinerator
6. Marblehead Lime
7. Republic Steel
8. Interlake Coke Plant
9. Interlake
10. Continental Grain-Elevator B
11. Alburn-Earth II
12. Ingersoll Products
13. Continental Grain-Elevator C
14. Indiana Grain Coop
15. Ford Motor
16. Bird and Son
17. Interlake
18. American Brick
19. Wyman-Gordon
20. Vulcan Mold and Iron
21. Material Service Corp.
22. Marblehead Lime
23. Com. Ed.-Stateline
24. NIPSCO-Mitchell
25. Jones and Laughlin
26. Inland Steel
27. Lehigh Portland
28. U.S. Steel
29. Bethlehem Steel

Sources in Compliance

1. Kirk Asphalt Corp
2. General Refractory
3. H B Reed
4. Harbison Walker Ref.
5. U.S. Reduction
6. Blaw-Knox Foundry
7. Hammond Lead
8. Amoco Refinery
9. Lever Brothers
10. Bliss and Laughlin
11. Atlantic Richfield
12. Louisville Cement
13. Heckett Engineering
14. Mississippi Lime
15. Cargill, Inc.
16. Cinders, Inc.
17. Illinois Slag and Ballast
18. Boise Cascade

Figure A-30: Status of TSP Monitors in the Problem Area
(Annual Geometric Mean 1981)

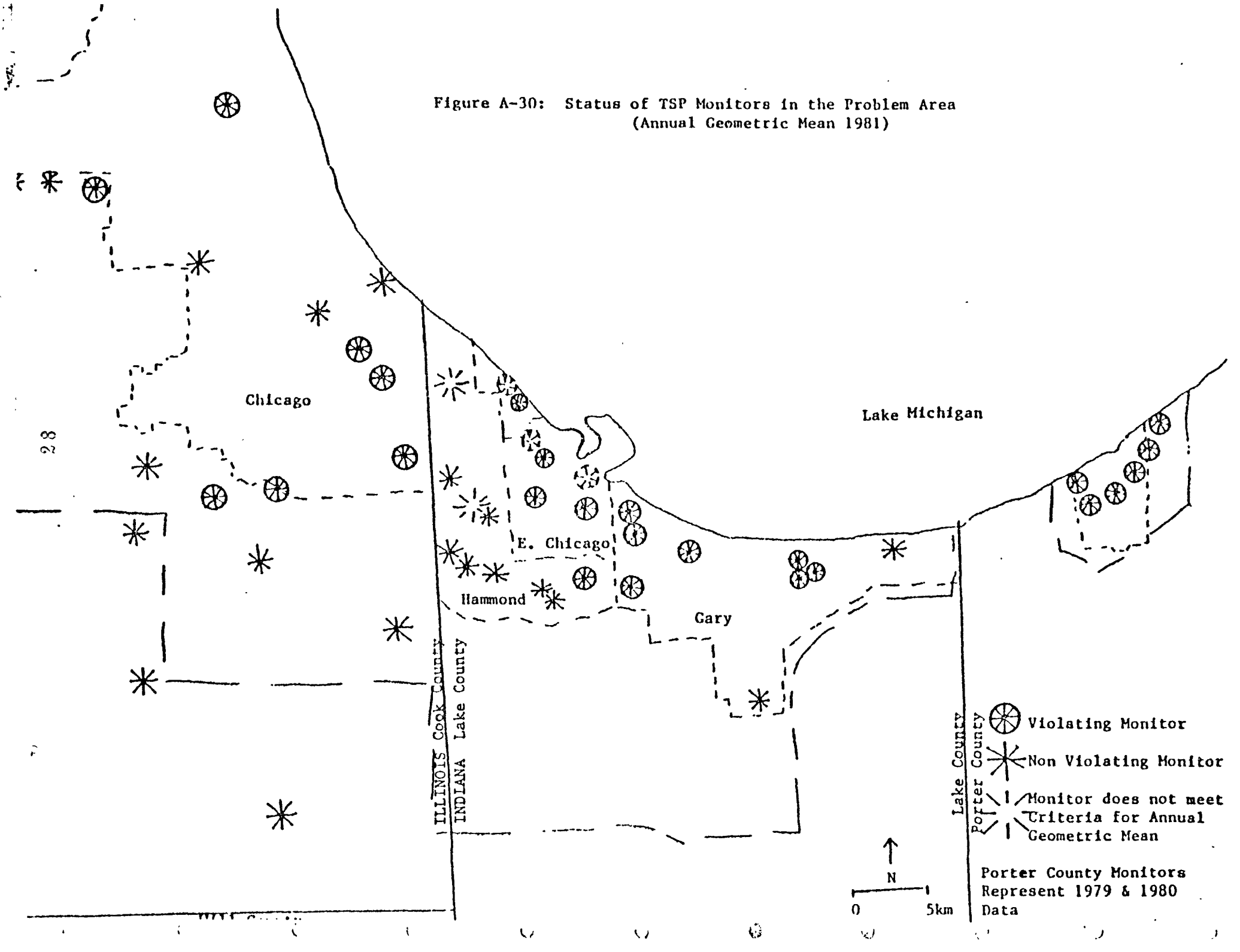


Figure A-31: Chicago Problem Area TSP Annual Geometric Means

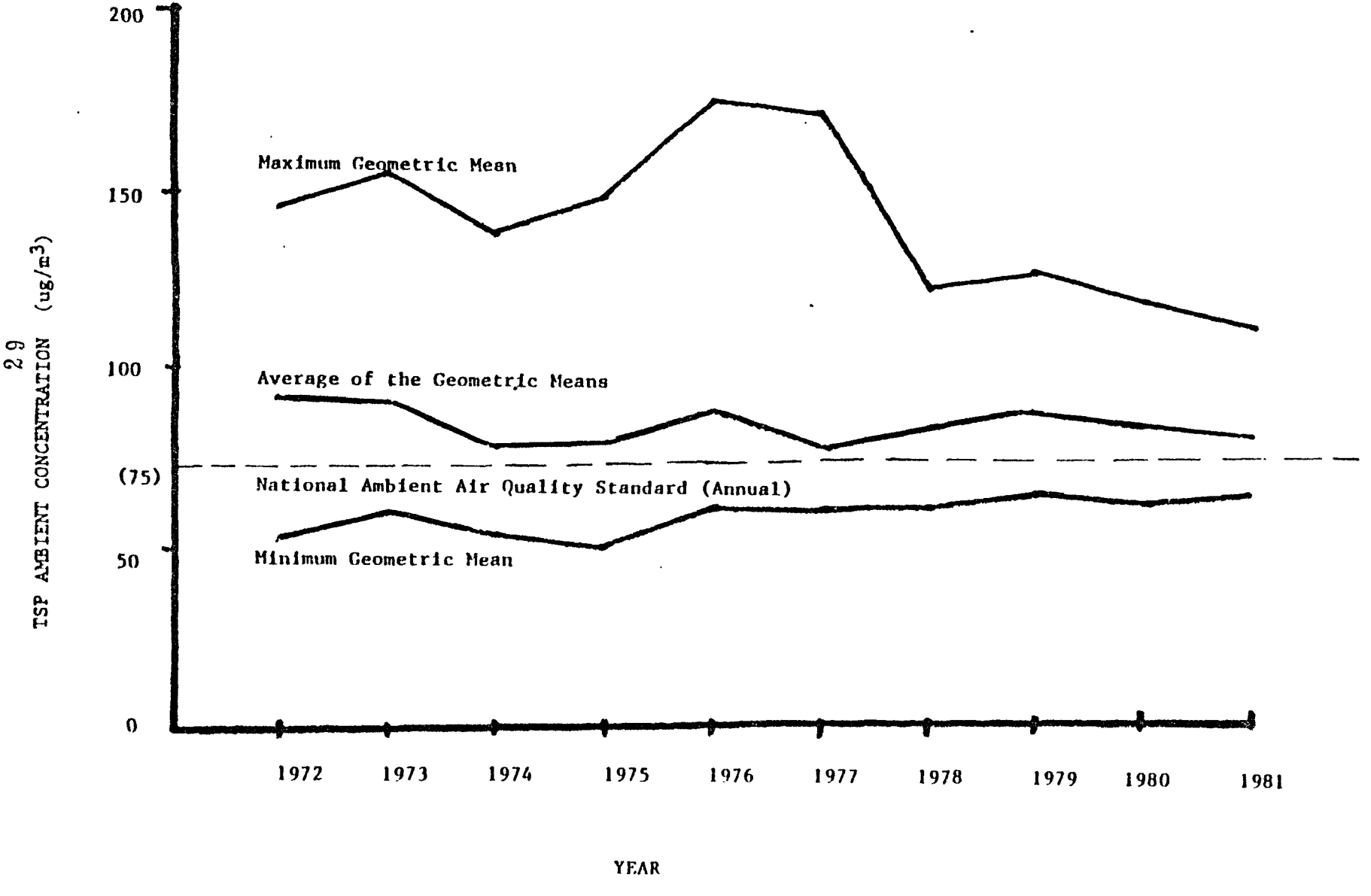


Figure A-32: Chicago Area Isopleths for TSP (Annual Geometric Mean)-1972

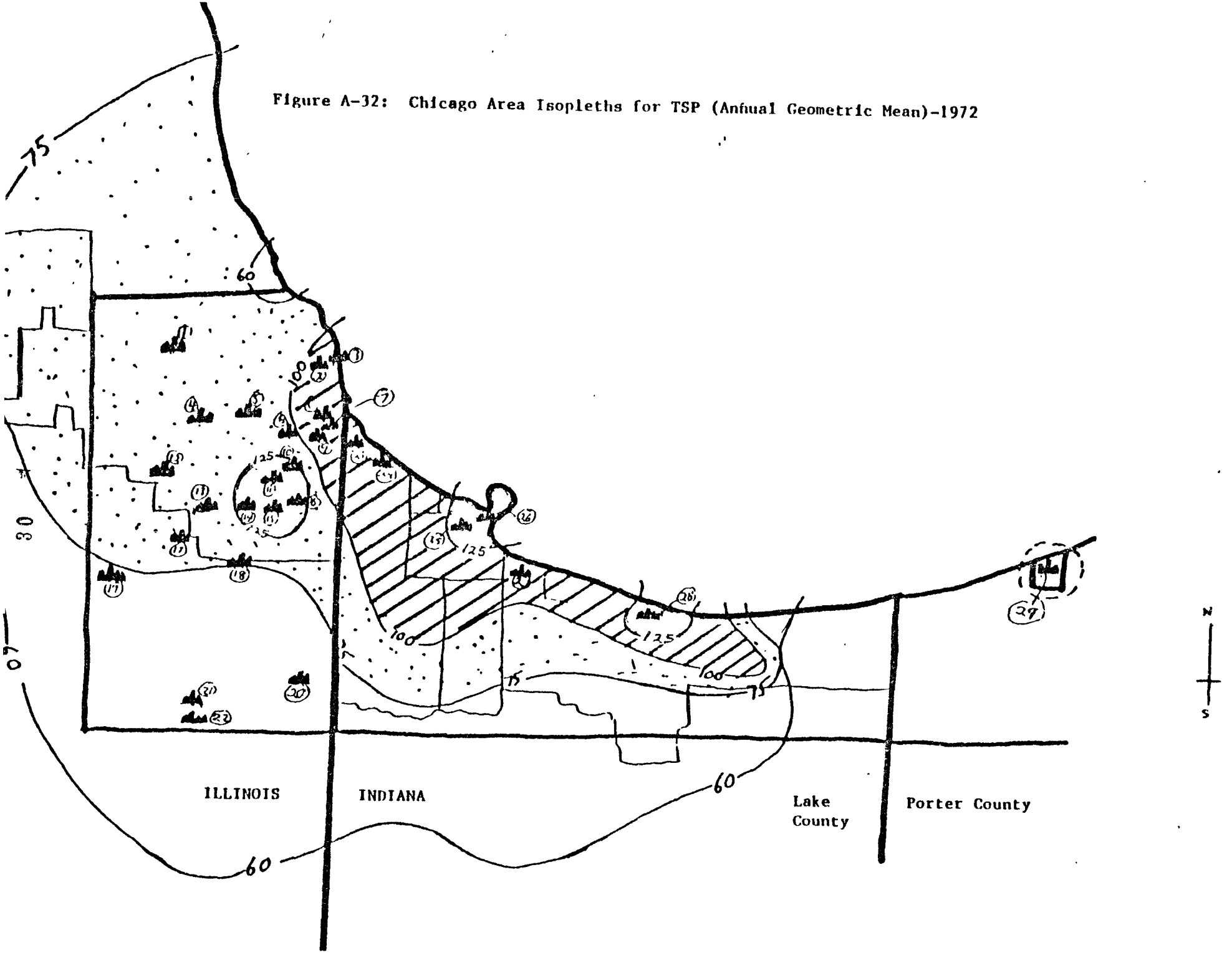


Figure A-33: Chicago Area Isopleths for TSP (Annual Geometric Mean)-1981

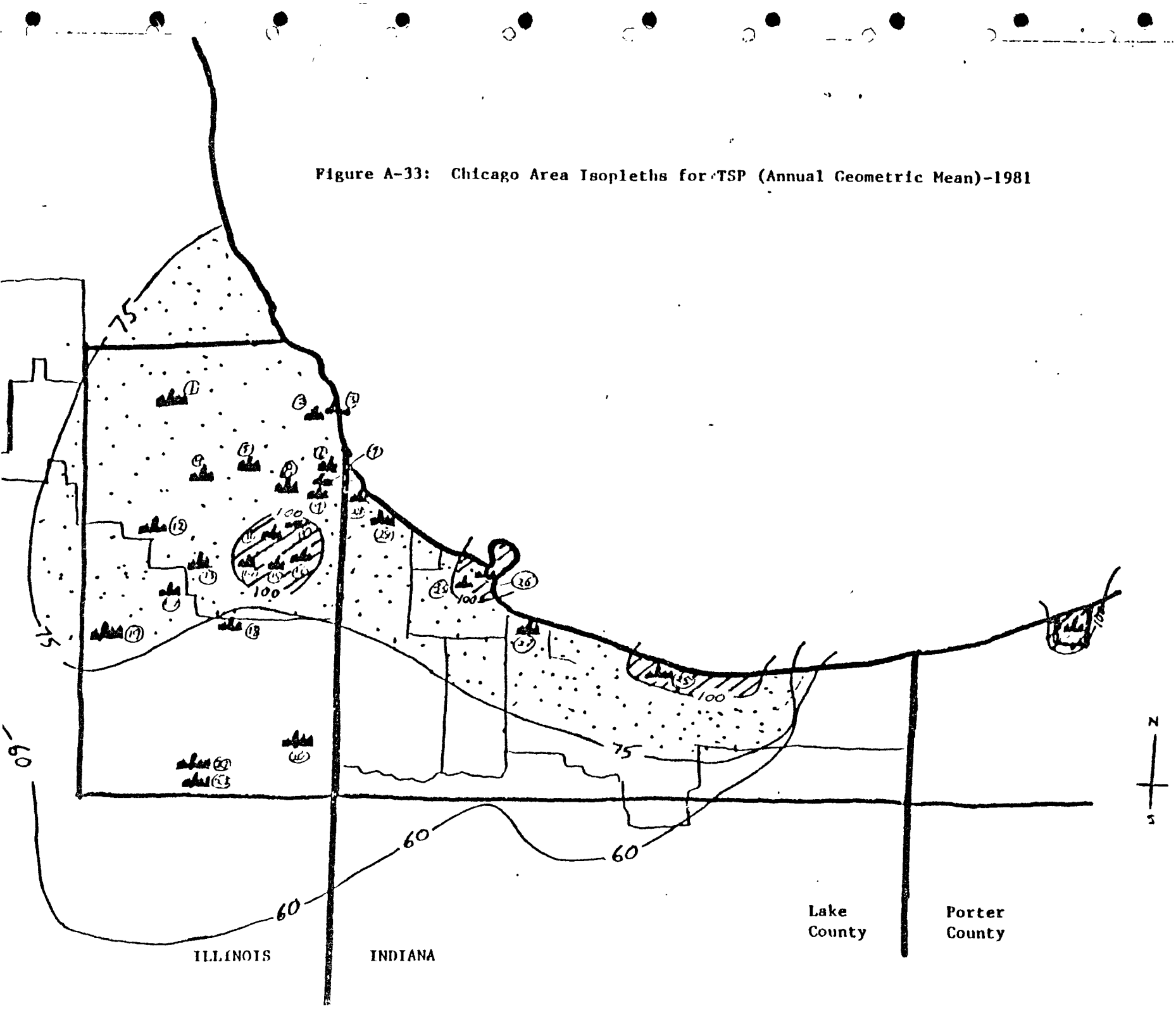
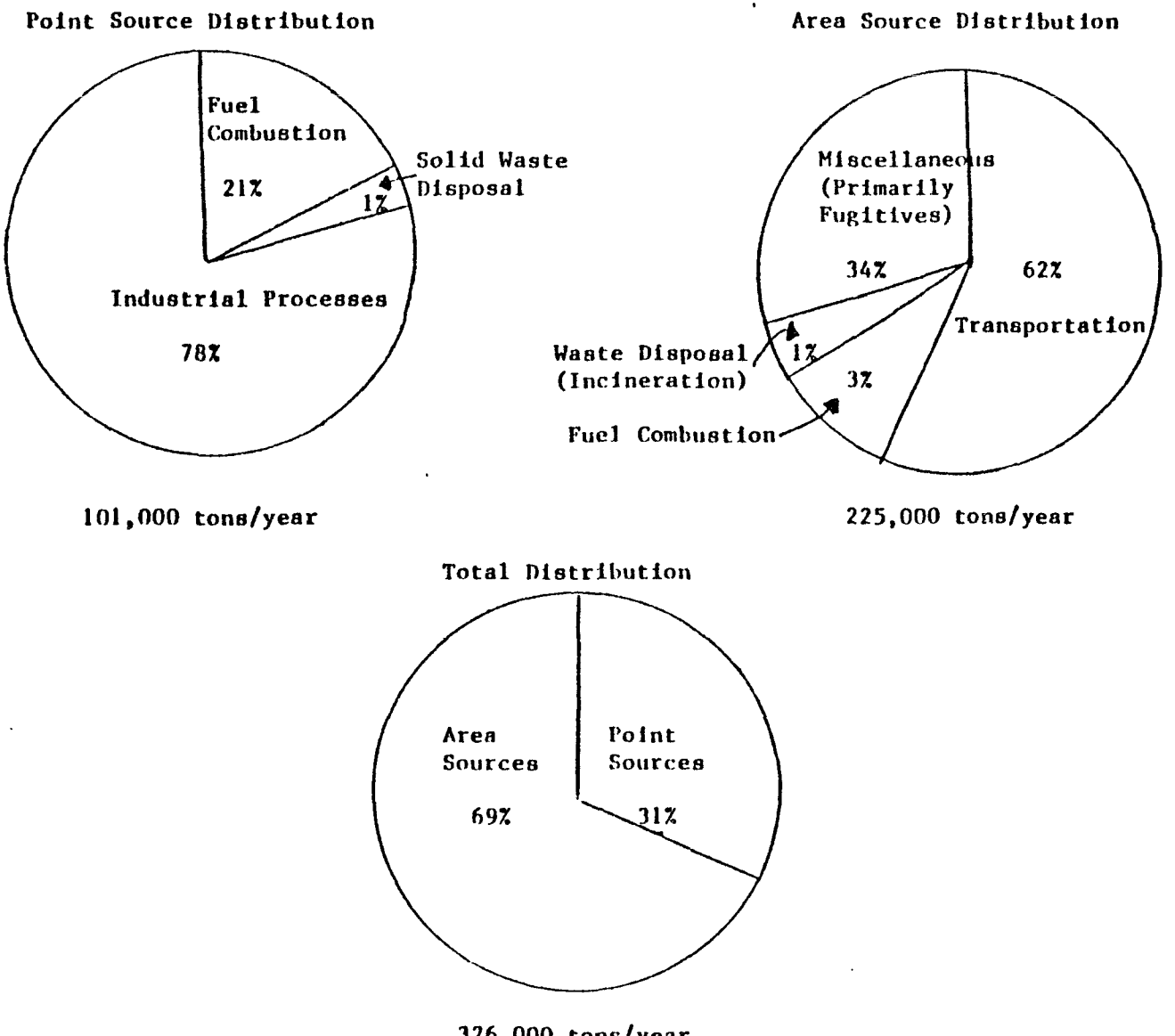


Figure A-34: TSP Emissions Source Distribution
(Cook County, Illinois and Lake and Porter Counties, Indiana)



Analysis 5: Detroit TSP

Figure A-35 delineates the TSP nonattainment area in the Detroit industrial area. Figure A-36 demonstrates that the total number of persons exposed to TSP levels exceeding the annual U.S. primary standard sharply decreased in the early 1970's, and more slowly in the latter years. The adjacent Canadian population is also experiencing less exposure. Figure A-37 depicts the major complying and noncomplying sources that are located in the areas where the remaining violating monitors are sited. As is shown by Figure A-38, the monitors that register violations of the annual primary standard are located in an 18 square-mile area extending from Dearborn to the Detroit River at River Rouge and from River Rouge to southern Detroit. No monitors in the area exceeded the alert level. Two monitors in the City of Windsor, Ontario also showed violations of the U.S. standard. Figure A-39 (which reflects all monitors operating in the target area in any given year) shows that the annual geometric means have shown a general decrease in value. However, the annual mean dropped below the primary standard only in 1980 and 1981 when economic decline has caused reduced industrial activity. But, the magnitude of the impact of reduced industrial activity on air quality has not been quantified. Isopleths of TSP concentrations in Figure A-40 show that the eastern three-quarters of the primary nonattainment area as well as Southern Macomb County were above the primary standards in 1972. In the River Rouge-Southern Detroit area, TSP levels reached concentrations above 150 ug/m^3. Isopleths in Figure A-41 show a sharp improvement in the air quality in 1981 with a third of the primary non-attainment area below the secondary standard and only a small portion of the area above the primary standard. Yet, the TSP levels in the River Rouge-Southern Detroit area are still at 100 ug/m^3 and above. Figure A-42 identifies major categories contributing to the TSP problem. It is important to note that while industrial point sources contribute only 24 percent of the total TSP, they are most dangerous to health because industrial sources contain most of the very fine inhalable particles. Figure A-43 demonstrates TSP loadings for various wind directions at the 1981 violating monitoring sites (U.S. side only). Notice that at each site the heaviest loadings occur in the directions of major noncomplying sources.

In summary, a large improvement in TSP air quality has been made in the Detroit nonattainment area; however, there remains a persistent pocket of high-level TSP in the Southern Detroit metropolitan area where 400,000 Americans and Canadians are exposed to unhealthful levels of TSP.

Figure A-35:

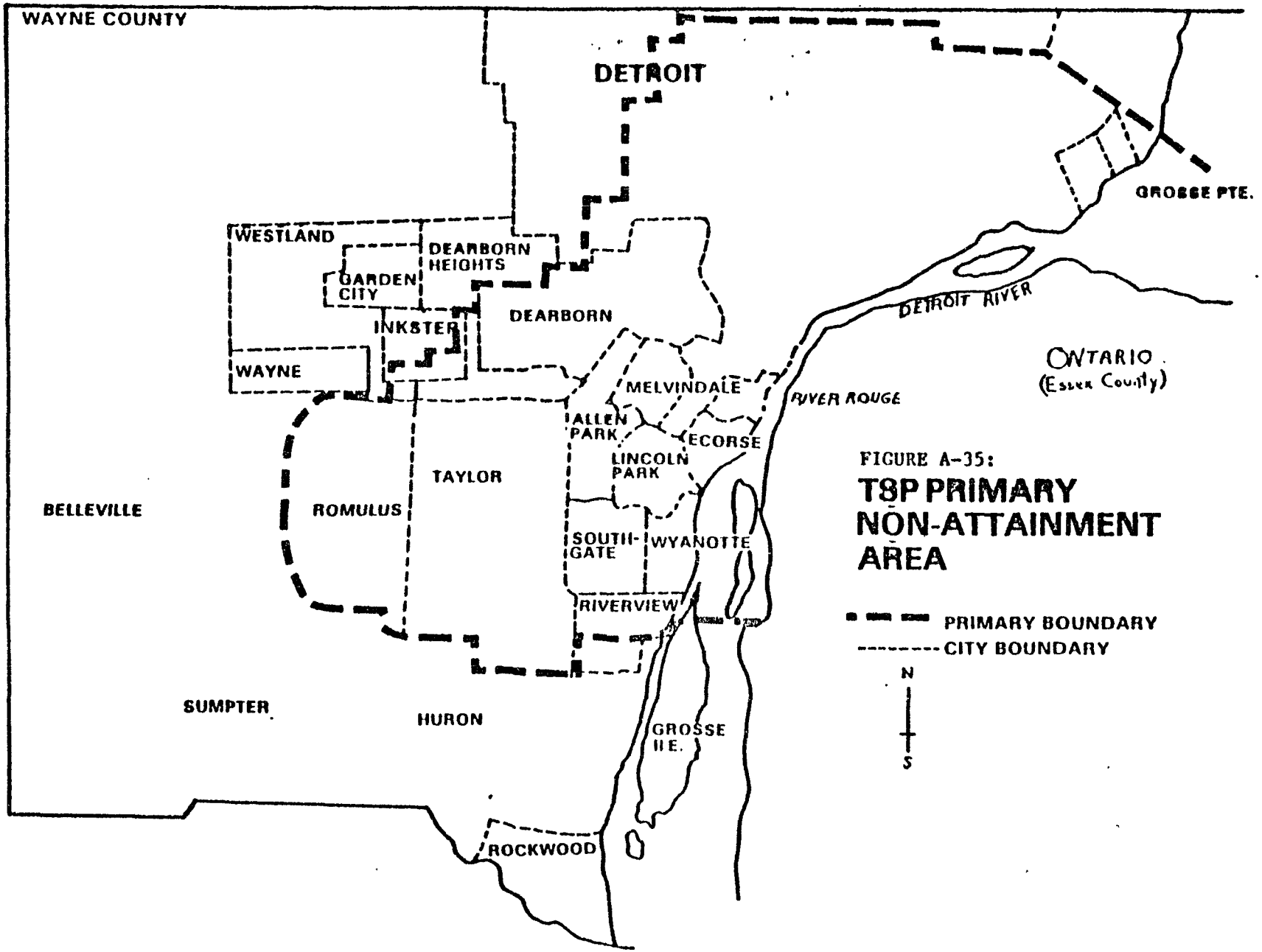
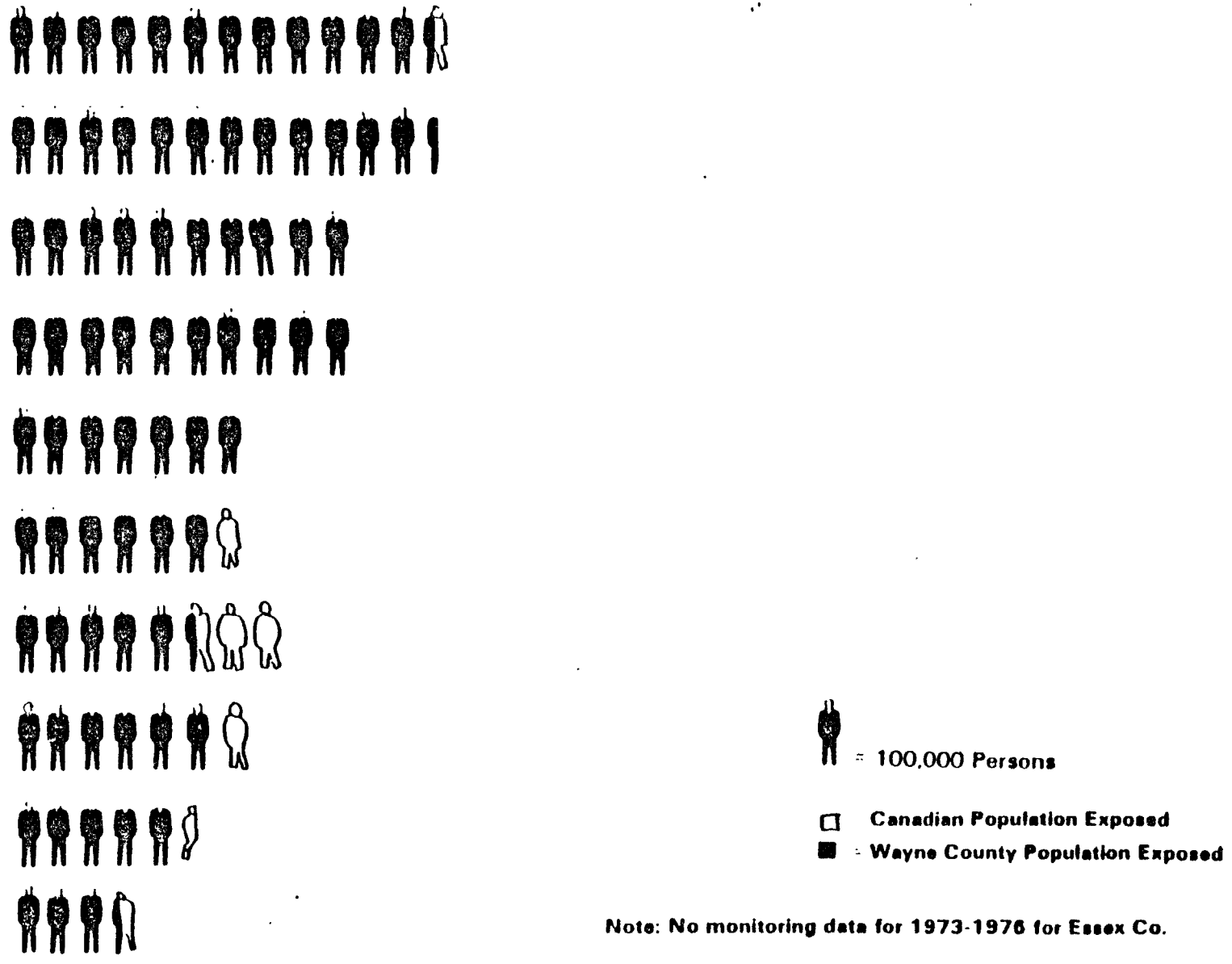

WAYNE COUNTY
DETROIT
GROSSE PTE.
WESTLAND
DEARBORN HEIGHTS
GARDEN CITY
INKSTER
DEARBORN
DETROIT RIVER
ONTARIO
(Essex County)
WAYNE
MELVINDALE
RIVER ROUGE
ALLEN PARK
ECORSE
LINCOLN PARK
TAYLOR
BELLEVILLE
ROMULUS
SOUTH-GATE
WYANOTTE
RIVERVIEW
SUMPTER
HURON
GROSSE ILE
ROCKWOOD
FIGURE A-35:
T8P PRIMARY NON-ATTAINMENT AREA
PRIMARY BOUNDARY
CITY BOUNDARY
N
S

Figure A-36:

POPULATION EXPOSED TO TSP LEVELS EXCEEDING ANNUAL U.S. PRIMARY STANDARD IN WAYNE AND ESSEX COUNTIES



Note: No monitoring data for 1973-1976 for Essex Co.

FIGURE A-37:
DETROIT AREA-MAJOR PARTICULATE SOURCES

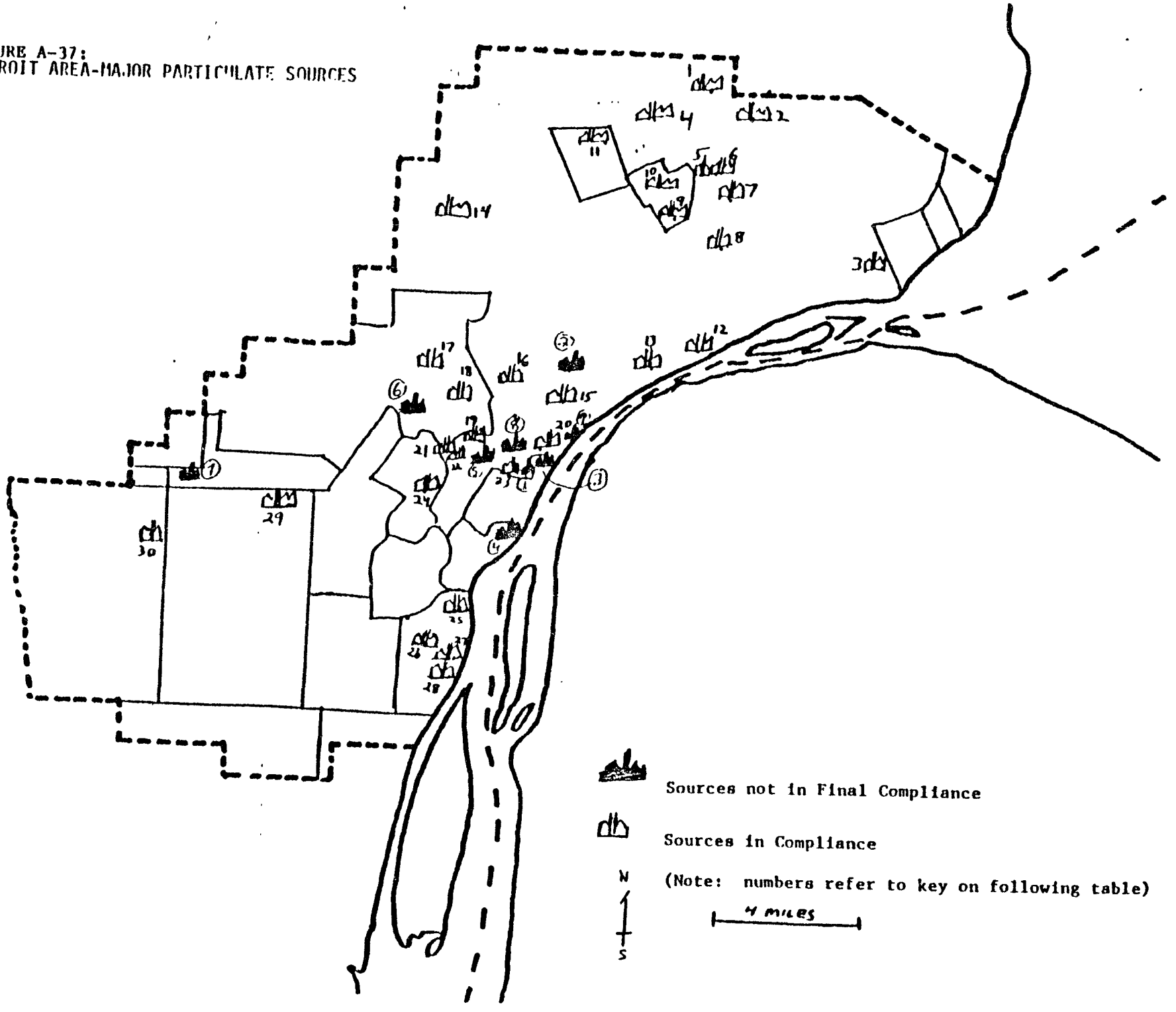


Figure A-38:

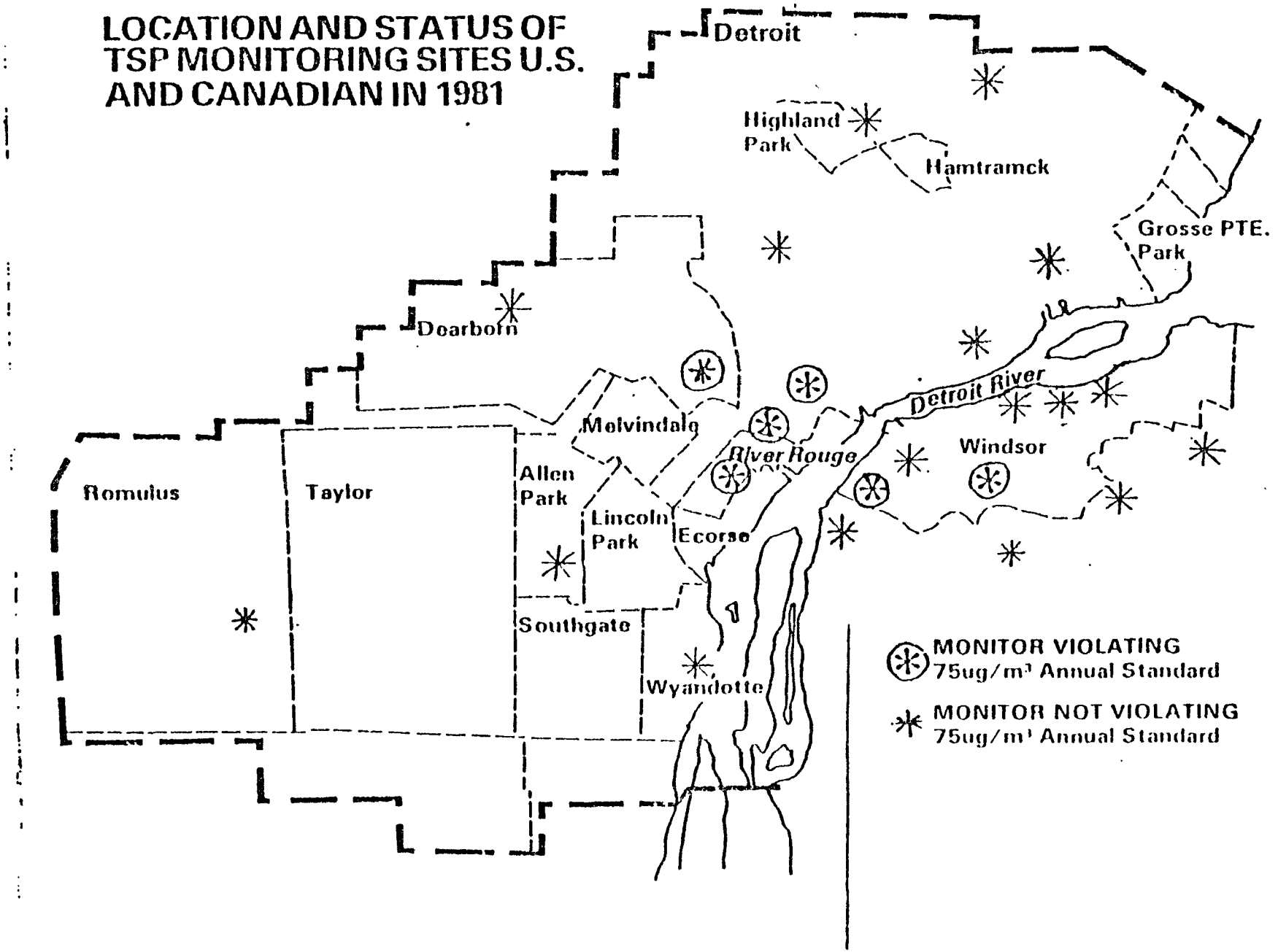
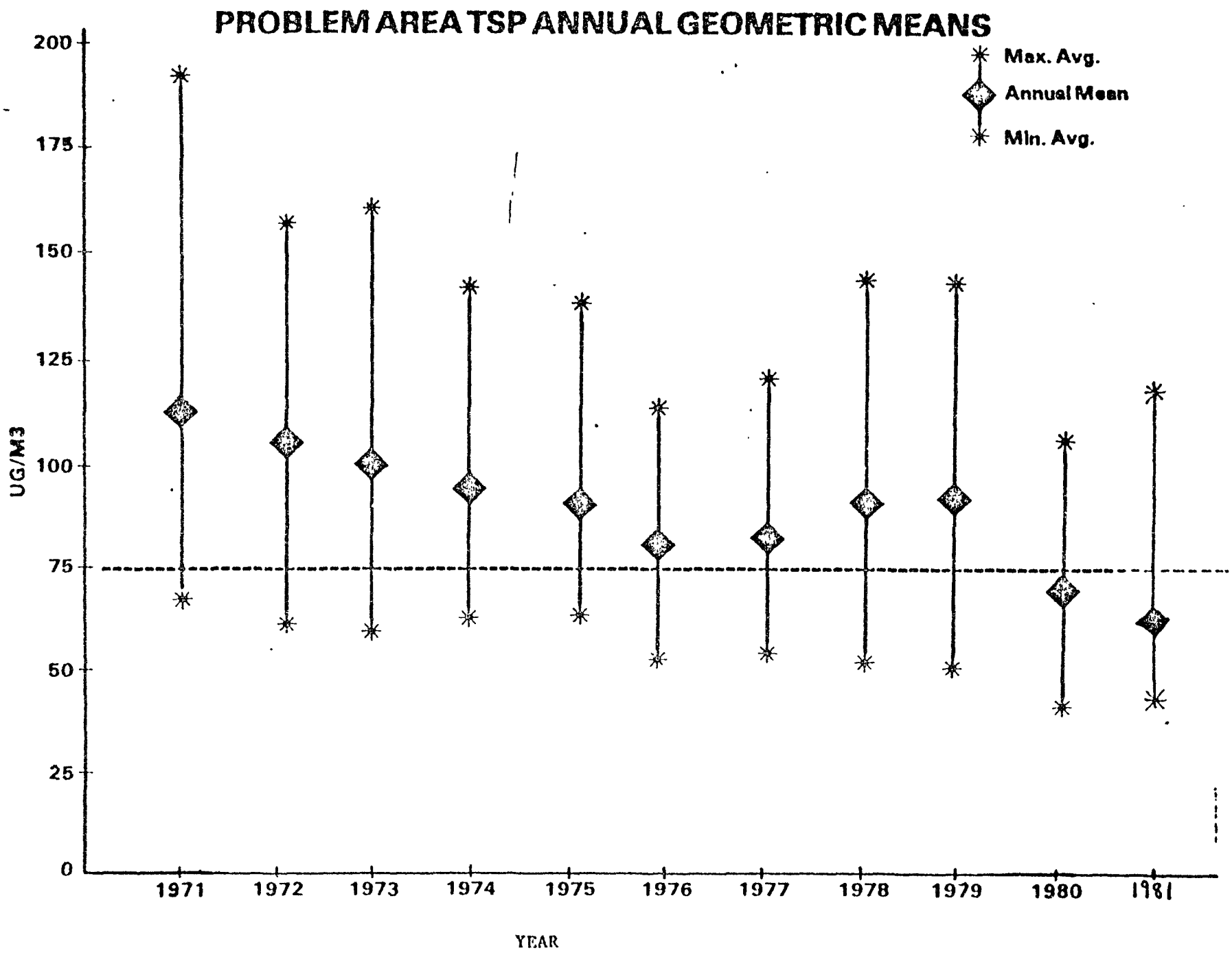

LOCATION AND STATUS OF TSP MONITORING SITES U.S. AND CANADIAN IN 1981
Detroit
Highland Park
Hamtramck
Grosse PTE. Park
Dearborn
Melvindale
River Rouge
Detroit River
Windsor
Romulus
Taylor
Allen Park
Lincoln Park
Ecorse
Southgate
Wyandotte
MONITOR VIOLATING 75ug/m³ Annual Standard
MONITOR NOT VIOLATING 75ug/m³ Annual Standard

Figure A-39:


PROBLEM AREA TSP ANNUAL GEOMETRIC MEANS
Max. Avg.
Annual Mean
Min. Avg.
UG/M3
200
175
150
125
100
75
50
25
0
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
YEAR

Detroit Problem Area-Major Sources

Sources not in Final Compliance

1. Detroit Sewage Treatment Plant
2. GMC Cadillac Motor Plant
3. Great Lakes Steel-Zug Island
4. Great Lakes Steel-Ecorse
5. International Salt
6. Rouge Steel
7. Central Wayne County Sanitary Authority
8. Ford Motor
9. Detroit Coke Co.

Sources in Compliance

1. Industrial Smelting
2. Champion Spark Co.
3. Chrysler-Jefferson Assembly
4. IMC Foundry
5. Chrysler Corp.-Eldon Axle Plant
6. Chrysler-Lynch Road
7. Chrysler-Winfield
8. Bellevue Process
9. Chrysler-Hamtramck Plant
10. Celeanese Coating
11. Ford Motor
12. Central Iron Foundry
13. National Gypsum
14. Metro Metal Process
15. Detroit Housing Community
16. Asphalt Products
17. Asphalt Products
18. Mercier Corp.
19. Asphalt Products
20. GMC-Fisher Body Plant
21. Asphalt Products
22. Ajax Materials
23. Marblehead Lime
24. Delray Steel Casting
25. BASF Wyandotte-North Works
26. Chem-Met Services
27. BASF Wyandotte
28. BASF Wyandotte-South Works
29. Consolidated Lumber
30. Ajax Material

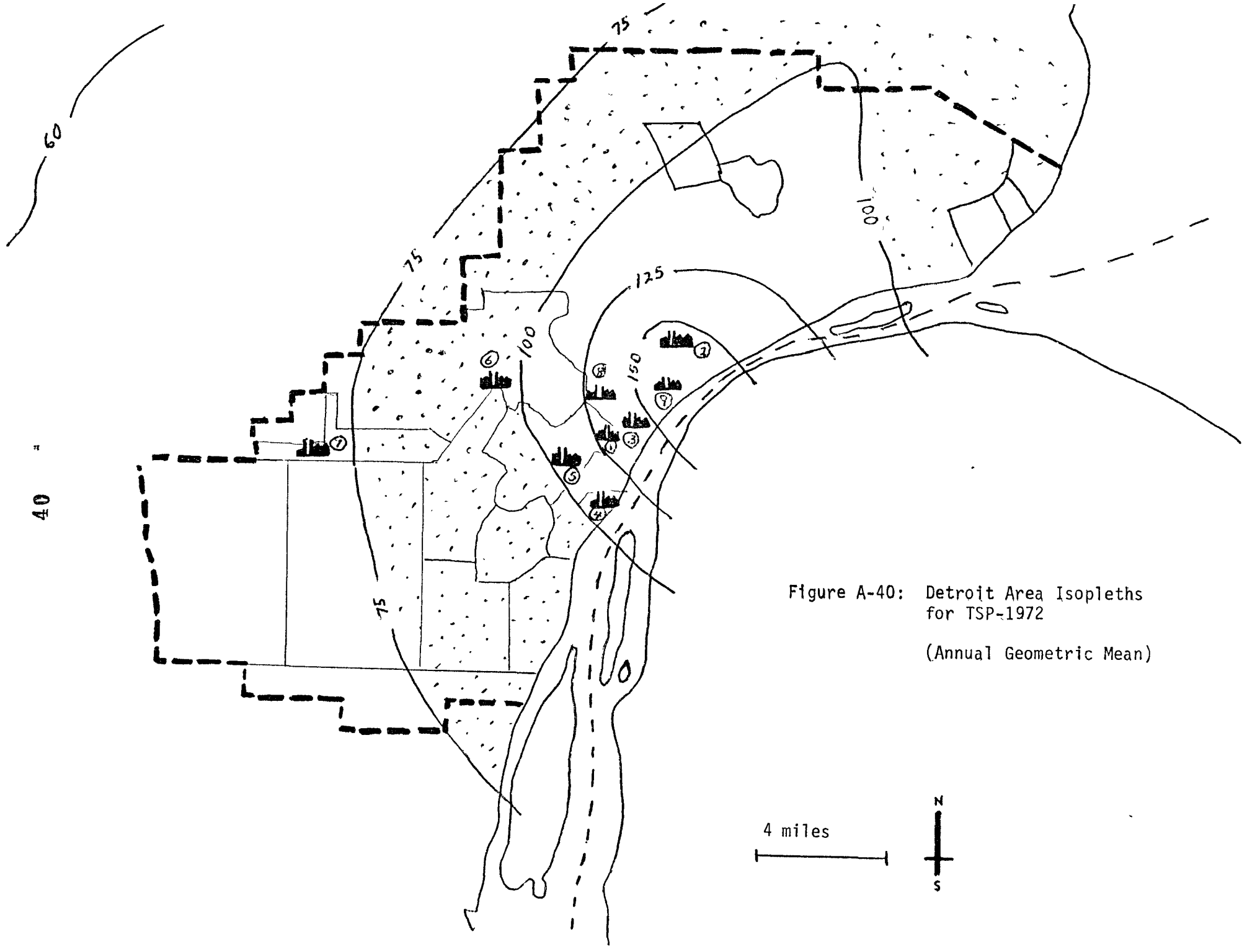


Figure A-40: Detroit Area Isopleths for TSP-1972

(Annual Geometric Mean)

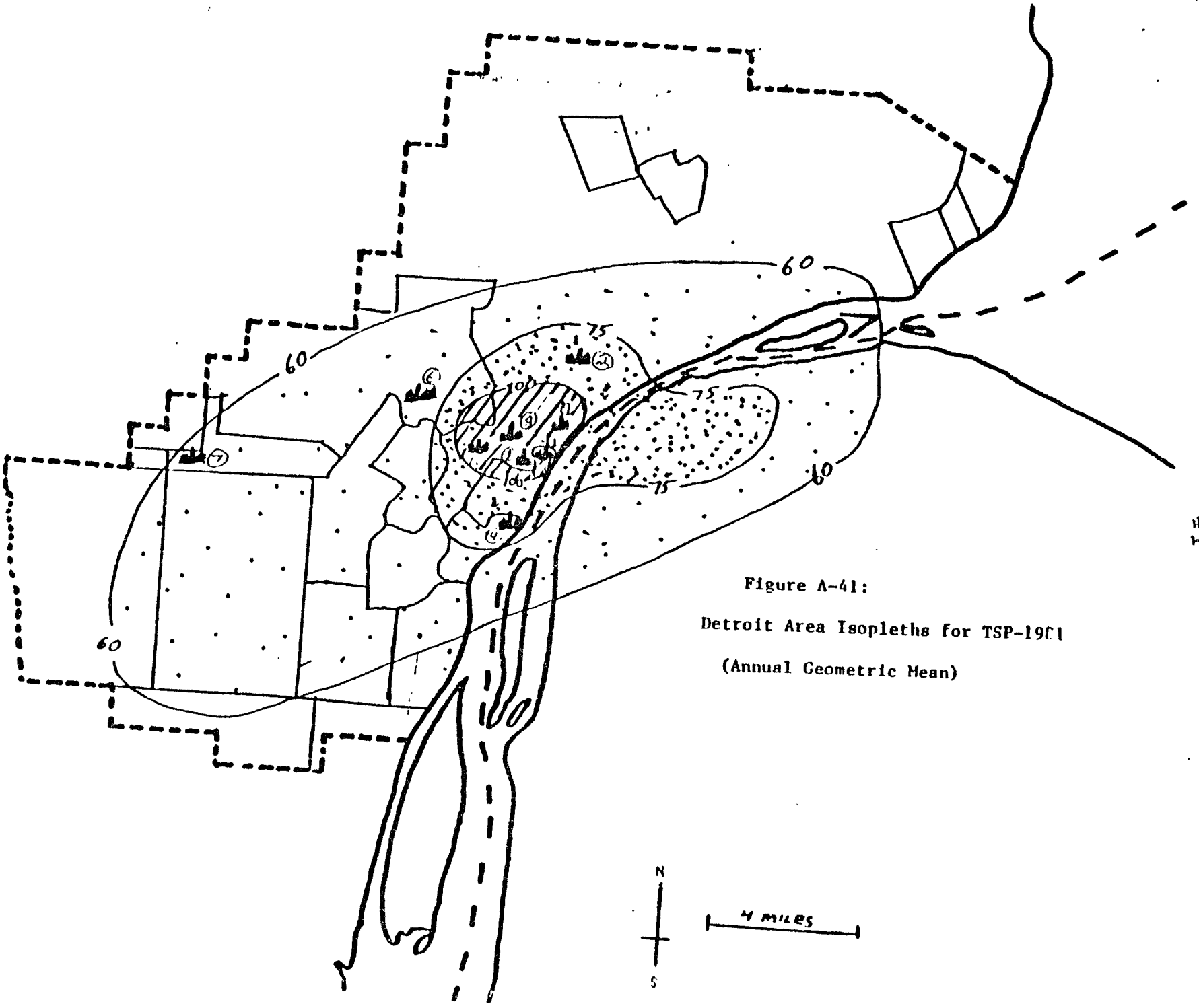


Figure A-41:

Detroit Area Isopleths for TSP-1971

(Annual Geometric Mean)

Figure A-42:

TSP EMISSION SOURCE DISTRIBUTION

Wayne County

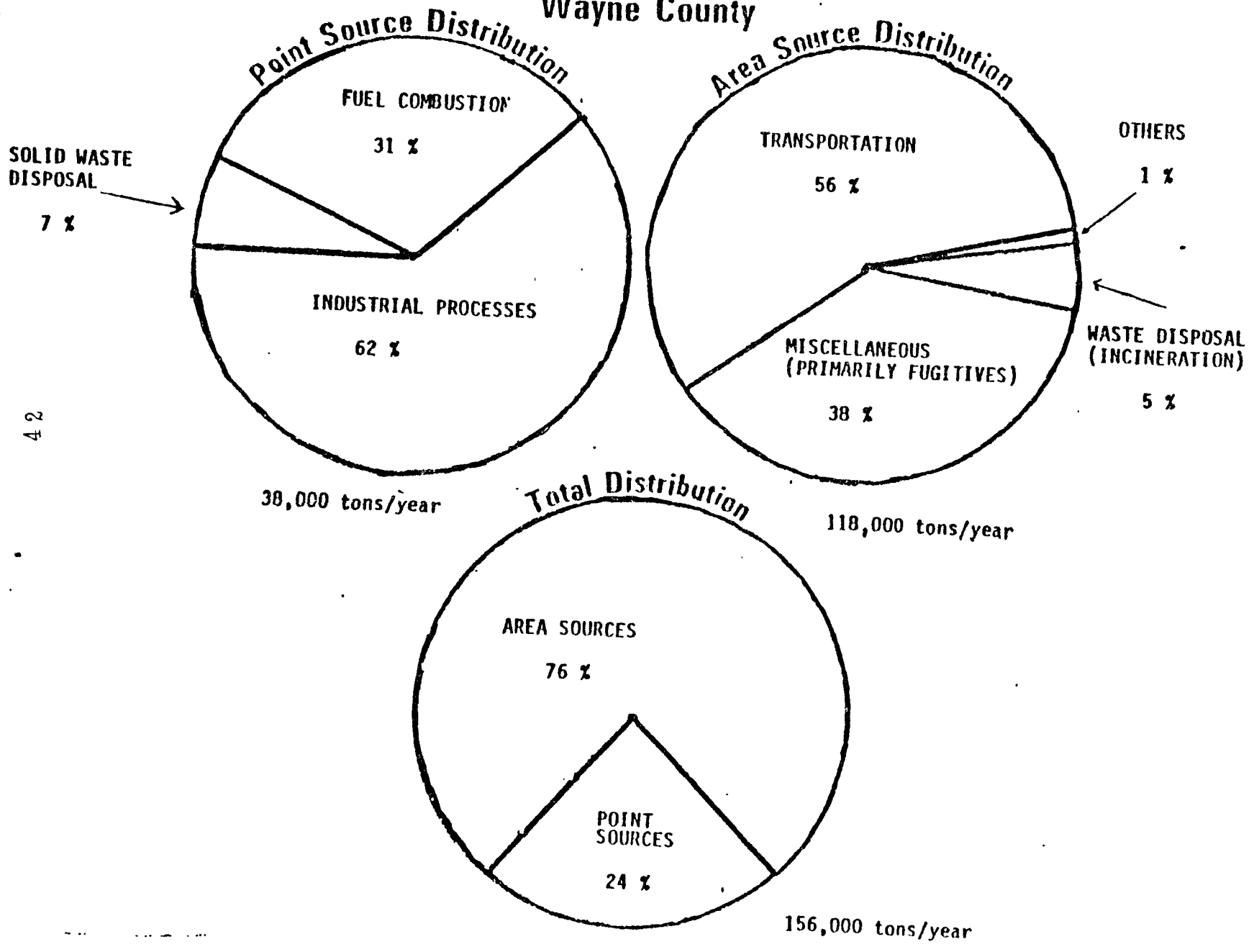
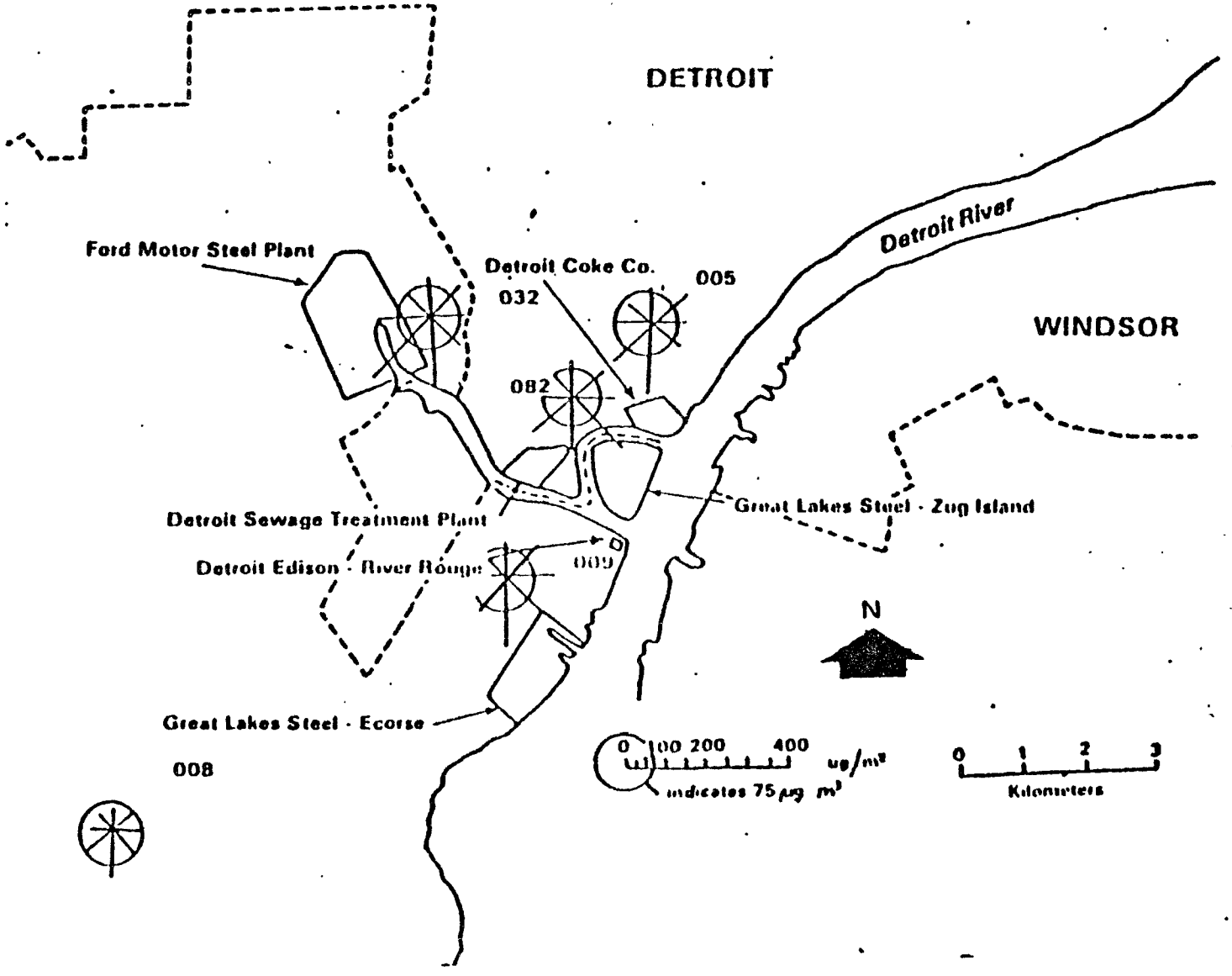


Figure A-43:

TSP POLLUTION ROSES
for
STEADY WIND DIRECTION DAYS, 1977-79



Analysis 6: Cleveland TSP

The Cleveland TSP particulate problem area is located in the Cities of Cleveland, Bratenahl, Newburgh Heights, Cuyahoga Heights, and Brooklyn Heights (see Figure A-44). A smaller, more severe area has been located along the Cuyahoga River Valley, passing through Central Cleveland. This area approximates the heavy industrial area of Cleveland. The number of persons exposed to the excessive particulate levels in the whole area are shown in Figure A-45. There has been a sharp drop in the total exposure with the 1981 population exposed being about 25% of the 1972 population exposed. Figure A-46 shows the major sources and their compliance status. Note that many of these sources and almost all of the noncomplying sources are in the Cuyahoga River Valley. The annual primary standard violation status of monitors in the area are shown in Figure A-47. Note that most violating monitors are located in a belt extending from Cuyahoga Heights in the South to Lake Erie in the North, approximately the same area as the sites of the steel industries. Figure A-48 states that while the annual geometric mean has shown a steady decline since 1972, it is still well over the primary standard. By comparing Figure A-49 to Figure A-50, the massive decrease in the size of the area with TSP levels over the annual primary standard is obvious. However, Figure A-50 depicts two areas of very high levels of over 100 ug/m^3. These two spots are located around steel industry sources. About 50% of the total TSP emissions, as seen in Figure A-51, are due to re-entrainment of dust from transportation sources. The main source of point source emissions is fuel combustion.

While Cleveland has experienced a tremendous improvement in particulate air quality, much of the City of Cleveland and nearby communities still experience harmful ambient levels. These levels are significant since their likely sources, steel processing and fuel combustion, emit large amounts of the unhealthy inhalable particulates and SO_2.

Figure A-44: Cleveland Total Suspended Particulates Problem Area

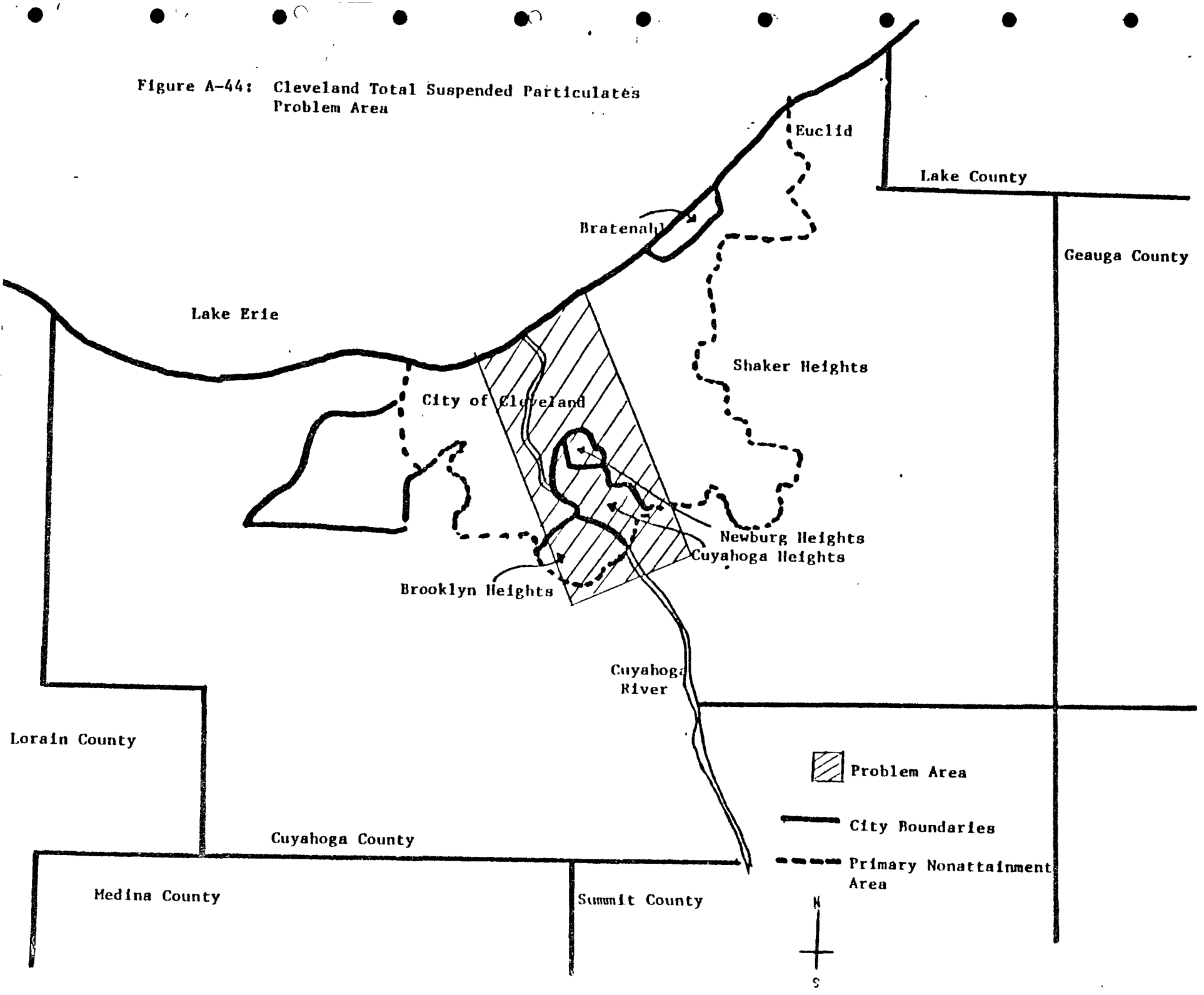


Figure A-45: Population Exposed to TSP Levels Exceeding Annual Standard in the Cleveland Area

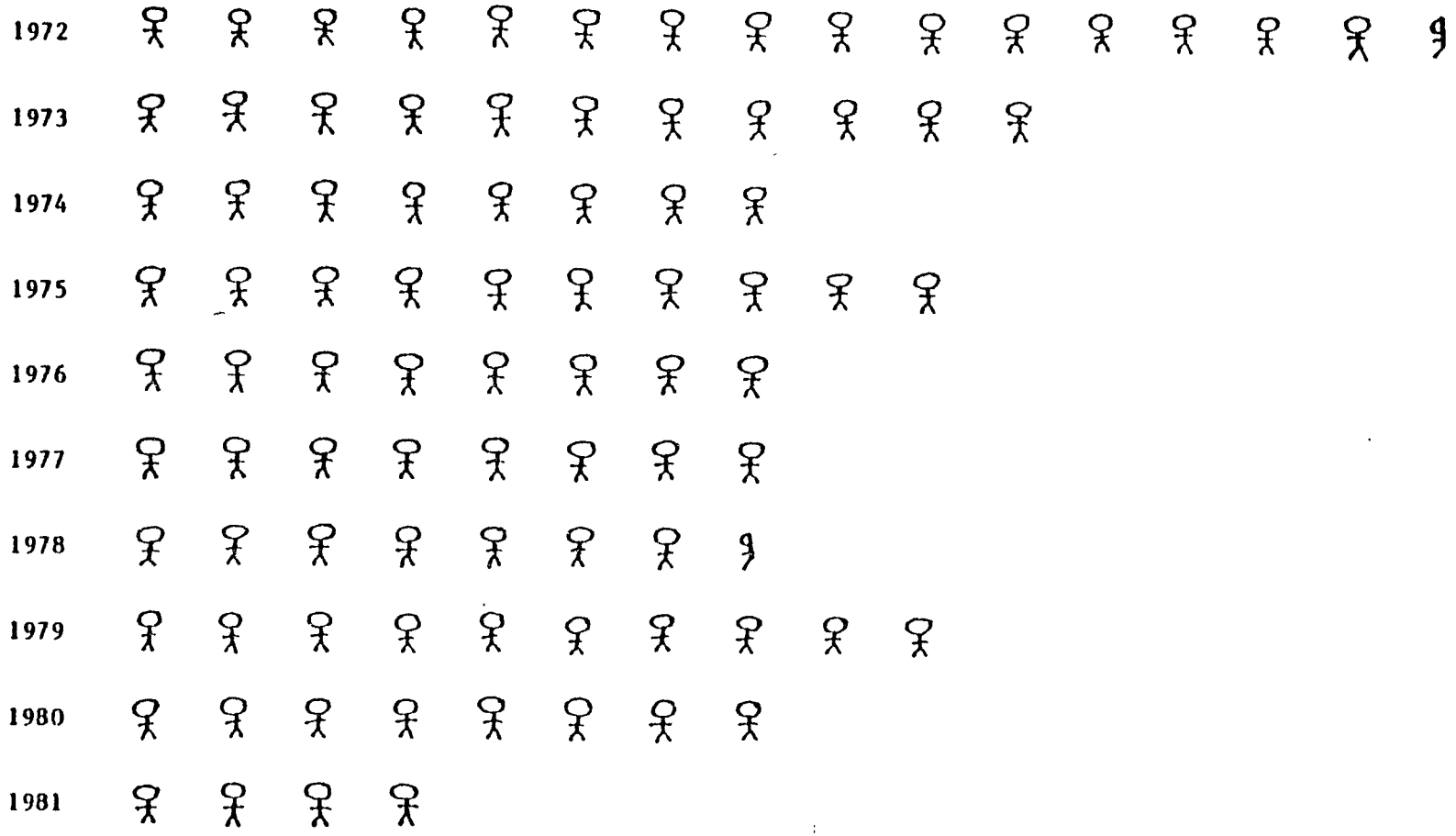


Figure A-46: Cleveland Area Major Particulate Sources

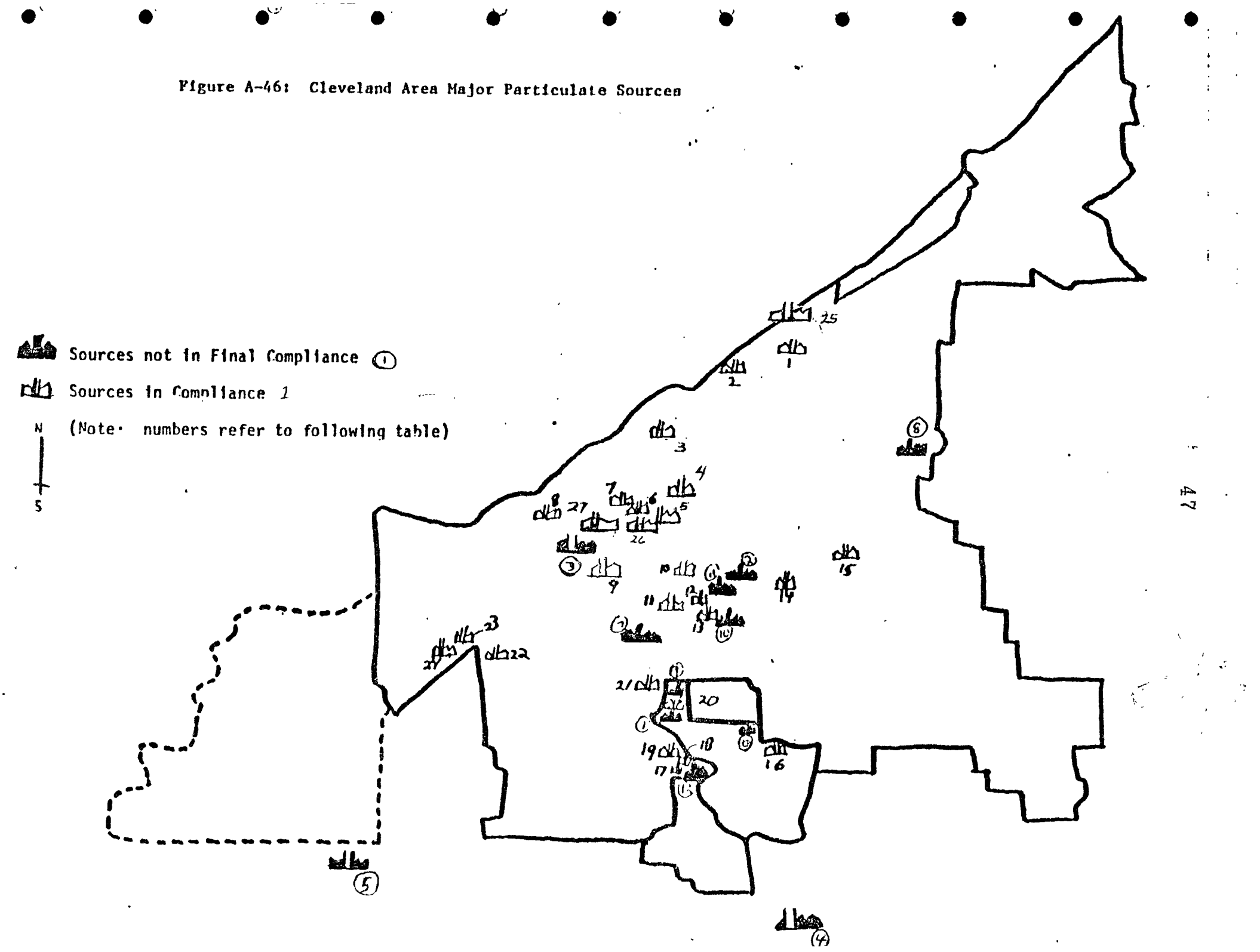


Figure A-47: Status of TSP Monitors in the Cleveland Area
(Annual Geometric Mean-1981)

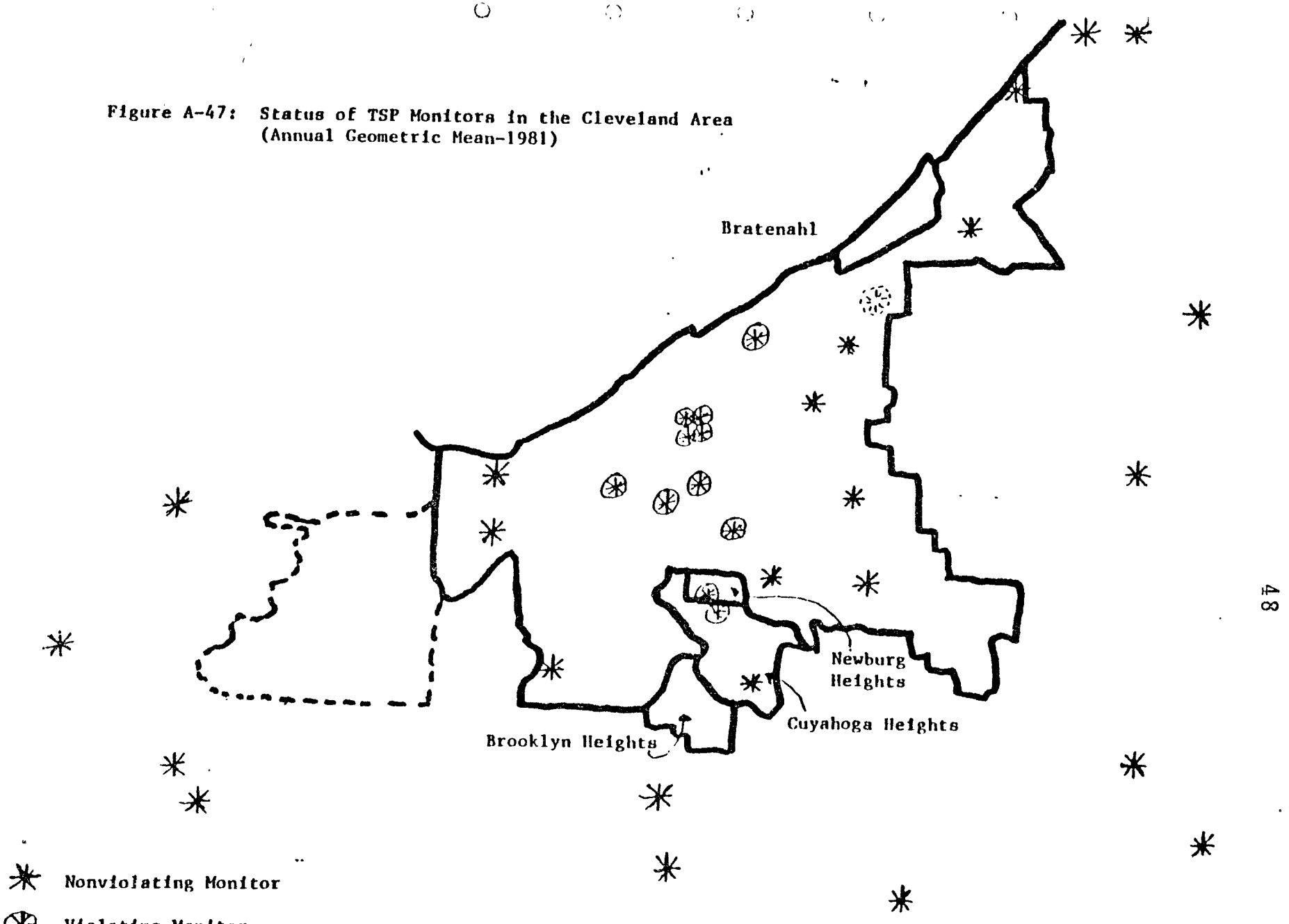
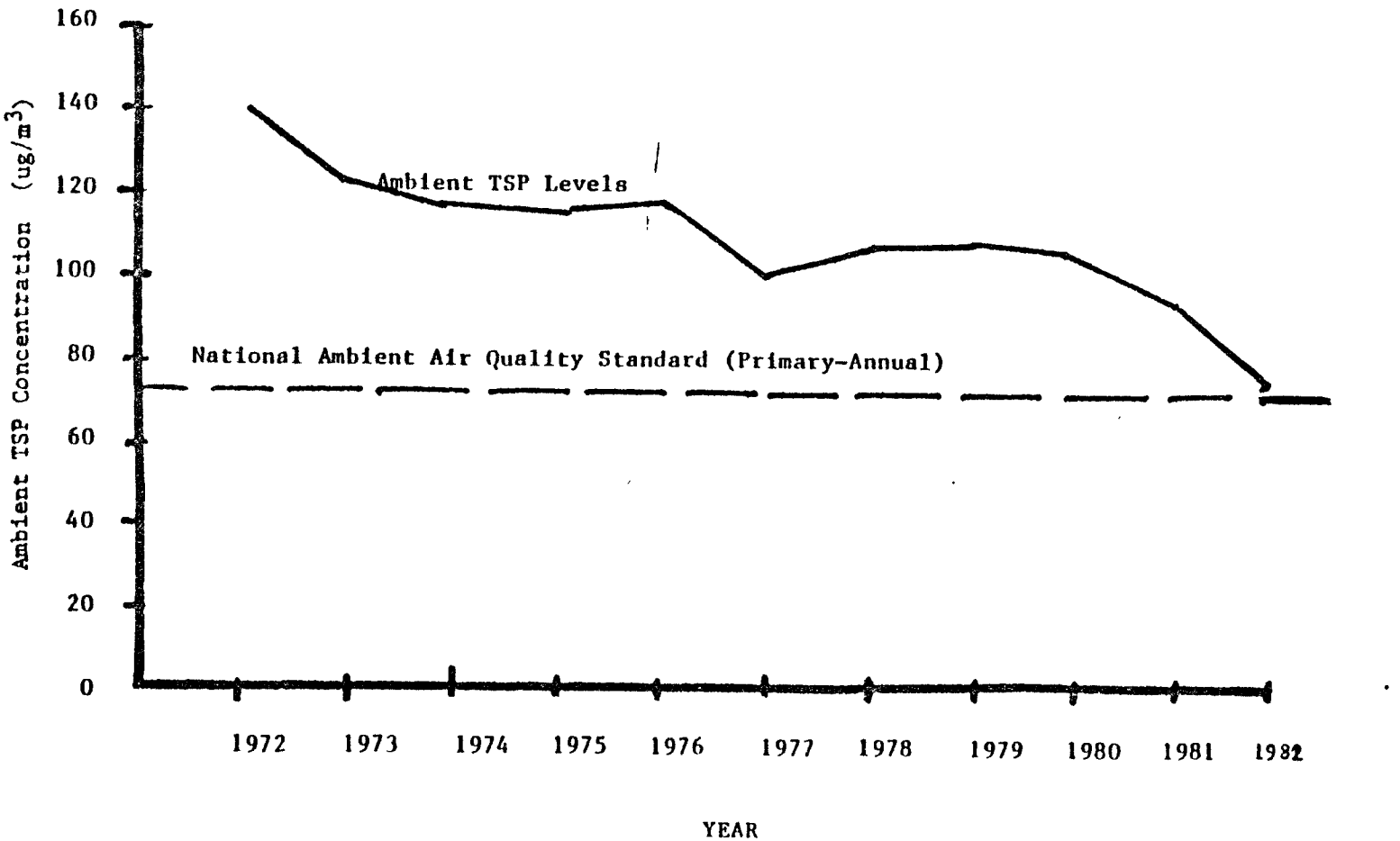


Figure A-48: Cleveland Area Trends in the TSP Problem Area Annual Geometric Means



CLEVELAND PARTICULATE PROBLEM AREA-MAJOR SOURCES

Sources not in Final Compliance

1. ALCOA
2. Boyas Excavating
3. Cleveland Trindidad Paving
4. Ford Motor Stamping Plant
5. Ford Motor Casting Plant
6. Ferro Corp
7. Jones and Laughlin
8. Medical Center
9. Republic Steel
10. Republic Steel
11. Republic Steel
12. Wabash Alloy

Sources in Compliance

1. Metal Blast (Shut Down)
2. Cleveland Municipal Light and Power (Shut Down)
3. Cleveland Electric Illuminating-Hamilton
4. Independent Towel (Changes to Gas)
5. Great Lakes
6. Bassachis Corp.
7. Cleveland Builders
8. Division Pumping Station (Changes to Electric)
9. Forest City Foundary (Shut Down)
10. City of Cleveland Asphalt Plant (Shut Down)
11. Horvitz Co.
12. Reilly Tar and Chemical
13. W. E. Plechaty
14. Ferro Engineering
15. S. E. A. Polishing and Buffing
16. Apex International Alloy
17. Bradley Metal
18. Shell Sands
19. Cuyahoga Smelting
20. Harshaw Chemical
21. Cuyahoga Lime
22. Atlas Foundry (Shut Down)
23. Crucible Steel Casting (Shut Down)
24. Forest City Foundry
25. Cleveland Electric Illuminating - Lake Shore
26. Cleveland Electric Illuminating - Canal Road
27. Cereal Food Processor

Figure A-49: Cleveland TSP Isopleths-1972

(Annual Geometric Mean)

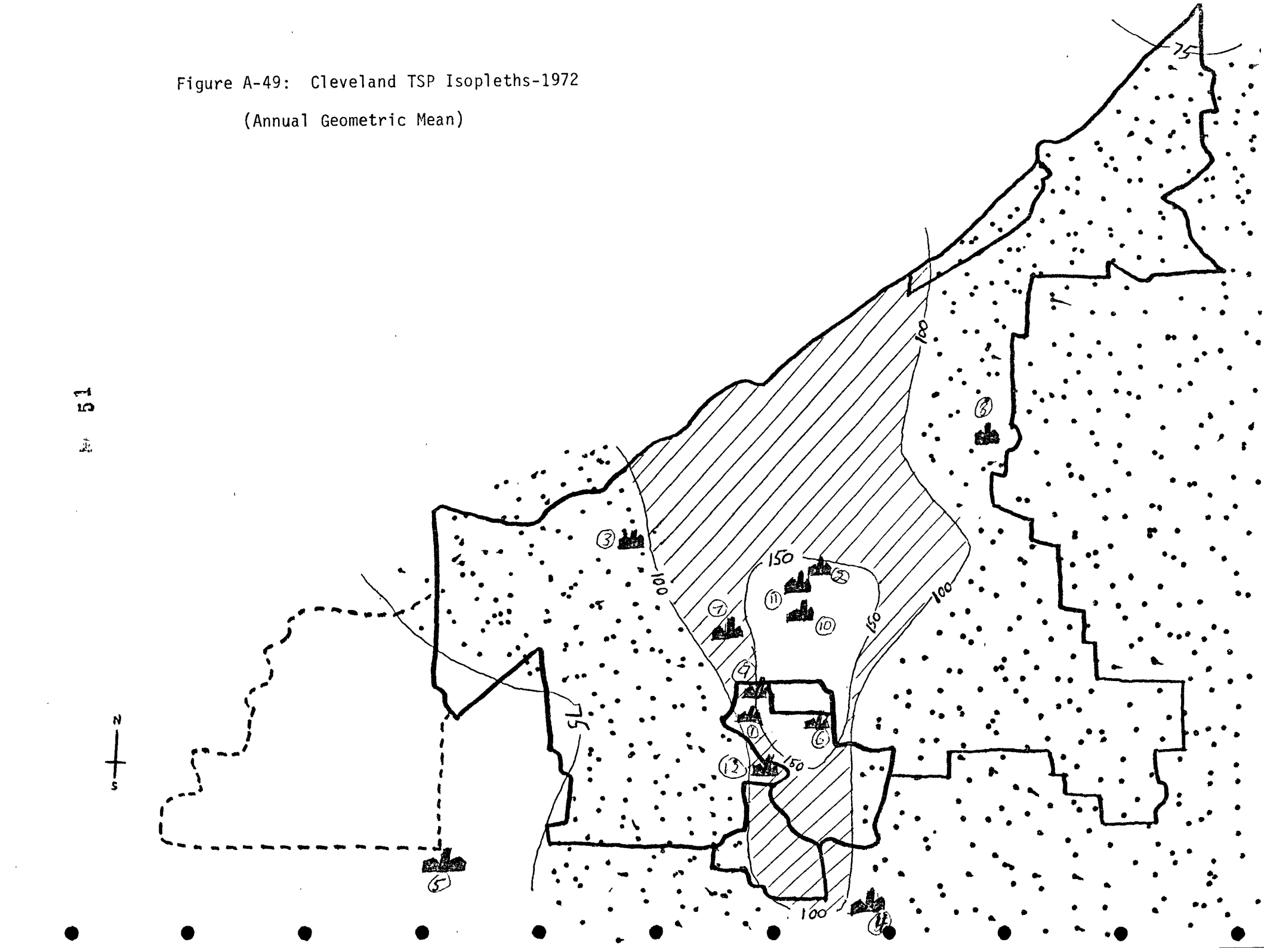


Figure A-50: Cleveland TSP Isopleths-1981

(Annual Geometric Mean)

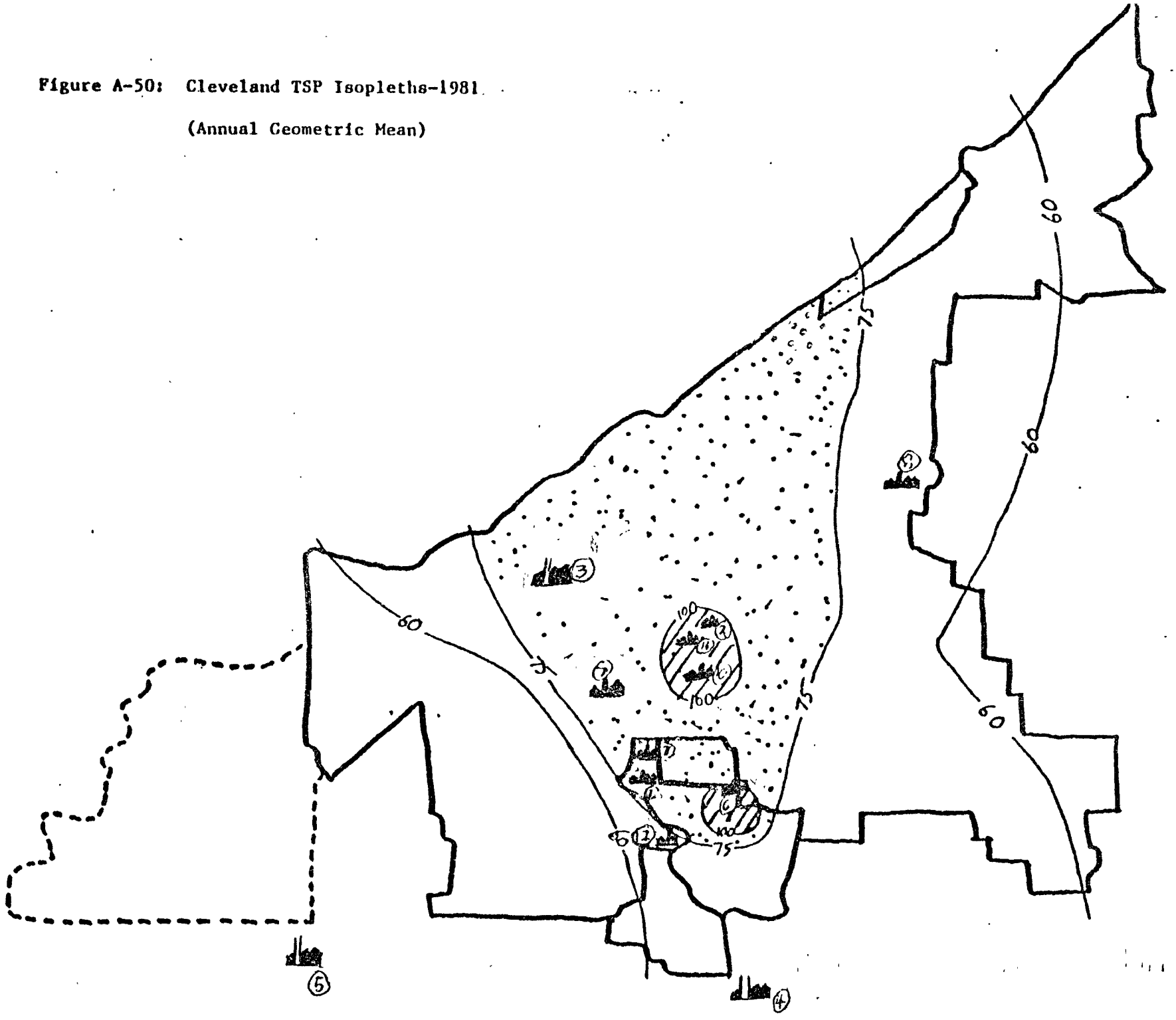
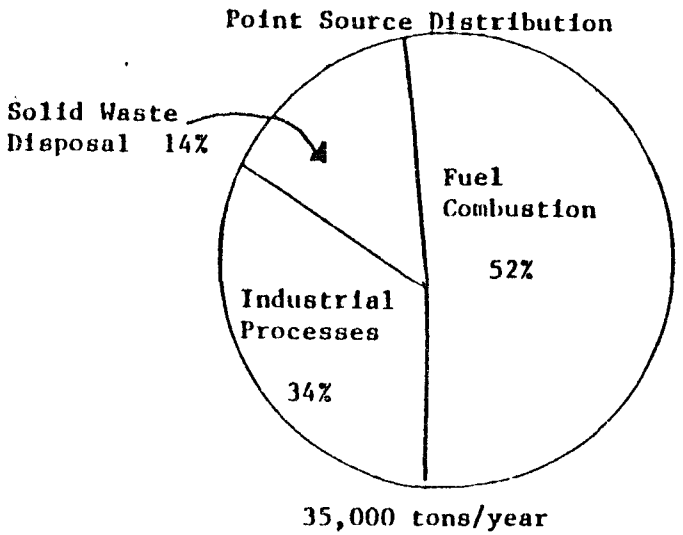
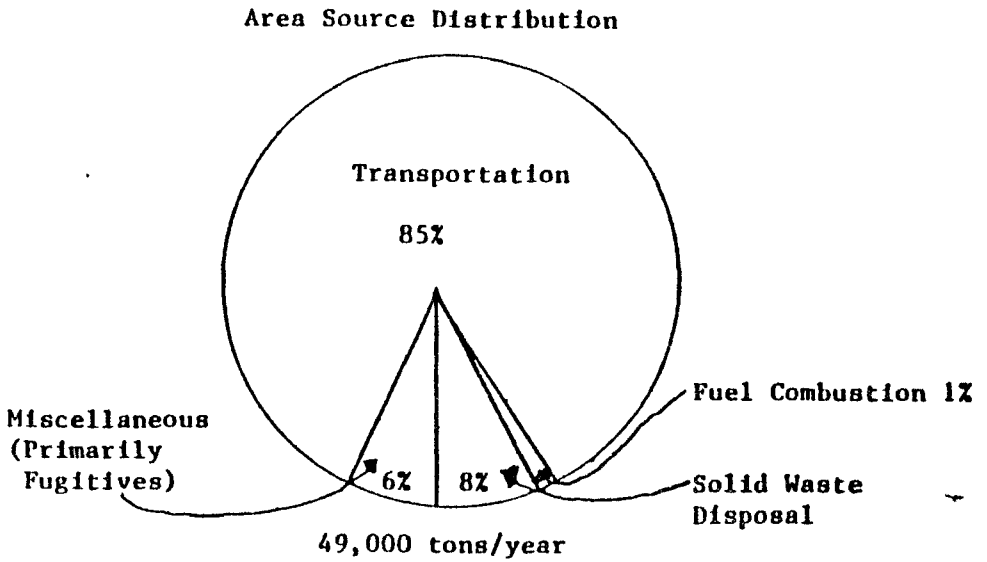
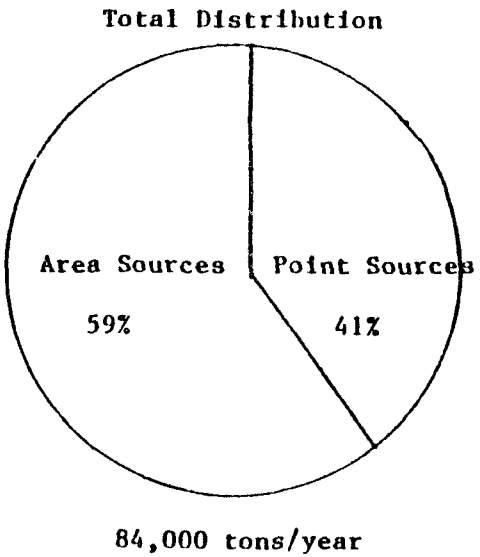


Figure A-51: TSP Emissions Source Distribution for Cuyahoga County-1981







REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT B

LAND

PESTICIDES

Environmental Contamination Due to Pesticide Drift and Overspray

A significant number of environmental incidents have occurred in Region V through the careless application of pesticides. Both private and commercial applicators have been involved. Most incidents are attributable to commercial aerial applicators. Crops, lakes, rivers and streams have been contaminated. Resulting damage has been illegal residues on crops, significant damage to beekeepers, contaminated ground and drinking water, fish kills and the destruction of mon-target vegetation.

State regulatory officials in Illinois, Michigan and Minnesota have analyzed their enforcement programs and consider drift and overspray as their primary priority. Wisconsin and Indiana officials also consider drift and overspray as major issues. In fact, Wisconsin Department of Agriculture, Trade and Consumer Protection officals have amended the State's pesticide statute to strengthen the drift and overspray provisions.

The state regulatory officials, as well as the pesticide training specialists, are endeavoring to make pesticide users more aware of the inherent dangers of drift by emphasizing equipment calibration. Training sessions devoted exclusively to calibration are conducted for both aerial and ground applicators. It is anticipated that increased emphasis will be placed on this in the future.

The extent of environmental contamination, because of drift, is measured primarily through the number of incidents that occur rather than through a continuous environmental monitoring program. Environmental monitoring must be emphasized to insure that pesticide residues are not building up in the environment and especially the rivers, lakes, streams, ground water, and sediment.

Environmental Contamination Due to Improper Handling, Storage and Runoff

Three of five states (Indiana, Michigan, and Minnesota) have experienced a significant number of pesticide incidents relating to handling, storage and runoff. These incidents usually result in major, but localized health and/or environmental problems. For example, improper handling of containers while loading trucks or railroad box cars results in broken and leaking containers, improper disposal, inhalation of toxic vapors, excessive chemical residues on the handler, leaving containers in areas that are accessable to livestock and small children.

Pesticide inspectors have found numerous violative products remaining in storage and in the channels of trade. Also, suspended and cancelled pesticides, (for example, DDT, arsenic, 2,4,5-T) in leaking containers and broken bags are improperly stored in old, decaying farm buildings. Heavy rains have washed the chemical into rivers, lakes and streams and in some instances contaminated drinking water supplies.

The vast majority of farmers in Region V incorporate granular pesticides into the soil for insect control as crops are planted. Spray applications are also applied at this same time to control weeds. Heavy rainfall following application causes runoff of both the soil and the pesticide adhering to soil particles. Strong winds may also contribute to this problem. The most, significant and evident problem resulting from runoff is fish kill. The least apparent problem is a build up of illegal pesticide residues in crops and non-target vegetation where the eroding soil/residues accumulate. Vegetation may be consumed by dairy cattle, fish and wildlife, resulting in illegal residues. Accumulation of pesticides as a result of runoff can be toxic to pheasants and other wildlife. Bee colonies suffer because of runoff problems. Highly intensive agriculture, continuous annual cropping, minor crop rotation and a minimum of soil conservation through idle acres, contribute to this problem.

State pesticide, natural resources and soil conservation officials are at odds as to how this problem should be corrected. Most feel stricter use regulations are warranted.

Aldicarb Use and Contamination of Groundwater in the Central Sands Region of Wisconsin *

Aldicarb is the active ingredient found in Temik 15G and Temik 10G, systemic carbamate pesticides manufactured and marketed by the Union Carbide Agricultural Products Company, Inc. In 1980, 1981, and 1982 aldicarb was confirmed to be present in groundwater samples collected in Adams, Langlade, Marathon, Portage, Barron, Waypaca and Waushara counties. In some samples, the amount of aldicarb detected exceeded 10 parts per billion (ppb), a guideline based on assessments made by the National Academy of Sciences, and accepted by the U.S. Environmental Protection Agency (U.S. EPA) and the Wisconsin Department of Health and Social Services as the threshold action level for public health purposes. Based on this unofficial state standard, the presence of aldicarb in drinking water at levels in excess of 10 ppb is presumed to constitute a threat to public health.

Temik 15G contains 15% active ingredient by weight and has been used in Wisconsin, primarily on potatoes, since 1975. Perceived benefits of using Temik over an alternative insecticide for the control of potato pests include a wider spectrum of pest control and a greater persistence during the growing season. Prior to a change in product labeling in 1982 which reduced the amount of aldicarb that can be applied to an acre of Wisconsin potatoes, Temik 15G was labeled for the control of certain nematodes. This provided another advantage to growers.

As a granular pesticide formulation, Temik is incorporated into the soil. This significantly reduces the potential for applicator exposure to the pesticide and the possibility of pesticide drift or overspray. The risk to birds and other wildlife is also minimized, when the granule is soil incorporated.

In 1974, at the time of aldicarb product registration by the U.S. EPA, it was expected that, under normal conditions of use, aldicarb would fully degrade in the soil, and therefore, would not reach any potential source of drinking water, such as subsurface water. This has not been the case in some areas of Wisconsin. Union Carbide first confirmed findings of aldicarb in Wisconsin groundwater in 1980.

Prior to the 1982 planting and growing season, the Wisconsin Department of Agriculture, Trade and Consumer Protection ("DATCP") adopted a temporary emergency rule to restrict the use of aldicarb in Wisconsin, pursuant to ss. 94.69 and 227.027, Stats. The rule was published on March 12, 1982 with a scheduled effective date of March 15. The rule remained in effect until July 13, 1982, when it expired automatically.

The emergency rule established aldicarb-use moratoriums in the recharge zones of aquifers where aldicarb had been detected in potable water wells, at 1 ppb or more, at any time prior to November, 1981. Approximately 130 sections of land, or 83,200 acres (not all potato growing acres), were included in the

*Information taken from Environmental Impact Statement For Proposed Rules Relating to Special Restrictions On The Use of Pesticides Containing Aldicarb, Wisconsin Department of Agriculture, Trade and Consumer Protection, December 1982.

moratorium areas. Growers in the moratorium areas were prohibited by the emergency rule from using aldicarb in a 15% formulation in 1982. All users in Wisconsin of the Temik 15G formulation were required to report their intended use of the pesticide to the DATCP at least 15 days prior to use, regardless of the location of use in the state or the crop on which the aldicarb was to be applied.

Under Wisconsin ss. 94.70 Stats., no person may apply a pesticide in a manner inconsistent with label directions.

1. Aldicarb is designated as a restricted-use pesticide which may not be applied except by state-certified private or commercial pesticide applicators, or by other persons under the direct supervision of a certified applicator.

2. Aldicarb applications on potatoes in Wisconsin are to be made 4-6 weeks after planting, rather than at time of planting. Directions for use on potatoes also require at least 50 days between crop treatment with aldicarb and crop harvest.

3. Aldicarb may not be applied to the same field more than once every 2 years. Fields treated with aldicarb in 1981 could not be treated with aldicarb in 1982.

4. Application rates on Wisconsin potatoes are reduced to a maximum of 2 lbs. of active ingredient per acre (ai/A).

5. The revised Wisconsin label includes a statement of groundwater hazards associated with aldicarb use.

The 5 label changes were estimated by Union Carbide to reduce the potential for aldicarb reaching groundwater. Postponing the date of application permits soil temperatures to increase approximately 10 degrees, thus increasing the activity of microorganisms. This may promote more rapid breakdown of the product in the soil, before it leaches to groundwater. A later application date will also avoid 6-8 inches of water infiltration brought by early rains, and application made above the root system to an established plant will increase the amount of pesticide taken up into the plant, therefore reducing the amount available to potentially migrate into groundwater.

Reducing the rate of application from 3 lbs. ai/A to 2 lbs. ai/A reduces the amount of aldicarb available to reach groundwater. Changing from an annual application to one application every other year reduces by 50% the amount of aldicarb applied to the soil.

Only certified applicators are able to apply Temik in Wisconsin because of its restricted-use classification. This, and the addition of an environmental hazard statement, help insure that applicators are aware of the product's potential for leaching into groundwater.

Simultaneous to the Temik 15G label changes being made, Temik 10G was registered for use on agricultural crops, including potatoes. Union Carbide is not currently marketing the 10% formulation for agricultural use, however.

Union Carbide stated during a November 3, 1981 meeting of the state's Pesticide Advisory Council that the then proposed label revisions would lessen the amount of groundwater contamination (where samples showed aldicarb present at 50 ppb, Union Carbide estimated a reduction in aldicarb levels to 9 ppb). No data are currently available to support the position that label changes alone will prevent aldicarb from leaching to subsurface water.

To date, 1982 sampling has consisted of resampling, on a quarterly schedule, those wells in which aldicarb was previously detected, and of expanding sampling to areas where aldicarb is used but which were not initially considered "high risk." Recent sampling efforts show the presence of aldicarb in previously unsampled wells in Portage and Marathon counties. Samples taken from Jefferson, Waukesha and Sauk counties showed no aldicarb present. Although research is under way, no trends in aldicarb behavior in Wisconsin's groundwater are apparent at this time.

Of the 505 different wells sampled by Wisconsin and Union Carbide officials in 1982, 93 wells sampled contained detectable levels of aldicarb. Thirty-four of the 93 wells sampled contained detectable levels of aldicarb over 10 ppb at one time or another.

Aldicarb continues to be detected in Wisconsin's groundwater, and use in compliance with product labeling has not yet been shown to prevent the pesticide from leaching into groundwater. Even if the 1982 label changes are ultimately successful in reducing new contamination, such that net additions over time are kept within "acceptable" bounds, these additions may nevertheless be unacceptable in the short run when combined with high existing accumulations from former years' applications under the prior label. In areas where significant contamination has already occurred, localized use moratoriums may be necessary to prevent undue aggravation of existing problems, and to reduce contamination to "acceptable" levels. The DATCP is therefore proposing an amendment to Ch. Ag 29, Wisconsin Administrative Code, which would place special restrictions on aldicarb use in the state.

TOXICS

Manufacturing Sites of Toxic or Potentially Toxic (Hazardous) Substances

In order to determine where potential hot spots of toxic chemical contamination may be located, Region V has developed detailed maps indicating the location of facilities which produce toxic or potentially toxic substances. The set of maps included here identifies manufacturers of substances which were listed in the 1979 Chemical Activities Status Report. This information was generated by cross referencing with the 1977 chemical inventory generated under the TSCA. The substances included in the Chemical Activities Status Report include substances regulated or being reviewed under the Clean Air Act, Clean Water Act, Federal Insecticide, Fungicide and Rodenticide Act, Resource Conservation and Recovery Act, Safe Drinking Water Act, and the Toxic Substances Control Act. Manufacturers of potential carcinogens, substances found in the Great Lakes Basin, and chemicals found in fish have also been determined.

This information provides a means to help identify facilities and areas manufacturing large numbers and quantities of toxic or potentially toxic (hazardous) substances. Such identification provides a logical means to select sites for environmental assessments to determine if significant quantities of toxic substances are being released to the environment.

The maps and computer printouts of manufacturing sites of these groups of substances have been supplied to the environmental regulatory agency within each State in Region V. Due to a lack of resources, very little, if any, monitoring for these substances was conducted by the end of 1982. Because of the high potential for adverse health effects as a result of exposure to these chemicals and because many of the sources are also located near highly populated urban areas, it is imperative that these potential hazards be evaluated. The best method to evaluate these potential sources would be a multi-media approach, including ambient air and water monitoring and investigating land disposal sites where wastes from producing these toxic chemicals may have been illegally disposed.

Maps of the chemical production of substances listed in the Chemical Activities Status Report cross-referenced to the 1977 TSCA inventory are presented in the following pages for each State in Region V. Those counties having chemical production exceeding one billion pounds per year have been shaded. Only non-confidential information has been included in these maps, so the absence of chemical information in some counties or the numbers indicated in other counties do not necessarily reflect all the chemical manufacturing information gathered under TSCA. The data, therefore, must be viewed with these constraints.

WMD/TMB/ATT B-2

PCB contaminated Harbors (Green Bay, Ashtabula, and Waukegan)

Several harbors in the Great Lakes are known to be contaminated with PCBs. Sediment samples showing PCB levels in excess of 50 parts per million (ppm), a level which EPA considers as significant contamination, have been taken from the Fox River at Green Bay, Wisconsin, and harbors located at Waukegan, Illinois; Sheboygan and Milwaukee, Wisconsin; Grand Calumet River and Indiana Harbor Canal, Indiana; and Ashtabula Harbor, Ohio. The most severe PCB problem is PCB contamination of Waukegan Harbor at Waukegan, Illinois. This site contains the highest known concentrations of uncontrolled PCBs in the country. PCBs in one drainage ditch leading to the Harbor have been detected at levels as high as 25%. The source of this contamination was Outboard Marine Coporation, which discharged PCB oils into the drainage ditch. This contamination has resulted in an immediate threat to Lake Michigan water quality, where unacceptably high concentrations of PCBs have been found in fish tissue. Sport fish from Lake Michigan, including lake trout and coho salmon, have been found to contain PCB concentrations ranging from 7 to 20 ppm (FDA's action level is 5 ppm). Sale of these species of fish in interstate commerce has been restricted.

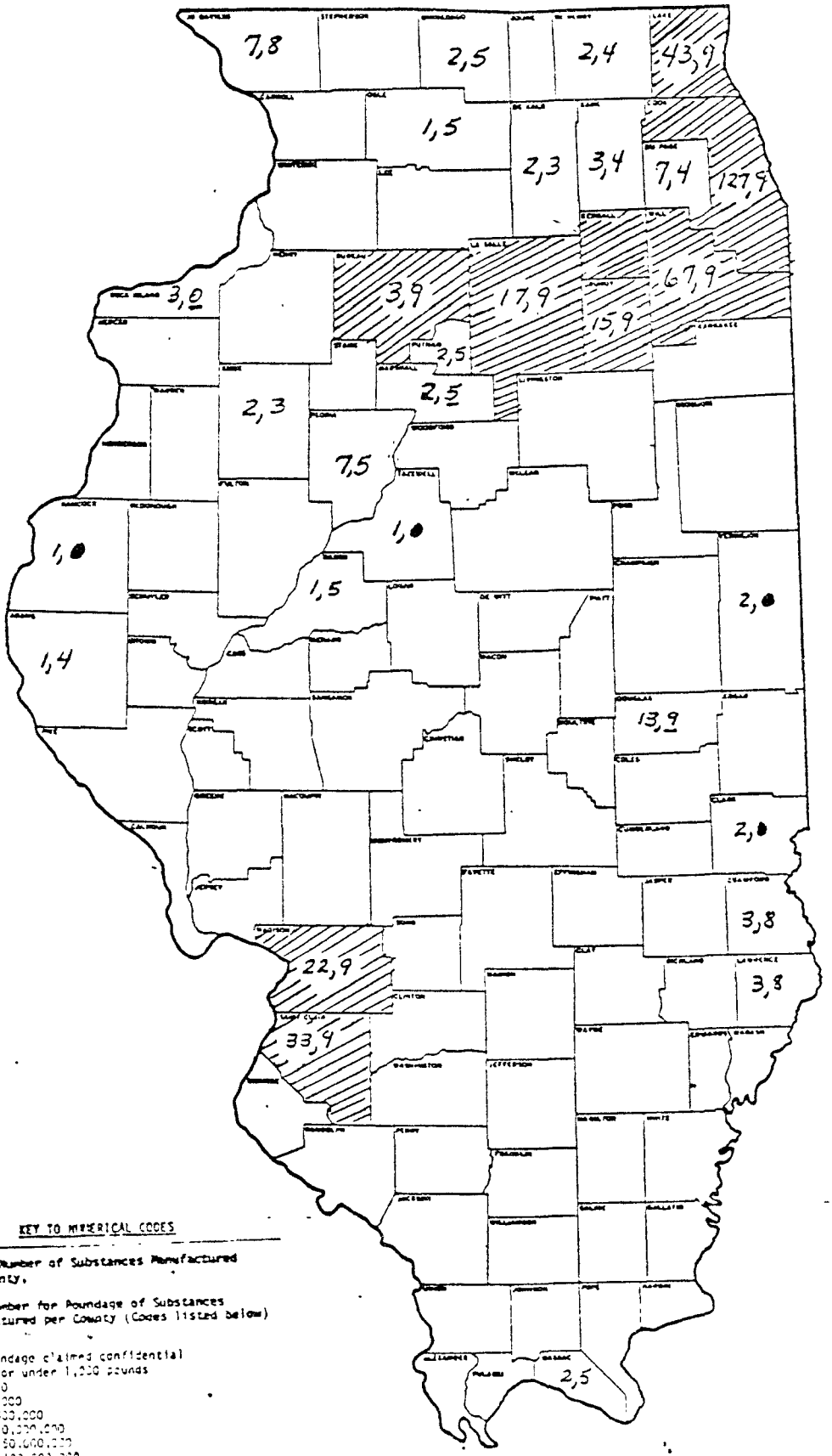
The Fox River, which empties into Green Bay in Wisconsin, has been found to be contaminated with PCBs and mercury. In 1977, a study conducted by the Wisconsin Department of Natural Resources found PCBs up to 16 ppm in sediment samples from this river. The highest levels were found immediately downstream from the outfalls of paper companies or the City of Green Bay. In November of 1982, samples from three birds, obtained at Green Bay, Wisconsin, were analyzed for polychlorinated dibenzofurans (PCDFs), dioxins (PCDDs), and PCBs. The birds were a belted kingfisher and two black-crowned night herons. These birds contained PCB levels of 192 ppm, 86 ppm and 28 ppm. PCDDs were found in all three birds at levels of 37,188 and 88 parts per trillion (ppt). PCDFs were found in the kingfisher and one heron at levels of 164 ppt and 8 ppt, respectively.

In Ohio, PCB contamination has been found in the Ashtabula Harbor and in rivers leading to the Harbor. Sediment samples from the Harbor have revealed concentrations of PCBs ranging from 5 to 70 ppm. One small tributary of the Ashtabula River, Fields Brook, has PCB concentrations in the sediment ranging from 3 to 4 ppm.

A number of industries are located in the drainage area leading to the Harbor, and waste water discharges are believed responsible for much of the PCB contamination found.

MANUFACTURE OF TOXIC AND POTENTIALLY TOXIC (HAZARDOUS) SUBSTANCES

ILLINOIS



KEY TO NUMERICAL CODES

First Number: Actual Number of Substances Manufactured per County.

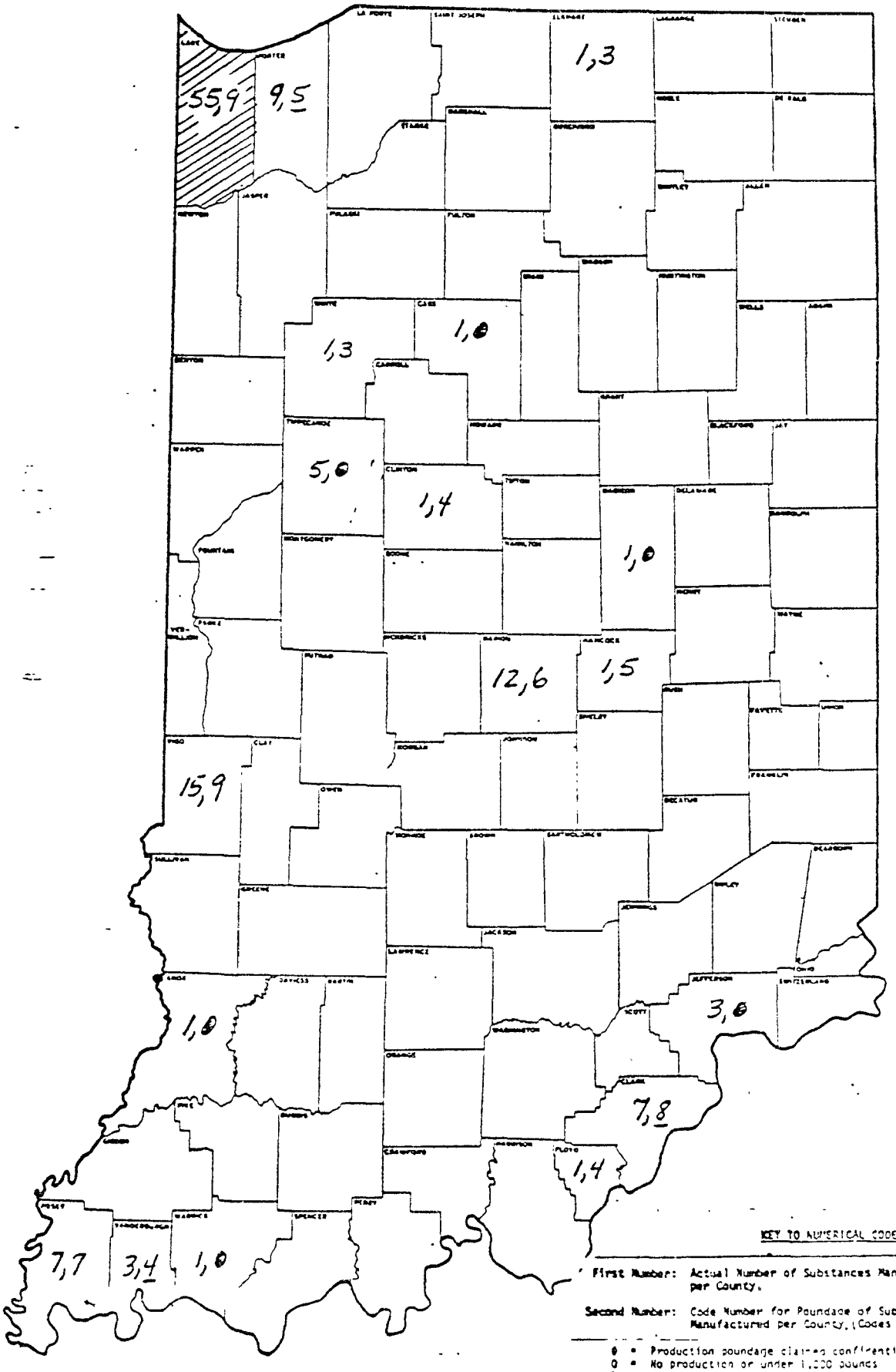
Second Number: Code Number for Poundage of Substances Manufactured per County (Codes listed below)

9 = Production poundage claimed confidential
0 = No production or under 1,000 pounds
1 = 1,000 to 10,000
2 = 10,000 to 100,000
3 = 100,000 to 1,000,000
4 = 1,000,000 to 10,000,000
5 = 10,000,000 to 50,000,000
6 = 50,000,000 to 100,000,000
7 = 100,000,000 to 500,000,000
8 = 500,000,000 to One Billion
9 = Over One Billion

Underlined numbers indicate underestimation of poundage

MANUFACTURE OF TOXIC AND POTENTIALLY TOXIC (HAZARDOUS) SUBSTANCES

INDIANA



KEY TO NUMERICAL CODES

First Number: Actual Number of Substances Manufactured per County.

Second Number: Code Number for Poundage of Substances Manufactured per County, (Codes listed below)

- 0 = Production poundage claimed confidential
- Q = No production or under 1,000 pounds
- 1 = 1,000 to 10,000
- 2 = 10,000 to 100,000
- 3 = 100,000 to 1,000,000
- 4 = 1,000,000 to 10,000,000
- 5 = 10,000,000 to 50,000,000
- 6 = 50,000,000 to 100,000,000
- 7 = 100,000,000 to 500,000,000
- 8 = 500,000,000 to One Billion
- 9 = Over One Billion

KEY TO NUMERICAL CODES

First Number: Actual Number of Substances Manufactured per County.

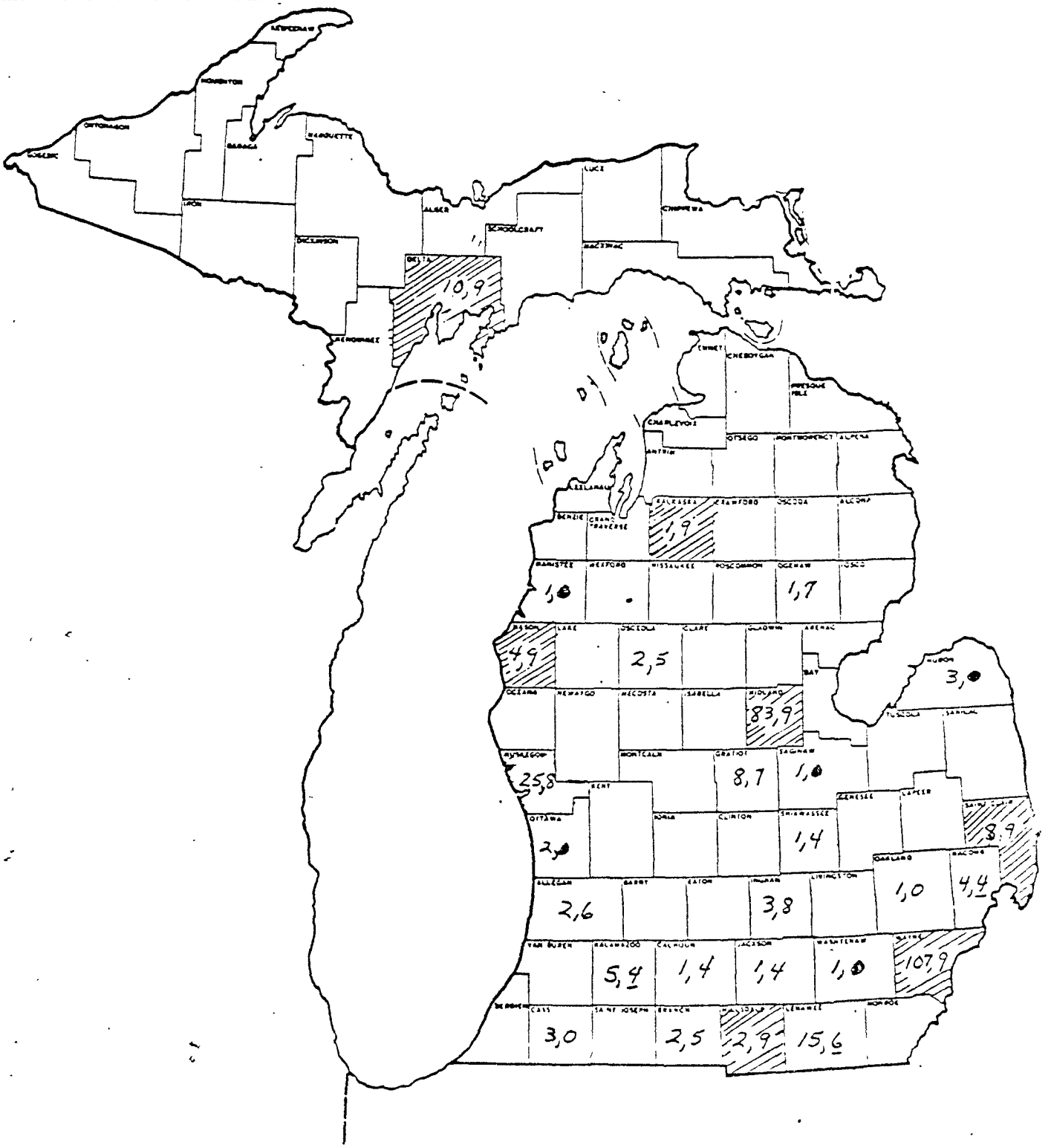
Second Number: Code Number for Poundage of Substances Manufactured per County (Codes listed below)

0 = Production poundage claimed confidential
0 = No production or under 1,000 pounds
1 = 1,000 to 10,000
2 = 10,000 to 100,000
3 = 100,000 to 1,000,000
4 = 1,000,000 to 10,000,000
5 = 10,000,000 to 50,000,000
6 = 50,000,000 to 100,000,000
7 = 100,000,000 to 500,000,000
8 = 500,000,000 to One Billion
9 = Over One Billion

Underlined numbers indicate underestimation of poundage because of the inclusion of confidential data.

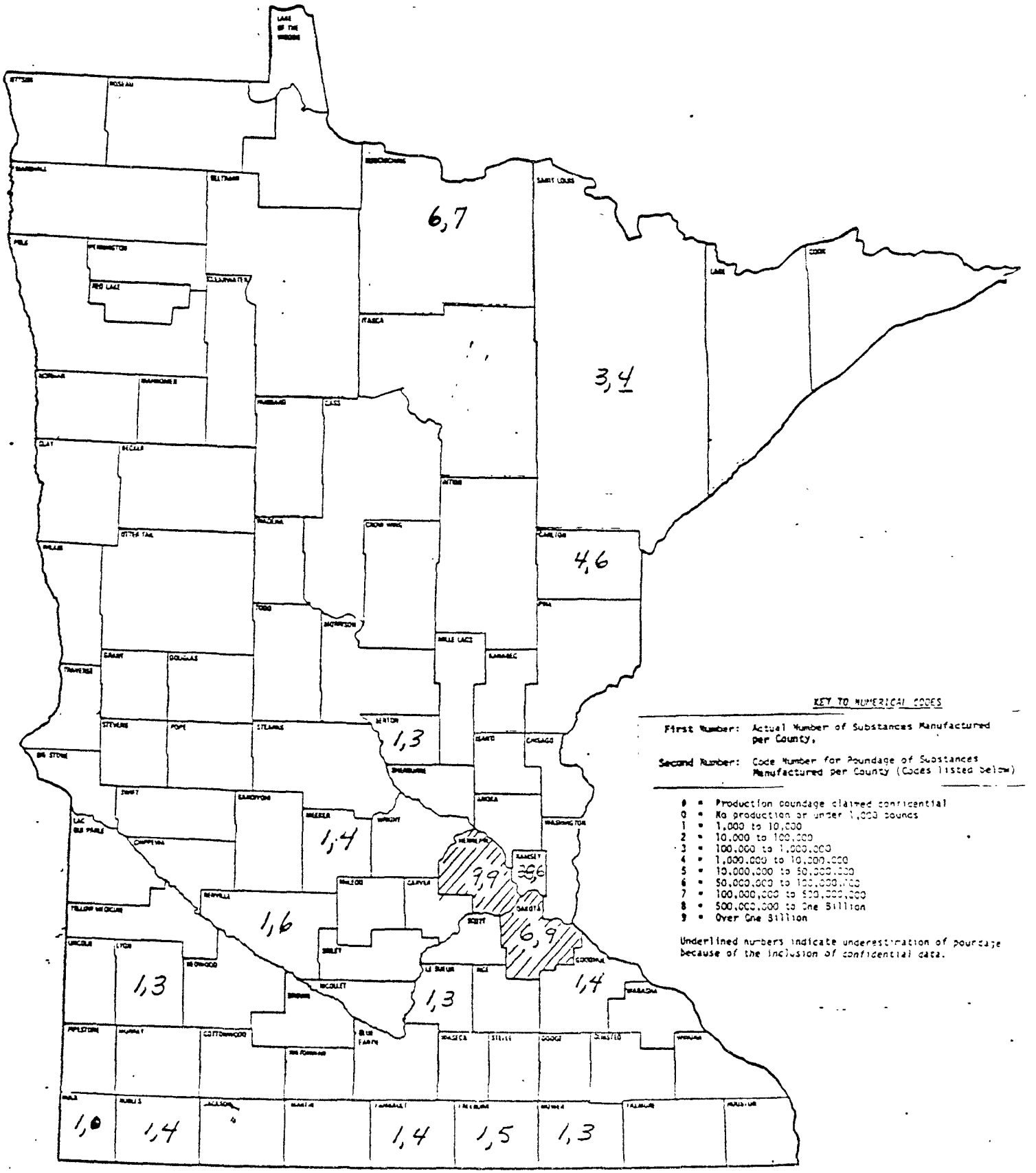
MANUFACTURER OF TOXIC AND POTENTIALLY TOXIC (HAZARDOUS) SUBSTANCES

MICHIGAN



MANUFACTURER OF TOXIC AND POTENTIALLY TOXIC (HAZARDOUS) SUBSTANCES

MINNESOTA



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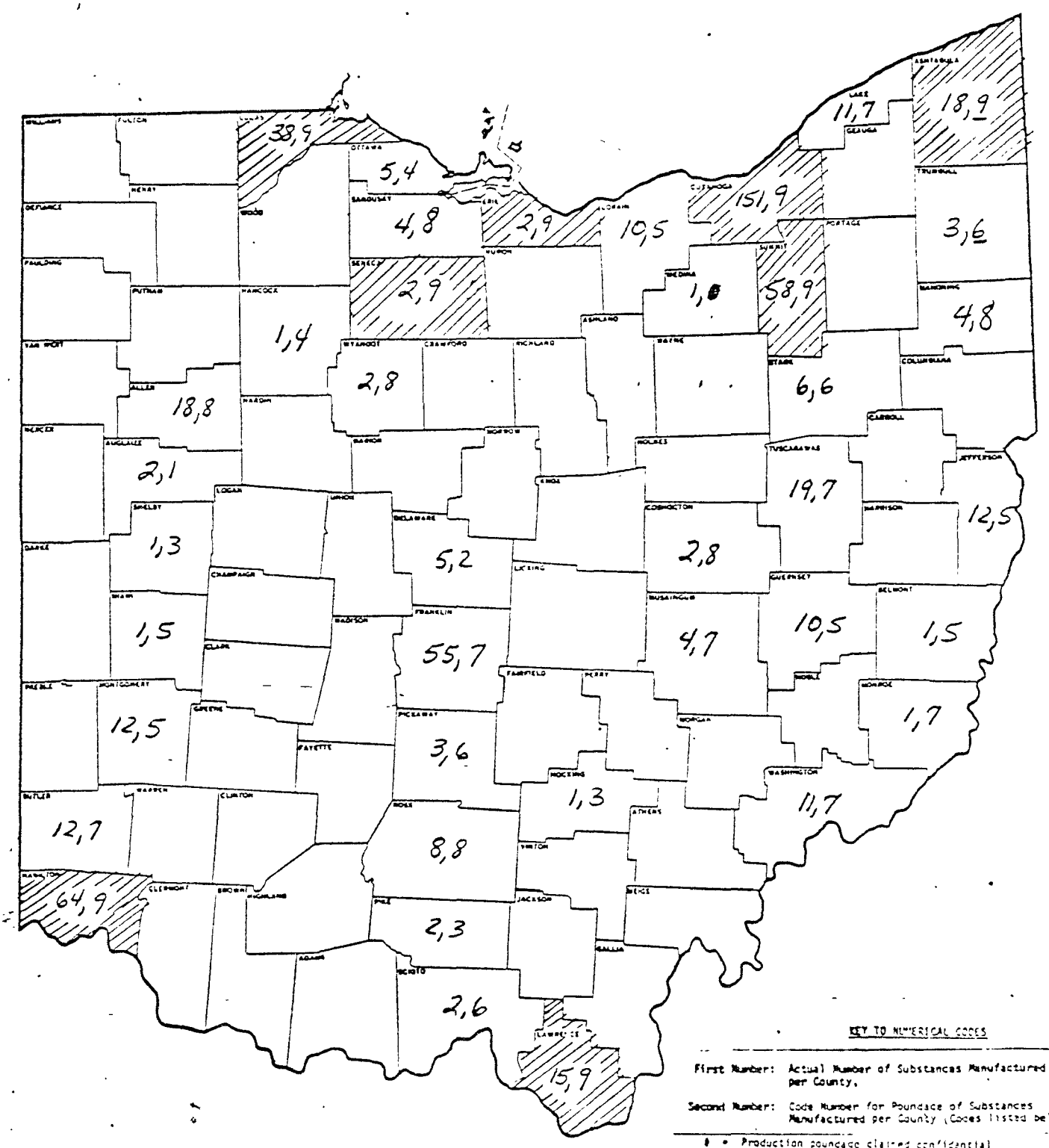
5 = 10,000,000 to 50,000,000
6 = 50,000,000 to 100,000,000
7 = 100,000,000 to 500,000,000
8 = 500,000,000 to One Billion
9 = Over One Billion

Underlined numbers indicate underestimation of poundage because of the inclusion of confidential data.

MANUFACTURER OF TOXIC AND POTENTIALLY TOXIC (HAZARDOUS) SUBSTANCES

OHIO



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- 4 = 1,000,000 to 10,000,000
- 5 = 10,000,000 to 50,000,000
- 6 = 50,000,000 to 100,000,000
- 7 = 100,000,000 to 500,000,000
- 8 = 500,000,000 to One Billion
- 9 = Over One Billion

Underlined numbers indicate

MANUFACTURER OF TOXIC AND POTENTIALLY TOXIC (HAZARDOUS) SUBSTANCES

WISCONSIN

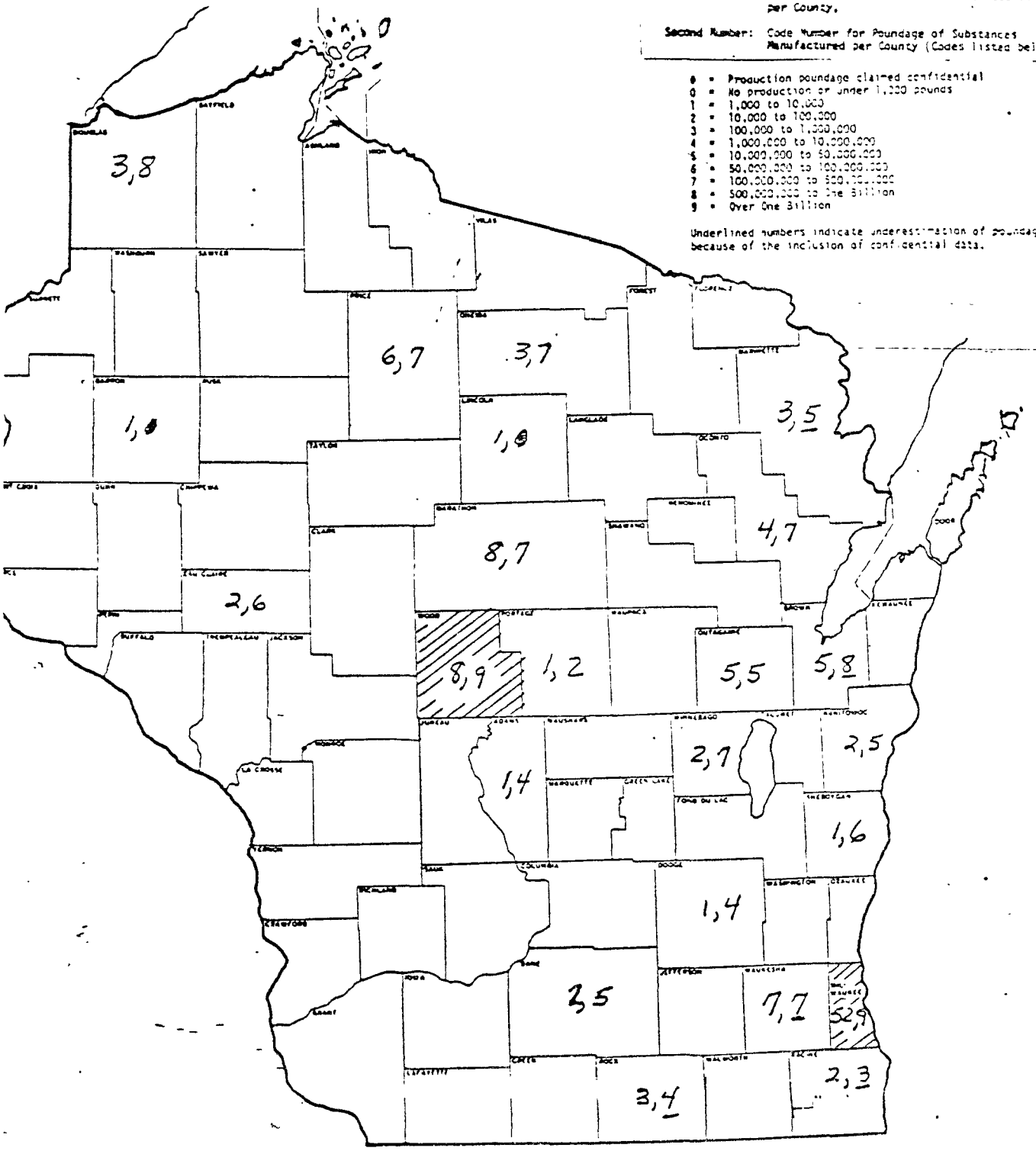
KEY TO NUMERICAL CODES

First Number: Actual Number of Substances Manufactured per County.

Second Number: Code Number for Poundage of Substances Manufactured per County (Codes listed below)

0 = Production poundage claimed confidential
0 = No production or under 1,000 pounds
1 = 1,000 to 10,000
2 = 10,000 to 100,000
3 = 100,000 to 1,000,000
4 = 1,000,000 to 10,000,000
5 = 10,000,000 to 50,000,000
6 = 50,000,000 to 100,000,000
7 = 100,000,000 to 500,000,000
8 = 500,000,000 to One Billion
9 = Over One Billion

Underlined numbers indicate underestimation of poundage because of the inclusion of confidential data.



Unregulated Toxic Substances

Overview

Increasingly, Region V is directing its attention in all program areas toward the identification, assessment, and control of toxic substances pollution. This progressive shift in program emphasis is a logical outgrowth of the Agency's successes in addressing conventional pollution problems; improved scientific understanding of the nature and extent of toxic substances in the environment; and, of course, the recent rapid growth in the number and volume of toxic and hazardous substances in the environment. One by-product of these developments and experiences is the growing awareness that toxic substances in the air, water, and land media present a far more complicated set of pollution concerns that any we have confronted to date. Confounding this situation is the fact that the more scientists learn about toxic substances, the more regulatory agencies realize that control mechanisms applied at present are inadequate.

The emerging problem of unregulated toxic substances has a number of dimensions. First, the information base necessary to develop an understanding of the nature and extent of toxic substances problems is incomplete. One element of this is our information on the actual and potential sources of toxic substances. This information should consist of qualitative and quantitative data about chemical production, importation, transportation, or use at specific locations; information about types of industries, raw materials used, production processes, catalysts, intermediates, products and by-products, point source discharges, and emissions; and data on the location, number, and contents of active and inactive disposal sites.

Another critical informational element is data on the physical, chemical, and toxicological properties of toxic substances. This information enables scientists to gain insight into the movement, fate, and effects of toxic substances in the environment. It also provides a basis for estimating the potential for exposure to chemical substances. And, most importantly, characteristics information is used to assess the degree of hazard a chemical substance poses to organisms, and to set priorities for regulating specific toxic substances.

A final element in our toxic substance information base is the measurement of the actual incidence and accumulation of specific chemical substances in the environment. Through research, monitoring, and surveillance activities, information is gained on new or previously undetected potentially toxic substances in the environment, instances of detrimental effects on human populations and natural resources from toxic contamination, and trends in the environmental concentration of specific toxic chemicals.

The second dimension of the emerging toxic substances problem is the complex area of hazard and risk assessment. The data in the information base are used in the assessment of the potential hazard a substance poses to humans and other organisms. An assessment is used to assist in deciding which substances should receive priority attention for regulation, monitoring, or further investigation. In essence, hazard assessment is a continuous process that involves the estimation of the potential hazard of a toxic substance to an organism.

The complementary exerise to hazard assessment is formal risk assessment. Risk assessment is a process of estimating the probability that exposure to a chemical at a particular level will cause an adverse effect in humans, other living organisms, or important non-living environmental components. Risk assessments should contain the following common elements:

1. definition and quantification of exposures;

2. characterization of the exposed population in quantitative terms;

3. chemical and physical properties of the substance and its chemical reactivity in relation to exposure;

4. prudent quantitative mathematical extrapolation of the responses from observed to estimated exposure ranges within the observed biologic system; and

5. qualification of the estimated risks in light of identifiable biological and toxicological differences that may be present in the exposed human population.

The toxic substance assessment process sketched above is a highly complex exercise for which no one definitive model exists, nor is remotely likely to be developed. This very individualized process is undertaken by many regulatory agencies on a continual basis for the purpose of deciding in specific situations what the most appropriate control or remedial measures are. In view of the plethora of toxic substances in the environment, it can readily be seen from even this very general outline of the purposes and elements of the assessment process that our capacity to deal with toxic substances is severely strained.

The third and final dimension of the unregulated toxic substances problem is the regulatory and control programs designed to manage toxic substances. In this country there is an array of programs in all media under a variety of environmental legislation designed at least in part to address toxic substances from the time of their proposed introduction into commerce,

through their use, to the time of their disposal or discharge. Federal laws addressing toxic substances in the environment include the TSCA, FIFRA, CAA, CWA, SDWA, RCRA, and CERCLA. In practice, the various programs under these laws have been able to address toxic substances with varying degrees of effectiveness.

In the air medium, toxic air emissions and their potential health effects are a growing concern in Region V due to the concentration of potential industrial and hazardous waste sources and their coincident proximity to population centers. At present, toxic air pollutants are regulated under provisions of the CAA, in particular the National Emission Standards for Hazardous Air Pollutants (NESHAP). Despite concern about the magnitude of the health and environmental impacts of toxic air pollutants and a substantial expenditure of effort to date, NESHAP regulations have been promulgated for only four substances. They are vinyl chloride, beryllium, asbestos, and mercury. Lead is also regulated as a criteria pollutant. In addition, just three other substances, benzene, radionuclides, and inorganic arsenic, have been designated as hazardous. Thirty-seven chemicals are on a list that was undergoing assessment for possible listing. No regulations for them are proposed. The present scope of Federal regulatory control over hazardous air emission is clearly very limited. As a result of the complex and accordingly, expensive process for listing toxic air pollutants, not to mention setting scientifically and legally defensible control standards, the efficacy of the powers under the CAA are correspondingly limited.

Furthermore, although it is known that controlling particulates and volatile organic compounds will generally limit associated toxic emissions, there are limits on the regulatory agencies' abilities to use pollutional surrogates to control toxic air emissions.

Additional air toxicants authorities, however, exist at the state level. State agencies are developing emission inventories, defining potential problems and creating regualtory programs. A current initiative is an effort to define a limited number of sites and facilities around the Region upon which Federal and state resources may be focused.

In the water medium, toxic substances under the CWA are controlled primarily through wastewater effluent limitations derived from technology-based evaluations and water quality standards. The information bases for these programs are generated through the discharge permitting and compliance process, National Effluent Guidelines development, environmental fate pollutant monitoring, and research on toxic pollutants.

The National Pollutant Discharge Elimination System (NPDES) permit program generates limited toxic data as well as information on flow, plant configuration, and effluent concentration. Much of the information on toxicants was generated before 1977 and is now being updated for significant critical facilities.

All plants (some 2,300 in USEPA Region V alone) in some 30-35 industrial categories are currently required to conduct limited chemical evaluations or have evaluations conducted on their behalf for the 126 priority pollutants published by the USEPA. In addition, the industries are required to provide updated raw material, production, and discharge information. The states and

Region are requiring that a more select group of industries, with the highest potential for the discharge of toxicants, conduct special biological, chemical, treatability, and manufacturing process evaluations to aid in determining limitations for toxicants and other parameters of concern. This evaluation and limitation development process is designated to balance human health and environmental risks with treatability and the economics of control.

Overall product use and environmental fate data-gathering are centralized in National Effluent Guidelines and water quality criteria development. Most fate and risk studies have been within the purview of the USEPA Office of Research and Developments' national laboratories. Unfortunately, the data base is generally too fragmented to identify trends in large categories of chemicals.

Limited environmental contaminant trends for a selected number of toxicants, particularly pesticides, have been developed for a number of locations in Region V. However, broad-scan analytical capability for a large number of other toxicants is just being implemented, particularly for fish flesh and sediment surveys. The fish flesh and wildlife contaminant trend monitoring programs have been largely limited to sporadic reviews every few years. Most NPDES permit data are updated primarily through the permit reissuance process cycle of 3-5 years. However, the manufacturing information available from the TSCA inventory for identifying potential toxic discharges is becoming outdated, as most of it was gathered in 1977. The most significant new source of toxicant production and release information is expected to be the locally developed detailed industrial inventories from implementation of the pretreatment regulations for industries discharging to municipal treatment plants and revised NPDES applications. The municipalities and states are also now starting to evaluate and control toxicants which have and are contaminating municipal sludge. In some instances, contaminant sludge has been used by home gardners to raise vegetables and can have resulted in significant health problems.

The information utilized in the CWA toxicant comtrol programs is usually sufficient to perform first-cut analysis and problem identification. However, information is not as yet available on product contaminants and by-products present in the wastewater. This type of information requires intensive and time-consuming reviews of target facilities.

Treatability and potential water impacts provide the technical basis for assessments. These assessments are formalized and are uniform in approach at the national level, but are applied to only a limited number of parameters. Furthermore, the degree of control specified by these assessments is affected

by industrial sector economics, successful court challenges, and non-uniform timing in implementation of controls. National, state, and regional formal assessment procedures for toxicants, other than guideline parameters, are mostly in the initial stage and are aimed primarily at control level specification for industrial facilities. The assessment process, due to extensive delays in developing Best Available Technology Economically Achievable (BAT) Effluent Guidelines, has resulted in significant delays in implementing toxicant controls. Moreover, many of the BAT development efforts are focusing only on a limited number of pollutants of national interest, primarily the heavy metals. The development of toxicant effluent controls for other toxicants, therefore, must be based on "best professional judgement" for each facility, a condition requiring extensive staff work. Moreover, even where the criteria development has resulted in a strong data base for toxicant control under water quality standards, the site specific nature of the control again requires intensive specialized regulatory development.

The CWA authorities seem adequate to support the necessary toxicant control programs. However, the delays in implementing Best Available Technology Currently Available (BAT) requirements for toxic substances, the increasing reliance on resource intensive BPJ approaches in a time of shrinking resources, the need to undertake time-consuming site-specific criteria modifications, and the intensive water quality standard-setting process limit the scope and effectiveness of the CWA tocicant control program.

In the water supply problem area, the program does not seek to control toxicants and their use in the environment, but rather assures that the public does not consume toxic substances in its drinking water. At present, maximum contaminant levels (MCL's) have been set for only eight constituents (i.e., heavy metals), nitrate, flouride and six pesticides formulations, in addition to several non-toxicant contaminants. Clearly, the regulatory scope is limited relative to the number and volume of potential toxic contaminants of groundwater and drinking water. In view of the complexity and expense associated with toxic substances control in groundwater and drinking water, Region V is increasingly concerned with the actual or potential presence of unregulated volatile synthetic organic chemicals in drinking water, toxic chemical degradation of groundwater from a variety of agricultural and industrial sources, contamination from in-place toxicants, and the adverse impacts of toxic-contaminated municipal sluoge. Limited capacity to sample and analyze, as well as the lack of scientifically sound risk assessments, result in insufficient knowledge to address the full extent of toxic substance pollution problem in ground water and drinking water.

In the hazardous, or land, media, which is the focus of the FIFRA program and the newer Agency programs under TSCA, RCRA, and CERCLA, the variety and extent of the unregulated toxic substances problem is most evident. Under the Toxic Substances Control Act (TSCA), the Region has utilized the 1977 inventory of chemical production to identify manufacturers of various categories for toxic

chemical and potential problem areas and geographic concentrations of major chemical manufacturers. Unfortunately, this TSCA inventory is outdated (1977 data), unsuitable for trend analysis (no automatic updating mechanism), and limited with respect to manufacturer claims of confidentiability. These limitations adversely affect the Region's ability to base inspectional and enforcement priorities on timely, scientific information.

TSCA also provides for the assessment of chemicals being manufactured which are considered to have potential risks to human health or the environment. This assessment is conducted using two methods. First, manufacturers are required to supply toxicological and environmental data on the chemicals produced. Then, under the direction of the Interagency Testing Committee (ITC), chemicals are recommended to the USEPA for regulatory action. Under this process, chemicals are assessed on the basis of production, volume, environmental release, and toxicological data. The ITC has established formalized methods for the review of chemicals during manufacture. However, the USEPA has experienced difficulty in responding promptly to the ITC's recommended priority chemical lists due to the now familiar problem of time consuming scientific hazard assessments. In this often times arduous process, the Agency must evaluate large amounts of toxicological data and, before restricting a chemical, must establish the degree of risk and the impact of possible regulatory actions. The difficult and resource-consumptive assessment requirements under the TSCA, while certainly essential from the persective of scientific soundness, are nonetheless extremely difficult to meet in a truly comprehensive manner. The result is that toxic substances in the environment are not regulated. While all chemical substances will likely not require restriction, our limited capacity to identify with certainty those substances is an emerging concern in Region V. The states have only limited ability to complement federal assessment efforts for several reasons: formalized, uniform testing procedures are at best remotely possible due to variations in state capabilities; state program support under the TSCA will soon cease; and the extremely specialized nature of some of the assessment procedures create scale economics and efficiencies realizable only in a national-level program.

In the pesticides area, much of the above discussion concerning activities under the TSCA applies. The FIFRA controls pesticide manufacturing, packaging movement in commerce, disposal, and use by requiring that all products (approximately 35,000) be registered. Product registration is a detailed process requiring the submission of data which addresses at a minimum product efficacy, chemistry, environmental fate, toxicology, residue chemistry, and ecological effects. Similar to TSCA, there have been delays in the complicated processes of product registration and classification, although recent efforts to streamline the procedures have resulted in fewer delays. However, these streamlined procedures must be sufficiently vigorous to prevent the introduction of products which pose unreasonable risk of injury to human health and the environment. Another area of concern relative to unregulated pesticides involves the need for generally available, adequate disposal facilities and techniques for pesticides containers and application wastes. Simply stated, there is a growing concern in this Region of Heavy pesiticides use about the proper disposal of pesticides in accordance with the regulations. This problem is in fact one aspect of the general hazardous materials disposal issue.

The real issues concerning unregulated toxic substances in the hazardous waste areas involve the long-term adequacy of environmentally-sound disposal capacity; the unregulated disposal of hazardous wastes by small-quantity generators; the proper listing and regulation of hazardous substances, such as dioxin; the control of hazardous wastes in recycling operations; and the control of hazardous wastes in blended fuels for use in boilers or heat-recovery units. One other major concern involving unregulated toxic substances relates to the extent to which the individual Superfund sites will be cleaned-up. This is commonly known as the "how clean is clean" issue.

REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT B

WATER

TOXICS - SAUGET, ILLINOIS

Geographic Location and General Description

The Sauget Area consists of the City of East St. Louis, and the Villages of Sauget and Cahokia. As noted on the location map (Attachment 1), these communities are all bounded by the Mississippi River on the west. It is generally known that this area is underlain with sand and that groundwater flow is toward the Mississippi River. Groundwater within this area is not used for drinking water purposes. Potable water in the area originates from the Mississippi River, upstream of the Village of Sauget.

There are many large industries in this area, particularly within the Village of Sauget. The area contains several landfills which are now closed. Since the 1950's, several of these landfill sites received large quantities of various chemical wastes. Dead Creek is a small intermittent stream that flows through the Sauget Area. The Illinois EPA has documented that the creek bed sediments of this waterway are highly contaminated from surface water discharges and the probable dumping of chemical wastes.

Sauget Sewage Treatment Plant and Mississippi River Impact

The Sauget STP serves approximately 200 local residents plus the industrial wastewater of several large industries including the Monsanto Krummrich Plant. The STP is a physical-chemical plant described in Attachment 2. The Sauget plant treats approximately 8 million gallons a day of a wastewater that is laden with organic chemicals. The results of U.S. EPA sampling on March 2-3, 1982, revealed the influent and effluent to contain several organic chemical compounds which are not removed, to any degree, by the STP. The location of the STP is identified in Attachment 4.

The environmental impact of the present STP discharge on the Mississippi River is not well defined. Organic chemicals, known for their persistent and bioaccumulative characteristics, dilute down to below analytical levels of detection due to the large dilution volume of the river. In November 1982, the U.S. EPA Water Division conducted a caged fish study in the Mississippi River upstream and downstream of Sauget. The intent of this study is to define, under controlled conditions, any bioaccumulation of organic compounds in the study fish. Also, some native fish are to be analyzed as a part of this study. There is known to be some commercial fishing in the river, south of Sauget. The fish are generally sold in local markets for human consumption. The results of this study are expected to be complete by mid-1983.

Groundwater Contamination

Contamination of the groundwater appears to be the result of the numerous landfills in the area. A diagram showing these past dumpsites is described by Attachment 4. On March 3, 1982, U.S. EPA sampled several wells in the Sauget Area. The results are listed in Attachment 5. Additionally, low levels of some organic compounds were found in the groundwater, in particular, bis (2-ethyl hexyl) phthalate. Groundwater in the Sauget Area is not used as a drinking water source, but is used by some residents as a supplemental water source for watering their vegetable gardens.

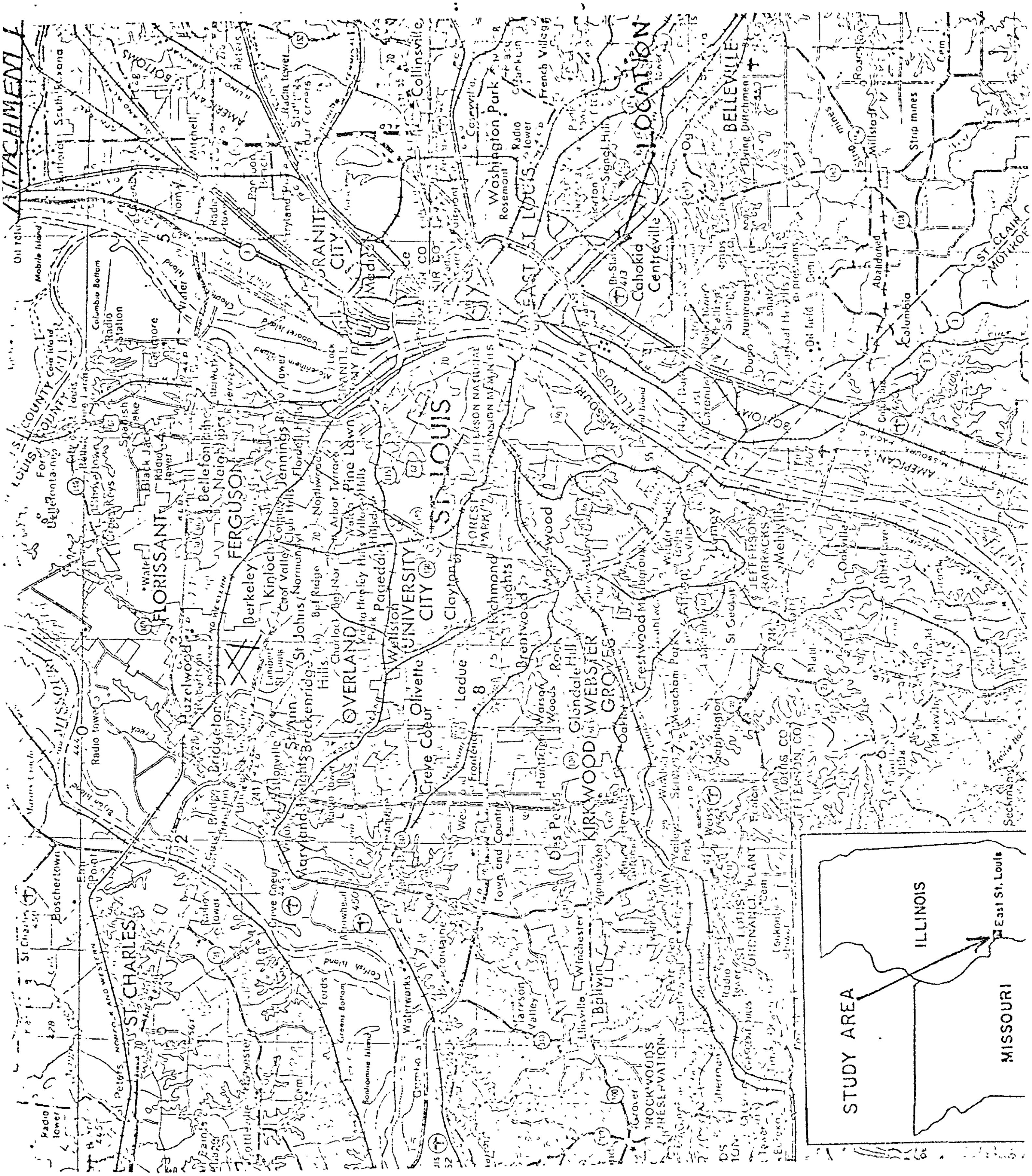
Proposed Remedial Action

The Sauget STP effluent will be further treated by the American Bottoms Regional Treatment Plant upon its completion in 1985-1986. That treatment facility will employ the use of powdered activated carbon to adsorb the organic chemical wastes before discharging to the Mississippi River. Waste Management Division has evaluated and calculated MITRE scores on the inactive landfills and dumpsites in the Sauget Area. Due to the relatively low MITRE scores, to date, only the Dead Creek area has received remedial improvement measures. This has consisted of enclosing the Dead Creek with chain link fence near a residential area.

The construction and operation of a Regional Treatment Plant is a longer term solution to an environmental problem that has been in existence for many years. Alternative shorter term solutions could consist of reducing the quantity and types of chemical wastes to the Sauget STP by implementing process controls and modifications at the contributing industries. Additionally, chemical wastes from the contributing industries could be pretreated on-site by the industry. Neither alternative has received a favorable reception from the industries of the Sauget Area.

Further groundwater studies are necessary to define the full extent of environmental contamination caused by the landfills and dumpsites of the Sauget Area. These studies are then condensed into a Remedial Action Master Plan (RAMP) which defines what remedial actions are necessary to achieve a specified level of cleanup and the probable cost of such actions. Such remedial actions are longer term in nature. Short term immediate action should consist of advising the area residents of the limitations on the use of groundwater. Active landfills in the area are regulated by State and Federal law. The deposition of wastes in the landfills is restricted to prevent further degredation of the groundwater.

Attachment 1



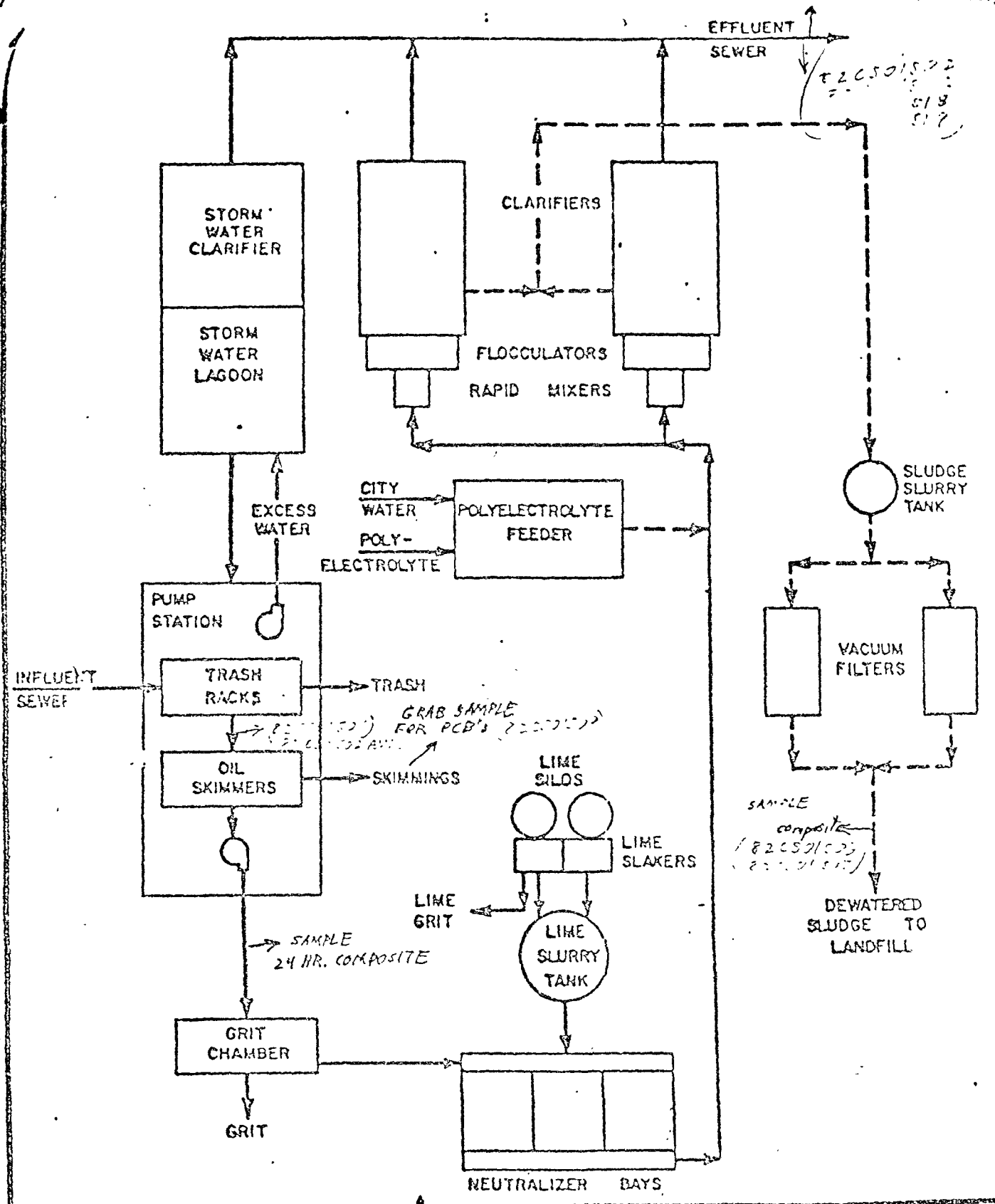


FIGURE 1

VILLAGE OF SAUGET

PHYSICAL – CHEMICAL

SEWAGE TREATMENT PLANT

Attachment 3

DATA TABULATION OF LABORATORY RESULTS FOR NON-METAL PERMIT PARAMETERS
LOCATION: Sauget POTW
SURVEY DATE: March 2-3, 1982
(All Results in mg/l Unless Otherwise Noted)

CDO Sample Number 82CS01	S01 influent	S02 effluent	S03	R04	Permit Limit
Flow (Avg) MGD	10.38				
pH(pH units) Field		7.9-9.56			6-9
Suspended Solids	34	10			120*
Suspended Solids kg/day		400			5907*
BOD	210	126			332*
BOD kg/day		4950			16342*
Cyanide	<.01	<.01	<.01	<.01	0.2**
Phenolics mg/l	1.3	1.6		<.005	19*
Phenolics (kg/day)		68.9			770*
Fluoride	1.6	1.1			
Oil & Grease		190			58*
Oil & Grease (kg/day)		7470			2347*

*30 day average
**Daily maximum

Attachment 3

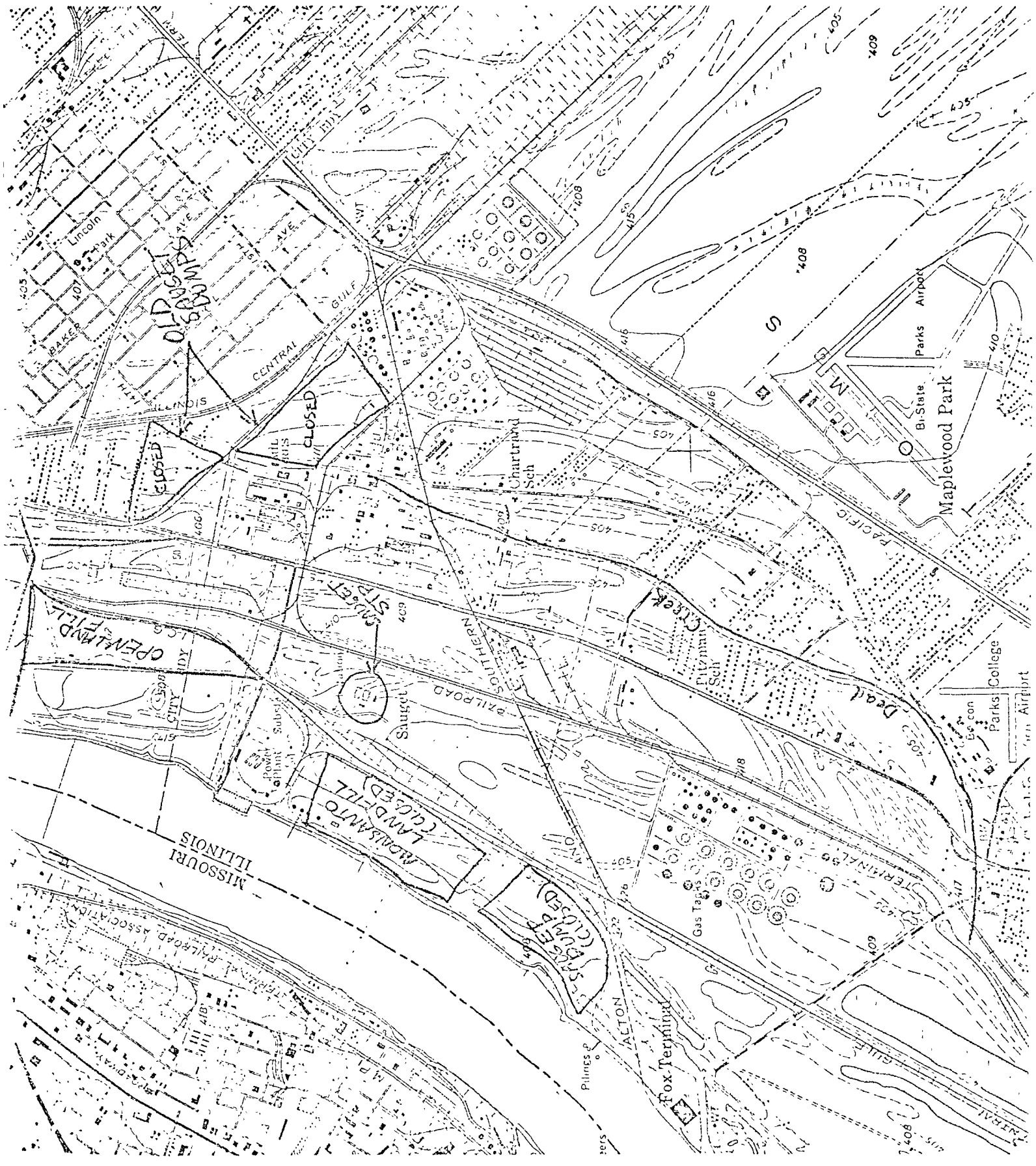
DATA TABULATION OF LABORATORY RESULTS FOR METALS
LOCATION: Sauget POTW
SURVEY DATE: March 2-3, 1982
(All Results in ug/l Unless Otherwise Noted)

Attachment 3

CDO Sample Number	Influent S01	Effluent S02	Effluent S03	Effluent S18	Effluent S19	Blank R04
2,4,6-trichlorphenol	370	510	740			ND
2-chlorophenol	57	170	200			ND
2,4-dichlorophenol	160	510	720			ND
2-nitrophenol	1400	2300	4500			ND
4-nitrophenol	12000	4000	10000			ND
phenol	140	70	140			ND
bis(2-chloroethyl)ether	3600	ND	ND			ND
1,2-dichlorobenzene	96	1100	990			ND
isophorone	43	ND	ND			ND
butyl benzyl phthalate	370	1100	680			ND
aldrin	24.2	13.1	ND			ND
alpha BHC	35.1	38.3	41.0			ND
*beta-BHC and/or heptachlor	1000	1061	635			ND
gamma-BHC	72.3	72.1	65.4			ND
1,4-dichlorobenzene	110	500	450			ND
naphthalene	ND	170	190			ND
bis(2-ehtylhexyl)phthalate	<10	97	ND			ND
di-n-butylphthalate	ND	32	26			<10
di-n-octylphthalate	<10	12	ND			ND
benzene		17000		24000	14000	ND
chlorobenzene		3600		5400	3300	ND
chloroform		490		620	670	ND
ethylbenzene		360		620	360	ND
methylene chloride		1500		750	930	34
toluene		1600		1300	600	ND

*These two compounds coeluted in the contractor's spike analysis. Therefore, we must assume that the company can not be differentiated in this sample.

Attachment 4



Attachment 2

DATA TABULATION OF LABORATORY RESULTS
LOCATION: Ground Water Monitoring, Sauget, Illinois
SURVEY DATE: March 3, 1982

Site Number 82CX01		S01	S02	S03	S04	S05	S06	R09
Aluminum	ug/l	<200	410	390	<200	940	1200	<200
Arsenic	"	11	<10	<10	29	<10	<10	<10
Barium	"	<100	<100	<100	<100	<100	<100	<100
Boron	"	10500	11000	8000	1800	140	110	<100
Cadmium	"	4.2	14	31	5.3	<1	2.8	<1
Chromium	"	12	<10	<10	<10	<10	<10	<10
Cobalt	"	62	70	82	95	<50	<50	<50
Copper	"	65	<50	<50	<50	<50	<50	<50
Iron	"	65000	31000	38000	28000	530	250	<50
Lead	"	570	97	74	9	11	10	<5
Managmese	"	1600	1100	1500	5100	460	80	<15
Mercury*	"	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Nickel	"	<40	<40	<40	<40	<40	<40	<40
Selenium	"	<2	<2	<2	<2	<2	<2	<2
Silver	"	<10	<10	<10	<10	<10	<10	<10
Tin	"	<20	<20	<20	<20	<20	<20	<20
Vandium	"	<200	<200	<200	<200	<200	<200	<200
Zinc	"	107000	109000	40000	1900	260	350	<10
Antimony	"	<20	<20	<20	<20	<20	<20	<20
Thallum	"	<10	<10	<10	<10	<10	<10	<10
Beryllium	"	<5	<5	<5	<5	<5	<5	<5
Mercury**	"	0.1	0.4	0.4	0.2	0.1	<0.1	<0.1

rnia Analytical Laboratory Test **CRL Laboratory Test. CRL mercury result is considered redible because analysis was performed within the required holding time.

Attachment 3

82

DATA TABULATION OF LABORATORY RESULTS
LOCATION: Ground Water Monitoring, Sauget, Illinois
SURVEY DATE: March 3, 1982

Sample Number 82CX01		S07	S10	S11	R12
Total Aluminum	mg/kg	750	600	430	<10
" Arsenic	"	1.3	1.0	<1.0	<1.0
" Barium	"	80	80	80	<10
" Boron	"	<10	<10	<10	<10
" Cadmium	"	1.06	1.64	0.29	<0.1
" Chromium	"	2.2	<1.0	<1.0	3.2
" Cobalt	"	<5.0	<5.0	<5.0	<5.0
" Copper	"	16	24	13	<5.0
" Iron	"	340	360	240	<5.0
" Lead	"	45	20	25	<0.5
" Managmese	"	120	630	134	<1.0
" Mercury	"	<0.02	<0.02	<0.02	<0.02
" Nickel	"	6.5	5.5	4.0	<4.0
" Selenium	"	<0.2	<0.2	<0.2	<0.2
" Silver	"	<1.0	<1.0	<1.0	<1.0
" Tin	"	<2.0	<2.0	<2.0	<2.0
" Vandium	"	<20	<20	<20	<20
" Zinc	"	96	77	130	<1.0
" Antimony	"	<2.0	<2.0	<2.0	<2.0
" Thallum	"	<1.0	<1.0	<1.0	<1.0
" Beryllium	"	<0.5	<0.5	<0.5	<0.5

TOXICS - WATER - DIOXINS IN MIDLAND, MICHIGAN

The Michigan Department of Natural Resources (MDNR) and Region V, beginning in 1981, cooperated in the development of a wastewater characterization study for the Dow Chemical Company facility in Midland, Michigan. The study was to identify and quantify discharges of contaminants with special emphasis on toxic substances. The data obtained was to be utilized, along with additional engineering and toxicological analyses, in the development of Dow's next NPDES permit. A preliminary report was prepared in March, 1983. More than 40 toxic organic chemicals were identified and quantified in the main process wastewater outfall, most in the low part per billion range. Discharge of toxic organic pollutants from the plant is estimated to exceed 6 tons per year. More than 30 organic chemicals were found in whole fish exposed to the main outfall plume at levels ranging from a few parts per billion to over 1 part per million. These chemicals included chlorinated benzenes, phenols, and pesticides. A number of dioxin isomers were found in the discharges and the caged fish. The most toxic chlorinated dioxin isomer, 2,3,7,8-tetrachlorodibenzo-p-dioxin, was found at a level of 50 parts per quadrillion in the main process effluent and at 100 parts per trillion in whole fish exposed to the effluent. The complete results from the fish bioaccumulation study are not yet available. The remaining analyses will be completed this summer.

The Region continues to work closely with Michigan to study this problem and that of other toxics in the environment. The cost and complexity of analytical procedures and the need to perfect analytical methods for sample analysis in the sub-parts per trillion range poses major Regional and National problems. This is a limiting factor to the number of samples that can be analyzed. The development of a study plans and associated technical protocols to perform credible and scientifically sound studies is imperative.

*Aldicarb (Temik) Contamination of Ground Water in Wisconsin

Introduction

Aldicarb is the active ingredient found in Temik 15 G and Temik 10 G, systemic carbamante pesticides manufactured and marketed by the Union Carbide Agricultural Products, Inc. ("Union Carbide").

In 1974, at the time of aldicarb product registration by EPA, it was expected that, under normal conditions of use, aldicarb would fully degrade in the soil, and therefore, would not reach any potential source of drinking water, such as subsurface water. However, under normal use conditions, in certain environmental circumstances, aldicarb residues have leached into the groundwater before being fully degraded in the soil. This characteristic of aldicarb was discovered in Suffolk County, New York (Long Island) in 1979 where high rates of aldicarb were used on potato fields. Groundwater sampling for aldicarb residues was then initiated in other states where the pesticide is used under similar conditions, Wisconsin being one of those states.

In 1980, 1981 and 1982 aldicarb was confirmed to be present in ground water samples collected in several Wisconsin counties (See enclosure1). In some samples, the amount of aldicarb detected exceeded 10 parts per billion (ppb), which is the drinking water guideline accepted by EPA, the Wisconsin Department of Health and Social Services and the Wisconsin Department of Natural Resources as the threshold action level for public health purposes. Therefore, the presence of aldicarb in drinking water at levels above 10 ppb is considered a threat to public health.

Location and Severity of the Problem

Although indications are that aldicarb applications in Wisconsin were made in compliance with pesticide rules and according to product label directions, aldicarb has leached through soil and into the groundwater in some areas of the state. Union Carbide first confirmed findings of aldicarb in Wisconsin ground water in 1980. In 1981, Union Carbide, the University of Wisconsin, the Wisconsin Department of Natural Resources, and the Portage County Community Human Services Department participated in extensive cooperative program of well water sampling and analysis for aldicarb.

Wisconsin water sampling sites were initially selected based on land use patterns and soil and groundwater characteristics. Sampling concentrated on potable water wells in those areas thought to most suscepitable to groundwater contamination by aldicarb. "High risk" sites

chosen for sampling were those where: aldicarb was used the two preceding years; there is sandy, acidic soil with little organic matter preset; the water table is close to the soil surface; and irrigation is practiced. Based largely on these criteria, 363 well water samples were collected and analyzed from 10 counties in 1981. Of the 363 samples collected in 1981, 68 contained detectable levels of aldicarb (over 1 ppb). Of these 68 samples, 51 contained aldicarb residues of 10 ppb or less, 13 contained levels ranging from 11-30 ppb, and 4 contained levels greater than 30 ppb. The highest level of aldicarb in any one sample was 111 ppb. In 1981, aldicarb residues were detected in groundwater in Portage, Adams, Barron, Langlade, Marathon, Waupaca, and Waushara counties. No aldicarb was detected in samples taken in Juneau, Vilas, or Wood counties.

1982 sampling consisted of resampling, on a quarterly schedule, those wells in which aldicarb was previously detectd, and of expanding sampling to areas where aldicarb is used but which were not initially considered "high risk." Recent sampling efforts showed the presence of aldicarb in previously unsampled wells in Portage and Marathon counties. Samples taken from Jefferson, Waukesha and Sauk counties showed no aldicarb present. No trends in aldicarb behavior in Wisconsin's groundwater are apparent at this time from rearch that is underway.

Of the 505 different wells sampled in 1981 and through May, 1982, 93 wells sampled contained detectable levels of aldicarb. Thirty-four of the 93 wells sampled contanied detectable levels of aldicarb over 10 ppd at one time or another. The analysis of samples collected between August 27 and September 27, 1982 by DNR and the Portage County Community Human Services Department shows that 27 different potable water wells in 5 counties (Adams, Portage, Marathon, Langlade and Waushara) contain aldicarb at levels above 10 ppb. (See enclosure 3).

Analysis and Discussion of Problem

Characteristics, Uses, and Effects of Aldicarb (Temik)

Temik 15 G contains 15% aldicarb by weight and has been used in Wisconsin, primarily on potatoes, since 1975. It is thought that using Temik for the control of potato pests rather than alternative pesticides provided wider spectrum of pest control and greater persistence during the growing season. Temik 10G contains 10% aldicarb by weight and is registered for specific uses in greenhouse and on outdoor nursery planting. In 1982 agricultural uses were added to the Temik 10G registration and label. As a granular pesticide formulations Temik is incorporated into the soil. Temik is effective as an insecticide because it inhibits the production of acetylcholinesterase, an enzyme which

mediates neurological transmission at nerve/muscle junctions This effect has been observed in mammals and other higher species, as well as in insects. Aldicarb has a high acute toxicity and is both dermally and orally toxic to humans. Aldicarb is not known to be a carcinogen, mutagen, or teratogen.

Actions Already Taken to Minimize the Potential for Aldicarb Contamination of Ground Water.

State Emergency Rule

Prior to the 1982 planting and growing season, the Wisconsin Department of Agriculture, Trade and Consumer Protection DATCP adopted a temporary emergency rule to restrict the use of aldicarb in Wisconsin. The rule was published on March 12, 1982 with a scheduled effective date of March 15. The rule remained in effect until July 13, 1982, when it expired automatically.

Voluntary Product Label Changes

In addition to the DATCP's action, Union Carbide submitted 5 changes to the Temik labels to EPA on March 11, 1982. These changes, approved by EPA on March 15, 1982, and applicable today, were designed to reduce the likelihood of aldicarb contamination in groundwater by lessening the amount of aldicarb available for leaching, and include the following changes for use of Temik 15G in Wisconsin. Under s. 94.70, States., no person may apply a pesticide in a manner inconsistent with label directions.

The 5 label changes were estimated by Union Carbide to reduce the potential for aldicarb reaching groundwater. Postponing the date of application permits soil temperatures to increases approximately 10 degrees, thus increasing the activity of microorganisms. This may promote more rapid breakdown of the product in the soil, before it leaches to groundwater. A later application date will also avoid 6-8 inches of water infiltration brought by early rains, and application made above the root system to an established plant will increase the amount of pesticide taken up into the plant, therefore reducing the amount available to potentially migrate into groundwater.

Reducing the rate of application reduces the amount of aldicarb available to reach ground water. Changing from an annual application to one application every other year reduces by 50% the amount of aldicarb applied to the soil.

Only certified applicators are able to apply Temik in Wisconsin because of its restricted-use classification. This, and the addition of an environmental hazard statement, help insure that applicators are aware of the product's potential for leaching into groundwater.

Union Carbide has stated to Wisconsin's Pesticide Advisory Council that the label revisions would lessen the amount of ground water contamination. However, no data are currently available to support the position that label changes alone will prevent aldicarb from leaching to subsurface water.

Actions Under Consideration by EPA, State and Others

Proposed State Rule

It is the State of Wisconsin's position that use of aldicarb in compliance with product labeling, even the 1982 label changes, has not yet been shown to prevent the pesticide from leaching into groundwater. Even if the labelling changes are successful in reducing new contamination, any additions may be unacceptable when combined with high existing accumlations from former years' applications. In areas where significant contamination has already occurred, localized use moratoriums may be necessary to prevent aggravation of existing problems, and to reduce contamination to "acceptable" levels. Therefore, the Department of Agriculture, Trade and Consumer Protection is in the process of promulgating an amendment to Ch. Ag 29, Wisconsin Administrative Code, which will place special restrictions on aldicarb use in the State. The rule is expected to be in effect for the 1983 growing season.

Central Sands Study

The Central Sands study is being completed by the Wisconsin Department of Natural Resources and was funded by a 208 Water Quality Management grant. It will provide further documentation of the ground water problems in the Central Sands Area and recommendations for potential solutions.

EPA Review of Health Advisory Limits

At the request of Union Carbide, EPA Headquarters is currently reviewing the SNARL (Suggested No Adverse Response Level) for aldicarb to determine whether this drinking water health advisory limit should be changed based on new information.

Other Potential EPA Actions

Other actions which can be taken by EPA at this time are limited. If contamination from this source continues to occur at an unacceptable level in spite of new states rules and label changes, consideration could be given by EPA and the State to withdrawing registration of the pesticide. Since the environmental and economic consequences of such an action have not been fully evaluated, an in-depth study would have to conducted before pesticide cancellation would occur.

Enclosure 1:
Preliminary Draft of:
Source: Central Sands Study, Wisconsin Department of Natural Resources

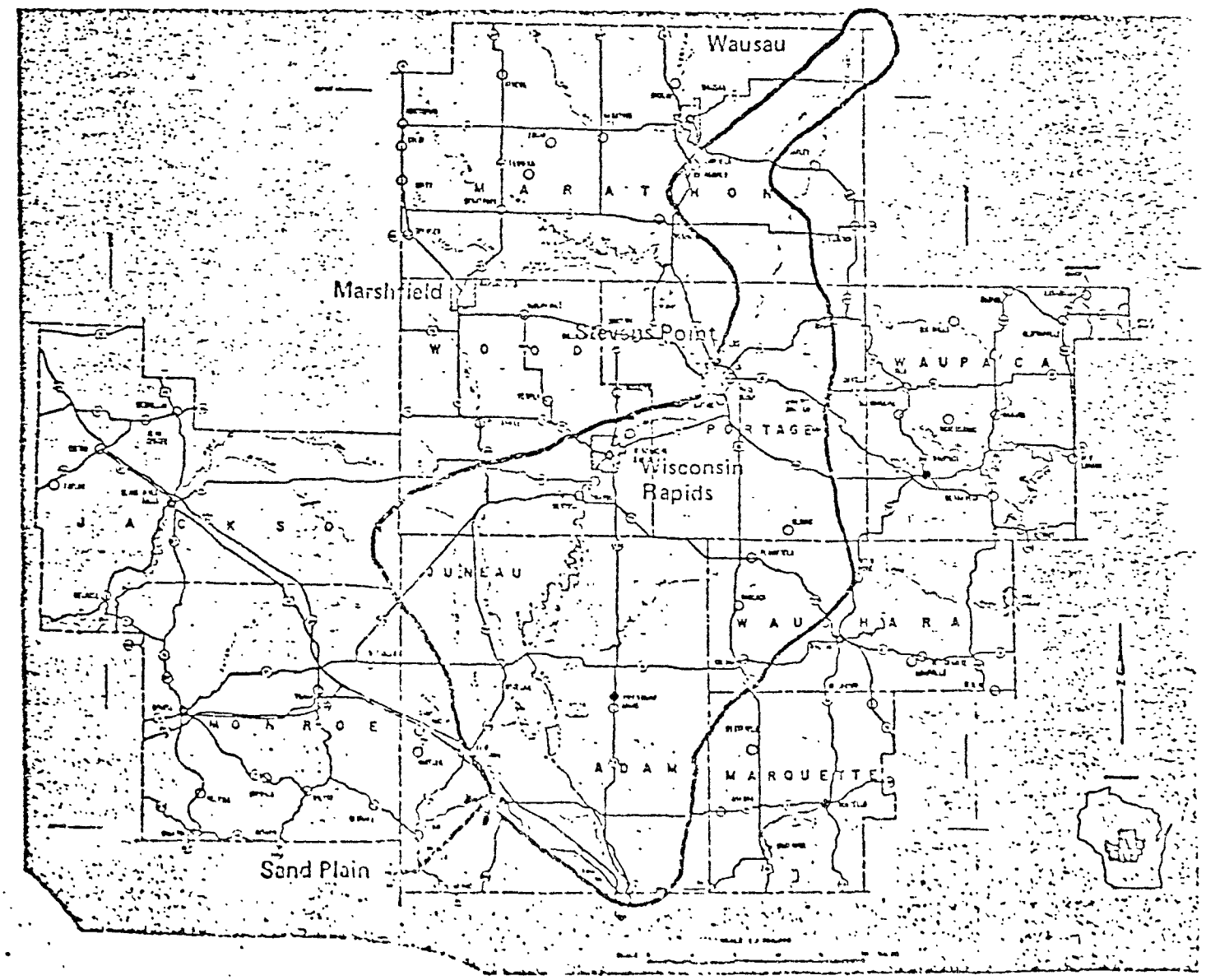


Figure 1. Map of the 10 counties of central Wisconsin and the approximate boundaries of the Sand Plain (interpreted from numerous sources).

Enclosure 2:
Source: Environmental Statement on proposed rule relating to special restrictions on the use of pesticides containing aldicarb Wisconsin Department of Agriculture Trade and Consumer Protection.

Appendix D

Results of Analyses of Potable Water Wells in Wisconsin for Aldicarb Residues - 10/30/81

	Total Wells	ND	<10 PPB	11-30 PPB	>30 PPB
Portage	189	146	28	11	4
Adams	40	37	2	1	0
Barron	15	11	4	0	0
Juneau	5	5	0	0	0
Langlade	30	26	4	0	0
Marathon	11	6	4	1	0
Vilas	10	10	0	0	0
Waupaca	8	7	1	0	0
Waushara	45	42	3	0	0
Wood	5	5	0	0	0
Totals	358	295	46	13	4

Enclosure 3:
Source: Environmental Statement on proposed rule relating to special restrictions on the use of Pesticides containing aldicarb Wisconsin Department of Agriculture Trade and Consumer Protection.

APPENDIX F

Summary of 133 Wisconsin Well Water Samples Collected Between August 27 and September 7, 1982.

Aldicarb detections grouped by ppb levels.
Repeat samplings shown as up, down, or even.

County	Number of Wells			Number of Wells by ppb Detect Level				Repeats		
	Total	New	Repeats	0	1-10	11-30	≥30	Up	Down	Even
Adams	14	1	13	11	2	1	0	2	3	8
Barron	10	4	6	7	2	0	0	0	1	5
Juneau	5	1	4	5	0	0	0	0	0	4
Langlade	8	2	6	5	2	0	1	0	2	4
Marathon	35	27	8	7	11	10	7	0	5	3
Portage	34	22	12	21	6	4	3	2	6	4
Waupaca	9	7	2	7	2	0	0	1	0	1
Waushara	10	5	5	8	1	1	0	2	0	3
Wood	8	5	3	8	0	0	0	0	0	3
	133	74	59	79	27	16	11	7	17	35

Great Lakes Water Quality Board

Report to the International Joint Commission

GREAT LAKES

EXCERPTED FROM:

1982 Report on Great Lakes Water Quality

November 1982
Windsor, Ontario

Appendix
Areas of Concern

INTRODUCTION

DEFINITION

An area of concern is identified when an Agreement objective or a jurisdictional standard, criterion, or guideline has been exceeded.

PROCEDURE

To identify, evaluate, and classify each area of concern from a technical perspective, all available environmental data - fish, sediment, and water - are used to provide as complete a description as possible. The 1978 Agreement objectives, along with jurisdictional standards, criteria, and guidelines, provide the basis for review and evaluation of these data. To the extent possible, the Board has established the human and environmental significance of the observed ecosystem quality. The Board has also established a cause-effect relationship between observed environmental conditions and the sources of environmental insult. This leads to a description of regulatory and remedial measures which have been implemented in response to the degraded environmental conditions in each area of concern.

Detailed information about present and proposed remedial programs is then evaluated, in order to decide whether environmental problems can be solved and beneficial uses restored.

DESCRIPTION OF CONCERN

In order to provide as complete a description and evaluation of all potential areas of concern, the following have been considered to the extent necessary and possible:

1. Compilation of surveillance and monitoring data for fish and other biota, sediment, water column, and air, in order to develop a description of present and historical conditions.

2. Comparison of these data with Agreement objectives and jurisdictional values in order to establish and substantiate duration and extent of any violations. Values for sediment and fish are given in Tables 6 and 7, respectively. Agreement objectives and jurisdictional values for water are presented where appropriate in the discussion of specific areas below.

3. Discussion of potential and observed environmental and human health effects and uses affected.

4. Information about biological community structure, e.g. types, relative abundance, and absolute abundance of benthos and fish. Consideration of how the community structure reflects and is a consequence of observed ecosystem quality and anthropogenic inputs. Discussion about the direction in which the community structure might

TABLE 6

GUIDELINES FOR CLASSIFICATION OF GREAT LAKES SEDIMENTS

(Concentrations in mg/kg dry weight)

	U. S. E P A			ONTARIO M O E
	NONPOLLUTED	MODERATELY POLLUTED	HEAVILY POLLUTED	
Volatile Solids	<50,000	50,000-80,000	>80,000	60,000
Chemical Oxygen Demand	<40,000	40,000-80,000	>80,000	50,000
Total Kjeldahl Nitrogen	<1,000	1,000- 2,000	>2,000	2,000
Oil and Greese	<1,000	1,000- 2,000	>2,000	1,500
Lead	<40	40- 60	>60	50
Zinc	<90	90- 200	>200	100
Mercury	<1	-	>1	0.3
Polychlorinated Biphenyl	<1	1- 10	>10	0.05
Ammonia	<75	75- 200	>200	100
Cyanide	<0.10	0.10- 0.25	>0.25	0.1
Phosphorus	<420	420- 650	>650	1,000
Iron	<17,000	17,000-25,000	>25,000	10,000
Nickel	<60	20- 50	>50	25
Manganese	<300	300- 500	>500	-
Arsenic	<3	3- 8	>8	8
Cadmium	-	-	>6	1
Chromium	<25	25- 75	>75	25
Barium	<20	20- 60	>60	-
Copper	<25	25- 50	>50	25

Discussion of the applicability and limitations of these guidelines is found in the report of the Dredging Subcommittee, "Guidelines and Register for Evaluation of Great Lakes Dredging Projects", 1982. The U.S. EPA guidelines are from the report, "Guidelines for Pollutional Classification of Great Lakes Harbor Sediments".

TABLE 7

MAXIMUM CONTAMINANT LEVELS IN FISH
(Concentrations in mg/kg wet weight)

PARAMETER	AGREEMENT OBJECTIVE (Edible portion)	U.S. FDA ACTION LEVEL (Edible portion)[b]	CANADA HEALTH PROTECTION GUIDELINE (Edible portion)
Aldrin/Dieldrin	0.3	0.3	-
DDT and Metabolites	1.0[a]	5.0	5.0
Endrin	0.3	0.3	-
Heptachlor/Heptachlor Epoxide	0.3	0.3	-
Lindane	0.3	0.3	-
Mirex	Substantially Absent	0.1	0.1[a]
Polychlorinated Biphenyls	0.1[a]	5.0	2.0[a]
Kepone	-	0.3	-
Mercury	0.5[a]	1.0	0.5
Toxaphene	-	5.0	-
2,3,7,8-TCDD (Dioxin)	-	0.00005	0.00002

a. Whole fish
b. Fillet with skin.

shift, and why, as a consequence of changes in ecosystem quality and in loadings.

5. Causes of violations. Specific point source dischargers and/or nonpoint inputs (including land runoff and the atmosphere) are named along with the loadings of substances for which violations are observed. If a violation is the result, in whole or in part, of a natural phenomenon, this is noted.

6. Remedial or corrective measures. Controls presently in place are described. These are evaluated to determine their present ability to control the release of a particular substance, the correctability of the problem, any modifications or additional measures required, and the probable cost. Observed and/or projected changes in ecosystem quality are described.

Consideration of the above information provides a common basis for selecting and evaluating areas of concern. This approach also establishes a comparable depth and breadth to the data base required to substantiate a concern.

EVALUATION OF ENVIRONMENTAL INFORMATION

Through consideration of the above information, the Water Quality Board prioritized areas of concern into two classes:

1. A Class "A" designation is assigned to those areas exhibiting significant environmental degradation, where impairment of beneficial uses is severe.

2. A Class "B" desingation is assigned to those areas exhibiting environmental degradation, where uses may be impaired.

The Board employed a set of guidelines to evaluate, from a technical perspective, available information for each area of concern, in order to prioritize that concern. The initial questions asked were:

1. Are one or more Agreement objectives or jurisdictional values violated?

2. Are values exceeded for a significant number of parameters? Which ones?

3. For each parameter, is the violation persistent over a number of repeat observations?

4. How many samples were taken? Over what period of time and what geographic area?

5. Is the value for each parameter exceeded by a significant amount?

6. How old are the data? Are such data still relevant?

A positive response to most of these questions would suggest a Class "A" or a Class "B" classification. A negative response would suggest that no further evaluation is required at the present time.

To further rank the relative severity of a problem, additional questions were considered:

7. Is a use impacted? Which one or ones?

8. Is the violation related to current discharges or historic accumulation?

9. Are there any transboundary implications?

If the responses were positive, then a Class "A" classification would be suggested.

Through consideration of available technical information, and through application of its professional judgement to help identify where the most severe problems exist, the Water Quality Board identified and reported on 18 Class "A" and 21 Class "B" areas of concern in its 1981 report. These 39 areas of concern are given in Table 8.

EVALUATION OF REMEDIAL PROGRAM INFORMATION

In this report, the Water Quality Board has evaluated specific information about present and proposed remedial programs, in order to decide whether environmental problems could be solved and beneficial uses restored. The Board considered:

1. The nature of the environmental problem.

2. The nature of the remedial programs in place or planned.

3. The schedule to initiate or complete these programs.

4. Factors which would preclude timely and satisfactory resolution of the problem and restoration of uses, including costs, technical considerations, and further definition of the issue.

5. Expected date by which the problems would be resolved and uses restored.

Based on its evaluation, the Board reached one of the following conclusions for each area of concern:

1. Remedial measures currently in operation will resolve the identified environmental problems and restore beneficial uses over the near term (5 to 10 years).

2. Remedial measures currently in operation will not resolve the identified problems and restore uses over the near term:

TABLE 8

CLASS "A" AND CLASS "B" AREAS OF CONCERN

CLASS "A"	CLASS "B"
LAKE SUPERIOR BASIN	
None	St. Louis River, Minnesota Thunder Bay, Ontario Nipigon Bay, Ontario Jackfish Bay, Ontario Peninsula Harbour, Ontario
LAKE MICHIGAN BASIN	
Fox River/Southern Green Bay, Wisconsin Milwaukee Estuary, Wisconsin Waukegan Harbor, Illinois Grand Calumet River and Indiana Harbor Canal, Indiana	Manistique River, Michigan Menominee River, Michigan-Wisconsin Sheboygan, Wisconsin Muskegon, Michigan White Lake, Montague, Michigan
LAKE HURON BASIN	
St. Marys River, Michigan and Ontario Saginaw River System and Saginaw Bay, Michigan	Spanish River Mouth, Ontario Penetang Bay to Sturgeon Bay, Ontario Collingwood, Ontario
LAKE ERIE BASIN	
St. Clair River, Ontario and Michigan Detroit River, Michigan and Ontario Rouge River, Michigan Raisin River, Michigan Maumee River, Ohio Black River, Ohio Cuyahoga River (Cleveland), Ohio Ashtabula River, Ohio	Clinton River, Michigan Wheatley Harbour, Ontario
LAKE ONTARIO BASIN	
Buffalo River, New York Niagara River, New York and Ontario Hamilton Harbour, Ontario	Eighteen Mile Creek, New York Rochester Embayment, New York Oswego River, New York Toronto Waterfront, Ontario Port Hope, Ontario Bay of Quinte, Ontario
ST. LAWRENCE RIVER	
Cornwall, Ontario-Massena, New York	None

A. However, additional programs and measures have been imposed, and these will be adequate and timely.

B. Additional programs and measures have been imposed, and environmental problems will eventually be resolved and uses restored. However, there is a long lag time between completion and operation of the remedial measures and the response of the environmental system.

C. Even though all reasonable remedial measures have been or are being taken, it is doubtful whether the environmental problems will be completely resolved and uses restored.

D. There are apparently no firm programs additionally planned that will resolve problems and restore uses.

3. Insufficient information has been received or is available in order to make a reasonable judgement as to whether control measures are adequate, or to decide when such measures may be required.

Presented below is information describing the environmental quality, discharges, and remedial measures for each Class "A" area of concern. This information has been updated and expanded from the material presented in Appendix II of the Board's 1981 report. Also presented below is the Board's evaluation of present and proposed remedial programs, and conclusions about whether and when environmental problems will be solved and beneficial uses restored.

The sources of information are given also below for each area of concern; the reader is referred to these for additional details. In general, the fish data for U.S. areas of concern were obtained from records compiled by EPA's Great Lakes National Program Office in Chicago. The sediment data for these areas were drawn primarily from reports prepared by the U.S. Army Corps of Engineers or by EPA; these reports are available through EPA's Great Lakes National Program Office. The U.S. water data are from STORET. The summaries of environmental data for Canadian areas of concern were provided by the Ontario Ministry of the Environment, Toronto. In addition, several jurisdictions have published special reports describing aspects of these areas in detail.

Information about Class "B" areas of concern is given in the Board's 1981 report. The Board has also compiled available information about other areas in the Great Lakes; this information is maintained at the Commission's Great Lakes Regional Office. These other areas are also being kept under close scrutiny and, where appropriate, the Board encourages the development of information to establish the nature and extent of uses impacted by discharges or by conditions existing within these areas.

FOX RIVER AND SOUTHERN GREEN BAY, WISCONSIN

ENVIRONMENTAL DATA

SEDIMENT

The sediments of the lower Fox River and the navigation channel leading out into Green Bay were examined in an intensive 1977 survey. Sediments in the river were grossly polluted, with high concentrations of volatile solids, chemical oxygen demand, total Kjeldahl nitrogen, oil and grease, mercury, phosphorus, lead, zinc, and ammonia. The sediments were also contaminated with PCB in excess of 10 mg/kg. Pollutant levels in sediments decrease away from the river mouth; at the end of the navigation channel, about 16 km from the river mouth, sediments are classified as unpolluted.

In the 1980 and 1981 sampling of sediments in the lower Fox River, all samples continued to show elevated levels of PCB - in the 4 to 6 mg/kg range - but down substantially from the greater than 10 mg/kg levels in 1977. The highest value was found at Highway 29 bridge in the city of Green Bay, 2.9 km above the river's mouth. DDT was also found at this location in the sediments and at another site closer to the bay itself.

FISH

Fish collected both upstream and at the mouth of the Fox River in 1978 and 1979 were analyzed for more than 20 metals and organic substances. Levels of PCB routinely exceed the U.S. FDA action level of 5.0 mg/kg; the maximum reported level is 90 mg/kg. DDT and mercury levels were below the FDA action level. Traces of pentachlorobenzene, α-BHC, HCB, nonachlor, pyridine carboxamide, tri-, tetra-, and pentachlorophenol, copper, and chromium have been reported.

PCB levels exceed the 5.0 mg/kg FDA action level in 18 of 30 fish samples collected from other tributaries to Green Bay: Duck Creek, Little Suamico River, Oconto River, Peshtigo River, Pensaukee River, Big Suamico River, and Red River. Subsequent sediment sampling, however, showed no detectable sources of PCB on these tributaries. Investigations also showed that the fish had migrated into the streams from the bay.

Fish sampling in 1980 in the 11.7 km sector below the DePere Dam found 8 of the 9 samples exceeding the PCB action level. PCB levels decreased above the dam with only one sample exceeding the action limit. In 1981, 9 of the 11 fish samples on the lower Fox River exceeded the PCB action level.

WATER

Five automatic monitoring stations are located in the 64.4 km (40.0 miles) stretch of the lower Fox River between the outlet of Lake Winnebago and the stream's mouth at Green Bay. These stations have been operational since 1971. They are polled hourly by computers providing electronically sensed data on four or five parameters including dissolved oxygen, pH, temperature, and specific conductivity. The data are stored directly in the computer for later statistical comparison and/or printed out on the teletype. Stations can be contacted manually at other times.

Additionally, since 1959 a monitoring station has been maintained near the mouth in the DePere-Green Bay section where samples are collected monthly for a broader range of chemical testing. Fish, sediment, and biological sampling is done routinely at the station too, but at less frequent intervals.

There is a series of dams in the lower Fox River but negligible storage capacity below Lake Winnebago. Tributary inflow to the Fox River in this section is of little significance. A stream flow gauging station is located at Rapid Croche Dam, near the mid-point of the lower Fox River section, and its flow is considered applicable throughout the stream sector. For 84 years of stream flow records through the 1980 water year, the average flow was 117 cubic metres per second (4,163 cubic feet per second) and the most recent determination of $Q_{7,10}$ (minimum 7 days flow in 10 years) is 27 m^3/s (950 ft^3/s).

Generally the worst stream conditions at the automatic monitoring stations have been found at Rapid Croche Dam. For comparison, data at that station for the month of August are shown for 1972, 1980, and 1981. The base year, 1972, was chosen because there was little advanced wastewater treatment along the Fox River at that time and flow and temperatures were similar to those in 1981.

RAPID CROCHE DAM - AUGUST MONITORING DATA

				Change	
	1972	1980	1981	1980 to 1981	1972 to 1981
Max. Daily Ave. D.O. (mg/L)	2.46	8.48	9.80	1.32	7.34
Min. Daily Ave. D.O. (mg/L)	0.00	6.63	4.43	-2.20	4.43
Ave. Monthly D.O. (mg/L)	0.74	7.73	7.74	0.01	7.00
Ave. Monthly Temp. (^0F)	76.2	75.0	76.5	1.5	0.3
Ave. Monthly pH	7.82	9.10	8.50	-0.6	0.68
Ave. Monthly Flow (ft^3/s)	2,334	3,804	2,046	-1,758	-283
Min. Daily Fow (ft^3/s)	1,335	1,598	1,556	-42	221

Total phosphorus analysis was conducted on the monthly samples collected in the Green Bay-DePere area. For calendar years 1972, 1980, and 1981 the respective total phosphorus averages were 0.20, 0.19, and 0.14 mg/L.

Ammonia can be detrimental to water quality in different ways. In its decomposition and stabilization, each part of ammonia requires 4.44 parts of oxygen for conversion to the end products of nitrates and water and, in so doing, can remove sizeable amounts of the water's dissolved oxygen. This stabilization of the nitrogeneous materials does not start to take place until most of the carbonaceous material is oxidized. Extensive mathematical modelling of the lower Fox River from the outlet of Lake Winnebago to the DePere Dam - 64.4 km to 11.7 km from the mouth - does not show that a significant problem exists or is likely. Studies of the downstream portion from the DePere Dam and in southern Green Bay are continuing.

Ammonia is toxic at fairly low levels. As the pH increase, the ammonium/ammonia equilibrium is shifted further toward higher concentrations of the latter. Algal activity can contribute to pH increases. Although no toxic problems have been observed, it is believed there is a potential for such near the mouth of the Fox River and for some distance out into Green Bay.

Nitrogen and phosphorus are considered as key nutrients in the eutrophication of a body of water. Nitrogen as ammonium, ammonia, and nitrates is directly utilizable by aquatic plants and algae, and eutrophic growths can result. Both Lake Winnebago and southern Green Bay have historic eutrophication problems, and the additional impacts from industrial and municipal discharges have not been determined with any certainty.

Significant sources of ammonium discharges occur in the Lower Fox River. Monthly average effluent concentrations of ammonium from municipal installations are about 15 mg/L at Appleton, 10 to 15 mg/L at Heart of the Valley, and 35 to 55 mg/L at Green Bay. Levels of 10 to 30 mg/L at Ford Howard Paper, Green Bay; 3 to 200 mg/L at Nicolet Paper, DePere; and 5 to 40 mg/L at Consolidated Papers, Appleton make up the list of significant industrial discharges of ammonia to the Fox River.

CAUSES AND REMEDIAL MEASURES

The lower Fox River has the largest concentration of pulp and paper facilities in the Great Lakes Basin. Sixteen mills discharge treated wastes directly to the Fox River while five other mills route all of their wastewaters to local municipalities for treatment and subsequent discharge to the same stream. Over the past decade, the industry has made significant reductions in their discharge of suspended solids and BOD as noted in the 1981 report of the Pulp and Paper Task Force to the Water Quality Board.

Municipal discharges are the second most significant source of pollutants on the lower Fox River. Besides handling all domestic wastes from their jurisdictions, the seven major municipal treatment systems treat the total wastewater loads from 5 pulp and paper mills (some of the waste streams from other mills provide their own treatment), and essentially all wastes from other wet industries such as those involved in meat, milk, and vegetable processing. All these municipalities provide phosphorus removal and, with the exception of Appleton, which was under construction, were meeting the 1.0 mg/L phosphorus discharge requirement. The 1981 average total phosphorus discharge for Appleton was 1.4 mg/L. The flow-weighted average for the other 6 dischargers was 0.55 mg/L.

A study to determine the phosphorus budget and dynamics for Green Bay, its relation to phytoplankton growth, and how the phytoplankton affects the oxygen resources versus the effects from organic loading is underway by investigators at Michigan Technological University, Houghton, Michigan.

Dischargers must meet permit requirements and are required to provide detailed records of treatment plant performance. For the 16 pulp and paper mills, this means a daily record of treatment plant performance and stream loadings. The mills have increased production by about 50% in the past 10 years. The population served by the municipal treatment plants has at least equalled the 7% county-wide gain shown in the 1970 and 1980 censuses and totals an estimated 240,000 to 250,000 people. The Wisconsin Department of Natural Resources' Lake Michigan District Office, Green Bay, has a team of experienced professionals on operation and maintenance to ensure that treatment plant performance continues at a high level.

LOWER FOX RIVER POLLUTIONAL LOADINGS
(Kilograms per day)

	1972	1980	1981	Percent Change 1980 to 1981	Percent Change 1972 to 1981
Pulp and Paper					
BOD	122,420	15,300	13,782	-9.9	-88.7
Suspended Solids	97,500	16,775	15,223	-9.3	-84.4
Municipal					
BOD	17,547	6,275	5,436	-13.4	-69.0
Suspended Solids	17,376	6,041	4,857	-19.6	-72.0
Combined					
BOD	139,967	21,575	19,218	-10.9	-86.3
Suspended Solids	114,876	22,816	20,080	-12.0	-82.5

The 1981 records show that Consolidated Papers at Appleton and Appleton Papers discharged average phosphorus concentrations of 3.8 and 1.1 mg/L respectively. These are above the Agreement goal of 1.0 mg/L. Phosphorus in these cases may be from excesses used in the wastewater treatment process.

Three of the pulp and paper mills on the lower Fox River recycle paper that may contain PCBs: Wisconsin Tissue, Bergstrom Paper Company, and Fort Howard Paper Company. High removal of PCB with the treatment plant sludges is likely, although an effluent sample from the Fort Howard mill was found to contain 4.0 ug/L. Paper recycling operations are specifically exempted by state law from restrictions on the use of PCB-containing materials.

The Wisconsin Department of Natural Resources has established the total maximum daily loadings of BOD which can be assimilated in the Fox River above the DePere Dam and still maintain state water quality standards for fish protection. These allowable loadings have been established for varying conditions of river flow and temperature in three separate reaches of the river. This assimilative capacity has been allocated, through the permit process, to the various dischargers in each reach. The allocation for each individual discharger is proportional to the quantity of BOD which would be allowed under the categorical effluent standards program.

Wasteload allocations will be in effect on July 1, 1983 for most of the lower Fox River and are under development for the point sources in the DePere-Green Bay sector. Waste load allocations, including ammonia restrictions, for the entire lower Fox River will become effective January 1, 1985. Facilities for treating BOD and suspended solids are essentially in full operation now. The use of highly efficient wastewater treatment technology has resulted in current discharges from the pulp and paper mills to be less than one-half the quantity permitted under the categorical treatment standards. (The combined permit averages for BOD and suspended solids - 35,646 and 51,113 kg/d, respectively - compares to the 13,782 and 15,223 kg/d actually discharged by the pulp and paper mills in this stream section.) Further reductions called for by waste load allocations are expected to be achieved by reduced production and waste storage. It also appears that substantial ammonia reductions could be attained by changing industrial production methods. This will likely be explored in lieu of treatment.

Ammonia concentrations in the effluents from facilities at Heart of the Valley and Appleton are probably in line with what would be expected for the type of treatment and a municipal waste. The Consolidated and the Fort Howard plants both have biological type treatment units which require nutrient additions, including ammonia. High ammonium readings at Nicolet Paper are from problems associated with an ammonia-based coating process. The Green Bay Metro Plant receives high strength ammonium wastes from the Proctor and Gamble ammonium bisulfite pulping operations at their Fox River Mill; and from the use of ammonia to neutralize wastes at the James River Paper Mill, formerly American Can Company.

Consolidated Papers at Appleton will permanently discontinue operations by October 1, 1982. Nicolet Paper's recent discharge permit gives them until July 1, 1984 to correct their ammonia problem. Fort Howard Paper and the Green Bay metropolitan facility are in the DePere-Green Bay section of the lower Fox River which is under study and mathematical modelling. This section is tentatively scheduled to be subject to waste load allocations, including temperature/flow/ammonia requirements, if necessary, by January 1, 1985.

Emphasis is also being given to control of toxic materials released by the pulp and paper making processes. As part of their reapplication for reissued WPDES permits, individual mills were required to analyze their effluents for the U.S. EPA list of priority pollutants. They were also asked to assess their pulp and papermaking processes to determine the potential sources of toxic contaminants in the wastewater. Permit applications and other information sources were reviewed for deleterious concentrations of toxic pollutants. Although specific limitations on toxic pollutants were not placed in permits (ammonia limitations were, however, included in some cases), some mills are required to conduct additional monitoring, including bioassays, to more clearly define the presence of toxic substances in their effluents. In addition, the Wisconsin Department of Natural Resources is initiating a trend monitoring program for selected toxic substances and a PCB "hot-spot" identification study on the river. Inventory studies (e.g. Sullivan and Delfino's 1982 report, "A Select Inventory of Chemicals Used in Wisconsin's Lower Fox River Basin") are helpful in designing such monitoring programs.

ASSESSMENT

A big improvement has been made in the water quality of the lower Fox River in the past 10 years, and all waste discharges are now essentially in compliance with their permit requirements. When the wasteload allocations are in effect for the DePere-Green Bay dischargers, tentatively scheduled for January 1, 1985, water quality standards should consistently be met with respect to dissolved oxygen and suspended solids. Reduced production and waste storage, rather than treatment are expected to be the principal ways in meeting waste load allocations during periods of low stream flows and high temperatures.

Wisconsin has prohibited the use of dieldrin and DDT and the manufacture and most uses of PCB. Point sources of these can be eliminated as they are identified but diffuse sources will persist in the environment for some time. The Wisconsin Department of Natural Resources is continuing an active program for the identification and control of toxic substances.

INFORMATION SOURCES

For specific information regarding the lower Fox River and Southern Green Bay, please refer to the following reports:

1. Sullivan, J.R. and Delfino, J.J., "A Select Inventory of Chemicals Used in Wisconsin's Lower Fox River Basin." University of Wisconsin Sea Grant Institute WIS-SG-82-238, March 1982, Madison, WI.

2. Christianson, R., "Wisconsin's Approach to Developing Waste Load Allocations", J. Water Poll. Contr. Fed., Vol. 51, No. 3, March 1979, pp. 630-635.

3. "Waste Load Allocated Water Quality Related Effluent Limitations." Wisconsin Department of Natural Resources Regulations, Chapter NR212, Wisconsin Administrative Code, Register, No. 309, September 1981.

Additional specific information about the lower Fox River and southern Green Bay can be obtained from the files and reports of the Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, Wisconsin 53707.

Five stations on the lower Fox River are automatically polled hourly for temperature, dissolved oxygen, pH, and conductance. This information is routinely summarized on a monthly basis for averages, maxima, and minima, as well as stream flow. The data may also be displayed graphically by day, week, month, or year. Contact: Bruce Fenske, Water Quality Evaluation Section.

The ambient monitoring station in the DePere-Green Bay section of the lower Fox River is part of the statewide monitoring network and is sampled monthly for chemical parameters and about annually for fish and benthos. The network has been operational since 1961 and data collected have been published through 1980. Contact: Carol Tiegs, Water Quality Evaluation Section.

Mathematical modelling of the lower Fox River is under the immediate direction of Dale Patterson, Water Quality Evaluation Section. He and Mike Llewelyn, Water Quality Planning, with staff assistance from the Municipal and Industrial Wastewater Sections, generally guide wasteload allocations.

Additional general information about both the lower Fox River and southern Green Bay and the Milwaukee Estuary can also be obtained from the Wisconsin Department of Natural Resources.

Municipal and industrial loading information was obtained from monthly discharge monitoring reports submitted by the industries and the municipalities. The loadings are usually based on the arithmetic average of daily counts. An annual summary of pulp and paper mill discharges is made, showing the daily averages by month and year, together with the average discharges called for in the WPDES discharge permit. Contacts: Paul Didier, Chief, Industrial Wastewater Section, and Chuck Ledin, Municipal Wastewater Section.

Information about toxic substances in fish was extracted from the annual reports of the Coastal Zone Project. A bibliography of toxic substances reports published by the Wisconsin Department of Natural Resources has also been prepared. Contact: Tom Sheffy.

The Department's Bureau of Water Quality Management has prepared a list of major research, survey, and investigative activities for the period July 1, 1980 through June 30, 1982. A bibliography of water quality reports published by the Department has also been prepared. Contact: F.H. Schraufnagel.

The U.S. Geological Survey prepares an annual report showing daily average stream flows at principal gauging stations, with physical and chemical data also collected for streams and rivers in Wisconsin.

MILWAUKEE ESTUARY, WISCONSIN

ENVIRONMENTAL DATA

SEDIMENT

Surveys conducted in 1973 and in 1980 reveal that the sediments in Milwaukee Harbor are heavily polluted, according to EPA's "Guidelines". The sediments contain high levels of oil and grease, chemical oxygen demand, total Kjeldahl nitrogen, total phosphorus, lead, zinc, cadmium, and copper. The 1980 surveys also showed portions of the estuary to have PCB levels in excess of 50 mg/kg.

Further 1980 and 1981 sampling was reported in the October 1981 Departmental publication to Coastal Zone Management on the Toxic Substances Survey project. This report indicated that sediment contamination in the Milwaukee River can be divided into 3 reaches. The first, between the mouth and Hampton Avenue, shows an average PCB sediment level of 9.60 mg/kg. The second, from Silver Spring Drive to County Highway C below Grafton, shows an average PCB level of 0.28 mg/kg. A sediment sample from Cedar Creek, which flows into the Milwaukee River below County C, showed a PCB level of 0.73 mg/kg below the Cedarburg sewage treatment plant. In the third reach, above Grafton, PCB levels were below detection limits.

Detectable levels of DDT (0.19 mg/kg average) were confined to the reach from the mouth to Silver Spring Drive. Four sediment samples from the Woolen Mills impoundment at West Bend shows this area to be a low-level source of PCB, DDT, and chlordane. Average values for these residues were 0.28, 0.13, and 0.04 mg/kg, respectively. Dieldrin was not detected in any sample.

The other two rivers draining the Milwaukee metropolitan basin also displayed measurable amounts of sediment contamination. PCB was identified in the Menomonee River sediment from Highway 100 downstream to its mouth. Three samples were taken in the Kinnickinnic River between Kinnickinnic Avenue and Jackson Park; elevated levels of PCB were found in all three with the highest nearest the mouth. Chlordane (0.02 mg/kg) was found at Kinnickinnic Avenue.

FISH

Fish collected in 1978 and 1979 surveys by the Wisconsin Department of Natural Resources were found to be heavily contaminated with PCB; the maximum observed level is 88 mg/kg; the FDA action level is 5.0 mg/kg. DDT in some fish exceeds the Agreement objective of 1.0 mg/kg; the maximum observed level is 2.98 mg/kg. Also present in the fish at trace levels or present but not quantified are hexachlorobenzene, α- and γ-BHC, cis- and trans-chlordane, dieldrin, trans-nonachlor, mercury, copper, and chromium.

The 1981 Toxic Substances Survey report showed that all 11 fish samples from the three rivers in 1980 exceeded the PCB action level, with a range of 8.6 to 88.0 mg/kg. One sample from the Kinnickinnic River exceeded the chlordane action level. The 1981 extensive sampling of the Milwaukee River fish revealed a PCB problem area extending from the mouth upstream to Grafton. Fifteen of the 23 samples in this area exceeded the PCB action level with a range of 5 to 49 mg/kg. Fish from the Kinnickinnic River in 1981 continued to show PCB values above acceptable levels.

WATER

Water samples collected in 1976 from Milwaukee Harbor exceed the Agreement objectives for conductivity, ammonia, zinc, cadmium, mercury, lead, and copper. Note: Little new water quality data are available for the Milwaukee Harbor at this time. The current harbor/estuary study is generating considerable data, but it is mainly for design purposes, has not been adequately analyzed to date, and toxics coverage probably is minimal.

PCB (1.0 µg/L) was detected in the final effluent to the Milwaukee River at the Saukville sewage treatment plant. Dieldrin (0.1 µg/L) and DDT (0.89 µg/L) were detected in the Butler storm sewer discharge to the Menomonee River at 124th Street and Villard Avenue. More intensive sampling is required to determine the exact sources of these microcontaminants.

Dieldrin and DDT were also detected in the leachate from the Woolen Mills landfill at West Bend. Two samples were taken, one of which showed dieldrin (0.07 µg/L) and both of which showed DDT (0.73 µg/L average).

The Milwaukee Health Department has found that bacterial counts increase at area beaches as a result of combined sewer overflows after heavy rainfall. Beaches are therefore subject to a two-day closure, as a precautionary measure, whenever rainfall exceed 0.60 inches. In 1981, South Shore Park was closed 3 times for a total of 7 days, out of a 68-day swimming season.

CAUSES AND REMEDIAL MEASURES

The Milwaukee Estuary is heavily developed and highly industrialized. However, the current water quality problems are primarily related to combined sewer overflows and in-place pollutants. The combined sewer effluents contain significant amounts of heavy metals in addition to the normal oxygen-demanding materials, oil, and nutrients. In June 1981, the Milwaukee Metropolitan Sewerage District obtained approval of a comprehensive Master Facilities Plan for upgrading its facilities to meet federal and state clean water laws. The Milwaukee Water Pollution Abatement Program is estimated to cost $1.6 billion in 1982 dollars. Over $300 million in work has already been completed or is under contract. Following are the court-ordered deadlines for completing the initial plan elements:

1. July 1, 1982 for meeting treatment standards during dry weather periods.

2. July 1, 1983 for completion of relief sewers.

3. July 1, 1986 for elimination of wet-weather bypassing in the separated sewer area.

4. July 1, 1993 for correction of the combined sewer overflow problem, if sufficient grant funds are available. If they are not, minimum expenditures of $13 million (in 1976 dollars) per year until the combined sewer overflow project is completed.

The current treatment facilities have highly efficient phosphorus removal systems and consistently meet secondary treatment requirements during dry weather periods. The Milwaukee Metropolitan Sewerage District is presently developing a pretreatment control program to help reduce the industrial impact on sludge and on treatment plant effluent quality.

A pretreatment standard for cadmium has been enacted by the Sewerage District. As a result, pretreatment installed by one industry has reduced the cadmium content of Milwaukee's sludge product, Milorganite, to one-half of previous levels. Standards have been developed, and are undergoing public review for zinc, nickel, copper, and lead.

The primary rationale for these pretreatment standards is to reduce the metals content in sludge and thus extend the site life for land applications. An additional advantage of pretreatment is the removal of toxic and gross pollutants that would otherwise discharge to surface waters during periods of combined sewer overflows. In accordance with Milwaukee's WPDES permit, the Sanitary District must have an approved pretreatment program by July 1, 1983.

Due to high levels of PCB found in fish native to the estuary and its tributaries, U.S. EPA conducted a special sediment survey in 1980. The results showed that, overall, the contamination level in the inner harbor area was lower than expected. Investigations under the Toxic Substances Control Act were conducted by U.S. EPA to identify the potential sources of the PCB "hot spots".

The Milwaukee Metropolitan Sewerage Commission is conducting a comprehensive study of the harbor/estuary to establish the level of pollution abatement needed for the combined sewer overflows. The study completion date is scheduled for December 1984. Pollution abatement for the combined sewer overflows is anticipated to rely on conveyance and storage facilities to intercept flows that would otherwise spill and store these flows until capacity is available at the treatment plants. The results of the study will determine the amount of storage volume needed. Additional planning efforts will then determine costs. These costs, in addition to the provisions of the court order Milwaukee is under, will determine the length of time required to complete the abatement works. While the study is being conducted, overflows from the separated sewer area and treatment plant deficiencies are being corrected.

ASSESSMENT

Some of the contaminants in the Milwaukee Harbor and lower parts of the Milwaukee, Kinnickinnic, and Menomonee Rivers are also found upstream. Indications are that diffuse sources or discontinued operations are or were involved. Wisconsin banned the use of dieldrin and DDT in the late 1960's

and, effective July 1, 1977, with some exemptions, prohibited the manufacture and purchase for use of substances containing PCB. Although the Wisconsin Department of Natural Resources continues to seek upstream sources to eliminate, these contaminants could persist in the aquatic environment for some time.

Also, with the correction of sewage overflows and treatment plant deficiencies, the Milwaukee Estuary problem will continue as a major pollution problem until the combined sewer overflows in the metropolitan area can be addressed. Complying with the court ordered clean-up of the combined sewer overflows and possibly the implementation of measures to mitigate the in-place pollutants, should eliminate the area of concern. This is a costly undertaking, and completing installation of the facilities in a reasonable amount of time, 10 to 12 years, will rely on funding at the level of $20 million (1982 dollars) per year in local funds and $20 million (1982 dollars) per year in state aid from the newly created Combined Sewer Overflow Fund.

The schedule to resolve the environmental problems should be nearly identical to the schedule to place the controls into operation, although some lag might be expected, depending on the specific problem involved. It should be noted that, although the final date for the combined sewer overflow problem correction is July 1, 1993, work is proceeding and the problem is not 100 percent uncorrected until that time.

INFORMATION SOURCES

For specific information regarding the Milwaukee Estuary, please refer to the report, "Study Design for the Milwaukee Harbor Estuary Comprehensive Water Resources Planning Program," prepared by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) in September 1981.

The interests of the state of Wisconsin and its Department of Natural Resources, insofar as the court stipulation, agreements, and follow-up on progress is concerned, are handled by Jay Hochmuth, Special Assistant for Milwaukee Metropolitan Environmental Affairs.

General information sources are given at the end of the presentation for the lower Fox River and southern Green Bay.

WAUKEGAN HARBOR, ILLINOIS

ENVIRONMENTAL DATA

Data obtained by U.S. EPA since October 1978 were subject to a protective order issued by the court at the request of Outboard Marine Corporation. The order was lifted in mid-June 1981. These data are now available from U.S. EPA, Region V, Chicago.

SEDIMENT

The sediments in Waukegan Harbor and the nearby North Ditch, a tributary to Lake Michigan, are grossly contaminated with PCB. Levels up to 500,000 and 380,000 mg/kg have been found in Slip No. 3 in the harbor and in North Ditch, respectively.

FISH

PCB contaminant levels (whole fish) for samples of fish collected in the harbor over a four year period are listed below:

Date of Collection	Number of Samples	Average Concentration of Total PCB in Whole Fish (mg/kg)	Number of Samples Exceeding 5 mg/kg U.S. FDA Action Level for Edible Portion of Fish
August 1978	9	18.9	6
May and July 1979	9	29.7	8
September 1980	7	77.4	5
July 1981	4	8.2	1

A 1980 study demonstrated that uncontaminated fish exposed to water from Slip No. 3 for thirty days achieved PCB levels of 20 mg/kg. After an 84-day reacclimation period in open-lake water, the PCB levels did not drop below 8 mg/kg. The U.S. FDA action level for PCB in fish is 5.0 mg/kg.

WATER

PCB levels in water in Waukegan Harbor range from 0.1 µg/L to several µg/L in Slip No. 3.

CAUSES AND REMEDIAL MEASURES

The Outboard Marine Corporation (OMC) has an aluminum die-casting facility located between Waukegan Harbor and the North Ditch, a tributary to Lake Michigan. The facility had purchased 8.4 million pounds of PCB as hydraulic fluids from Monsanto Company between 1959 and 1972, and it is estimated that an additional 1.5 million pounds were purchased between 1954 and 1959. OMC has estimated that as much as 15 to 20% (1.5 to 2.0 million pounds) of these PCB may have been released to the environment. A U.S. EPA consultant estimated in a 1981 report that about 350,000 pounds of PCB remain in the harbor sediments and about 500,000 pounds remain the North Ditch sediments.

Initial actions taken in 1976 by the U.S. EPA and the Illinois EPA were successful in substantially reducing the PCB load from the facility's discharges. However, the residual PCB contamination of sediments and soils in the harbor, North Ditch, and the facility's property continue to impact the surrounding area.

The U.S. EPA and the Illinois EPA filed suit against OMC in 1978 and against Monsanto in 1980 for a remedy to the PCB contamination. Trial is now scheduled for December 1982.

Substantial engineering work on alternative mitigative measures has been done by U.S. EPA in support of the lawsuit as well as for potential government clean up under the Comprehensive Environmental Response, Compensation and Liability Act (Superfund).

The warning signs against consumption of fish caught in the harbor posted by the Lake County Health Department in 1980 remain in place.

The U.S. Army Corps of Engineers has a study underway to identify a suitable disposal site for sediments to be dredged from the federally maintained portions of the harbor. In the meantime, dredging is only being conducted outside of the breakwaters in the entrance channel where accumulated material is uncontaminated, being primarily littoral drift sand from Lake Michigan.

U.S. EPA, which has been pursuing remedies through the lawsuit as well as Superfund, has now decided to concentrate on the lawsuit. Consequently, on May 7, 1982, U.S. EPA withdrew its application to the U.S. Army Corps of Engineers, Chicago District, for the dredge and fill permit under the provision of Section 404 of the Clean Water Act of 1977. The Corps acknowledged the withdrawal of the application and advised the Illinois EPA. This action by U.S. EPA obviates the need of the Illinois EPA to continue work on the water quality certification, required by Section 401 of the Clean Water Act; lacking an active application, no certification is necessary.

The Illinois EPA also has received an application for a permit to construct retaining lagoons and filter systems to receive the dredged material. A review had been completed and comments addressed to U.S. EPA on the facilities. At present the application lies dormant, since the Section 404 dredge and fill permit application was withdrawn.

ASSESSMENT

Since resolution of this environmental problem is the subject of extensive litigation involving several parties, remedial controls and reclamation programs have not been specified as of this date. Therefore, assessment of their adequacy is impossible.

INFORMATION SOURCES

Information about environmental conditions in Waukegan Harbor and about the status of remedial programs may be obtained from:

Great Lakes National Program Office
U.S. Environmental Protection Agency
536 South Clark Street
Chicago, Illinois 60605

Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

GRAND CALUMET RIVER AND INDIANA HARBOR CANAL, INDIANA

ENVIRONMENTAL DATA - RIVER AND CANAL

SEDIMENT

Sediment surveys conducted from 1977 to 1980 confirm that all sediments in

Indiana Harbor Canal and the Grand Calumet River are heavily polluted for all conventional pollutants and heavy metals, and have high levels of organic chemicals associated with heavy industry. The concentrations of pollutants are among the highest reported in the Great Lakes System. Maximum observed concentrations for representative substances are: oil and grease 175,000 mg/kg (17.51%), volatile solids 609,000 mg/kg (60.9%), iron 326,000 mg/kg (32.6%), chemical oxygen demand 415,700 mg/kg (41.57%), total phosphorus 15,000 mg/kg, lead 15,000 mg/kg, zinc 13,000 mg/kg, chromium 2,000 mg/kg, and PCB 89.22 mg/kg.

FISH AND MACROINVERTEBRATES

Fish are observed in the area only occasionally. In 1980, the Indiana Stream Pollution Control Board and U.S. EPA captured several fish from the Indiana Harbor Canal for contaminant analyses: carp (some with fins rotted off), a spotfin shiner, and a yellow perch. Several organic substances were reported as present, including PCB, α-BHC, hexachlorobenzene, pentachloroanisole, cis-nonachlor, cis- and trans-chlordane, oxychlordane, p,p'-DDD, p,p'-DDE, and dieldrin. Based on the total absence of fish in the Canal at other times that collections were attempted, and considering the small size and the condition of the fish that were collected, these fish were likely not indigenous to the area but were washed in during heavy flow periods.

A macroinvertebrate sampling program was carried out in 1979. When recovered, the sampler plates were covered with oily silt and sludge. A few segments which appeared to be portions of oligochaetes were found on the plates, but no other organisms were present.

A 1980 sampling program confirmed the presence of oligochaetes and an extremely small number of other macroinvertebrates.

WATER

Two water surveys conducted in 1978 showed that the Agreement objectives were exceeded for copper, iron, mercury, zinc, ammonia, phenol, and conductivity. The maximum cyanide level was 87 µg/L, and the maximum observed PCB concentration was 17 µg/L.

A water survey conducted by U.S. EPA in 1980 showed that the Agreement objectives were exceeded for copper, lead, selenium, iron, zinc, ammonia, and phenolics. Indiana water quality standards were exceeded for ammonia, cyanide, phenol, total phosphorus, chloride, fluoride, mercury, and oil and grease. The maximum cyanide level was 320 µg/L.

SURVEILLANCE DATA - NEARSHORE LAKE MICHIGAN

Outflow from the Grand Calumet River and Indiana Harbor Canal also has an adverse environmental impact on the adjacent nearshore area of Lake Michigan.

WATER

Based on intensive sampling by the Indiana Stream Pollution Control Board, in cooperation with the Indiana Department of Natural Resources, in 1980 and 1981, elevated concentrations or violations were found for cadmium, phenol,

and ammonia in the nearshore area of Lake Michigan. In addition, phosphorus, chloride, and sulphate concentrations appear to be increasing.

The extent to which the Agreement objective for cadmium (0.2 µg/L) is exceeded is not clear, since the analytical detection limit was 1.0 µg/L. Ninety-one percent (540 out of 596) of the samples were less than the detection limit. How many of these would have been less than 0.2 µg/L is unknown. The Indiana water quality standard for cadmium (10 µg/L) was not, however, exceeded.

Phosphorus concentrations appear to have increased slightly from 1980 to 1981, but are well below the Indiana water quality standards of 0.30 mg/L average and 0.40 mg/L maximum. Chloride and sulphate appear to be increasing but do not exceed Indiana water quality standards (15 mg/L monthly average and 20 mg/L daily maximum, and 26 mg/L monthly average and 50 mg/L daily maximum, respectively).

Violations of bacteriological standards for whole body contact continue periodically following rainfall. The beach at Hammond Lake Front Park remains permanently closed, and the beach at Jerose Park, in East Chicago, was closed during 1981. The four other beaches along the Lake Michigan shoreline in Lake County, Indiana were open for the 1981 season.

FISH

The 1981 annual fish flesh survey near Michigan City, included analysis of the anterior steak of lake trout, ranging from 22 to 32 inches and from 4 through 9 years of age. Violative concentrations were found for PCB, total chlordane, total DDT, and dieldrin. Pollutants not detected were heptachlor, aldrin, p,p'-methoxychlor, o,p'-methoxychlor, and endrin; γ-BHC was detected in only a few fish. All other pollutants checked were below violative concentrations, including mercury, pentachloroanisole, heptachlor epoxide, and hexachlorobenzene.

REMEDIAL MEASURES AND ASSESSMENT

The Grand Calumet River and Indiana Harbor Ship Canal, no more than 13 miles in total length, predominantly consist of treated industrial and municipal wastewater and storm runoff with little, if any, "natural" flow. Recognizing this, as well as other unnatural features of these waterways, the Indiana Stream Pollution Control Board has designated these waters for partial body contact, limited aquatic life, and industrial water supply use only. The Board has established water quality standards and effluent limits to obtain these limited uses, as well as to protect the water quality and higher uses of Lake Michigan. It is doubtful that the river and harbor will ever meet some Agreement objectives and that these waters will be suitable to support all uses.

The major industrial facilities discharging to this watershed were in compliance with their permit requirements in 1980. The permits are being reviewed by the Indiana Department of Health to determine whether additional requirements may be needed for control of toxic substances.

Sulphate and chloride increases are caused by wastewater treatment techniques to reduce cyanide in steel plant discharges and constitute a trade-off, presumably for the better. These increases will continue, accelerated by cyanide reduction wastewater treatment techniques. Whether or not such increases are a significant ecological concern is unknown.

Phenols originate from steel plant and oil refinery discharges but, while exceeding the objective in some areas, do not cause taste problems for Indiana municipal water treatment plants. U.S. Steel and the sole remaining refinery, AMOCO, are meeting best practicable technology limits, and U.S. Steel is close to meeting best available technology limits. Other steel mills, however, discharge their phenolic wastewater to the East Chicago sewerage system, which passes through the treatment plant with little effective treatment.

A special "sweep" of the area by U.S. EPA, Indiana, and local agency staff identified a large number of industrial waste landfills in the northwest Indiana area. Some of these have contaminated seepage and runoff to Indiana Harbor and its tributaries. As information becomes available, U.S. EPA is taking appropriate action under Section 311 of the Clean Water Act to contain these inputs. Where needed, responsible parties are being taken to state and federal courts to ensure that the necessary abatement measures are taken.

The East Chicago wastewater treatment facility was not in compliance with its NPDES permit requirements in 1980, including requirements for phenol and ammonia. Some phenol violations will persist in the receiving water unless the steel companies discharging into the East Chicago sewerage system provide pretreatment. However, existing violations do not affect Indiana water treatment and should not affect Chicago. Recent Indiana Stream Pollution Control Board lake surveys show no concentrations above detection limits (2.0 µg/L) outside Indiana waters.

Ammonia violations occur primarily because the East Chicago wastewater treatment facility receives high ammonia-bearing wastewater from area steel mills. An ammonia effluent limitation has been imposed in the facility's NPDES permit which, if met, should result in the elimination of violations in the nearshore area of Lake Michigan. However, ammonia violations will persist until East Chicago installs and operates ammonia reduction facilities. Their progress in adding the necessary sewerage system improvements through federal/state construction grants appears to be stymied. No forecast of when the ammonia limitation will be met can be made at this time.

Joint enforcement action by Illinois, Indiana, and U.S. EPA is in progress against East Chicago concerning all its permit violations. Several meetings with all parties have been held to reach an agreement. When finalized, a realistic abatement compliance schedule should result.

The Gary Sanitary District was not in compliance with its permit requirements in 1980. New facilities are under construction.

The Cities of Gary, Hammond, and East Chicago have completed combined sewer overflow studies. These will be forwarded to the state for review.

In 1974, Indiana allocated dry weather waste loads for the Grand Calumet River and Indiana Harbor Canal. Indiana water quality standards for the area have been changed since 1977. The river flow has been significantly reduced

since 1975, due to recycling of cooling water by U.S. Steel. Indiana plans to update the 1974 waste load allocations according to the following strategy:

1. The 1983 waste load allocation study will be based on current state water quality standards. New EPA advanced treatment review policy and effluent guidelines for industrial dischargers will be adopted in the study.

2. Projected effluent flows for both municipal and industrial dischargers will be used. The progress of the U.S. Steel recycling plan will be taken into account.

3. The 1983 study will include a seasonal waste load allocation analysis, which was not considered in 1974.

Toxic and conservative waste loads will be evaluated and allocated for at least phenol, cyanide, chloride, sulphate, and phosphorus.

While the Hammond sewage treatment plant met its requirements, a faulty sewer resulted in the bypassing of combined municipal wastes and stormwater. This resulted in extended beach closings along the southern Lake Michigan shoreline in 1980. An emergency $8 million construction program was initiated in the fall of 1980 and completed in May 1981.

Periodic fecal coliform violations at some Lake Michigan bathing beaches are caused by combined sewer overflows to the Grand Calumet River. While dry weather discharges have been and will continue to be eliminated, it is doubtful that wet weather overflows will ever be totally eliminated due to the expense and engineering difficulties involved. East Chicago may also contribute by the discharge of inadequately treated sewage which could be eliminated by better operation and plant improvements. No remedial action is comtemplated other than enforcement of NPDES limits on wastewater treatment plant discharges.

Whether contaminated sediments in the Grand Calumet River, Indiana Harbor Ship Canal, and Indiana Harbor are a sink, or a source for uptake by aquatic organisms, is unknown, even though the sediments appear to effectively remove pollutants from the water column. No remedial action is planned at this time.

The chlordane, PCB, DDT, and dieldrin in most lake trout (those greater than 20 inches or more than 4 years old) caught in the Indiana waters of Lake Michigan are apparently not attributable to municipal and industrial discharges in the area. These pollutants are widespread throughout the entire lake. Federal and/or state remedial measures prohibiting or limiting the use and disposal of these products has already been taken. Until more is known of the sources, uptake mechanisms, and the efficacy and the feasibility of source control (once determined), no remedial measures can be proposed other than the continued issuance of fish advisories.

INFORMATION SOURCES

Additional information about environmental conditions and remedial measures may be obtained from:

Indiana Stream Pollution Control Board
1330 West Michigan Street
Indianapolis, Indiana 46206

Great Lakes National Program Office
U.S. Environmental Protection Agency
536 South Clark Street
Chicago, Illinois 60605

ST. MARYS RIVER, MICHIGAN AND ONTARIO

ENVIRONMENTAL DATA

SEDIMENT

The Ontario Ministry of the Environment (MOE) carried out intensive sediment analyses during 1973. The data indicated high levels of iron, zinc, phenol, cyanide, and oil exist in the sediment along the Canadian shore for a distance of 5 km from the Algoma Slip to downstream from the Canadian locks. Elevated levels of PCB (as high as 300 µg/kg) were found in 1974 along the U.S. shore downstream from the locks. The area of contamination extended 2 km from the locks with a maximum width of 300 m. High PCB levels (as high as 120 µg/kg) also existed in the Lake George channel downstream from the Sault Ste. Marie, Ontario sewage treatment plant and in Little Lake George. Restrictions have been placed by Ontario MOE on the disposal of dredged materials.

FISH

The 1982 Ontario Ministry of the Environment and Ministry of Natural Resources publication entitled, "Guide to Eating Ontario Sport Fish", indicated that mercury, PCB, mirex, and DDT in boneless, skinless fillets of dorsal muscle flesh of fish from Lake George are suitable for unrestricted consumption for fish in size up to 26 inches. Species such as northern pike (>26 inches), lake trout (>22 inches), and walleye (>18 inches) show elevated levels of mercury and have consumption advisories. The Canada consumption guideline for mercury is 0.5 mg/kg.

WATER

Discharges from Algoma Steel Corp. Ltd. have contributed to elevated levels of phenols, ammonia, and cyanide in the St. Marys River. Ontario MOE monitored the river quality through 5 cruises during 1981. Phenol levels higher than the Agreement objective (1 µg/L) persisted along the Ontario shoreline of the river down to Little Lake George. Levels ranged from 100 µg/L at 300 m from the Algoma outfall to 5 µg/L at Little Lake George (12 km from the source). Frequent equipment breakdown in the coke oven by-product plant is largely responsible for the elevated levels of phenolic compounds in the river. Free cyanide levels exceeded the provincial objective (5 µg/L) for a relatively small distance not exceeding 1 km from the source. Levels were in the range of 10 to 120 µg/L. Similarly, total ammonia levels (ranging from 0.2 to 1.2 mg/L) met the Agreement objective at 1 km.

Bacterial contamination resulting from sewer system overflows along the Sault Ste. Marie, Ontario waterfront continues to restrict recreational use in some areas. The provincial fecal coliform objective (100 counts/100 mL) was exceeded at 50% of the stations located along the Sault Ste. Marie

waterfront. In the Lake George channel, downstream from the Sault Ste. Marie sewage treatment plant, fecal coliform levels exceeded the provincial objective at 50% of the stations for a distance of 7 km.

REMEDIAL MEASURES

Algoma Steel Corp. Ltd. at Sault Ste. Marie, Ontario is not yet meeting Ontario MOE's effluent requirements for suspended solids, oil, grease, cyanide, zinc, phenols, solvent extractables, dissolved iron, sulphite, and ammonia. On June 21, 1982, Ontario MOE served the company with a Control Order which will require Algoma Steel to limit the discharge of sulphides, cyanides, and ammonia, by September 30, 1985, such that the effluent will be non-toxic at the end of the prescribed mixing zone. The order also specifies that:

1. By September 30, 1986, Algoma must install the first phase of a dual media filtration system designed to reduce ether solubles from the existing 9,000 to 6,000 lbs/d and to reduce total suspended solids from 25,000 to 19,250 lbs/d.

2. By December 31, 1987, Algoma must install a biological treatment plant to treat phenols discharging from the steelworks, so as to reduce the load to 50 lbs/d or less. A load of 50 lbs/d will eliminate the transboundary movement of phenols.

3. By September 30, 1988, Algoma must install the second phase of the dual media filtration system and further reduce ether solubles to 3,000 lbs/d or less and suspended solids to 13,500 lbs/d or less.

The above program is based on the best available technology, reducing the concentration of all contaminants to levels that are either non-toxic or as low as technically achievable.

The installation of a primary clarifier by the Abitibi-Price Paper Mill in Sault Ste. Marie, Ontario should resolve the existing suspended particulate problems associated with the plant. This clarifier is expected to be operational before the end of 1982.

On May 20, 1982, an agreement was signed among the federal, provincial, and municipal governments in Sault Ste. Marie, towards the funding of a second municipal sewage secondary treatment plant (4.2 MIGD), to serve the westerly section of Sault Ste. Marie, Ontario. The first phase of this sewage treatment plant is expected to be completed and operational by 1985.

Michigan dischargers to the St. Marys River are in substantial compliance with NPDES permit requirements.

ASSESSMENT

WATER

The effluent limitations contained in the Control Order for Algoma Steel Corporation will, when implemented, prevent the problem of transboundary pollution and will ensure that the Agreement objectives will be met in a relaively small distance downstream.

The increased municipal sewage treatment capacity resulting from the provision of the new secondary plant is expected to ensure the protection of shoreline recreational areas.

SEDIMENT

The high contaminant levels in sediment are primarily a result of past discharges from Algoma Steel and Abitibi-Price. The Control Orders are expected to ensure that no further significant deposition of toxic or otherwise objectionable substances will occur. Dredging carried out as part of the Great Lakes Power Development project in 1981 resulted in the removal of some of the contaminated sediments. Material was disposed of in a confined area. The problem does not appear to warrant any further direct remedial action at this time. Natural physical and biochemical processes are expected to reduce the contaminant levels and lead to re-establishment of a healthy benthic fauna community over the longer term.

FISH

Since the problem of mercury levels in sport fish in the St. Marys River is not of local origin, no remedial action is indicated. The origin of the problem, point surce inputs of mercury to Lake superior associated with chlor-alkali and pulp mill operations, were eliminated in the early to mid-1970's. The remedial programs cited above with regard to phenolics, sulphides, cyanides, and ammonia will, however, contribute to a healthier sport fishery.

SUMMARY

The transboundary phenolics problem is expected to be corrected by 1987. The remedial programs scheduled for implementation over the period to 1988 are expected to correct the local bacterial and other pollution problems described. Improvement of bottom sediment quality and recovery of the benthic fauna will occur over the longer term through natural recovery processes.

INFORMATION SOURCES

Detailed environmental and remedial program information may be obtained from two reports:

1. Hamdy, Y.S. and G. La Haye, 1982. "Water Quality Conditions in the St. Marys River 1966-1980." Paper presented at XXV IAGLR Conf., Sault Ste. Marie, Ont., May 4-6, 1982.

2. Hamdy, Y.S., J.D. Kinkead, and M. Griffiths, 1978. "St. Marys River Water Quality Investigations 1973-74." Ontario Ministry of the Environment, Water Resources Branch, Toronto, 52 pp.

Information may also be obtained from:

Ontario Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario M4V 1P5

Information about the Michigan shoreline of the St. Marys River may be obtained from:

Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

SAGINAW RIVER SYSTEM AND SAGINAW BAY, MICHIGAN

ENVIRONMENTAL DATA

SEDIMENT

Sediments in the Saginaw River contain levels of PCB up to 25.1 mg/kg. Sediments in the Pine River contain levels of PBB up to 77 mg/kg; however, PBB has not been detected further downstream. Chlorinated dioxins have not been detected in sediments from the Tittabawassee River.

FISH

Samples of whole fish collected in the Saginaw River in 1976 contained 8 to 12 mg/kg PCB, exceeding the Food and Drug Administration guideline of 5.0 mg/kg for fillets. Levels of hexachlorobenzene were 10 to 100 times greater in these fish, compared to levels in fish from other Great Lakes tributaries. High levels of PCB have been found in fish from the Flint and Shiawassee Rivers, tributaries to the Saginaw River.

PCB was detected in the Saginaw fishery at the following levels in 1980:

Chinook Salmon	3.04 mg/kg
Coho Salmon	2.28 mg/kg
Channel Catfish	6.80 mg/kg
Carp	9.47 mg/kg

Fish samples taken in 1974 and 1976 from the Pine River, another Saginaw River tributary, contained PBB levels up to 2 mg/kg; however, fish from locations further downstream did not contain detectable levels of PBB. Of ten composite fish samples taken from the Pine River in 1981, only three exceeded the 0.1 mg/kg detection limit; PBB was detectable only in rock bass.

The chlorinated dioxin 2,3,7,8-TCDD was detected in fish from Saginaw Bay at the following levels in 1980:

Northern Pike	4.0 ng/kg
White Sucker	Not detectable
Carp	61.0 ng/kg
Catfish	50.0 ng/kg

Levels of dioxin in fish samples from the Saginaw River system have been reported as high as 600 ng/kg; the U.S. FDA guideline is 50 ng/kg. A channel catfish from the Tittabawassee River in 1978 contained 695 ng/kg of dioxin; the highest level detected in fish samples taken from the Tittabawassee River in 1980 was 142 ng/kg in a carp. Tests are currently underway to more fully investigate the extent of dioxin contamination in fish from the Saginaw River system.

Michigan has issued fish consumption bans for the following rivers, because of contamination of fish by the substances noted: South Branch of the Shiawassee River (M-59 to Owosso) - PCB; Chippewa River (downstream from Chippewa Road in Isabella County) - PBB; Pine River (downstream from St. Louis) - PBB; Tittabawassee River (downstream from Midland) - PBB and TCDD; Cass River (downstream from Bridgeport) - PCB; and Saginaw River - PBB and TCDD.

A fish consumption advisory is also in effect for Saginaw Bay. Carp, catfish, muskellunge, salmon, and trout should not be eaten by children or by women who are pregnant, nursing, or expect to bear children; all others should limit consumption to no more than one meal per week. The advisory on muskellunge, salmon, and trout also applies to the whole of Lake Huron.

Additional discussion of area biota, including contaminants in herring gull eggs, is contained in the report of the Surveillance Work Group, "Great Lakes Surveillance," prepared as an appendix to the 1981 report of the Water Quality Board.

WATER

All 24 samples collected at the mouth of the Saginaw River during water year 1980 exceeded the total dissolved solids objective of 200 mg/L. The mean concentration was 468 mg/L.

REMEDIAL MEASURES

Several wastewater treatment plants discharging to the bay have come into compliance within the past year. The Bay City plant was in compliance for all of 1981. The West Bay plant has been on line since December 1981 and has been in compliance since April 1982. The Flint plant is now in compliance for all parameters except ammonia and nitrates.

The annual total phosphorus loading from the Saginaw River to Saginaw Bay decreased from 1,044 tonnes in 1974 to 409 tonnes in 1979. The 1980 load increased, however, to 472 tonnes. The 1981 tributary load cannot be estimated with a high degree of confidence, due to the paucity of flow and concentration data for that year. Since the 1978 Water Quality Agreement proposed target phosphorus load for Saginaw Bay is 440 tonnes per year, and since the Saginaw River makes up approximately 90% of the total loading to the bay, it is apparent that the target load is being approached.

Programs to reduce phosphorus loadings from point source discharges are generally in place in Saginaw Bay and Saginaw River System. It is estimated that more than half of the loading decrease between 1974 and 1979 was due to phosphorus removal efforts by municipal treatment plants in the Saginaw River Basin and to the detergent phosphorus ban in Michigan. The annual municipal phosphorus load to Saginaw Bay decreased from an estimated 800 tonnes in 1974 (Upper Lakes Reference Group estimate) to 211 tonnes in 1979. The annual loads in 1980 and 1981 were 220 and 232 tonnes, respectively. This increase in municipal phosphorus load from 1979 to 1980 and 1981 is due in part to an increase in the number of facilities reported, an increase in the total flow treated, and to poor performance by one or more of the municipal facilities. The point source component of the phosphorus load to Saginaw Bay nonetheless appears to have stabilized.

The rest of the phosphorus loading decrease from the Saginaw River to Saginaw Bay between 1974 and 1979 was due to reductions in river flow. The increase between 1979 and 1980 is mainly due to increased tributary flow.

The Saginaw Bay ecosystem has responded favorably to phosphorus load reductions over the last decade. The following changes in water quality indicators have been observed to date. Total phosphorus concentrations and secchi depth measurements have improved slightly, with an apparent lag in response to the reduction in loadings. Trend analysis on spring and fall chlorophyll a concentrations in Saginaw Bay shows a significant decline for the period 1974 to 1980.

Changes in the phytoplankton in Saginaw Bay have been dramatic. The peak blue-green algal concentration in inner Saginaw Bay in the fall of 1974 was 1.29 mg-dry weight/L while in the fall of 1980 it was 0.027 mg-dry weight/L. In addition, two species of nuisance-producing blue-green algae have virtually disappeared from most areas of the bay. The number of days that the odor of water (thought to be caused by these algae) at the Saginaw-Midland water treatment plant, the largest water intake on Saginaw Bay, exceeded the U.S. Public Health Service standard has been reduced from 56 in 1974 to 0 in 1980.

Indicators of eutrophication in the zooplankton community have also responded significantly to phosphorus reduction. The extremely abundant crustacean, Bosmina longirostris, has decreased almost 4-fold since 1974. Other indicators, such as total rotifer concentration and predatory rotifer concentration, have also decreased.

Eutrophication may be a natural characteristic of Saginaw Bay; however, continuance of point-source control programs now in place will ensure minimum human contribution to accelerating the eutrophication process.

PCB contamination in the Saginaw River basin is the result of historical contamination of the sediments and atmospheric deposition rather than current discharges. PCB in the intake water of the Chevrolet Plant in Bay City has decreased from approximately 7 µg/L in 1972 to less than 0.5 µg/L in 1980; PCB concentrations in the discharge from this facility have similarly decreased. PCB contamination exists in the Shiawassee River at the Cast Forge site. Dredging of contaminated sediments will be completed by October 1, 1982. The plant site was previously cleaned up.

PBB contamination exists in the Pine River but has not been detected in Saginaw Bay. The source, the Velsicol Chemical site, has been capped, and an approved plan for controlling runoff is now in place. There are on-going negotiations at the state and federal level for full resolution of the PBB problem.

All industrial dischargers on the Saginaw River are in compliance with permit limits. Dow Chemical Company, Michigan Division, is adjudicating its new permit but, it is, to date, submitting studies required by the permit. The new Dow permit placed increased monitoring requirements on the company and limitations on nine additional non-conventional/toxic pollutants. The permit requires a detailed wastewater characterization and a dioxin bio-uptake study.

Control measures proposed for implementation by Michigan are directed at providing necessary controls over chlorinated hydrocarbons; however, additional testing in Saginaw Bay will be necessary to determine the adequacy of these control measures and the impacts, if any, on Saginaw Bay of contamination problems in tributaries to Saginaw Bay.

Agricultural land management appears to contribute suspended solids, nutrients, pesticides, organic matter, and pathogenic organisms to Saginaw Bay and the Saginaw River system. These are detrimental to the quality of the water and the aquatic environment.

Agricultural nonpoint source contributions occur as either a direct or indirect result of the tilling of soils, supplemental drainage measures, or the disposal of plant and animal residues. The pollutants are transported to surface waters by wind, erosion, water runoff, leaching through agricultural tile systems, and by direct discharge.

The Saginaw Monitoring and Evaluation Project in Huron and Tuscola Counties, a program covering 72,000 acres and about 20% of the agricultural drainage in the Saginaw Bay Basin, has shown that the nutrient and suspended solids loads from agricultural nonpoint sources are measurable in the streams and ditches which directly receive agricultural runoff. Coastal areas and tributary mouths on the southeastern section of Saginaw Bay, areas which are most directly affected by the agricultural activities within this drainage basin, are especially degraded locations in Saginaw Bay.

Siltation is a problem throughout the Saginaw region, resulting in fish habitat degradation, the filling of surface drainage ways, and the filling of the Saginaw Federal Navigation Channel.

The dissolved oxygen level of the Saginaw River is particularly dependent upon photosynthetic oxygen production and the benthic oxygen demand. Both of these characteristics are adversely affected by the nutrient and suspended solids loads contributed by agricultural activities. Loadings from wholly agricultural tributaries of the Saginaw River, i.e. Dutch Creek and Cheboyganing Creek, have been shown to cause dissolved oxygen sags to as low as 1.9 mg/L in 1976.

INFORMATION SOURCES

Detailed information about environmental conditions in Saginaw Bay may be obtained from the following sources:

1. "Michigan Fishing Guide", Lansing, 1982.

2. Letter from W.E. McCracken, Michigan Department of Natural Resources, Lansing, to G.D. Haffner, IJC, Windsor, June 8, 1981.

3. "1981 - Highlights of Water Quality and Pollution Control in Michigan", Michigan Department of Natural Resources, Lansing.

4. "The Great Lakes Environmental Contaminants Survey. Summary Report 1972-1980." Michigan Department of Natural Resources Publication No. 3730-0038, Lansing, March 1982.

5. T.K. Rohrer, "2,3,7,8-Tetrachlorodibenzo(p)dioxin Residues in Fish from the Tittabawassee and Saginaw Rivers and Saginaw Bay - 1980," Michigan Department of Natural Resources, Lansing, 1982.

6. Bierman, V.J. Jr., D.M. Dolan, R. Kasprzyk, and J.L. Clark, "A Retrospective Analysis of the Responses of Saginaw Bay, Lake Huron, to Reductions in Phosphorus Loadings", U.S. Environmental Protection Agency, Grosse Ile, Michigan, 1982 (To be published after internal U.S. EPA review).

7. Great Lakes Water Quality Board, "1981 Report on Great Lakes Water Quality. Appendix: Great Lakes Surveillance," International Joint Commission, Windsor, Ontario. November 1981.

Information may also be obtained from:

Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

Great Lakes National Program Office
U.S. Environmental Protection Agency
536 South Clark Street
Chicago, Illinois 60605

ST. CLAIR RIVER, ONTARIO AND MICHIGAN

ENVIRONMENTAL DATA

SEDIMENT

As a result of the elimination of point sources, mercury levels in sediments have declined significantly in the last decade; however, concentrations are still higher in some locations along the Canadian shore than the provinicial guideline for open water disposal. In 1977, Ontario data indicated that the average mercury concentration in the surficial sediment was 3 mg/kg compared to an average level of 250 mg/kg in 1969. During the same year, PCB levels ranged from not detected to a maximum of 5.3 mg/kg, with an average level of 0.3 mg/kg. These high levels of PCB and mercury render the river sediments, especially in the vicinity of industrial discharges, unsafe for open water disposal. Ontario Ministry of the Environment (MOE) guidelines for open water disposal for mercury and PCB are 0.3 and 0.05 mg/kg, respectively.

Most stations in 1977 contained concentrations of heavy metals in excess of Ontario MOE's guidelines for open water disposal. Fourteen percent of the stations exceeded the 50 mg/kg guideline for lead, 97% exceeded the 25 mg/kg guideline for chromium, 34% exceeded the 100 mg/kg guideline for zinc, and 60% exceeded the 25 mg/kg guideline for copper.

A marked improvement in the biological community of the river sediment has occurred over the last decade. A resurgence of bottom-dwelling life forms is evident in the nearshore waters, as indicated by increased numbers and a greater variety of taxa.

FISH

Mercury concentrations in all species of fish from the St. Clair system have declined to less than half of what they were in 1970. The application of stringent controls on mercury losses from the Dow Chemical Company's chlor-alkali plant in Sarnia in 1969 and the subsequent elimination of the mercury cell operation led to this decline.

High levels of mercury in larger sizes of most fish species still necessitate restrictions on consumption. In 1982, Ontario published a consumption advisory for gizzard shad >10 inches from the St. Clair River. Restricted consumption of the following sport fish from Lake St. Clair was also advised due to elevated mercury concentrations: rock bass, pumpkinseed, and largemouth bass >6 inches; bluegill >8 inches; black crappie, smallmouth bass, yellow perch, and brown bullhead >10 inches; white bass and freshwater drum >12 inches; walleye >14 inches; channel catfish, northern pike, white sucker, and quillback carpsucker >18 inches; carp >22 inches; muskie >26 inches; and sturgeon >40 inches. Larger sizes of carp and channel catfish also contained elevated levels of PCB (exceeding the Canadian federal guideline of 2 mg/kg), necessitating consumption advisories.

Michigan has a fish consumption advisory in effect for muskellunge caught from the St. Clair River, because of elevated mercury levels; the mean mercury concentration in 1980 was 2.10 mg/kg.

The incidence of fish tainting had declined significantly in recent years, although it is still occasionally reported in areas close to industrial sources.

WATER

In 1981, Ontario data indicated that levels of total phenols ranged from 1 to 25 µg/L along the Ontario shoreline of the St. Clair River. The extent of the Agreement objective (1 µg/L) violation was 15 km along the shore with a maximum width of 50 m.

During the same year, fecal coliform levels exceeded the provincial objective (100 counts/100 mL) along the Sarnia waterfront (Sarnia Bay) for a longitudinal distance of 300 m and a maximum width of 30 m.

A recent survey of trace organics in industrial effluents indicated that, while there is no immediate threat to water supplies or fish, additional controls on the discharge of these compounds are warranted, for the long-term protection of the river ecosystem.

REMEDIAL MEASURES

ONTARIO

Significant industries are concentrated on the Canadian side of the St. Clair River. Shell, Petrosar, DuPont, Union Carbide, and Ethyl Canada are located at Corunna; Lambton Generating Station and CIL at Courtright; Suncor, Dow Chemical, Polysar, Imperial Oil, and Esso Chemical at Sarnia. Several industries in the St. Clair area are not meeting Ontario MOE's effluent requirements for conventional parameters on a consistent basis.

Phenols and BOD/COD loadings from Polysar exceed the effluent requirements. A two-stage remedial program has been required by Ontario MOE to correct water pollution problems. Stage 1 was completed on schedule, and Stage 2 is scheduled for completion in 1982 and will result in 85% of the organics being directed to a biological treatment plant.

Two industries, Petrosar and Esso Chemical, periodically exceed requirements for phenol in spite of the fact that both have effluent polishing with activated carbon. Neither contributes to the narrow band along the Ontario shoreline where the ambient objective for phenolic compounds is exceeded, since the outfalls extend into the deeper channel where dilution is achieved rapidly.

Lead levels from Ethyl Canada continue to exceed discharge objectives in spite of the installation of an inclined plate clarifier in 1981. The unit has been dismantled in an attempt to rectify shortcircuiting problems and should return to service by late summer 1982.

Since 1975, Ontario MOE has been investigating organic chemicals in municipal and industrial effluents along the St. Clair River. A report on the 1977-78 studies indicates that organics are present in municipal and industrial effluents. In 1979 and 1980, Ontario MOE and Environment Canada undertook a joint study to further characterize and quantify toxics in industrial effluents in the St. Clair River area; the study reports are in the final stages of completion. It is anticipated that this joint study will improve the data base on effluent characteristics both qualitatively and quantitatively, with the result that Ontario MOE may impose further requirements for toxic control on the industries involved, to ensure that water quality continues to improve in the St. Clair River.

Additional surveillance work is planned by Ontario MOE to refine the data obtained in the above studies, to assess trends, and to evaluate the benefit of recent and impending improvements in effluent quality from several industries. At the same time the industries are being required, by way of conditions on Certificates of Approval for new or modified discharges, to monitor for specific toxic organic chemicals. This will permit Ontario MOE to maintain an active data base of each outfall and monitor improvements achieved by process modifications or control techniques.

MICHIGAN

Michigan industrial and municipal dischargers to the St. Clair River are in substantial compliance with permit requirements.

ASSESSMENT

WATER

Remedial action at Polysar Corporation in conjunction with the extension of the Township ditch and other outfalls will significantly reduce the mixing zones associated with phenolic compounds and generally lower contamination concentrations within the river. Regulatory controls and discharge monitoring results indicate PCB input has been virtually eliminated. Achievement of further controls on persistent and non-persistent toxic substances emissions

will follow from further definition of priority compounds, identification of sources, and selection of appropriate control technology. It is expected that this will proceed on a scheduled basis as the results of additional fish contaminants analysis, discharge monitoring, and predictive modelling of instream concentrations become available.

SEDIMENTS

Improvements in contaminant levels and the zoobenthic community observed over the last decade suggest that effluent controls and natural river processes are contributing to system rehabilitation. The removal of contaminated sediment for confined disposal as part of periodic capital and maintenance dredging projects carried out in the immediate industrial area will result in further improvement. No other action is warranted at this time.

FISH

The mercury levels in sport fish in Lake St. Clair are now being resolved through natural processes. Scheduled abatement activity is expected to totally eliminate the fish tainting problem.

SUMMARY

The remedial action essential to reducing mercury levels in fish was taken in the early 1970's. Levels have declined in fish and should continue to do so, albeit at a reduced rate, as natural physical and chemical processes reduce the availability of mercury in sediments. Similarly, the major controls necessary to the recovery of the benthic community along the Ontario shoreline are in place and progress is being monitored.

Remedial measures at Polysar, when completed this year, should markedly improve water quality in the Sarnia area.

Correction of the bacterial contamination problem in Sarnia Bay is being sought in cooperation with the municipality.

INFORMATION SOURCES

Detailed information about environmental conditions in the St. Clair River may be obtained from the following reports:

1. Government of Ontario, 1982. "Guide to Eating Ontario Sport Fish - Southern Ontario and Great Lakes," Toronto, 1982, 191 pp.

2. Ontario Ministry of the Environment, Water Resources Branch, Toronto, 1977. "St. Clair River Organics Study. Fish Toxicity and Tainting Evaluations for Selected Industrial Effluents." Rept. LTS 81-1, 21 pp.

3. Hamdy, Y.S. and J.D. Kinkead, 1979. "St. Clair River Organics Study. Waste Dispersion." Ontario Ministry of the Environment, Toronto. 27 pp.

4. Ontario Ministry of the Environment, Southwestern Region, 1979. "St. Clair River Organics Study. Biological Surveys. 1968 and 1977." 90 pp.

5. Bouner, R.F. and O. Meresz, 1981. "St. Clair River Organics Study. Identification and Quantitation of Organic Compounds." Ontario Ministry of the Environment, Laboratory Services Branch Report, Toronto, 219 pp.

6. Ontario Ministry of the Environment, Laboratory Services Branch, Toronto, 1981. "St. Clair River Organics Study. The Screening of Industrial Effluents for Genotoxic Activity." 69 pp. plus appendices.

7. "Michigan Fishing Guide," Lansing, 1982.

8. "Great Lakes Environmental Contaminants Survey, Summary Report 1972-1980," Michigan Department of Natural Resources, Publication No. 3730-0038, Lansing, March 1982.

Additional information about remedial measures may be obtained from:

Ontario Ministry of the Environment
Southwestern Region Office
London, Ontario

Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

DETROIT RIVER, MICHIGAN AND ONTARIO

ENVIRONMENTAL DATA

SEDIMENT

The Ontario Ministry of the Environment (MOE) conducted a survey of bottom fauna, metals, and organic pollutants in the sediments of the Detroit River in 1981 in preparation for a more intensive study in the future. Levels in excess of the Ontario guidelines for open-water disposal of dredged materials for PCB (0.05 mg/kg) and mercury (0.3 mg/kg) were found at 78% and 34% of the stations sampled, respectively. The majority of exceedances were in sediments along the U.S. shore in the vicinity of the Detroit sewage treatment plant, Great Lakes Steel, and the Rouge River mouth, and would necessitate confined disposal of dredged materials.

Improvements in distribution and numbers of the pollution-sensitive mayfly have occurred along both sides of the river since 1968. However, a significant portion of the U.S. shoreline in the vicinity of and downstream from the Rouge River mouth still exhibits very high densities of tubificids (sludgeworms).

The Michigan Department of Natural Resources (DNR) will conduct a preliminary study of organic pollutants in the sediments of the Detroit River in 1982 in preparation for an intensive study in the future.

Conditions near the Detroit River mouth and in western Lake Erie suggest that an overall reduction has occurred in organic and phosphorus waste loadings into the area.

FISH

The 1982 Ontario Ministries of Environment and Natural Resources publication entitled, "Guide to Eating Ontario Sport Fish", indicated that mercury levels in walleye (>16 inches) and rock bass (>6 inches) ranged from 0.5 to 1.0 mg/kg. The Canadian federal guideline for fish consumption is 0.5 mg/kg. Fish consumption advisories issued by Ontario for the above species and sizes remained in effect.

Michigan has issued an advisory against consumption of muskellunge from the Detroit River as a result of a mean level of mercury contamination of 2.10 mg/kg.

WATER

In water year 1980, 78 of 456 samples (17.1%) from the Detroit River exceeded the fecal coliform bacteria objective. The mean phenol concentration was 0.5 µg/L in 1980, compared to a mean of 0.93 µg/L in 1979. Concentrations exceeded Agreement objectives most often below the confluence with the Rouge River. Total iron concentrations exceeded the objective at every station on the Detroit River on at least one date, but violations occurred more frequently in the lower reaches. The mean total iron concentration was 188 µg/L. The mean total dissolved solids concentration of 103 mg/L met the Agreement objective, but samples collected at both the head and mouth ranges in water year 1980 exceeded the objective.

The Ecorse River, a tributary to the Detroit River, in the past contributed to fecal coliform and phenol problems in the Detroit River, due largely to combined sewer overflows. In 1980, 15 of 18 samples exceeded the Agreement objective for fecal coliform bacteria, with a maximum of 2.6 million colonies/100 mL. Phenol concentrations reached 19 µg/L; the mean of 12 samples was 6 µg/L. One 1980 sample showed a total iron concentration of 620 µg/L, compared to 630 µg/L in one sample in 1979. Total dissolved solids concentrations averaged 382 mg/L in 1980, with a maximum of 754 mg/L. However, the communities of Lincoln Park, Taylor, and Dearborn Heights on the Ecorse River now have separate sewer systems, and Allen Park is under federal court order to construct a separate system.

The River Rouge is also a significant source of pollutants to the Detroit River. This river is considered below, as a separate area of concern.

Total phosphorus loadings from the Detroit River into the western basin of Lake Erie have declined significantly over a 12-year period. This improvement is reflected by a decrease in phosphorus levels in the western basin of Lake Erie and a decline in algal densities at a municipal intake in the basin.

The 1981 Ontario data for bacterial levels along the Ontario shoreline from Windsor to Amherstburg confirmed the restriction of the water use for recreational swimming, bathing, and other activities along the shoreline. This restriction is due to frequent violation of the provincial objective for

fecal coliform (100 organisms/100 mL). Bacterial contamination in the Detroit River does not, however, extend along the north shore of the western basin of Lake Erie.

REMEDIAL MEASURES

MICHIGAN

The Detroit Wastewater Treatment Plant, long a major pollutant source to the Detroit River, has fully met the standards for secondary treatment and phosphorus removal, as ordered by the courts, since June 1981 for all dry weather flows. The plant meets the standards for oil and grease removal for all flows through plant. The plant meets the standards for phenol removal for all flows up to 805 million gallons per day, which includes peak dry weather flows. Results are tabulated below:

DETROIT WASTEWATER TREATMENT PLANT DISCHARGE

		June 1980 - June 1981[a]	June 1981 - June 1982[b]
Flow	(average)	660 MGD	684 MGD
	(maximum)	993 MGD	1081 MGD
	(total)	241 billion gallons	249 billion gallons
Total Suspended Solids			
	(average)	52 mg/L	24 mg/L
	(total)	50650 tons	(25000 tons)[c]
BOD_5	(average)	37 mg/L	17 mg/L
	(total)	35350 tons	(18000 tons)[c]
Phenol	(average)	46 mg/L	19 mg/L
Total Phosphorus			
	(average)	1.32 mg/L	0.57 mg/L
	(total)	1259.5 tons	(590 tons)[c]
Fecal Coliforms			
	(average)	110 MPN	83 MPN

a. Data obtained from "Final Fiscal Year Record", prepared by the Detroit Water and Sewerage Department.

b. Data obtained from "Monthly Operating Report", prepared by the Detroit Water and Sewerage Department.

c. Estimate.

The Detroit Wastewater Treatment Plant, probably the main source of phenol to the Detroit River is now in compliance with the phenol limits. From September 1980 to May 1982, the 30-day and the 7-day averages for phenols discharged from the plant were 103.26, and 144.53 pounds, respectively. The limits are 400 to 800 pounds, respectively.

The Ford Motor Company, also previously a major discharger of phenols, is now in compliance.

Although preliminary examination of 1981 data indicates the phenol objectives may be exceeded in the Detroit River, those communities (Monroe, Wyandotte, and Detroit-Southwest Plant) drawing water supply from the Detroit River no longer register problems with taste or odor.

Several sites possibly contributing to surface water degradation have been or are being cleaned up. The BASF Wyandotte southworks are closed and being demolished. The mercury cell room has been closed and is being torn down. A previously owned BASF site in the City of Wyandotte has been cleaned up and capped.

The Liquid Disposal Incineration, Incorporated site in Shelby Township is being cleaned up under Superfund emergency provisions. The site is on the interim national priority list to receive funds for remedial action.

Urban surface runoff from the City of Detroit directly into the Detroit River, combined sewer overflows in the Rouge River Basin, and combined sewer overflows from the City of Detroit result in elevated levels of bacteria in the Detroit River and contribute to the total phosphorus load to the river and to the western basin of Lake Erie. The Detroit Water and Sewerage Department conducted a $5,000,000 facilities planning study addressing combined sewer overflows from the City of Detroit. The study showed that, although pollutant loads to the river from this source could be reduced, no significant improvement in water quality would result from any of the abatement alternatives identified to date. Any load reductions and improvements would be masked by the direct surface runoff from the City of Detroit and by the combined sewer overflows in the Rouge River Basin. There are no plans to address direct land runoff into the river. Combined sewer overflows in the Rouge River Basin are discussed below in a separate area of concern. It should be noted, however, that over the past ten years, the City of Detroit has eliminated approximately 50% of its combined sewer overflows through in-system storage, and by preventing river inflow; also, as a result of improved plant operation, this wastewater is receiving better treatment than in the past.

In its 1981 report, the Water Quality Board reported that the estimated annual phosphorus load from combined sewer overflows at Detroit was 110 tonnes. The Board further reported that, when all municipal treatment plants in the Lake Erie Basin achieve an effluent limitation of 1.0 mg/L, combined sewer overflows at Detroit would constitute the third largest point source of phosphorus in the basin, in terms of annual load. Since combined sewer overflows and direct land runoff contribute a sizeable loading of phosphorus, control of these sources could afford a greater measure of protection and improvement to the water quality of the Detroit River and the western basin of Lake Erie.

Monsanto Company in 1981 discharged 117 pounds per day of phosphate phosphorus, an annual average concentration of 0.92 mg/L, which represents 98.8% removal of phosphorus from the process waste flow. This is considered to be best available treatment and no further remedial action is proposed.

The high contaminant levels in sediment are primarily a result of past discharges from industries along the U.S. shore of the river. The regulatory emphasis on hazardous waste disposal sites in the Detroit metropolitan area ensure that no further significant deposition of toxic substances will occur. Natural physical and biochemical processes are expected to reduce the contaminant levels and lead to re-establishment of a healthy benthic fauna community.

ONTARIO

While Ontario industrial inputs do not in themselves result in objective exceedances or use impairment, described above, there are a number of waste treatment deficiences which are under active resolution or investigation with the objective of reducing overall waste loading. As such, they should contribute to the maintenance of water quality in the Detroit River and western Lake Erie once controls on major Michigan inputs are complete.

Ford Motor Company of Canada, Chrysler Canada Limited, Gulf and Western Canada Limited, Hiram Walker and Sons Limited, Allied Chemical Canada Limited, and Canada Salt Company Limited at Windsor and BASF Wyandotte Corporation at Fighting Island are the industrial sources. Except for Chrysler Canada Limited and Ford Motor Company, all of these Ontario sources are in compliance with Ontario MOE effluent requirements.

Chrysler Canada Limited was not in compliance with Ontario MOE loading requirements for phosphorus. The Company is planning to segregate those waste streams containing relatively high phosphorus concentrations for separate treatment, designed specifically for phosphorus removal.

Ford Motor Company was marginally not in compliance with the loading requirements for phenol and suspended solids. The reasons for this non-compliance are being investigated.

Shoreline bacterial contamination downstream of Windsor and at Amherstburg is being addressed through a number of municipal projects. The City of Windsor completed expansion of its Little River plant in 1981 and is presently expanding its Westerly wastewater treatment plant to 163 x 10^3 m^3/d (36 MIGD). Completion of this expansion is expected in late 1981. Extension of trunk and lateral sewers to areas presently serviced by septic tank systems will continue as an ongoing program.

A $20 million program to provide a sewage collection system, including pumping stations and forcemains, is presently under construction in Sandwich West Township, located immediately south of Windsor. This provincially financed system, when completed in late 1981 or early 1982, will transfer wastes to the West Windsor pollution control plant. Completion of this project should improve water quality in the Detroit River immediately downstream from Windsor.

At Amherstburg, a proposal to expand the existing 4.5 x 10^3 m^3/d (1.0 MIGD) primary type sewage treatment facility is presently under review by Ontario MOE for preliminary acceptance. Also included in the proposed expansion are pumping stations and modifications to chemical dosing

equipment. Upon acceptance of the proposal, final design will have to be completed and funding secured by the municipality before construction begins.

Recently completed and ongoing improvements to the Windsor area collection systems and expansion of sewage treatment facilities at Windsor and Amherstburg, coupled with the phased extension of sewer services into areas presently serviced by septic tanks, will bring about steady improvement in bacterial levels along the Ontario shoreline, and help ensure that the provincial objectives for public health indicator bacteria will be met.

The Windsor and the Amherstburg plants are currently discharging 97.2 x 10^3 and 4.3 x 10^3 m^3/d, respectively, with annual average phosphorus concentrations of 1.0 and 1.9 mg/L, respectively.

In addition to the above Canadian point sources, recent developments concerning the possible future use of Fighting Island, located in the Detroit River, are also noted. The island is in Canada and is owned by BASF Wyandotte of Michigan. It has been used for waste disposal since the 1920's. The U.S. EPA, Environment Canada, Ontario MOE, and Michigan DNR are concerned about the possible discharge of toxic substances in the event that Fighting Island is used as a treatment/containment facility for sewage sludge from the City of Detroit. Detroit proposed a pilot project for sewage sludge disposal on the island; this proposal received provisional approval from Ontario MOE and is now underway. The process basically consists of mixing sewage sludge with the settled materials from the abandoned treatment beds with the object of determining the feasibility of employing waste material to support vegetation to rehabilitate the island. The pilot study is expected to require 2-3 years for completion.

INFORMATION SOURCES

Detailed information about environmental conditions and remedial programs may be obtained from the following reports:

1. Ontario Ministry of the Environment, Southwestern Region and Water Resources Branch, 1981. "An Assessment of the Bottom Fauna and Sediments of the Western Basin of Lake Erie, 1979." Ontario Ministry of the Environment, Toronto. 24 pp.

2. Ontario Ministry of the Environment, Southwestern Region, London, and Water Resources Branch, Toronto. Unpublished data on 1981 trace contaminants and macrozoobenthos survey of Detroit River sediments.

3. Letter communication from W.E. McCracken, Michigan Department of Natural Resources, to G.D. Haffner, International Joint Commission, Windsor, June 8, 1981.

4. "1981 - Highlights of Water Quality and Pollution Control in Michigan", Michigan Department of Natural Resources, Publication Number 4833-9804, Lansing.

5. "Great Lakes Environmental Contaminants Survey, Summary Report, 1972-1980", Lansing, Michigan.

Information may also be obtained from:

Ontario Ministry of the Environment
Southwestern Region Office
London, Ontario

Ontario Ministry of the Environment
Water Resources Branch
135 St. Clair Avenue West
Toronto, Ontario M4V 1P5

Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

ROUGE RIVER, MICHIGAN

ENVIRONMENTAL DATA

SEDIMENT

No recent data are available; historical data show severe degradation.

WATER

In 1980, fecal coliform concentrations exceeded the Agreement objective in 11 of 12 samples, with a maximum of 60,000 colonies/100 mL. Phenol concentrations exceeded the Agreement objective, with a mean concentration of 9 µg/L and a maximum of 24 µg/L. Two samples were analyzed for total iron in 1980 with a mean concentration of 1,085 µg/L, compared to 6,700 µg/L in one sample in 1979. The mean total dissolved solids concentration was 295 mg/L in 1980, and the maximum was 490 mg/L.

FISH

No fish analyses have been performed. It should be noted as anecdotal evidence of improved water conditions that two steelhead were caught in the Rouge River in the spring of 1982.

REMEDIAL MEASURES

Industrial dischargers to the Rouge Basin are in substantial compliance with permit requirements.

The River Rouge is, nonetheless, a significant source of pollutants to the Detroit River. Combined sewer overflows are the major problem. Twenty-five percent of the total Rouge basin is drained by combined sewer networks. The outfalls from these combined sewers are located in the lower portions of the branches of the Rouge which are subject to low stream velocities. Many pollutants from the combined sewers settle out on the bottom and perpetuate polluted conditions for days and weeks after the combined sewers overflow.

Combined sewer overflow studies for communities in the basin, upstream from Detroit, were undertaken. The main study has been completed and other

studies will be completed by fall of 1982. More than $500 million would be required to alleviate the effects of combined sewer overflow. Based on information available, and considering the benefits to be derived and the costs involved, the court has concluded that measures to correct combined sewer overflows in the Rouge River Basin are not warranted at this time.

INFORMATION SOURCE

Environmental information was provided by W.E. McCracken of the Michigan Department of Natural Resources in a letter to G.D. Haffner of the International Joint Commission, dated June 8, 1981. Additional information about environmental conditions and remedial measures can be obtained from:

Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

RAISIN RIVER, MICHIGAN

ENVIRONMENTAL DATA

SEDIMENT

Sediments collected during 1975 and 1976 surveys from Monroe Harbor and the approach to the Raisin River are heavily polluted with volatile solids, oil and grease, and metals. Chemical oxygen demand is high.

FISH

Fish were collected from the Raisin River in 1978 and 1979. PCB levels were as high as 111 mg/kg, compared with the U.S. FDA action level of 5.0 mg/kg. Also present were DDT, nonachlor, tri-, tetra-, and heptadecane, naphthalene, methyl- and dimethylnaphthalene, methylbiphenyl, phenanthrene, fluoranthrene, pyrene, pyridine carboxamide, and mono- and dichlorobiphenyl.

WATER

Water samples were collected in 1978. Agreement objectives were violated for cadmium, chromium, copper, iron, nickel, zinc, dissolved oxygen, specific conductivity, and fecal coliforms. The Michigan standard for pH was also violated.

REMEDIAL MEASURES

All major dischargers to the Raisin River are in substantial compliance with their permits. Existing water quality problems result to a great extent from contaminated sediments. However, the Michigan Department of Natural Resources received support from U.S. EPA to conduct process evaluations of several chemical and manufacturing facilities in the watershed, in order to identify potential sources of toxic contaminants. Three evaluations were completed during Phase II of the study, and no problems were identified. Phase III, to be completed in October 1982, will include evaluation of three more facilities in the Raisin River watershed.

INFORMATION SOURCE

Additional information about environmental conditions and remedial measures can be obtained from:

Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

MAUMEE RIVER, OHIO

ENVIRONMENTAL DATA

SEDIMENT

Surveys conducted in 1973 and 1975 reveal that the sediments in the lower Maumee River and Toledo Harbor are heavily polluted with volatile solids, chemical oxygen demand, and metals. Sediments in the outer bay are also polluted, although less heavily so.

FISH

Fish collected between 1976 and 1979 contain PCB up to 5.9 mg/kg; the U.S. FDA action level is 5.0 mg/kg. Also detected were DDT, hexachlorobenzene, chlordane, nonachlor, methylbiphenyl, methylbenzanthrene, pyridine carboxamide, pentachloroanisole, heptadecane, and nonadecane.

WATER

Water collected at the mouth of the Maumee River contains cadmium, iron, manganese, nickel, zinc, copper, and chromium in excess of the Agreement objectives or Ohio EPA standards. In addition, dissolved oxygen, specific conductivity, phosphorus, and fecal coliforms do not meet Agreement objectives.

CAUSES AND REMEDIAL MEASURES

The Maumee River is the largest source of sediment and non-point phosphorus loadings to Lake Erie. In recognition of this, a consortium of state, local, and federal agencies has agreed to foster no-till and associated soil conservation practices in the Maumee River Basin.

The U.S. EPA has funded several large agricultural land management demonstration projects in the Maumee River basin, including: The Black Creek watershed of northeastern Indiana, Allen and Defiance Counties, Ohio and the Accelerated Conservation Tillage project (a nine-county program in northwestern Ohio, specifically affecting three counties in the Maumee River basin). Preliminary results are showing 30% to 90% reductions in soil loss, with attendant phosphorus loss reductions, depending on the specific soils and tillage practices being used. In addition to encouraging conservation tillage, the Cooperative Extension Service of the University of Ohio, the Ohio Department of Agriculture, and the Ohio Department of Natural Resources, Division of Soil and Water Conservation are promoting lower rates of application of phosphate fertilizer in northwestern Ohio to more closely match the crop utilization rates.

All of the large Ohio municipal treatment facilities in the Maumee River estuary averaged below the 1.0 mg/L effluent phosphorus requirement during 1981. All of these plants are at the advanced secondary treatment levels required to protect the dissolved oxygen requirements of the river.

Combined sewer overflow problems are currently under study at Toledo, Perrysburg, and Oregon. This problem is also being evaluated by an outside consultant under contract to U.S. EPA's Great Lakes National Program Office. Remedial programs will be developed at the conclusions of these studies. However, the funds to finance these proposals may not be readily available, which may require the deferral of the implementation.

The industrial dischargers in the estuary are in compliance with the NPDES permit requirements which were designed to meet the 1977 requirements for the traditional sewage parameters and also to meet the water quality standards for toxicants (heavy metals, cyanides, and phenols). A program to control other toxic materials is being developed.

Acute, static bioassay tests with fathead minnows were performed on the effluents from the two petroleum refineries, Standard Oil Co. of Ohio and Sun Oil Co., during 1982. No acute toxicity was discovered. Additional remedial measures may be required based on this review and the issuance of best available treatment (BAT) requirements by U.S. EPA. These BAT requirements for the petroleum refineries are expected to be issued in 1982 with compliance under the Clean Water Act being required by July 1, 1984. However, the implementation of any required control programs may take 3 to 4 years, with final compliance in 1985 or 1986.

ASSESSMENT

WATER

The combination of NPDES permits, the pretreatment program, and enforcement practices should result in all principal dischargers meeting Ohio's water quality standards.

The water quality in the estuary may never meet the Agreement objectives for Lake Erie because of the natural chemistry of the water in the drainage basin and the existing land use patterns. In addition, modifications of the geometry of the estuary (installation of bulkheads, loading docks, and deep channel dredging) have changed the hydrology so as to slow the movement of water through the estuary, resulting in a decrease in reaeration of the water and the assimilative capacity of the streams. The modified geometry promotes sedimentation, requiring periodic dredging.

The Maumee River estuary is also profoundly affected by "lake effects" through its location at the end of a relatively shallow lake. During periods of northeast winds, lake water is driven up the estuary for many miles, thus preventing the normal flow in the river. The U.S. Gelological Survey gauging station on the Maumee River is located 21 miles up river at Waterville in order to be out of the area influenced by the "lake effects".

The water entering the estuary from upstream of Waterville showed only minor problems with violations of state water quality standards for lead,

cadmium, zinc, and mercury during the period October 1, 1978 through September 30, 1980.

SEDIMENT

A portion of the high contaminant loads in the sediment can be attributed to past discharges of municipal treatment plants and industries and from agricultural practices. The continued practice of the existing remedial programs is expected to ensure that no further significant deposition of toxicants (heavy metals, cyanide, and phenols) will occur. The sediment pollution from non-point sources is more difficult to control and the remedial programs are voluntary. Time and natural processes are expected to reduce the contaminant levels. The U.S. Army Corps of Engineers operates an annual dredging program for the navigation channel of the Maumee River in Toledo and Maumee Bay. Information from an assessment of that activity over the period 1976 to 1981 indicates that the sediment is becoming less contaminated with time. The material taken from the channel northward from the Toledo Harbor Light may be suitable for open lake disposal. (Toledo Harbor Assessment, in preparation).

FISH

The ban on PCB and natural attrition will in time result in the reduction of this contaminant in fish. A similar statement can be made for the persistent pesticides and metabolites (DDT, chlordane, and nonachlor). The other identified materials are hydrocarbons, presumably from petroleum refining, coke manufacture, and other petroleum oil uses. The major sources of these products have control measures in place which should minimize the occurrence of these materials and allow natural attrition to occur. The other remedial programs discussed previously will also contribute to a healthier fish population.

GENERAL

The remedial programs in place for permit sources should decrease the pollutant loads into the river so that the natural processes of attrition should remove the contaminants from the sediments and fish over the next 5 to 10 years. The programs for non-point pollution controls are just under way, but noticable improvements in sediment and phosphorus loadings should be realized within 5 years.

It is unlikely that the water in the estuary will meet all of the Agreement objectives for Lake Erie.

INFORMATION SOURCE

Additional information about environmental conditions and the status of remedial measures may be obtained from:

Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216

BLACK RIVER, OHIO

ENVIRONMENTAL DATA

SEDIMENT

A 1975 survey indicated that the lower Black River and Lorain Harbor are heavily polluted with volatile solids, chemical oxygen demand, oil and grease, nutrients, and metals.

FISH

Fish caught at the mouth of the Black River in 1978 contained PCB, DDT, methylnaphthalene, biphenylphenanthrene, flouranthrene, pyrene, fluorene, acenaphthalene, dibenzothioprene, pyridine carboxamide, terphenyl, phenylnaphthalene, and pentachloroanisole. Many of these substances are of industrial origin. A maximum PCB level of 12.6 mg/kg was recorded in 1979, in excess of the FDA's action level of 5.0 mg/kg.

WATER

Water samples collected during a 1978 survey contained concentrations of phosphorus, ammonia, cadmium, copper, iron, lead, manganese, zinc, mercury, cyanide, conductivity, dissolved oxygen, and fecal coliforms which violated either the Agreement objectives or Ohio EPA standards.

CAUSES AND REMEDIAL MEASURES

The observed pollution is attributed in part to past industrial discharges. Sediment sampling is currently under way to assess the extent of contamination with toxic organic substances.

The lower Black River is affected by the discharge from the Elyria municipal treatment plant, which has significant industrial inputs of heavy metals. Elyria has applied for federal grants to develop a pretreatment program to address the industrial inputs and to update its treatment plant. Completion of construction is currently scheduled for 1985.

Amherst's municipal treatment plant also contributes to the pollution of the Lorain Harbor area. This entity is currently operating under a consent decree requiring it to meet interim effluent limits and to improve its plant to meet advanced secondary limits by the end of 1986.

U.S. Steel will be initiating a remedial program to meet best available treatment and water quality standards. These requirements will be included in the renewal permit to be issued this year which will require compliance by July 1, 1984.

An intensive survey of the lower reaches of the Black River from Elyria to Lake Erie was conducted during the summer of 1982. These results, along with the chemical/physical data collected by U.S. EPA, Eastern District Office will be used to assess the water use that can be achieved and to allocate the pollutant loads among the dischargers. The data analysis and final report is scheduled to be completed by September 1983.

One hazardous material site in Lorain County, Chemical Recovery, has been cleaned up by the owners under a consent decree obtained by the City of Elyria. A second site in Lorain County, Ford Road Landfill, is currently being monitored and may be a candidate for clean-up, possibly with CERCLA funds ("Superfund").

ASSESSMENT

WATER

NPDES permits, the pretreatment program (Elyria), and enforcement (such as the consent decree for Amherst) should result in the entities involved meeting Ohio's water quality standards.

The natural chemistry of the drainage area and the current land use patterns may preclude the river water from attaining the Agreement objectives for Lake Erie.

SEDIMENT

The reduction in pollution from point source dischargers discussed above should reduce significant deposition of additional pollutants. Natural physical and biochemical processes are expected to, in time, reduce the contaminant levels.

FISH

The elimination of sources of the contaminants found in fish seems to be the only practical remedial program for ensuring a healthy fish population. The controls on dischargers should provide a mechanism to eliminate the contaminants.

GENERAL

The remedial programs under way should result in adequate controls of the discharges of wastewater into the river by mid-1986. There will be a residuals problem which will require an additional 5 to 10 years for natural processes to correct.

INFORMATION SOURCE

Additional information about environmental conditions and the status of remedial measures may be obtained from:

Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216

CUYAHOGA RIVER (CLEVELAND), OHIO

ENVIRONMENTAL DATA

SEDIMENT

An extensive 1977 survey revealed that sediment from the Cuyahoga River is polluted, as is the majority of the sediment from the outer harbor. Using EPA's "Guidelines for Pollutional Classification of Great Lakes Harbor Sediments", heavy contamination still exists for the metals arsenic, cadmium, chromium, copper, magnesium, lead, and zinc. The Guidelines are also exceeded for volatile solids, chemical oxygen demand, total Kjeldahl nitrogen, and oil and grease. Nonetheless, sediment quality is substantially improved since 1972.

PCB levels in both river and harbor sediment samples exceeded 2.2 mg/kg in 1977.

FISH

Because of polluted conditions, the fish population remains severely depressed, although carp, goldfish, and white sucker were actually caught in the Cuyahoga River in 1980. PCB levels in these fish ranged from 1.6 to 23.0 mg/kg; the FDA action level is 5.0 mg/kg.

WATER

Water samples collected at the river mouth in 1978 exceeded the Agreement objectives for dissolved oxygen, conductivity, ammonia, mercury, cadmium, copper, iron, manganese, zinc, and phenols. The fecal coliform level exceeded the Ohio standard.

CAUSES AND REMEDIAL MEASURES

The Cuyahoga River has been severely impacted by numerous municipal and industrial dischargers, non-point urban runoff, and combined sewer overflows.

The City of Akron instituted a phosphate detergent ban and is currently meeting the 1.0 mg/L phosphorus limitation in their discharge by adding polymers for better solids removal. The city is complying with an enforcement order that requires them to upgrade and expand the treatment plant, with a completion date of 1986. This upgrade will minimize the current problems with combined sewer overflows and sewer system by-passes.

The Northeast Ohio Regional Sewer District has three major wastewater treatment plants: Easterly, Southerly, and Westerly. There are construction programs under way at all three facilities:

1. Easterly is currently meeting the phosphorus limitation, and the rest of the construction is currently scheduled to be complete by 1983.

2. Southerly is scheduled to have the phosphorus control facilities in place by the end of 1982. The rest of the construction is scheduled to be completed by 1985.

3. Westerly is not meeting the phosphorus limitation and the schedule for needed facilities has slipped. Facilities are currently expected to be complete in 1983.

In addition to the wastewater treatment plant expansions, the District has two large interceptor programs:

1. Cuyahoga Valley Interceptor is on schedule and will pick up the Summit County Macedonia plant in 1982. The Phase 2 extensions to pick up Maple Heights and Cuyahoga County S.D.#13 are scheduled for funding in September 1985, with completion in 1989.

2. The Southwestern Interceptor slated to serve Berea, Brook Park, Middleburg Heights, and NEORSD-Strongsville A is scheduled for funding by 1986, with completion in 1990.

Wastewater treatment systems have been installed at the major industrial point sources in the estuary to control conventional pollutants and toxicants. These facilities are in compliance. These facilities are being reviewed to identify whether additional controls are needed for other toxic substances.

The best available treatment guidelines for the iron and steel industries have been issued. The U.S. Clean Water Act requires compliance by July 1, 1984. The NPDES permits for Republic Steel and for Jones and Laughlin are being reviewed to determine what additional treatment may be required.

The permits for the two major chemical companies, du Pont and Harshaw, are also under review, especially with respect to possible toxic pollutants.

Several hazardous waste sites have been identified, closed, and/or cleaned up.

The Ohio Drum Reconditioning site was leased by L. Gray Barrel & Drum Company in November 1981. There remains no discharge from this facility, the marshy area having been diked. Superfund money is expected to be utilized for clean-up of the PCB-contaminated marsh area.

Approximately $440,000 in Superfund emergency removal monies have been used to clean up the Chemical Mineral Reclamation site. The final phase may require an additional $115,000.

The Old Mill Creek site clean-up is under way, with 400 of 1000 drums removed. Additional sites at Anaconda Avenue and Woodford Road Quarry are under investigation.

An intensive survey of the navigation channel of the Cuyahoga River is tentatively scheduled for 1985. This survey will gather all the pertinent information on biology, chemical and physical conditions of the water, detailed information on dischargers and the altered geometry/hydrology of the channel. The survey will allow Ohio EPA to assess the uses that are attainable for the river and develop wasteload allocations to enable those uses to be achieved.

ASSESSMENT

WATER

Completion of the present remedial programs will result in improvement in the water quality of the river. However, achievement of high quality water is problematic because of the extensive alteration of the stream geometry along with the intensive use as a navigation channel.

SEDIMENT

The improvement in water quality will result in less deposition of contaminants. Enforcement actions, such as the Ohio Drum Reconditioning case in 1980 and the identification of uncontrolled waste disposal sites, will also reduce pollutants in the sediment.

FISH

The probability of the Cuyahoga River ever becoming a sport fishery is small. However, with improved water quality and reduced pollutants in the water and sediments, fish may start to reappear.

GENERAL

There is inadequate information available to determine what water quality the current remedial programs will permit. However, in light of the natural chemistry of the drainage basin, the current intensive land use, and the greatly modified geometry of the navigation section of the river, it is unlikely that the water quality in the river will ever meet the Agreement objectives for Lake Erie.

INFORMATION SOURCE

Additional information about environmental conditions and the status of remedial measures may be obtained from:

Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216

ASHTABULA RIVER, OHIO

ENVIRONMENTAL DATA

Analyses of sediment, fish, and water samples collected from the lower Ashtabula River, the harbor area, the navigation channel, and the tributaries (Black Creek, Field's Brook, and Strong Brook) reveal that this heavily industrialized area has been and continues to be polluted.

SEDIMENT

Based on 1974 studies, Ashtabula Harbor was classified as polluted, because concentrations of volatile solids, total Kjeldahl nitrogen, chemical oxygen demand, zinc, iron, manganese, chromium, and oil and grease exceeded

A group of major industries is located on Field's Brook, a tributary to the Ashtabula River in the navigable portion. The industries include Gulf and Western Natural Resources Division, Olin Corporation, SCM Corporation, Detrex Chemical Corporation, General Tire and Rubber Company, and RMI, Inc. The discharge from these companies comprises the flow of the stream under low flow conditions (the intake water is from Lake Erie). All of the companies have installed treatment facilities to meet the 1977 requirements for the historic sewage and toxic pollutants. The treated wastewater could not achieve the water quality standards for total dissolved solids, and Ohio EPA eased the standard for total dissolved solids from 1,500 to 3,500 mg/L for the brook below the industries.

Olin Corporation has closed its plant because the economics were no longer favorable. Detrex Corporation continues to operate its plant for limited production of hydrochloric acid and N-methyl pyrrole. The other industries are being evaluated to see if additional controls are needed, especially to see if toxic pollutants are being discharged.

The Detrex Chemical Company has an old dump site on its property. Evidence shows that chlorinated organics are leaching into the ground water and into Field's Brook. Negotiations are under way with the company to develop a program for clean up of the site.

The contaminated sediment in Field's Brook is under study to determine the best method of removal/containment. A joint, cooperative project with the industry in the area is being discussed, with the option of using Superfund monies as a back-up option. Field's Brook is a priority site on the Superfund list; it is the only site where Superfund monies are being considered for the removal of contaminated sediment from a stream.

The contaminated sediment in the navigation channel of the Ashtabula River will be dredged by the Corps of Engineers, with the material being deposited at a secure disposal site. An agreement among the various governmental entities, the U.S. Army Corps of Engineers and the owners of the preferred site is under active discussion.

Hazardous waste sites were identified in the Ashtabula River drainage basin:

1. Raser Tannery: The company went into receivership in 1980. The site has been cleaned up with $33,000 of Superfund money.

2. Poplar Oil/Laskins Waste Oil: Superfund monies were used to remove some of the waste oils on an emergency basis. A contractor has been selected and is currently awaiting an award of $1.56 million to clean up the site.

Additional sites under review include Sitrex Chemical Co., Big D Campground, North Kinesville Sanitary Landfill, New Lyme Township Sanitary Landfill, and Detrex Chemical Co.

EPA's "Guidelines for Pollutional Classification of Great Lakes Harbor Sediments."

An extensive 1979 study revealed the sediments in the navigation slip near Strong Brook to be heavily polluted with zinc, lead, and oil and grease.

Sediments collected in Field's Brook in 1979 contained high levels of chlorinated solvents, including hexachlorobenzene, polychlorinated butadienes, ethanes, ethylenes, and benzenes, as well as benzo(a)pyrene and PCB. These are all U.S. EPA priority pollutants. The sediments were also classified as heavily polluted with mercury, arsenic, cadmium, chromium, copper, lead, and zinc, all EPA priority pollutants.

Sediment samples collected in the navigation channel revealed contamination with polychlorinated compounds, including 1,4-dichlorobenzene. The metals arsenic, cadmium, and chromium were also present.

A 1980 study in Field's Brook reconfirmed that the sediments are heavily polluted with mercury, arsenic, cadmium, chromium, lead, and zinc. Polychlorinated solvents present in the sediments included trichloroethylene; 1,1,2-trichloroethane; tetrachloroethylene; 1,1,2,2-tetrachloroethane; hexachlorobutadiene; plus others. PCB is also present.

FISH

Fish collected from the Ashtabula River in 1976 contained a wide variety of chlorinated organic chemicals, including several known to be toxic and/or carcinogenic. Compounds present include PCB, polychlorinated butadienes, chlorinated propane, chlorinated propene, chlorinated styrenes, chlorinated norborenes, and hexachlorobenzene. No U.S. FDA action levels exist, except for PCB (5.0 mg/kg); the maximum PCB level measured was 7.2 mg/kg.

A 1978 study confirmed these findings. A 1979 study reported PCB (maximum 45.3 mg/kg) and hexachlorobenzene as present. A 1980 study again confirmed hexachlorobenzene to be present.

WATER

Water samples collected at the mouth of the harbor in 1978 exceeded Agreement objectives for conductivity, mercury, cadmium, copper, iron, and fecal coliforms.

CAUSES AND REMEDIAL MEASURES

The Ashtabula municipal wastewater treatment plant is probably the principal source of the violations of the fecal coliform objective due to a lack of a chlorine contact tank. Completion of construction of plant improvements is scheduled for 1984.

Acute, static bioassays were conducted for 24 and 48 hours on the effluents in 1981, using daphnia as the test organism. The results showed mortalities ranging from 0% to 100%. However, this species is sensitive to total dissolved solids and it is suspected that the high salt content of the effluents caused most of the mortality. Additional tests with other organisms will be performed.

ASSESSMENT

WATER

With respect to traditional pollutants and toxicants, the improvement of the municipal sewage treatment plant and the control facilities built by the industrial dischargers should result in improvements to the water quality. The currently ongoing studies for other toxics must be completed and decisions made as to other controls required for industrial dischargers before any assessment can be made as to overall improved water quality.

SEDIMENT

Until the study of the removal of the currently contaminated sediments is completed, it is not possible to make any assessment of the effectiveness of any remedial program to correct sediment pollution.

FISH

If the water quality continues to improve and if the contaminated sediment is removed, the fish population in the area should become healthier and less contaminated.

GENERAL

Significant progress has been achieved in the last ten years in improving the water quality in the river basin. In the early 1970's, Field's Brook was a sterile watercourse because of large discharges of chlorine in addition to the chlorinated organic compounds and residues from the titanium dioxide refining processes. In 1980, the major problems were corrected and pollution-tolerant fish have returned to the lower reaches of Field's Brook and the stream is meeting Ohio's water quality standards.

The upper reaches of the Ashtabula River are relatively free of pollution except for infrequent iron, lead, and phenolic violations that are suspected to be from non-point sources.

The estuary, despite the contaminated sediment, is an important spawning area for many important Lake Erie fish. Local sport fishermen and the U.S. Coast Guard report salmonoid migrations and large numbers of white bass in this segment.

The remaining problems are the residuals problem and need for additional interpretation of the impact on human health, particularly for the chlororganics, as well as continuing monitoring to assess the rate that natural attrition is improving the water quality.

INFORMATION SOURCE

Additional information about environmental conditions and the status of remedial measures may be obtained from:

Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216