CUYAHOGA RIVER REMEDIAL ACTION PLAN
STAGE ONE REPORT

IMPAIRMENTS OF BENEFICIAL USES AND SOURCES AND CAUSES IN THE CUYAHOGA RIVER AREA OF CONCERN

SUBMITTED TO THE
OHIO ENVIRONMENTAL PROTECTION AGENCY

JUNE 1992

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Approved for Submittal to the
Ohio Environmental Protection Agency

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Prepared By:

Cuyahoga River Remedial Action Plan Coordinating Committee

The Cuyahoga River Remedial Action Plan Stage One Report was prepared with funding assistance to the Northeast Ohio Areawide Coordinating Agency under Section 205(j)/604(b) of the Clean Water Act, through an agreement with the Ohio Environmental Protection Agency, and contributions from local jurisdictions of NOACA. Funding support was also provided by the Cuyahoga River Community Planning Organization, the George Gund Foundation, the City of Akron, the Northeast Ohio Regional Sewer District, and the Ohio Environmental Protection Agency.

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ACKNOWLEDGMENTS

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TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	i
LIST OF FIGURES AND EXHIBITS	xi
LIST OF TABLES	xvii
PREFACE	xxi
CHAPTER ONE: PUBLIC REVIEW SUMMARY	
Opening Quotes	1-1
List of CCC Members	1-2
Introduction and Key Findings (Cuyahoga River Ecosystem in the 1990s)	1-3
What are RAPS? (Remedial Action Plans for Areas of Concern: An Important Step Twoard Comprehensive Management of the Great Lakes)	1-5
The Cuyahoga RAP Process	1-9
The Historical Setting (The Cuyahoga River Environment: Past and Present)	1-14
What are the Sources of Environmental Degradation?	1-16
Beneficial Uses Impaired (The Problems Discovered in the Cuyahoga RAP Area of Concern)	1-21
The Research Agenda (What We Do Not Know)	1-35
Where Do We Go From Here	1-35
Glossary	1-39
List of Communities in the RAP Study Area	1-44
CHAPTER TWO: BACKGROUND	
2.1 Remedial Action Plan	2-1
2.2 Organization	2-11
2.2.1 Cuyahoga RAP Coordinating Committee	2-11
2.2.2 Steering Committee	2-11
2.2.3 Technical Committee	2-12
2.2.4 Community Involvement Committee	2-14
2.2.5 Plan Drafting Committee	2-14
2.2.6 Cuyahoga River Community Planning Organization	2-15
2.3 Goals of the Remedial Action Plan	2-17
2.3.1 Ecosystem Approach	2-17
2.3.2 Restoration of Beneficial Uses	2-19
2.3.3 Public Consultation	2-19
2.3.4 Virtual Elimination of Toxics	2-19

TABLE OF CONTENTS (Continued)

CHAPTER TWO (Continued)

		PAGE
2.4	Remedial Action Plan Elements	2-20
2.4.1	Stage One Document Elements	2-20
2.4.2	Subsequent Stages of the Planning Process	2-21
2.5	Review Process	2-21
2.6	Intended Use of Stage 1	2-21
	CHAPTER THREE: ENVIRONMENTAL SETTING	
3.0	Science Applications International Corporation (SAIC Report)	3-1
3.1	Location of the Area of Concern	3-1
3.1.1	Location of the Cuyahoga River Basin	3-1
3.1.2	Description of the Area of Concern	3-1
3.1.3	The Historical Cuyahoga River Environment	3-3
3.2	Natural Features	3-4
3.2.1	Drainage Basin	3-4
3.2.2	Topography	3-8
3.2.3	Hydrology	3-8
3.2.4	Soils and Erosion	3-16
3.2.5	Wetlands	3-19
3.2.6	Sediment Load Estimates and Dredging	3-19
3.2.7	Air Quality	3-20
3.3	General Land Use Information	3-23
3.3.1	The Cuyahoga River Watershed	3-23
3.3.2	The Nearshore Study Area	3-25
3.4	Current Land and Water Uses	3-26
3.4.1	Biota and Habitat	3-26
3.4.2	Recreation	3-37
3.4.2.1	Recreation Facilities	3-39
3.4.2.2	Recreational Use Data	3-43
3.4.3	Socio-economic Information	3-43
3.5	Water Quality Standards	3-54

TABLE OF CONTENTS (Continued)

CHAPTER FOUR: DEFINITION OF THE PROBLEM		PAGE
4.0	Introduction	4-1
4.1	Use Impairments Evaluated	4-4
i.	Restrictions on 1) Fish Consumption	4-4
	2) Wildlife Consumption	4-14
ii.	Tainting of Fish and Wildlife Flavor	4-15
iii.	Degraded Populations of 1) Fish	4-16
	2) Wildlife	4-22
iv.	Fish Tumors or Other Deformities	4-24
v.	Bird or Animal Deformities or Reproductive Problems	4-29
vi.	Degradation of Benthos	4-30
vii.	Restrictions on Dredging Activities	4-35
viii.	Eutrophication or Undesirable Algae	4-39
ix.	Restrictions on Drinking Water Consumption or Taste and Odor Problems	4-44
x.	Recreation Impairments, including Beach Closings	
	1) Beach Closings, Swimming	4-51
	2) Boating Impairments	4-57
	3) Fishing Impairments	4-65
xi.	Degradation of Aesthetics, including Trail Use Impairments, Active Sports and Passive Use Impairments	4-69
xii.	Added Costs to Agriculture or Industry	4-75
xiii.	Degraded Populations of 1) Phytoplankton	4-77
	2) Zooplankton	4-81
xi .	Loss of Habitat 1) Fish Habitat	4-84
	2) Wildlife Habitat	4-87
4.2	Chemical Quality Issues	4-89
4.2.1	Sediment Quality	4-89
4.2.1.1	Summary	4-89
4.2.1.2	General	4-89
4.2.1.3	Summary of Most Recent Data	4-92

TABLE OF CONTENTS (Continued)

CHAPTER FOUR (Continued)

		PAGE
4.2.2	Chemical Water Quality	4-96
4.2.2.1	1954-1989 Chemical Water Quality Trends	4-96
4.2.2.2	1990 Status of Chemical Water Quality in the Lower Cuyahoga	4-105
4.2.2.3	1991 Ship Mixing Study of the Cuyahoga River Modeling Project	4-121

CHAPTER FIVE: SOURCES AND CAUSES OF POLLUTION

5.0	Introduction	5-1
5.1	Point Source Inventory	5-3
5.1.1	Overview of Present-Day Point Source Dischargers	5-3
5.1.2	Permitted Plant Dischargers	5-3
5.1.2.1	Permitted Discharger Inventory	5-3
5.1.2.2	RAP Survey of Permitted Dischargers	5-5
5.1.3	CSO/SSO/Plant Bypass Dischargers in Cuyahoga River basin and Nearshore Area	5-31
5.1.3.1	NEORSD	5-31
5.1.3.2	Akron	5-48
5.2	Nonpoint Source Inventory	5-61
5.2.1	Introduction	5-61
5.2.2	Summary of Nonpoint Source Contributors	5-67
5.2.3	Report on Nonpoint Source Contributions Categories	5-70
5.2.3.1	Background Contribution	5-70
5.2.3.2	Atmospheric Deposition	5-74
5.2.3.3	Hazardous Waste Sites	5-76
5.2.3.4	Landfills	5-86
5.2.3.5	Quarries and Mines	5-90
5.2.3.6	Industrial Stock Piles	5-92
5.2.3.7	Tank Storage Areas	5-94
5.2.3.8	Underground Storage Tanks	5-96
5.2.3.9	Oil and Gas Wells	5-97
5.2.3.10	Waste Injection Wells	5-99
5.2.3.11	Pipelines	5-102
5.2.3.12	Chemical Spills	5-105

TABLE OF CONTENTS (Continued)

CHAPTER FIVE (Continued) PAGE

5.2.3.13 Home Sewage Systems 5-108
5.2.3.14 Crop Land 5-112
5.2.3.15 Rural Non-crop Land 5-115
5.2.3.16 Runoff from Urban Cores 5-120
5.2.3.17 Runoff from Suburban Areas 5-128
5.2.3.18 Runoff from Streets/Highways 5-131
5.2.3.19 Runoff from Urban-Construction 5-133

5.2.4 Summary of Sub-basin Level Data 5-140

5.3 Linkages Between Sources and Impairments 5-148

5.3.1 Introduction 5-148
5.3.2 Summary of Source - Impairment Linkages 5-151
5.3.3 Summary of Unknown or Nonexistant Impairments 5-180

5.4 Contaminants of Concern

5.4.0 Introduction 5-181
5.4.1 "Contaminants of Concern" Listing Criteria 5-181
5.4.2 Loadings and Concentrations Data on "Contaminants of Concern" 5-190
5.4.3 Effects of Contaminants of Concern 5-255

CHAPTER SIX: OVERVIEW OF CUYAHOGA RAP-RELATED TECHNICAL WORK

6.0 Introduction 6-1

6.1 Technical Task Groups 6-2

6.2 Bibliography/Data Base Development 6-2

6.3 Hydrodynamic Model Development 6-3

6.3.1 Seminar 6-4
6.3.2 Modeling Objectives 6-4
6.3.3 1990 Activities 6-4
6.3.4 1991 Objectives 6-5
6.3.5 Future Directions 6-5

6.4 Use Impairment Evaluations 6-5

6.4.1 Bacteria Survey Objectives 6-6

6.4.1.1 1989 Study 6-6
6.4.1.2 1990 Study 6-7
6.4.1.3 Results and Future Work 6-7

TABLE OF CONTENTS (Continued)

CHAPTER SIX (Continued)

		PAGE
6.4.2	Fish Tissue Analysis Objectives	6-8
6.4.2.1	1989 Study	6-8
6.4.2.2	1990 Study	6-9
6.4.2.3	Future Activities	6-9
6.4.2.4	Possible Future Areas of Study Suggested	6-10
6.5	USGS Cuyahoga River Bacteriological Study	6-10
6.6	Ohio EPA 1991 Intensive Survey for the Lower Cuyahoga River and Shipping Channel	6-11
6.6.1	Water Quality	6-13
6.6.2	Macroinvertebrate Communities	6-13
6.6.3	Fish Communities	6-13
6.7	NEORSD CSO Characterization Study	6-13
6.8	City of Akron CSO Characterization Study	6-14
6.9	Sediment Bioassays	6-15
6.10	Ongoing Issues	6-15
6.10.1	Use Designation for Navigation Channel	6-15
6.10.2	Wet Weather Modelling	6-15
6.12	Summary of Collaborating Agencies	6-16

CHAPTER SEVEN: RESEARCH PRIORITIES AND AGENDA

7.1	Background	7-1
7.2	Research Priorities	7-3
7.2.1	For Identification of Impairments	7-3
7.2.2	For Identification of Sources	7-4
7.2.3	To Address Needed Standards	7-6
7.2.4	To Identify and Evaluate Redmedial Options	7-7
7.2.5	To Support Monitoring Requirements	7-8
7.3	Research Agenda	7-9

CHAPTER 8: WATER QUALITY MANAGEMENT ACTIVITIES IN THE CUYAHOGA RIVER BASIN

8.1	Background: Cuyahoga River in the 1950s	8-1

TABLE OF CONTENTS (Continued)

CHAPTER EIGHT (Continued)

		PAGE
8.2	Summary of National Pollution Discharge Elimination System (NPDES)	8-2
8.2.1	History	8-2
8.2.2	Ohio EPA's Statewide Enforcement Program	8-5
8.3	Pretreatment Program	8-9
8.4	Regionalization of Point Source Treatment	8-10
8.4.1	Agency Planning Efforts	8-10
8.4.1.1	NEORSD	8-10
8.4.1.1.1	Control of SSOs	8-10
8.4.1.1.2	Control of Combined Sewer Overflows	8-20
8.4.1.2	Akron	8-24
8.4.2	State Agency Changes to Permit Regulations	8-25
8.4.2.1	Operator Certification	8-25
8.4.2.2	Stormsewer Pollution Control	8-25
8.4.2.3	CSO Control	8-25
8.4.2.4	Basin Approach to Stream Modeling	8-26
8.4.2.5	Antidegradation Policy	8-26
8.4.2.6	Toxic Substances Control	8-26
8.4.2.7	Pollution Prevention Policy and Strategy	8-26

CHAPTER NINE: COMMUNITY INVOLVEMENT ACTIVITIES

9.0	Introduction	9-1
9.1	Background	9-1
9.2	1989 Activities	9-2
9.2.1	Events	9-2
9.2.2	Public Information Materials	9-2
9.2.3	Speaker's Bureau	9-2
9.2.4	Creation of List of Organizations	9-2
9.2.5	Development of Slide Presentation	9-2
9.2.6	CCC Community Involvement Work Program Element	9-3
9.3	Reorganization of the Communications	9-3
9.3.1	Work Group To Form The Community Involvement Committee	

TABLE OF CONTENTS (Continued)

CHAPTER NINE (Continued) PAGE

9.4 1990 Activities of the Community Involvement Committee . 9-6

9.4.1 June 1990 Workshops 9-6
9.4.2 Friends of the Crooked River 9-8
9.4.3 Public Information Materials 9-8
9.4.4 Events 9-8

9.5 1991 Activities of the Community Involvement Committee 9-9

9.5.1 Workshops 9-9
9.5.2 Events 9-10
9.5.3 CIC Staff Support 9-10

CHAPTER TEN: LIST OF PLAN PARTICIPANTS AND CONTRIBUTORS

10.0 Introduction 10-1

10.1 Coordinating Committee as of November 1, 1991 and prior 10-2

10.2 Plan Drafting Committee of the CCC 10-3

Biota Impairments Subcommittee of the PDC 10-4
Nonpoint Source Subcommittee of the PDC 10-5
Point Source Subcommittee of the PDC 10-6
Recreation Impairments Subcommittee of the PDC 10-7
Socio-economic Subcommittee of the PDC 10-8
Toxics Consumption Subcommittee of the PDC 10-9
Source-Impairments Linkages Task Group of the PDC 10-10
Task Group of the PDC to review the SAIC Report text specific to Chapter Three 10-11

10.3 Community Involvement Committee of the CCC 10-12

10.4 Technical Committee of the CCC 10-13

APPENDICES

APPENDIX A: BIOTA IMPAIRMENTS REPORTS — PAGE

1. Periphyton and Phytoplankton Degradation — A-1
2. Assessment of Zooplankton Communities — A-13
3. Cleveland Harbor and Nearshore Benthic Invertebrates — A-24
4. Macroinvertebrate Community Trends in the Cuyahoga River 1984-1988 — A-33
5. Eutrophication of the Cuyahoga River and the Lake Erie Nearshore — A-43
6. Fish Community Trends in the Cuyahoga River: 1984-1988 — A-62
7. Fish Population Trends in the Cleveland Nearshore Area (an historical review of available literature) — A-77
8. Fish Tumors and Other Deformities — A-86
9. Longitudinal Trends in the Incidence of External Anomalies in the Cuyahoga River Fish — A-105
10. Assessment of Physical Habitat in the Lower Cuyahoga River and the Dredged Ship Channel — A-114
11. Terrestrial Vertebrate Populations: Population Survey Data — A-124

APPENDIX B: CHEMICAL QUALITY ISSUES REPORTS

1. Water Quality Trends for the Cuyahoga River — B-2
2. Cuyahoga River Sediment Quality — B-17
3. Ship Mixing Study Data — B-68
4. Cleveland Area Water Sampling for Unregulated Organic Chemicals — B-97
5. Akron Area Drinking Water Analysis — B-102

APPENDIX C: TOXICS CONSUMPTION REPORTS

1. Cuyahoga River Fish Tissue Evaluation — C-1
2. Cuyahoga RAP Fish Tissue Sampling Protocol — C-76
3. Toxics Consumption Subcommittee: Recommendations for Additional Use of Subcommittee Resources — C-88

APPENDICES (Continued)

APPENDIX D: RECREATION IMPAIRMENTS REPORTS — PAGE

1. Recreation Impairments: Cuyahoga Area of Concern — D-1

APPENDIX E: SOCIO-ECONOMIC IMPAIRMENTS REPORTS

1. Restrictions on Dredging Activities as a Use Impairment — E-1
2. Eutrophication or Undesirable Algae Socio-economic Issues — E-27
3. Aesthetics: Cuyahoga Area of Concern — E-37
4. Description of Area of Concern Debris and Recommendations for a Standardized Evaluation of the Debris Problem in the Cuyahoga River Area of Concern — E-47

APPENDIX F: EXERPTS FROM OHIO EPA BIOLOGICAL INDICES

1. Index of Biotic Integrity (IBI) IBI Metrics — F-2
2. Index of Well-Being (Iwb) — F-7
3. Modified Index of Well-Being (MIwb) — F-10
4. Invertebrate Community Index (ICI) — F-12
5. DELT Anomalies — F-14
6. Trophic Condition Index — F-16
7. Qualitative Habitat Evaluation Index (QHEI) — F-23
8. Ohio EPA Water Quality Standards — F-50
9. Ohio EPA "Five Freedoms" — F-71

APPENDIX G: POINT SOURCE SUBCOMMITTEE DATA

1. NPDES Permitted Dischargers Survey — G-2
2. Industries Required to Pretreat — G-9
3. Historical List of Point Sources in the Cuyahoga Basin — G-39
4. Improvements in the Akron Public Utilities Service Area — G-62

APPENDICES (Continued)

APPENDIX G (Continued)

	PAGE
5. Effluent Data Summary from the Akron Water Pollution Control Control Station: 1980s to Present	G-82
6. Preliminary Report from Dr. Brian Arbuckle, University of Akron, on 12 Sediment Samples from the Cuyahoga and Little Cuyahoga Rivers	G-109
7. U.S.EPA Guidelines for Identifying a Major Industrial Discharger	G-115
APPENDIX H: NONPOINT SOURCE SUBCOMMITTEE DATA AND REPORTS	
1. Nonpoint Source Loading Rate Estimates: Lower Cuyahoga River	H-2
2. Nonpoint Source Pollution: Groundwater	H-21
3. Preliminary Findings on Atmospheric Deposition	H-32
4. Home and Semi-Public Sewage Systems - A Significant Contributor to Nonpoint Source Pollution in Cuyahoga County	H-37
5. 1977 Land Use Distribution among Sub-basins of the Cuyahoga River Basin	H-43
6. Ohio EPA Remedial Response Section. 1990 Unregulated Sites Master List for Cuyahoga, Geauga, Portage and Summit Counties	H-47
7. Surface Water Samples Taken from Landfill Sites	H-75
8. Ohio EPA Emergency Response Section. Cuyahoga River Basin Spill Incidents: 1986-1990	H-94
9. Ohio EPA Potential Hazardous Waste Site Preliminary Assessment Summaries for Medium and High Priority Sites in the Cuyahoga RAP Study Area	H-102
APPENDIX I: TECHNICAL COMMITTEE DATA AND REPORTS	
1. Summary of 1990 Bacterial Conditions in the Cuyahoga River from River Mile 35 to the Mouth and in the Nearshore from East 55th Street Pier to the West Harbor Entrance	I-i
2. Summary of the 1989 Bacterial Conditions in the Cuyahoga River from river mile 42.6 to 13.2	I-28
3. Cuyahoga River Water Quality Database	I-46
4. Memorandum of Suggested Revisions to the Presentation of Wet/Dry Weather Conditions in the Nearshore Area	I-51

APPENDICES (Continued)

APPENDIX J: COMMUNITY INVOLVEMENT PAGE

1. Cuyahoga RAP Coordinating Committee Public Involvement Strategy
2. June 1990 Public Involvement Workshops Consultants' Report
3. January 1991 Public Involvement Workshop Summary
4. Materials Produced for Public Distribution
5. Compendium of Media Coverage of the Cuyahoga RAP

APPENDIX K: PLAN DRAFTING COMMITTEE MEMORANDA: GUIDELINES FOR DEVELOPMENT OF THE STAGE ONE REPORT

1. Use Impairment Evaluation Summary (September 14, 1990, Revised November 15, 1990) K-1
2. Plan Drafting Committee Utilization of Public Comments in Drafting the Remedial Action Plan Stage 1 Report (November 15, 1990) K-4
3. Consistency of Terminology in Statements of Use Impairment (November 15, 1990) K-6
4. Recommended Procedure for Documentation of Committee Review, Comment and Revision (November 15, 1990) K-8

APPENDIX L: CUYAHOGA RAP COORDINATING COMMITTEE WORK PROGRAM, AS APPROVED DECEMBER 14, 1989

APPENDIX M: RESEARCH IDEAS GENERATED BY MEMBERS OF THE PLAN DRAFTING COMMITTEE AND ITS SUBCOMMITTEES

1. Impairment-Based Research M-3
2. Source-Based Research M-10

APPENDIX N: CUYAHOGA RIVER COMMUNITY PLANNING ORGANIZATION

APPENDIX O: GLOSSARY OF TERMS

APPENDIX P: GLOSSARY OF ACRONYMS

APPENDIX Q: BIBLIOGRAPHY

LIST OF FIGURES AND EXHIBITS

CHAPTER TWO

		PAGE
Figure 2-1	Areas of Concern in the Great Lakes Basin	2-3
Figure 2-2	Organization and Role of Cuyahoga RAP Coordinating Committee	2-5
Figure 2-3	First Stage of the RAP Process: Establishing Causes of Use Impairments	2-10
Figure 2-4	Cuyahoga RAP Study Area	2-13
Figure 2-5	Roles of the Cuyahoga Coordinating Committee Subcommittees	2-16
Exhibit 2-1	Cuyahoga Coordinating Committee Members as of November 1, 1991	2-3
Exhibit 2-2	Cuyahoga Coordinating Committee Mission Statement and Statement of Scope of Plan	2-6
Exhibit 2-3	Great Lakes Water Quality Agreement Annex 2(1)(c): 14 Beneficial Use Impairments	2-7
Exhibit 2-4	Guidelines for Recommending the Listing and Delisting of Areas of Concern	2-8
Exhibit 2-5	Great Lakes Water Quality Agreement General Principles of Remedial Action Plans	2-18

CHAPTER THREE

Figure 3-1	Location of the Cuyahoga Basin within the Lake Erie Basin	3-2
Figure 3-2	Relationship of the Cuyahoga River Basin and the Basin to the East	3-6
Figure 3-3	Major Tributaries of the Cuyahoga River Basin	3-7
Figure 3-4	Detail of th Nearshore Study Area of the Cuyahoga River Area of Concern	3-9
Figure 3-5	Major Physiographic Regions in the Cuyahoga RAP Study Area	3-10
Figure 3-6	Profile of the Cuyahoga River from Lake Rockwell to Cleveland, Ohio	3-11
Figure 3-7	Typical Cross Section of Seasonal Lake Water Intrusion into the Cuyahoga River from Conductivity and Dissolved Oxygen Measurements	3-15

LIST OF FIGURES AND EXHIBITS (Continued)

CHAPTER THREE (Continued) PAGE

Figure 3-8	Typical Flow Pattern of the Cuyahoga River with the Dominant Southwest, West and North Wind Directions	3-17
Figure 3-9	Nearshore Study Area - Major Tributaries and Sub-basins	3-32
Figure 3-10	Annual Average Phytoplankton Densities in Lake Erie, 1920-1972	3-35
Figure 3-11	Lake Erie: Trophic Status of Lake Regions	3-37
Figure 3-12	Longitudinal Trends in the relative abundance of Fish collected from the Cuyahoga River Mainstem during 1984 and 1988	3-41
Figure 3-13	Major Permitted Dischargers in the Cuyahoga Study Area	3-62
Exhibit 3-1a	Cuyahoga River Basin (Low Flow Data) at Old Portage, OH (RM 40.2)	3-13
Exhibit 3-1b	Cuyahoga River Basin (Low Flow Data) at Independence, OH (RM 13.2)	3-14
Exhibit 3-2	The Ohio Wetlands Inventory	3-22

CHAPTER FOUR

Figure 4-1	1989 Cuyahoga RAP Fish Tissue Sampling Location-Cuyahoga River Basin	4-5
Figure 4-2	1989 Cuyahoga RAP Fish Tissue Reference Sampling Location-Chagrin River Basin	4-6
Figure 4-3	1990 Cuyahoga RAP Fish Tissue Sample Locations	4-7
Figure 4-4	1990 Cuyahoga RAP Fish Tissue Sampling Locations-Cuyahoga River Basin	4-8
Figure 4-5	1990 Fish Tissue Reference Sampling Location-Chagrin River Basin	4-9
Figure 4-6	Index of Biotic Integrity Values for the Cuyahoga River: 1984 and 1988	4-19
Figure 4-7	Modified Index of Biotic Integrity Values for the Cuyahoga River: 1984 and 1988	4-20

LIST OF FIGURES AND EXHIBITS (Continued)

CHAPTER FOUR (Continued)

		PAGE
Figure 4-8	A Comparison of External Anomalies in Cuyahoga River Fish From Hiram Rapids (RM 70) to the Mouth: 1984 and 1988	4-25
Figure 4-9	Cuyahoga River Invertebrate Community Index Scores from Hiram Rapids (RM 70) to the Mouth: 1984 and 1988, Ohio EPA	4-32
Figure 4-10	Invertebrate Community Index Scores at the Independence Monitoring Station (RM 13.2) from 1976-1990, Ohio EPA	4-33
Figure 4-11	Combined Disposal Facilities in the Cleveland, Ohio Area	4-36
Figure 4-12	Lake Erie: Trophic Status of Lake Regions	4-42
Figure 4-13a	Drinking Water Quality Comparison-Cleveland Water vs. Federal Standards	4-45a
Figure 4-13b	Drinking Water Quality Comparison-Akron Water vs. Federal Standards	4-45b
Figure 4-14	Average Chemical Values for the Cleveland Water System 1990 Summary	4-46
Figure 4-15	Comparison of Cuyahoga and Nearshore Area Raw Water to Cleveland Finished Drinking Water and Federal Drinking Water Standards	4-48
Figure 4-16	Designated Public Swimming Beaches in the Cuyahoga Area of Concern	4-52
Figure 4-17	Summary of 1990 Fecal Coliform Counts Collected in the Cuyahoga River Area of Concern	4-48
Figure 4-18	Cleveland Harbor Area 1990 Dry Weather versus wet weather fecal coliform count comparison	4-56
Figure 4-19	Lower Cuyahoga River 1990 NOACA/NEDO and NEORSD Bacterial Sampling Sites	4-59
Figure 4-20	National Park Service Sampling Sites (1990)	4-60
Figure 4-21	CVNRA Area 1990 Dry Weather versus Wet Weather Fecal Coliform Count Comparison	4-61
Figure 4-22	Lower Cuyahoga River 1990 Dry Weather versus wet weather fecal coliform count comparison	4-63
Figure 4-23	Fishing Facilities on Lake Erie in Northeast Ohio	4-68
Figure 4-24	Debris on the Cuyahoga Mainstem in Valley View (RM 17)	4-72

LIST OF FIGURES AND EXHIBITS (Continued)

CHAPTER FOUR (Continued)

		PAGE
Figure 4-25	Floating Debris and Litter Collected in the Navigation Channel	4-72
Figure 4-26	Discolored Water at the Confluence of Morgan Run and the Cuyahoga Mainstem in the Navigation Channel	4-73
Figure 4-27	Annual Average Phytoplankton Densities in Lake Erie, 1920-1972	4-78
Figure 4-28	QHEI Warmwater and Modified Warmwater Characteristics for the Cuyahoga River	4-85
Figure 4-29	Cuyahoga River 1999 Navigation Channel Sediment Data	4-90
Figure 4-30	Cuyahoga River Dissolved Oxygen Trends (1954 and 1984)	4-99
Figure 4-31	Cuyahoga River at Independence (RM 13.2) Dissolved Oxygen Violations Per Year	4-100
Figure 4-32	Cuyahoga River at West Third Street (RM 3.3) Dissolved Oxygen Violations Per Year	4-100
Figure 4-33	Cuyahoga River Biochemical Oxygen Demand Trends (1954 and 1984)	4-102
Figure 4-34	Cuyahoga River Ammonia Trends (1965 and 1984)	4-103
Figure 4-35	Cuyahoga River Ammonia Concentrations (1970-1990) near the Akron WWTP	4-104
Figure 4-36	Cuyahoga River Ammonia Concentrations (1972-1989) near NEORSD Southerly WWTP	4-104
Figure 4-37	Cuyahoga River Study Area Reference Points	4-107
Figure 4-38	1990 Cadmium Data - Cuyahoga River	4-108
Figure 4-39	1990 Chromium Data - Cuyahoga River	4-108
Figure 4-40	1990 Copper Data - Cuyahoga River	4-109
Figure 4-41	1990 Lead Data - Cuyahoga River	4-109
Figure 4-42	1990 Nickel Data - Cuyahoga River	4-110
Figure 4-43	1990 Zinc Data - Cuyahoga River	4-110
Figure 4-44	Cuyahoga River Cadmium: 1984 vs. 1990	4-111
Figure 4-45	Cuyahoga River Chromium: 1984 vs. 1990	4-111

LIST OF FIGURES AND EXHIBITS (Continued)

CHAPTER FOUR (Continued)

		PAGE
Figure 4-46	Cuyahoga River Copper: 1984 vs. 1990	4-112
Figure 4-47	Cuyahoga River Lead: 1984 vs. 1990	4-112
Figure 4-48	Cuyahoga River Nickel: 1984 vs. 1990	4-113
Figure 4-49	Cuyahoga River Zinc: 1984 vs. 1990	4-113
Figure 4-50	1990 Cyanide Data - Cuyahoga River	4-115
Figure 4-51	1990 $CBOD_{20}$ - Cuyahoga River	4-116
Figure 4-52	Cuyahoga River $CBOD_{20}$: 1984 vs. 1990	4-116
Figure 4-53	1990 Phosphorus Data - Cuyahoga River	4-117
Figure 4-54	Cuyahoga River Phosphorus: 1984 vs. 1990	4-117
Figure 4-55	1990 Ammonia-N Data - Cuyahoga River	4-118
Figure 4-56	Cuyahoga River Ammonia-N: 1984 vs. 1990	4-118
Figure 4-57	1990 Dissolved Oxygen Data: Cuyahoga River	4-119
Figure 4-58	Cuyahoga River Dissolved Oxygen	4-119
Exhibit 4-1	Abstract of Presentation on Liver Tumors in Brown Bullheads	4-28
Exhibit 4-2	Ohio EPA Goals and Objectives for Cuyahoga River Modeling Project	4-106

CHAPTER FIVE

Figure 5-1	1990 NPDES Permitted Dischargers	5-4
Figure 5-2	Akron WPCS Raw Sewage Bypasses	5-60
Figure 5-3	Sub-basins of the Cuyahoga River Basin (Including numbering scheme)	5-63
Figure 5-4	Sub-basins Schematic Demonstrating the Relationship of the Sub-basins of the Cuyahoga River to Major Tributaries and the Cuyahoga Mainstem	5-65
Figure 5-5	Sub-basins of the Nearshore Area and Major Tributaries (Including Numbering Scheme)	5-66
Figure 5-6	Cuyahoga River Sub-basins with the Highest Estimated Erosion Rates	5-73

LIST OF FIGURES AND EXHIBITS (Continued)

CHAPTER FIVE (Continued)

		PAGE
Figure 5-7	1990 Medium and High Priority Potential Hazardous Waste Sites in the Cuyahoga RAP Study Area	5-82
Figure 5-8	Cuyahoga River Sub-basins with 3% or More Land Area Occupied by Quarries and Mines	5-91
Figure 5-9	1990 Industrial Land Use (in the Cuyahoga RAP Source Area)	5-93
Figure 5-10	Gas and Oil Pipelines in the Cuyahoga RAP Source Area	5-103
Figure 5-11	Cuyahoga River Sub-basins with Cropland	5-113
Figure 5-12	Cuyahoga River Sub-basins with Rural Noncrop Lands	5-117
Figure 5-13	Discrete Points of Soil Erosion within the Boundaries of the Cuyahoga Valley National Recreation Area	5-118
Figure 5-14	Nearshore Area Sub-basins with Rural Noncrop Lands	5-119
Figure 5-15	Cuyahoga River Sub-basins with Urban Cores	5-121
Figure 5-16	Nearshore Area Sub-basins with Urban Cores	5-122
Figure 5-17	Cuyahoga River Sub-basins with Sub-urban Lands	5-129
Figure 5-18	Nearshore Area Sub-basins with Sub-urban Lands	5-130
Figure 5-19	Cuyahoga River Sub-basins with Highways covering more than 5% of the Area	5-132
Figure 5-20	Sub-basins of the Cuyhaoga River Basin (Including Numbering Scheme)	5-144
Figure 5-21	Sub-basins of the Nearshore Area (Including Numbering Scheme)	5-145
Figure 5-22	Cuyahoga River Sub-basins, Distinguishing Segments Used in the Nonpoint Source Loadings Analysis	5-193
Figure 5-23	Nearshore Area Sub-basins: Segment 9 in the Nonpoint Source Loadings Analysis	5-194
Exhibit 5-1	Cuyahoga RAP Study Area: Hazardous Waste Sites Index	5-83

LIST OF FIGURES AND EXHIBITS (Continued)

CHAPTER EIGHT PAGE

Figure 8-1	Cuyahoga River Dissolved Oxygen Trends: 1954-1984	8-3
Figure 8-2	Major Permitted Dischargers in the Cuyahoga RAP Study Area	8-5
Figure 8-3	Heights/Hilltop Interceptor Area	8-13
Figure 8-4	Heights/Hilltop Interceptor Area	8-15
Figure 8-5	Southwest Interceptor Area	8-17
Figure 8-6	Southwest Interceptor Area	8-18
Figure 8-7	Fixed Perpendicular Weir	8-21
Figure 8-8	Typical Control and Monitoring Regulator	8-22

CHAPTER NINE

Exhibit 9-1	On-going Interest Survey--June 1990 Public Involvement Workshops	9-7

LIST OF TABLES

CHAPTER THREE		PAGE
Table 3-1	Wetlands in the Four-County Area	3-24
Table 3-2	U.S. Clean Air Act Nonattainment Areas in the Four County Region as of 1990	3-26
Table 3-3	Relative Importance of Atmospheric and Nonatmospheric Inputs of Toxic Substances to Lake Erie	3-27
Table 3-4	General Land Use Summary of the Cuyahoga River Basin	3-29
Table 3-5	General Land Use Summary of the Nearshore Portion of the Study Area	3-33
Table 3-6	Mammals with Known Ranges in the Vicinity of Cleveland, Ohio	3-43
Table 3-7	Existing Boating Facilities	3-48
Table 3-8	Existing Fishing Facilities	3-49
Table 3-9	Existing Trail Facility Summary	3-49
Table 3-10	Existing Sports Facilities	3-50
Table 3-11	Summary of Facilities for Passive Activities	3-51
Table 3-12	Summary of Annual Use at Cleveland Lakefront State Park	3-51
Table 3-13	Population Change (1980-1990) and Population Density of the Cuyahoga Basin, by Community	3-53
Table 3-14	Businesses Dependent on Waterborne Commerce	3-57
Table 3-15	Customers Served by Businesses Dependent on Cuyahoga Waterborne Commerce	3-58
Table 3-16	Cuyahoga and Old River Bed Vessel Traffic in recent years, in thousands of tons	3-59
Table 3-17	Cuyahoga River Use Designations	3-66
CHAPTER FOUR		
Table 4-1	Summary of Current Findings Concerning Impairments of Beneficial Uses in the Cuyahoga River Area of Concern	4-3
Table 4-2	Summary of the 1990 Status of Compliance with the Fecal Coliform Bacterial Water Quality Standards in the Nearshore Area of Concern	4-49

LIST OF TABLES (Continued)

CHAPTER FOUR (Continued)

		PAGE
Table 4-3	Summary of the Status of Compliance with the Fecal Coliform Bacterial Water Quality Standards in the Cuyahoga River Area of Concern in 1990	4-64
Table 4-4	Four "Common" PAH Compounds in Sediments	4-93
CHAPTER FIVE		
Table 5-1	Permitted Discharger Inventory	5-7
Table 5-2	POTW Survey Respondents by County	5-18
Table 5-3	Industry Survey Respondents	5-24
Table 5-4	Cuyahoga Basin Industrial Dischargers Not Responding to the RAP Survey	5-29
Table 5-5	Combined Sewer Overflows in Area of Concern NEORSD Service Area	5-34
Table 5-6	Combined Sewer Overflow Annual Volume Estimates NEORSD Service Area	5-37
Table 5-7	Combined Sewer Overflow Sampling NEORSD Service Area	5-39
Table 5-8	Combined Sewer Overflow Concentration Data - NEORSD Service Area	5-40
Table 5-9	Annual Loading Calculations NEORSD Service Area	5-41
Table 5-10	NEORSD Separate Sanitary Sewer Overflow Inventory	5-43
Table 5-11	NEORSD Wastewater Treatment Plant Overflow and Bypass Data	
	a) Easterly 1989	5-47
	b) Southerly 1989	5-47
	c) Westerly 1989	5-48
Table 5-12a	Combined Sewer Overflows Area of Concern (Akron Service Area)	5-50
Table 5-12b	Combined Sewer Overflows Description (Akron Service Area)	5-51
Table 5-12c	Combined Sewer Overflows Characteristics (Akron Service Area)	5-52
Table 5-12d	Combined Sewer Overflows - Upstream Industrial Users (Akron Service Area)	5-53

LIST OF TABLES (Continued)

CHAPTER FIVE (Continued)

		PAGE
Table 5-12e	Sanitary Sewer Overflows Area of Concern (Akron Service Area)	5-56
Table 5-12f	Sanitary Sewer Overfloww Characteristics (Akron Service Area)	5-57
Table 5-12g	Stream Monitoring Stations - Ohio Canal and Little Cuyahoga River (Akron Service Area)	5-58
Table 5-13	NOACA Sub-basin Alignment with Ohio EPA Stream Segment Designations	5-64
Table 5-14	Nonpoint Source Contributors to the Cuyahoga River Area of Concern	5-68
Table 5-15	Distribution of Highly Eroding Lands as a Function of General Land Use in Areas of High Estimated Soil Loss	5-72
Table 5-16	Percent Contribution of Atmospheric Deposition to Contamination in Lake Erie	5-75
Table 5-17	Metals Found in Cleveland Area Rainfall	5-77
Table 5-18	1988 Base Year Emissions (tons/day) Inventory - Cleveland-Akron Consolidated Metropolitan Statistical Area	5-78
Table 5-19	Located Sanitary Landfills in the Cuyahoga River Basin, Operating and Closed	5-87
Table 5-20	List of Reported Petroleum Underground Storage Tank Release Incidents (Accidents/Spills) in the Cuyahoga River Basin, 1/1/87 to 7/30/90	5-98
Table 5-21	Number of Wells Drilled and Producing Oil and Gas, by County	5-100
Table 5-22	Summary of Spills in the Cuyahoga River Basin, 1986-1990	5-106
Table 5-23	1990 Numbers of Home Sewage Systems in the Cuyahoga River Basin by Community	5-110
Table 5-24	Estimates of Select Pollutant Loadings from Urban Areas	
	A) Cuyahoga River Basin	5-123
	B) Nearshore Area	5-126

LIST OF TABLES (Continued)

CHAPTER FIVE (Continued)		PAGE
Table 5-25	Construction - Residential, Commercial and Industrial Development in the Cuyahoga River Basin, 1980-1989	5-134
Table 5-26	Communities (in the Cuyahoga RAP Source Area) with Construction-Site Erosion and Stormwater Runoff Control Ordinances	5-138
Table 5-27	Land Use Profile of Sub-basins	
	A) Cuyahoga River Basin	5-141
	B) Nearshore Area	5-143
Table 5-28	Contaminants of Concern - Cuyahoga AOC	5-185
Table 5-29	Conventional Acute Water Quality Standards Sampling Results	5-187
Table 5-30	Profile of Acute Water Quality Standards Parameters Summary of STORET Data: 1986-1991	5-188
Table 5-31 to Table 5-61	Loadings Data (Table of Contents)	5-196
CHAPTER SIX		
Table 6-1	Summary of Agencies Collaborating in the Technical Work Activities of the Cuyahoga River Remedial Action Plan	6-17
CHAPTER EIGHT		
Table 8-1	Entities Referred for Enforcement Action	8-6
Table 8-2	Entities Issued Director's Findings and Orders	8-6
Table 8-3	Summary of Permitted Dischargers Elimination, Upgrades and New Permit Holders	8-7

PREFACE

This report was approved for submittal to the Ohio Environmental Protection Agency on June 25, 1992 by the Cuyahoga Remedial Action Plan Coordinating Committee. This approval followed a period of public review and comment that culminated in two public meetings held, respectively, in Garfield Heights, Ohio (on May 5, 1992) and Akron, Ohio (on May 7, 1992). These public comments and Coordinating Committee responses are documented in the Addendum of Public Review and Coordinating Committee Comments.

With this report we provide an analysis of environmental conditions in the Cuyahoga River and nearshore areas of Lake Erie. We are responding to provisions of the binational Great Lakes Water Quality Agreement which calls upon States and the Province of Ontario to prepare, under the supervision of the International Joint Commission (IJC), Remedial Action Plans (RAP) in Areas of Concern. The Cuyahoga River, which drains urbanized areas of Akron and Cleveland, Ohio, was declared an Area of Concern by the IJC because of its persistent pollution problems.

The Cuyahoga Remedial Action Plan Coordinating Committee (CCC) is a community-based committee, appointed by the Ohio EPA, to prepare the RAP. The CCC includes representatives from local, state and federal public agencies, industries and citizen groups.

This document - the Stage One Report - is the first report required by the Great Lakes Water Quality Agreement. Stage Two will identify remedial measures to address the problems documented in Stage One. Stage Three involves the monitoring of implementation to assure that the goals of the Agreement are achieved.

In drafting a Stage One Report for the Cuyahoga River Area of Concern, the committee was guided by Annex 2 of the Great Lakes Water Quality Agreement and by guidelines issued by the U.S. Environmental Protection Agency. In general, we tried to address the following two issues:

(i) a definition and detailed description of the environmental problem in the Area of Concern, including a definition of the beneficial uses that are impaired, the degree of impairment and the geographic extent of such impairment;

(ii) a definition of the causes of the use impairment, including a description of all known sources of pollutants involved and an evaluation of other possible sources.

Because the guidelines we had were general, we had to supply a significant amount of creative thinking and inventiveness to develop methods, procedures and an organizational structure that would adequately address the complex task at hand. We spent several months negotiating a work program and mission statement to direct our work. This work program embraces technical studies, planning, and communications activities and has served to coordinate the collaborative efforts of more than a dozen public and private organizations that have contributed resources to the process.

We are pleased with the scope of work we have accomplished to date, and the detailed information contained in the report. In some cases the information we present is incomplete, and this restricts our ability to draw conclusions concerning some use impairments in the Cuyahoga River Area of Concern and their causes. In some cases the committee was able to sponsor research that generated information that filled important gaps. Data on fish tissue contaminants and bacteria levels in the river and nearshore areas are cases in point. On balance, we believe this report addresses the major Stage One issues for the Cuyahoga River Area of Concern to the extent of our current knowledge.

In cases where we have identified data gaps, we have identified a research need. In fact, the committee will continue to pursue an active detailed research agenda to try to answer questions or narrow uncertainties throughout the RAP process. That Stage One is an on-going, iterative process is recognized by both the International Joint Commission and the Ohio Environmental Protection Agency.

The committee tackled a succession of puzzles as it worked its way through the Stage One requirements. The first puzzle was to define the boundaries of an Area of Concern, recognizing that whatever boundaries were set would likely be adjusted as we encountered the data. As an operational step, the committee decided that the area of impact, that is, that portion of the river that would be evaluated for use impairments would include the bottom 45 or so miles of the river beginning at the Ohio Edison Dam in Akron and continuing to the mouth in Cleveland, and the nearshore area in Lake Erie from Edgewater Park on the west to Wildwood Park on the east. However, we addressed the entire Cuyahoga River basin as a potential pollutant source area.

The second issue was to define impairments of beneficial uses. The Water Quality Agreement identifies fourteen beneficial uses that needed to be evaluated, and supplies specific criteria to determine whether these were impaired in our Area of Concern. The committee added to this list additional uses to be addressed. We also grappled with questions of measuring impairments. Did the data support a conclusion that we had an impairment, and if it did, how severe and how extensive was the impairment?

Thirdly, we made a major effort to determine the sources of pollution that were causing the impairments. Both point sources and nonpoint sources issues were addressed extensively. For the point source issue, we relied on data supplied by Ohio EPA and local agencies, and conducted a survey of all the permitted dischargers in the Cuyahoga basin. We relied on local agency expertise to systematically evaluate nonpoint source contributions to the Area of Concern.

Finally, the identification of contaminants of concern in the Cuyahoga River Area of Concern is an ongoing major challenge. We started with contaminants that had been identified by the IJC. These included persistent toxic substances that bioaccumulate, such as PCBs, PAHs and DDT, including some which are now embedded in the environment. We also relied on Ohio EPA water quality data and our own data. The ability to link specific pollution sources to conditions in the water column or sediment, and, in turn, establish causal links to use impairments is problematic. In many cases, data are limited. In other cases, the science that establishes the causal link is incomplete. Nevertheless, we believe our analysis of contaminants of concern is an excellent working tool with which to begin the process of identifying remedial options in Stage Two.

In all these efforts we were confronted with questions of uncertainty. To deal with these, the committee developed procedures for defining how much confidence we could claim for our premises and for our conclusions.

We were able to rely on technical experts who staffed several public agencies in Northeast Ohio and many private experts as well. These aided us in our search for data and in the interpretations we made of it. Our objective was to maintain a high caliber of scientific quality to our effort.

This document reflects the efforts of three working committees of the CCC.

The drafting committee (PDC) and its six subcommittees worked through all the material contained in this report in a series of meetings which began in February 1990. Over forty committee and subcommittee meetings took place in this timeframe, including nineteen meetings of the PDC since September, 1990. This committee was able to achieve a remarkable degree of consensus as a result of this intensive effort.

A Technical Committee and its working groups undertook a series of scientific studies to develop additional information specific to the Area of Concern. This involved the commitment and coordination of technical resources from a dozen local and federal agencies and several private organizations (described further in Chapter Six of the report).

A Community Involvement Committee planned and coordinated two rounds of public workshops (in June 1990 and January 1991) on the Stage One work, and maintained an ongoing program of communication and public outreach concerning the RAP process (described further in Chapter Nine of the report).

This Stage One report provides a baseline of environmental conditions in the Cuyahoga River Area of Concern. It is as comprehensive and thorough as we could make it. We believe it satisfies, to the extent of our current knowledge, the specific information requirements of the Water Quality Agreement, but it addresses many locally generated concerns as well. Finally we believe that it is a valuable source document for those members of the general public who are concerned about the environmental conditions in the Cuyahoga River and adjacent areas of Lake Erie.

Chapter One is a public review summary of the entire report.

Chapter Two describes the RAP process, the committee organization, and the goals and issues for Stage One.

Chapter Three provides the environmental setting for the Area of Concern and focuses on natural features, land use and water quality conditions.

Chapters Four and Five are the heart of the document. Chapter Four addresses the question: what beneficial uses are impaired and to what degree and extent are they impaired? Chapter Five addresses the question, what are the sources and causes of pollution that are impairing these uses, and more specifically what are the contaminants of concern in the Cuyahoga River Area of Concern?

Chapter Six summarizes technical studies that have been completed in support of the Stage One effort.

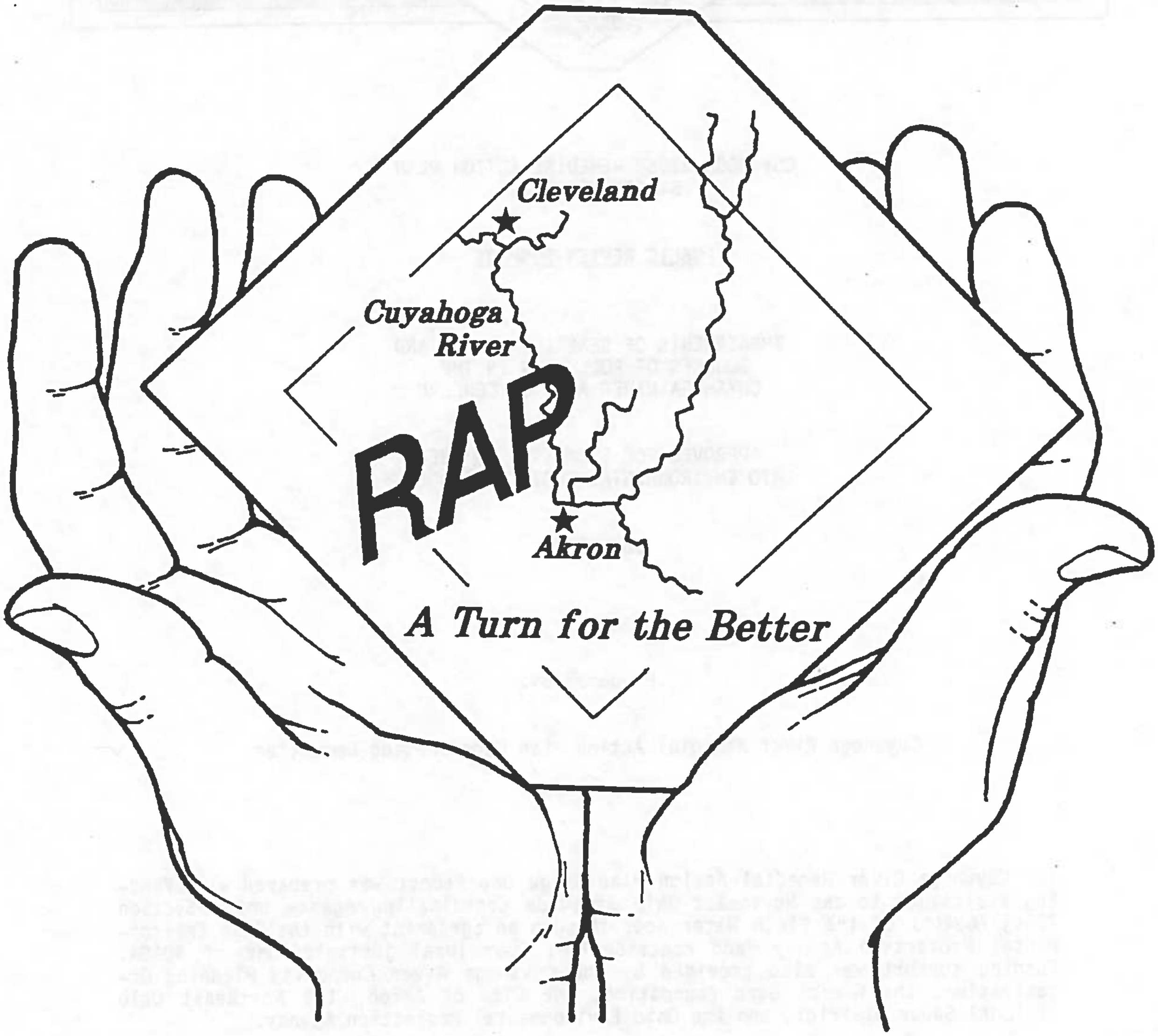
Chapter Seven sets forth our research priorities and agenda.

Chapter Eight summarizes ongoing water quality management activities.

Chapter Nine summarizes committee efforts for broader public involvement.

Chapter Ten lists those who have participated in the development of the RAP in all its phases to date.

These are further supplemented by forty-nine background or documentation reports organized into seventeen appendices.



CUYAHOGA RIVER REMEDIAL ACTION PLAN

Stage One Report

Public Review Summary

CUYAHOGA RIVER REMEDIAL ACTION PLAN
STAGE ONE REPORT

PUBLIC REVIEW SUMMARY

IMPAIRMENTS OF BENEFICIAL USES AND
SOURCES OF POLLUTION IN THE
CUYAHOGA RIVER AREA OF CONCERN

APPROVED FOR SUBMITTAL TO THE
OHIO ENVIRONMENTAL PROTECTION AGENCY

JUNE 1992

Prepared By:

Cuyahoga River Remedial Action Plan Coordinating Committee

The Cuyahoga River Remedial Action Plan Stage One Report was prepared with funding assistance to the Northeast Ohio Areawide Coordinating Agency under Section 205(j)/604(b) of the Clean Water Act, through an agreement with the Ohio Environmental Protection Agency, and contributions from local jurisdictions of NOACA. Funding support was also provided by the Cuyahoga River Community Planning Organization, the George Gund Foundation, the City of Akron, the Northeast Ohio Regional Sewer District, and the Ohio Environmental Protection Agency.

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THE CUYAHOGA RIVER IN THE 1790s

"As they coasted close along the shore, overhung by a dense green forest, mirrored in the waters over which they were passing, the mouth of the river disclosed itself, as a small opening, between low banks of sand....As they passed into the channel, and the broad river unfolded itself to their view; bordered by marshes, reeds, and coarse grass; their anticipations must have been somewhat moderated. The flats on the west side, and the densely wooded bluffs on the east, did not present a cheerful prospect for a city....It was necessary to proceed some distance along this [bank], before there was solid enough ground to effect a landing....[T]hey came to the bank, and scrambling out, trod for the first time the soil of the new city. While the boat was being unloaded, the agent had an opportunity to mount the bluff, and scan the surrounding land. This view must have revived his enthusiasm, more than the swamps along the river had depressed it. A young growth of oaks, with low bushy tops, covered the ground....A smooth and even field sloped gently towards the lake, whose blue waters could be seen extending to the horizon."

This passage is an account of the experience Moses Cleveland and his landing party had on their arrival at the mouth of the Cuyahoga River on July 22, 1796. From Charles Whittlesey, 1867. "Early History of Cleveland, Ohio", pp 208-209.

THE CUYAHOGA RIVER IN THE 1960s

Both the river and the Cleveland lakefront changed dramatically over the next century and a half. By the 1960s, "the lower Cuyahoga River and navigation channel through the Cleveland area was a virtual waste treatment lagoon. At times the river was choked with debris, oils, scums, and floating organic sludges. Foul-smelling gases rose from decomposing materials on the river's bottom. Viewed from the city's observation towers, the river appeared to be a chocolate brown or rust colored. During most of the year this lower section had no visible life, not even low forms such as leaches and sludgeworms, which usually thrive on wastes. Bacteria, debris, suspended solids, oxygen-consuming materials, dead fish, etc., were found along Cleveland's front door - the Lake Erie shoreline. Unlike many cities, which were able to rid themselves of garbage and wastes by discharging them to a nearby river for someone else to worry about, Cleveland's wastes festered in full view of its citizens. Along with inadequately treated wastes from all Cleveland-area treatment plants, combined sewer and stormwater overflows poured bacterial contamination onto the shore. Even during dry weather, raw sewage continuously overflowed from Cleveland's overloaded combined sewer system. The sewage and other wastes polluted the local bathing beaches, and Cleveland residents had to travel 60 to 100 miles to find lakefront beaches suitable for swimming."

This was one scientist's observation in the 1960s, which he documented in the book, "Erie, the Lake that Survived," by Dr. Noel M. Burns, 1985, pp 10-11.

THE CUYAHOGA RIVER IN THE 1990s

"Perhaps no Great Lakes 'Area of Concern' (AOC) has gained more national and international notoriety than the Cuyahoga: the 'river that burned' in the mid-1960s. And there is perhaps no more startling sign of progress in the fight to clean up the AOCs than the string of riverfront cafes and entertainment spots in Cleveland's newest nightclub area, 'The Flats' along the Cuyahoga."

From "The Great Lakes Reporter," Jan/Feb 1989 (page 5), a bimonthly publication of news and analysis from around the Great Lakes, produced by The Center For The Great Lakes. The Center is a binational, non-profit policy research institute.

MEMBERS OF THE CUYAHOGA RIVER REMEDIAL ACTION PLAN COORDINATING COMMITTEE (JUNE 1992)

CHAIRMAN: GREG STUDEN*

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OHIO DEPARTMENT OF NATURAL RESOURCES	KEN ALVEY
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LAKE CARRIERS ASSOCIATION	GORDON HALL
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GREAT LAKES TOMORROW	JIM COWDEN*
GREAT LAKES UNITED	JOHN PERERA
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FRIENDS OF THE CROOKED RIVER	ELAINE MARSH
SIERRA CLUB	MARY ANN TOTH
URBAN LEAGUE GREATER CLEVELAND	POSITION VACANT

LOCAL PUBLIC JURISDICTIONS

AKRON PUBLIC UTILITIES MANAGEMENT	DAVE CRANDELL*
CLEVELAND DEPARTMENT OF PUBLIC UTILITIES	DARNELL BROWN
CUYAHOGA COUNTY PLANNING COMMISSION	VIRGINIA AVENI*
CUYAHOGA COUNTY SANITARY ENGINEERING OFFICE	JIM BRUEGGEMAN
CUYAHOGA MAYORS & MANAGERS ASSOCIATION	ALAN MILLS
CUYAHOGA VALLEY COMMUNITY COUNCIL	PETE HENDERSON*
N.E. OHIO FOUR COUNTY REGIONAL PLANNING AND DEVELOPMENT ORGANIZATION	JOE HADLEY
NORTHEAST OHIO REGIONAL SEWER DISTRICT	LESTER STUMPE*
NORTHEAST OHIO AREAWIDE COORDINATING AGENCY	JOHN BEEKER**
SUMMIT COUNTY SANITARY ENGINEERING OFFICE	JEFF LINTERN

*MEMBER STEERING COMMITTEE
**SECRETARY

THE CUYAHOGA RIVER ECOSYSTEM IN THE 1990s

The Cuyahoga has made substantial progress since it was described as a "virtual waste treatment lagoon" in the 1960s. Federal legislation passed in the early 1970s forced dischargers to improve their waste treatment processes. Industries had to reduce the volume of metals and other pollutants which they once dumped into the river unchecked. Municipal sewage treatment plants on the Cuyahoga expanded their treatment capacities in the '70s and '80s, thus reducing the volume of raw sewage overflows to the river.

With the large polluters under some control, the 1980s witnessed the return of clean-water organisms which cannot tolerate pollution. Caddisflies and mayflies, along with the fish that selectively feed on them, have come back. Fishermen tell of catching a few trout and salmon in the river recently. Twenty years ago, not even the pollution-tolerant fish could survive in the river.

"The Flats" along the river banks in downtown Cleveland support popular restaurants and night clubs. Recreational boaters are back in large numbers at the river's mouth. The highly visible problems that brought Cleveland much embarrassment in the '60s - the oil slicks which burned, the discolored water and odors - are largely gone.

Yet significant problems still exist, such as the presence of persistent pollution. Persistent pollution, which may be found in the water at very low concentrations, can accumulate in wildlife and human systems. The presence of persistent pollutants throughout the Great Lakes has reduced wildlife populations and threatened human health. These problems can be the more difficult, more costly problems to solve. In many cases there is no single, large source of the problem, as there was in the '60s, at which to point a finger. Moreover, there are existing problems which are caused by, or magnified by, our own personal habits and choices.

The Cuyahoga River Remedial Action Plan Stage One Report is about the environmental conditions in the Cuyahoga River ecosystem today. The Report focuses on the human and biological uses of the water which have been impaired due to pollution or physical changes. Twenty current uses of the river and Cleveland lakefront are examined for the degree to which poor water quality and physical alterations of the river and adjacent lands have limited or prevented each use. The Stage One Report fulfills the first step of an agreement between Canada and the United States to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.

This document is the Public Review Summary of the Cuyahoga River Remedial Action Plan Stage One Report. Its purpose is to summarize the key findings of a much longer, more comprehensive report. For those of you who are interested in reviewing the full report, you will find additional information at the end of this summary. Also at the end of this summary is a discussion of how you can become involved in the Cuyahoga River Remedial Action Plan process.

A list of abbreviations, explanation of terms, and measurement unit conversions begins on page 39 of this document.

KEY FINDINGS OF THE CUYAHOGA RAP STAGE ONE REPORT

This is a list of the key problems caused by poor water quality or physical alterations of the river and adjacent lands. Please read Chapter Four of the full Stage One Report for a complete understanding of the points summarized below.

>> On Lake Erie, a health advisory is in place warning people not to eat carp or channel catfish caught from the lake. These fish have been found with levels of PCBs which exceed standards.

In the Cuyahoga River, fish caught along the entire length of the river below the Ohio Edison Dam in Cuyahoga Falls have elevated levels of PCBs and certain pesticides. But these levels do not exceed standards. Therefore, a consumption advisory for the river is not warranted.

Except for PCBs, the levels of contaminants in Cuyahoga River fish are similar to those in fish from other areas studied which were not necessarily impacted by urbanization. The other areas studied were the Chagrin River and the Upper Cuyahoga River.

>> A healthy diversity of fish populations is not found in the river below the Ohio Edison Dam. Furthermore, there is an unacceptably high rate of internal tumors and external problems in fish populations which are found in places along the river and nearshore area.

>> The populations of other aquatic organisms are reduced in many areas, especially in the navigation channel, which comprises the lower six miles of the river and is used for commercial navigation.

>> Wildlife habitat has been reduced in areas of the river and along Cleveland's lakefront, but habitat is especially impaired within the navigation channel.

>> For several days after storms, bacteria levels in the river and Cleveland area lakefront are likely to exceed the criteria for recreational uses which involve water contact. During dry weather, bacteria levels usually meet the water quality criteria for uses which involve contact.

>> The aesthetic quality of the river and Cleveland lakefront area is degraded by floating debris, public and private littering, visible outfall pipes, and discolored water.

>> Sediments dredged from the navigation channel must be disposed in costly confined disposal facilities because they are heavily polluted. Dredging occurs to maintain the navigation channel for commercial shipping.

>> Concentrations of eight contaminants (cadmium, chromium, copper, iron, lead, zinc, oil/grease, and cyanide) have exceeded water quality standards at least once during routine sampling since 1986. The standards for these contaminants were established by the Ohio Environmental Protection Agency in the river above the navigation channel to protect aquatic life.

Turn to page 21 for more details on each of these problem areas. Read on for a history of water pollution and environmental cleanup strategies in the entire Great Lakes region, and here at home on the Cuyahoga.

REMEDIAL ACTION PLANS FOR AREAS OF CONCERN: AN IMPORTANT STEP TOWARD COMPREHENSIVE MANAGEMENT OF THE GREAT LAKES[1]

The International Joint Commission (IJC) is a binational organization established in 1909 by the Boundary Waters Treaty which was signed by Canada and the United States. Through the IJC, Canada and the United States cooperatively resolve problems along their common border, including water and air pollution problems.

In 1912, the two Governments asked the IJC for the first time to examine the extent and causes of pollution in the Great Lakes. The IJC identified specific locations which were polluted with raw sewage. This pollution resulted in nearby human populations contracting waterborne diseases like typhoid fever and cholera. The IJC identified sources of pollution and recommended specific remedial actions, including water purification and treatment, to control the pollution. Such efforts eventually led to the elimination of waterborne disease epidemics in the Great Lakes basin.

THE GREAT LAKES WATER QUALITY AGREEMENT

With the passage of time, other environmental problems became evident, primarily accelerated eutrophication (increased algal growth, decreased water clarity and low levels of dissolved oxygen) due to excess phosphorus inputs. Increasing concern about the water quality degradation culminated in the Great Lakes Water Quality Agreement which was signed by Canada and the United States in 1972. The 1972 Agreement provided the focus for a coordinated cleanup effort to control phosphorus inputs and thus slow the eutrophication process.

The Agreement was revised and expanded in 1978 to address toxic substance loadings into the Great Lakes. An ecosystem approach was also emphasized, in which a more integrative and holistic perspective is required to protect water quality and the health of the entire Great Lakes ecosystem. This approach recognizes the complex interactions among water, land, air and all living things, including humans.

AREAS OF CONCERN

Despite considerable progress over the past decade, serious problems remain. The Great Lakes Water Quality Board, the IJC's principal advisory body on Great Lakes water quality issues, identified 43 Areas of Concern in the Great Lakes basin. In each of these areas, Agreement objectives or jurisdictional standards, criteria or guidelines which were established to protect uses, have been exceeded, and remedial measures are necessary to restore these uses. There are fourteen uses listed in the Agreement, including municipal and industrial water supplies, fish consumption, recreation and aquatic life. Areas of Concern include the major municipal and industrial centers on Great Lakes rivers, harbors and connecting channels.

The 43 Areas of Concern are identified in the figure on page 6.

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[1] From a brochure printed by the International Joint Commission. For further information contact the IJC Regional Office, P.O. Box 32869, Detroit, Michigan 48232. (519) 256-7821.

Forty-three Areas of Concern Identified in the Great Lakes Basin

Lake Superior

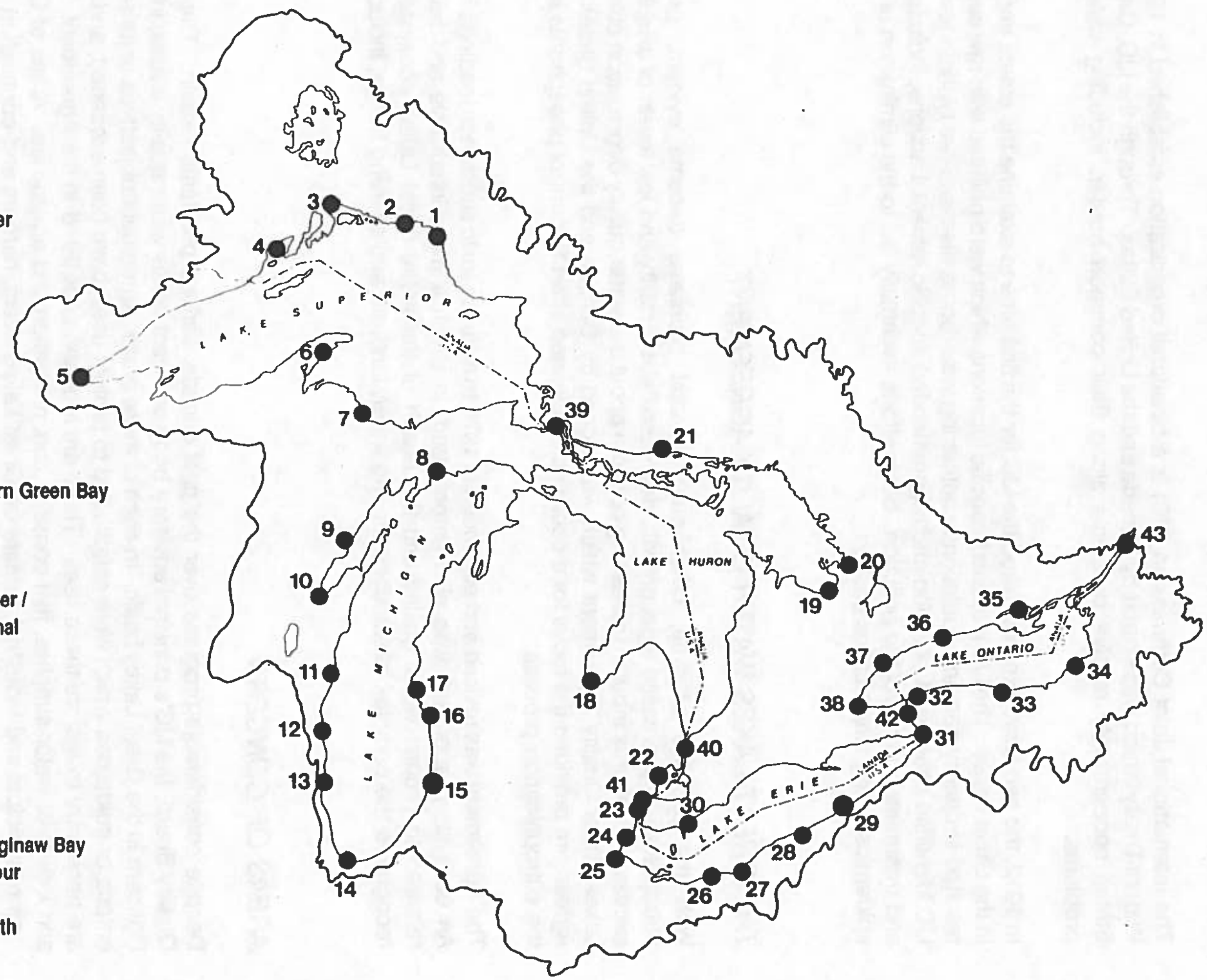
1 Peninsula Harbour
2 Jackfish Bay
3 Nipigon Bay
4 Thunder Bay
5 St. Louis Bay / River
6 Torch Lake
7 Deer Lake - Carp Creek / River

Lake Michigan

8 Manistique River
9 Menominee River
10 Fox River / Southern Green Bay
11 Sheboygan River
12 Milwaukee Estuary
13 Waukegan Harbor
14 Grand Calumet River / Indiana Harbor Canal
15 Kalamazoo River
16 Muskegon Lake
17 White Lake

Lake Huron

18 Saginaw River / Saginaw Bay
19 Collingwood Harbour
20 Severn Sound
21 Spanish River Mouth



Lake Erie

22 Clinton River
23 Rouge River
24 River Raisin
25 Maumee River
26 Black River
27 Cuyahoga River
28 Ashtabula River
29 Presque Isle Bay
30 Wheatley Harbour

Lake Ontario

31 Buffalo River
32 Eighteen Mile Creek
33 Rochester Embayment
34 Oswego River
35 Bay of Quinte
36 Port Hope
37 Metro Toronto
38 Hamilton Harbour

Connecting Channels

39 St. Marys River
40 St. Clair River
41 Detroit River
42 Niagara River
43 St. Lawrence River (Cornwall / Massena)

SOURCE: International Joint Commission, 1991

WHAT ARE REMEDIAL ACTION PLANS

As a result of the 1985 Report of the Water Quality Board which identified the 43 Areas of Concern, the eight Great Lakes states and the Province of Ontario have committed themselves to developing a Remedial Action Plan (RAP) for each Area of Concern to restore the uses which have been impaired.

The development of RAPs represents a challenging departure from most historical pollution control efforts where separate programs for regulation of municipal and industrial discharge, urban runoff and agricultural runoff were implemented without considering overlapping responsibilities. This new process will thus call upon the talents available in a wide array of programs far beyond those traditionally associated with water pollution control, including the involvement of local communities and a wide range of government agencies at all levels.

These programs may include, but are not limited to, municipal and industrial wastewater treatment; hazardous waste management; nonpoint source pollution control; groundwater; fisheries and wildlife management; dredging and harbor maintenance; land use planning; and recreation. They will involve public education and awareness building. Some problems which are exacerbated by personal habits must be addressed though the building of public awareness. Together these and other programs will form the first systematic and comprehensive effort to restore uses in the Areas of Concern, and will be consistent with the ecosystem approach outlined in the 1978 Agreement to protect the waters of the Great Lakes ecosystem.

In addition to the requirement to take an ecosystem approach to protect water quality, RAPs are to serve as an important step toward virtual elimination of persistent toxic substances.

The two terms, Virtual Elimination and Ecosystem Approach, are explained in more detail on the following page.

PUBLIC PARTICIPATION

RAPs are also noteworthy for their requirement for public involvement. By participating in the process, citizens help insure that the RAPs are comprehensive and that the plan will be implemented. Vigorous public participation is essential now because in the future, public support of the plan will be necessary, whether it be to support costly structural corrective actions or education programs which are geared toward changing human actions and habits that contribute to the water quality problem.

THE ECOSYSTEM APPROACH

The ecosystem approach includes several core ideas, or operating principles.

o One operating principle of the ecosystem approach is that RAPs cannot simply focus on the water, and the search for sources of contaminants must not be limited to the river banks in the Area of Concern. The Cuyahoga RAP study looked for a diversity of sources, and remedial actions will be directed toward abating a diversity of sources as well. Furthermore, the search for sources of pollution in the Cuyahoga encompassed the entire watershed.

Some problems are not the result of contaminants alone, but are due to conditions created by human use of the land and waters. For example, human uses of the land can preclude any use of the land as wildlife habitat.

o A second operating principle of the ecosystem approach is that in adopting remedial actions, the transfer of contaminants from one medium to another should be minimized. For instance, a decrease in the level of pollution in the water should minimize increases of pollution to the air or to the land. This exchange from one disposal method to another is referred to as "cross-media" contamination.

o A third operating principle of the ecosystem approach is that remediation strategies should be compatible with the economic health and social well-being of a community. Explicit linkages should be made between community economic development and the health of the ecosystem.

An important challenge of the RAP process is to characterize the problem in ecosystem terms, continue to study the ecosystem to further our understanding of the complex interactions which are occurring among air, land, water and all living organisms, and identify remedial actions which are comprehensive and sustainable.

VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

Remedial Action Plans must also work toward the goal of virtual elimination of persistent toxic substances from the Great Lakes. This means employing strategies where we can that change the inputs into the industrial processes or change the process itself, rather than attempting only to control or regulate what comes out of the pipes at the end of industrial processes. Furthermore, it means changing our life styles and altering our personal habits to avoid or reject using products which pollute the environment.

THE CUYAHOGA REMEDIAL ACTION PLAN PROCESS

THE CUYAHOGA AREA OF CONCERN

This RAP is an effort which focuses on the Cuyahoga Area of Concern. The Great Lakes Water Quality Board identified the Cuyahoga shipping channel and the Cleveland Harbor to be an Area of Concern in 1985. In 1988, the Cuyahoga RAP Committee decided to look for problems in the river beyond this short six-mile stretch, upstream though the Cuyahoga Valley National Recreation Area and into Akron. Also determined by the RAP Committee, the nearshore Area of Concern includes 10 miles of the Lake Erie shoreline, from Edgewater Beach on the west side of Cleveland to Wildwood Park roughly 9 miles to the east. A map which highlights the Cuyahoga Area of Concern in the Cuyahoga River Watershed and nearshore area is on page 10.

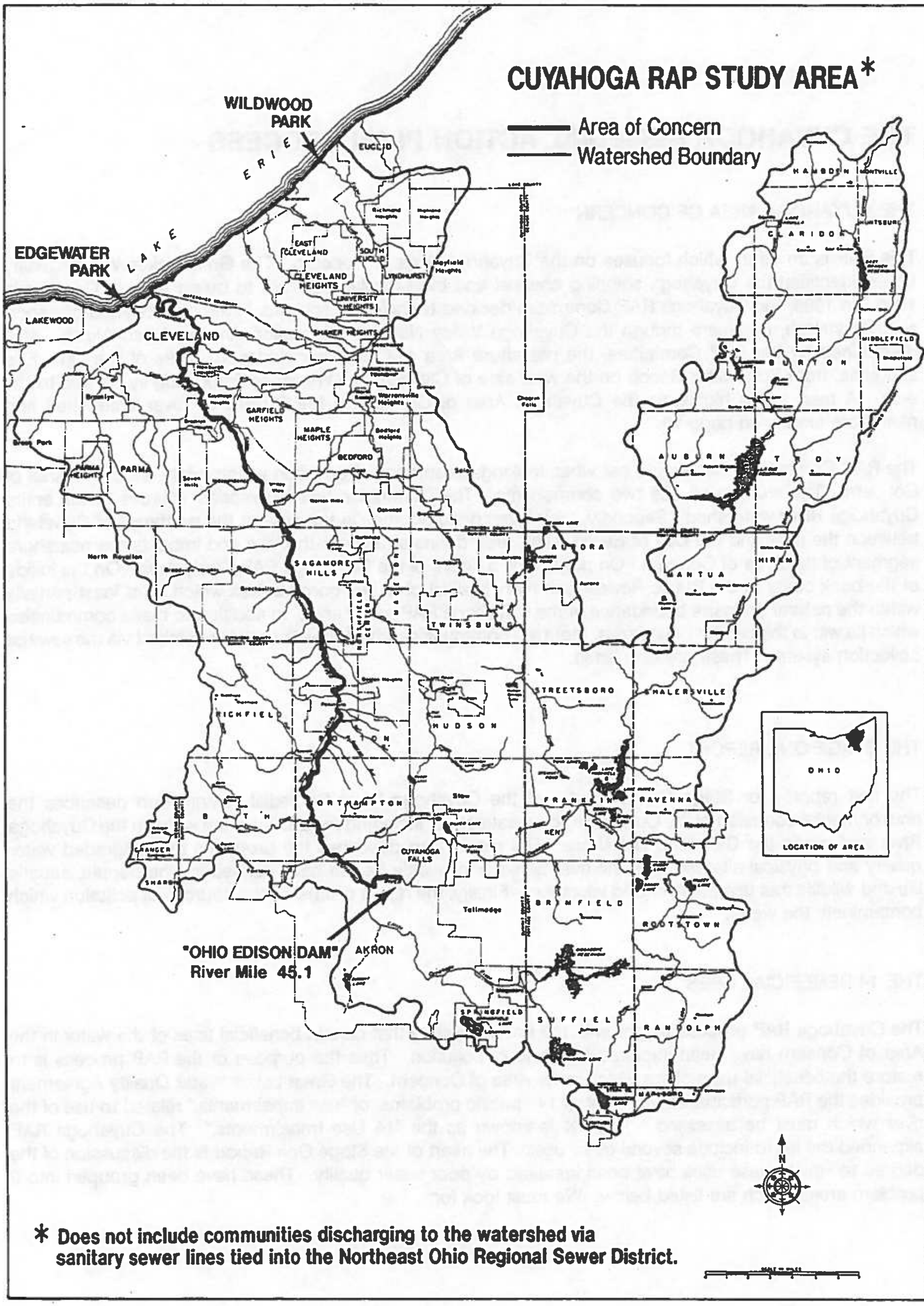
The RAP Committee cast a wide net when looking for sources of pollution which might affect the Area of Concern. The study area has two components. The Committee first inventoried sources in the entire Cuyahoga River watershed. Secondly, they inventoried sources in the area to the northeast of Cleveland between the river and the City of Euclid. This area drains directly to the lake and impacts the nearshore segment of the Area of Concern. On page 10 is a figure of the Cuyahoga RAP Study Area. On the inside of the back cover of the Public Review Summary is a list of all the communities which lie at least partially within the natural drainage boundaries of the Cuyahoga RAP study area. In addition to these communities which lie within the natural boundaries, there are communities which drain into the watershed via the sewage collection system. These are also listed.

THE STAGE ONE REPORT

The first report - or Stage One Report - of the Cuyahoga River Remedial Action Plan describes the environmental condition of the Cuyahoga River watershed, including the quality of the water in the Cuyahoga River and along the Cleveland lakeshore. The report also describes the problems that degraded water quality and physical alterations of the river banks and wildlife habitat have caused for the people, aquatic life and wildlife that use the river and lakeshore. Finally, the report discusses the sources of pollution which contaminate the water.

THE 14 BENEFICIAL USES

The Cuyahoga RAP process begins with the understanding that certain beneficial uses of the water in the Area of Concern have been impaired by years of pollution. Thus the purpose of the RAP process is to restore the beneficial uses of the water in the Area of Concern. The Great Lakes Water Quality Agreement provides the RAP participants with a list of 14 specific problems, or "use impairments," related to use of the river which must be assessed. This list is known as the "14 Use Impairments." The Cuyahoga RAP expanded the list to include several other uses. The heart of the Stage One Report is the discussion of the degree to which these uses have been impaired by poor water quality. These have been grouped into 6 problem areas which are listed below. We must look for:


CUYAHOGA RAP STUDY AREA*
Area of Concern
Watershed Boundary
WILDWOOD PARK
EDGEWATER PARK
LAKE ERIE
LAKEWOOD
CLEVELAND
EUCLID
EAST CLEVELAND
SOUTH EUCLID
CLEVELAND HEIGHTS
UNIVERSITY HEIGHTS
SHAKER HEIGHTS
GARFIELD HEIGHTS
MAPLE HEIGHTS
BEDFORD
PARMA
SAGAMORE HILLS
TWINSBURG
AURORA
MANTUA
HIRAM
AUBURN
TROY
BURTON
MIDDLEFIELD
CLARIDON
HAMBDEN
MONTVILLE
STREETSBORO
SHALERSVILLE
RICHFIELD
BOSTON
HUDSON
NORTHAMPTON
CUYAHOGA FALLS
FRANKLIN
RAVENNA
KENT
BRIMFIELD
ROOTSTOWN
GRANGER
SHARON
AKRON
SPRINGFIELD
SUFFIELD
RANDOLPH
Tallmadge
OHIO
LOCATION OF AREA
"OHIO EDISON DAM"
River Mile 45.1
N
* Does not include communities discharging to the watershed via sanitary sewer lines tied into the Northeast Ohio Regional Sewer District.

1) Human health problems resulting from the consumption of contaminated fish or wildlife, or from drinking contaminated water.

2) Problems for fish, leading to reduced populations, increased incidence of tumors or external deformities. Problems include a loss of habitat.

3) Problems for other aquatic organisms, leading to reduced populations or tumors and deformities.

4) Problems for wildlife (other than aquatic organisms including fish) which lead to reduced populations, birth defects or deformities. Problems include a loss of habitat.

5) Problems for recreationists, including swimmers, waders, boaters, fishers, birdwatchers, and many others.

6) Problems for those who use the river for commercial purposes, including shippers and receivers, the raw water users, and commercial recreation facilities. These are referred to in the Cuyahoga RAP as "socio-economic uses."

How each of the six problems areas is affected in the Cuyahoga Area of Concern is discussed in detail beginning on page 21.

THE CUYAHOGA RAP COORDINATING COMMITTEE AND PUBLIC INPUT INTO THE PLAN

The Stage One Report was prepared by a community based planning group. The members of this planning group, listed on page 2, were selected by Ohio EPA in 1987. This local group is the Cuyahoga River Coordinating Committee (CCC), and it is made up of 33 people who represent state and federal agencies; local industry; commercial and private interests; community interest groups; and local public jurisdictions. The CCC was created in such a way as to be a balanced representation of the broadest public that uses the river. The CCC was given the responsibility to draft the Stage One Report and to plan for the future phases of the RAP effort.

The CCC embodies the critical element of RAP development in that it includes public consultation at every step of the process. The CCC is representative of the multiple user groups of the river and nearshore area. Ohio EPA charged the CCC with the creation of the planning process and the development of the RAP Stage One Report itself. The CCC will continue to be the principal planning body as we move ahead toward the next stages of the process.

The CCC has continued to look beyond its own dimensions and seek out additional public input. All meetings of the CCC and its committees have been open to the public and have encouraged the public to attend them. In addition, a series of public workshops has been held to provide opportunities for input into the problem definition stage and to increase public awareness of the process. Roughly 200 people attended the workshops in June 1990, and about 100 attended a follow-up workshop in January 1991. There will be more opportunities to participate now and in the future. These are discussed in more detail at the end of this summary.

FUTURE STAGES OF THE CUYAHOGA RAP

Once the problems that restrict human and biological uses of the water have been identified and the sources of the pollution pinpointed, the second stage of the process is to develop goals and identify corrective strategies (remedial actions). Strategies which will be selected may include structural measures (for example, expanding wastewater treatment facilities to prevent combined sewer overflows (CSOs), or retention basins to treat urban runoff) and nonstructural measures (for example, education programs to teach people about reducing household hazardous waste, or recommendations for treating diffuse sources such as landfills and hazardous waste sites). Government regulations can help to implement either structural or non structural actions. Who is to implement these strategies and how implementation is to be paid for will also be identified in Stage Two.

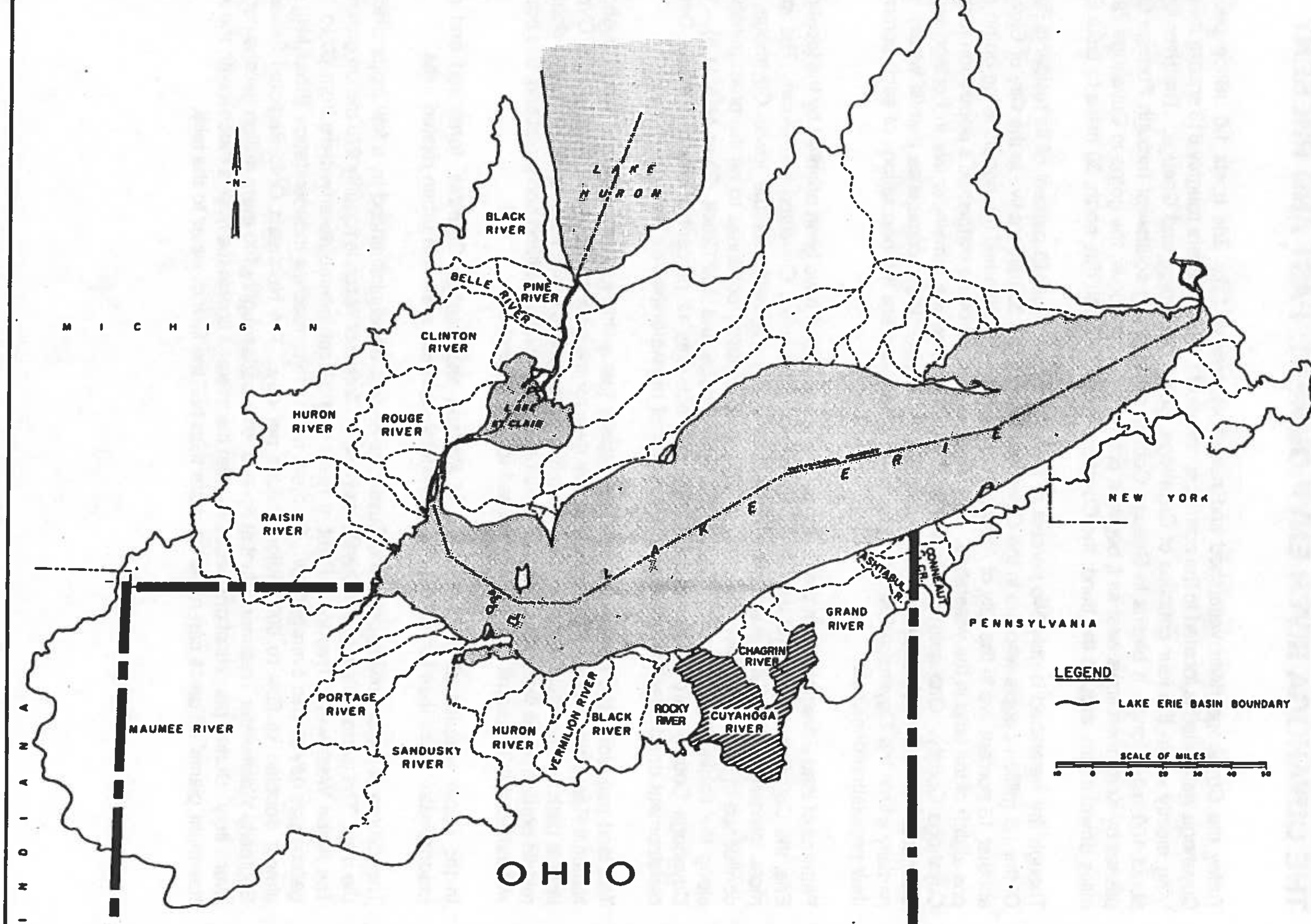
The Third Stage of the RAP process will be ongoing. It will include a monitoring program to insure that selected remedial actions are being implemented, and an assessment of the remedial actions which are implemented to insure that the remedial actions are indeed making the corrections they were intended to make.

LAKEWIDE AREA MANAGEMENT PLANS

The problems in the Cuyahoga River do not end at the mouth. The Cuyahoga watershed is an integral part of the Lake Erie watershed. On page 13 is a figure highlighting the Cuyahoga within the larger Lake Erie watershed. The Lake Erie watershed is part of an even larger ecosystem, the Great Lakes watershed. What goes into the Cuyahoga River and nearshore area ends up in Lake Erie, and has the potential to affect the rest of the Great Lakes basin downstream. Another element of the Great Lakes Water Quality Agreement is the preparation of Lakewide Area Management Plans (LAMPs) for each lake in the Great Lakes basin. Just in their beginning phases, LAMPs will be addressing the conditions of each lake, assessing the sources of pollution to the lake as a whole, and establishing a management plan for its protection and enhancement. The Cuyahoga RAP will become a part of the Lake Erie LAMP, and eventually the LAMP may affect the Cuyahoga RAP process.

Continue reading from here for a description of the Cuyahoga River watershed and the sources of pollution which have caused these problems.

Location of the CUYAHOGA BASIN within the LAKE ERIE BASIN



MODIFIED FROM: U.S. Army Corps of Engineers, Lake Erie Wastewater Management Study, June 1983

THE CUYAHOGA RIVER ENVIRONMENT: PAST AND PRESENT

Today the Cuyahoga River watershed and nearshore area of Lake Erie hosts 1.6 million people. The Cuyahoga watershed is located in the northeast corner of Ohio. It covers roughly 813 square miles of land, lying mostly within the four counties of Cuyahoga, Summit, Portage and Geauga. The river itself is just about 100 miles long. It begins in Geauga County, meandering southwest through Portage County. It passes by Kent, then flows west as it begins a crashing descent down the gorge in Cuyahoga Falls. A few miles downstream, around the bend, the Cuyahoga begins a path due north, 30 miles to Lake Erie.

Though the watershed is only two percent of the state's land area, 15 percent of its residents live in here. Of the 1.6 million people who live in the Cuyahoga study area, 30 percent live in the City of Cleveland and another 13 percent live in the City of Akron. That's a little less than half the people living on no more than one eighth of the land in the watershed. Altogether, two-thirds of the watershed's population resides within Cuyahoga County. One quarter lives in Summit County, and the remainder live in Portage and Geauga Counties. On the back cover of this summary is a list of all the communities that lie wholly or at least partially within the Cuyahoga RAP study area. Also reported are the populations of each community and their population densities.

Patterns of land development in the Cuyahoga River watershed have been oriented by the location of Lake Erie, the Cuyahoga River, and the Ohio Canal which once linked Cleveland and Akron. The watershed's most intensive industrial development is located along the banks of the lower Cuyahoga, from the confluence of Big Creek (River Mile 7.3) to Lake Erie. Industry continues to be the predominant land use along the banks, as far up the river as the I-480 bridge and Mill Creek (River Mile 11.5). Within the Cuyahoga County part of the watershed, industry occupies 12 percent of the land area. Dense urban development dominates the landscape in this part of the watershed as well.

The land use along the banks changes dramatically just a little further upstream. The Cuyahoga Valley National Recreation Area (CVNRA) saddles the river for the next 22 miles up the river. The CVNRA is the largest park in the watershed, with more than five square miles within its boundaries, and it dominates the middle portion of the watershed (Summit County). In addition to parkland and forestland, this portion of the watershed within Summit County is also used for agriculture.

In the upper reaches of the watershed, in Portage and Geauga Counties, forestland and agriculture predominate. Less than ten percent of the watershed in this area is in urban related uses.

The volume of water flowing down the Cuyahoga River is heavily influenced by a few major dischargers to the river. The average flow of the Cuyahoga River upstream of Akron is roughly 270 million gallons per day. The Akron Wastewater Treatment Plant at River Mile 37 can contribute anywhere from 60 to 100 million gallons per day to this average flow. By the time the river reaches Independence (River Mile 13), it has almost doubled its flow to 500 million gallons per day. The Northeast Ohio Regional Sewer District's Southerly Wastewater Treatment Plant at River Mile 11 adds roughly 100 more million gallons per day to the river's flow. During periods of dry weather, when the average flow in the river is much lower, the wastewater treatment plants' effluents can make up more than half the flow of water to the lake.

THE CUYAHOGA RIVER - PRIOR TO THE TWENTIETH CENTURY

The Cuyahoga River and its valley, between the present day sites of Akron and Cleveland, has a long history of use for navigation and travel. For over 2,500 years many Native American tribes shared this important resource for living space, hunting, and transportation on their long journeys between Lake Erie and the Gulf of Mexico. The river prior to the nineteenth century was described as "gentle" with "few riffles or swift running places," and "muddy."

The entire area where the Cuyahoga river entered the lake was a large, nearly level plain covered by marsh and swamp. It was only through dredging and breakwall construction around 1825 that the Cuyahoga River marshes became the Cleveland Harbor with a discernible mouth.[2]

William Coates said of the Cuyahoga,

> "...[I]n the early days, before the presence of a great city dyed its waters, the stream abounded in fish, which were a great factor in the food supply. We need not go back to the days when the Chippewa [Indians] occupied its banks for this fact. In quite recent years, the mullet, redhorse, bass, catfish, bullhead, sturgeon, shad and other varieties were caught in great numbers. Sturgeon, five, six and seven feet in length, were often the prey of fishermen.
>
> Wild game was attracted to the river banks, sometimes in great numbers, and then the river valley became valuable hunting grounds. Because of the forests and with it the leaves in the summer and the slow melting of snow, the lack of ditches and tile drainage, accompaniment of civilization, the flow of water in the river was more regular throughout the year than it is now. Floods did not rise to such proportions and navigation was not impeded by the low water of the dry season, as in later years."[3]

With the completion of the Ohio-Erie Canal linking Cleveland and Akron in 1827, and the Valley Railroad in 1850, Cleveland and Akron communities grew by leaps and bounds. By 1850, Cleveland's population was over 17,000, and ten years later 43,000 people lived in the city. With the rapid growth of the cities, the river began to experience an increasing intensity of use.

Although large industrial development and subsequent urbanization meant prosperity for the region, they brought with them the major sources of pollution between Akron and Cleveland. Over the period of roughly 150 years, the Cuyahoga River would be used to support commercial shipping, major steel, rubber and chemical manufacturing processes, and the disposal of industrial and human wastes. Drastic deterioration of water quality in the Cleveland area began in earnest in the 1850s.

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[2] James Bissell, Staff Botanist. "Natural History of Arcola Creek Estuary." Cleveland Museum of Natural History, July 30, 1987.

[3] William Coates, "A History of Cuyahoga County and the City of Cleveland." 1924.

WHAT ARE THE SOURCES OF ENVIRONMENTAL DEGRADATION ?

Prior to the 1970s, a lion's share of water pollution was caused by the industries which took advantage of the river, positioning themselves on its banks like miniature cities. The industries used the river to carry away their untreated process waters. They drew river water to cool their machines and then returned it, heated and contaminated. Rainwater that fell on the mountains of stockpiled industrial materials and carried contaminated soil from industrial yards eventually ran into the river. Use of the river and its banks for transporting raw materials and finished products caused spills which further contaminated the water.

But the 1970s saw the passage of federal environmental legislation that was intended to control industry. One of the most significant additions to water quality regulations was the direct control of wastewater effluent to the river through the issuance of discharge permits. The Ohio Environmental Protection Agency (Ohio EPA), the agency responsible for issuing these discharge permits (called National Pollutant Discharge Elimination System, or NPDES, permits) to every Ohio industry and sanitary sewage plant, has been working to bring all the dischargers into compliance with the law and to improve the permitting system itself. Owing to the passage of the Clean Water Act in 1972; the regulatory oversite by Ohio EPA; major capital investments by industries and municipalities; and significantly improved operation and management systems; there have been dramatic decreases in the pounds of pollutants discharged to the river. The decrease in pollutants thus far has already had a positive effect on the quality of the water and aquatic wildlife populations.

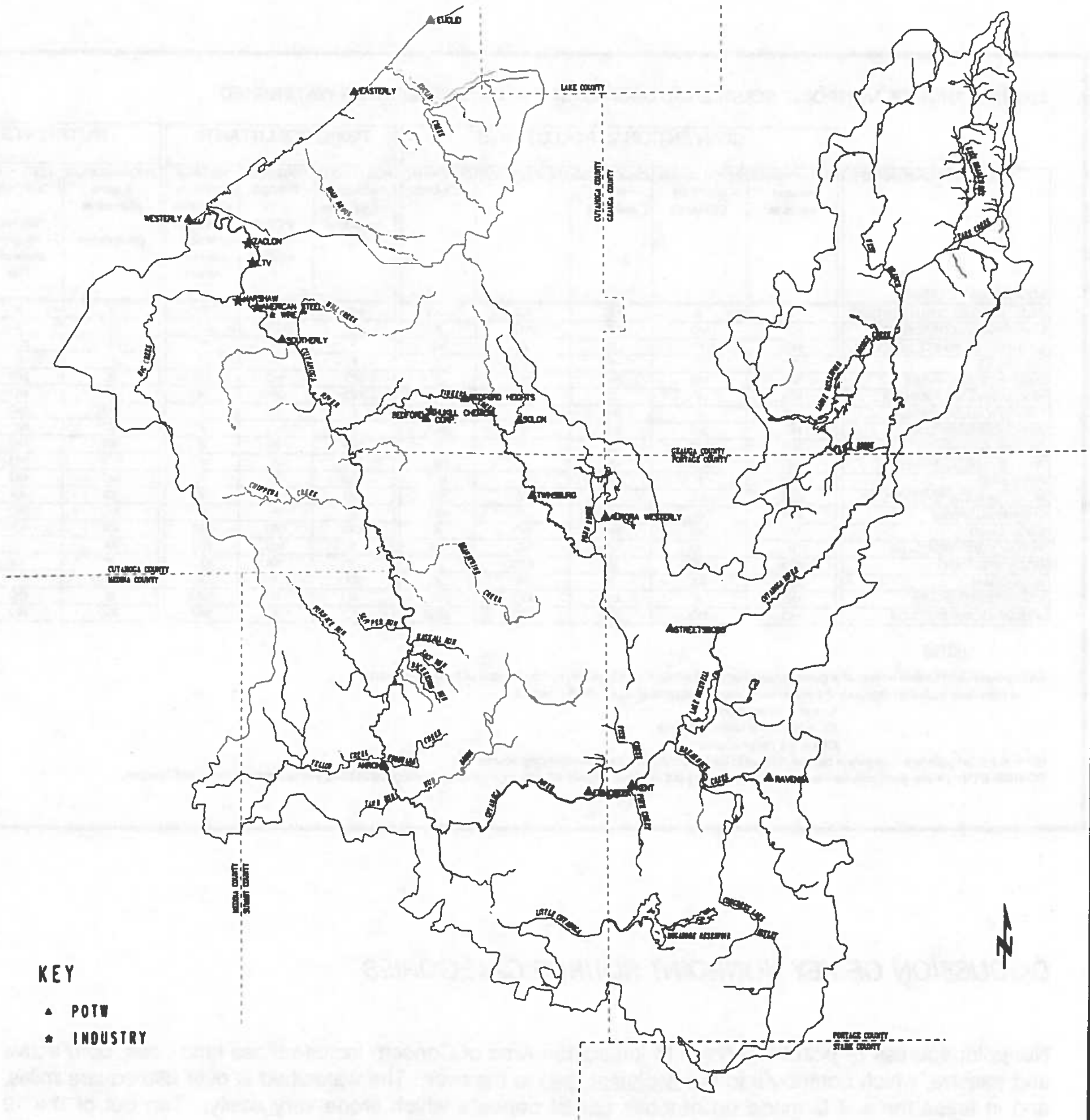
Today the permit system is by no means perfect. Ohio EPA continues to look for and find illegal dischargers. Another challenge is the large number and varied nature of the permitted dischargers. Since 1985 there have been approximately 175 permitted dischargers in the Cuyahoga River watershed alone. Roughly two-thirds of these permits were issued to industries. The remaining third were issued to sanitary sewage plants. These sources of pollution, the industries and the sanitary sewage plants, are known as ***Point Sources*** because their waste comes to the river at one point, through a discharge pipe. Their treated wastewater, even after applying the best available technology, can contribute measurable levels of metals and conventional pollutants.

Not all of these permit holders were discharging in 1991. Several entities have stopped discharging directly to the river by connecting their discharge pipes to regional or city sewer lines. Several have altered their processes to eliminate the need to discharge altogether. Some entities are only discharging stormwater which they collect from their property and treat before discharging it to the river. Both the industries and the sanitary sewage plants have been working to upgrade their treatment processes to improve the quality of their effluent as regulations have become more and more restrictive. The major point sources in the Cuyahoga River watershed are located in the figure on page 17.

Nonpoint Source pollution has not been paid as much attention as the industrial dischargers and the sanitary sewage plants, nationally or locally. The Cuyahoga RAP Stage One Report documents 19 types of nonpoint source pollution that may be impacting the water quality in the Area of Concern.

Nonpoint source pollution originates in areas of the watershed where some use of the land, whether for farming, feedlots, oil and gas wells, storage tanks, landfills, industrial stock piles, streets, construction and development, urban cores and suburban housing (to name a few), has resulted in the disturbance of the earth and/or contamination of the surrounding land. The contamination is washed from the area by rainfall, often attached to soil particles which may be eroding from the area, and carried to the river in the stormwater runoff. In stormwater runoff one can find virtually anything that can be found in industrial and sanitary sewage plant waste streams and more, including PCBs and pesticides.

MAJOR* PERMITTED DISCHARGERS IN THE CUYAHOGA RAP STUDY AREA



KEY

▲ POTW

★ INDUSTRY

* POTW'S – annual average flow greater than 1.0 mgd
INDUSTRY – point system based on toxic pollutant potential, wastewater volume, individual pollutant loadings, potential public health impacts and expected effects of the discharges on the water quality standards in the receiving stream.

** American Steel and Wire recycles most of its process water and discharges infrequently

The following table lists all the categories of nonpoint sources investigated by the Cuyahoga RAP and the types of pollutants associated with each nonpoint source. A few of the key nonpoint sources are described further in the text following the table.

SIGNIFICANCE OF NONPOINT SOURCE CATEGORIES IN THE CUYAHOGA RIVER WATERSHED

	CONVENTIONAL POLLUTANTS					TOXIC POLLUTANTS			NUTRIENTS	
POLLUTANT CATEGORIES / SOURCE CATEGORIES	PATHOGENS viruses bacteria	BIOCHEMICAL OXYGEN DEMAND	CHLORIDES brine road salt	OIL & GREASE	SEDIMENT VOLUME	PESTICIDES herbicides insecticides fungicides	ORGANIC TOXICS PCBs PAHs others	METALS cadmium chromium iron lead mercury others	PHOSPHORUS soluble phosporus phosphates	NITROGEN COMPOUNDS nitrites nitrates ammonia TKN
BACKGROUND CONTRIBUTION	X	X	NO	NO	XXX	NO	NO	XX	X	X
ATMOSPHERIC DEPOSITION	NO	NO	NO	NO	X	XX	XXX	XXX	NO	X
HAZARDOUS WASTE SITES	NO	P	P	P	NO	P	P	P	NO	NO
LANDFILLS	P	P	P	P	P	P	P	P	P	P
QUARRIES AND MINES	NO	NO	NO	NO	X	NO	NO	NO	X	NO
INDUSTRIAL STOCK PILES	NO	X	X	X	X	NO	XXX	X	X	NO
TANK STORAGE AREAS	NO	P	NO	P	NO	P	P	P	NO	NO
UNDERGROUND TANKS	NO	NO	NO	P	NO	P	NO	P	NO	NO
OIL AND GAS WELLS	NO	NO	X	P	P	NO	P	P	NO	NO
WASTE INJECTION WELLS	NO	NO	P	P	NO	NO	P	P	NO	NO
PIPELINES	NO	P	NO	P	NO	NO	P	P	NO	NO
HOME SEWAGE SYSTEMS	XXX	XX	X	X	NO	NO	X	X	XX	XX
CHEMICAL SPILLS	NO	P	NO	P	NO	P	P	P	NO	NO
CROP LAND	NO	NO	NO	NO	X	XXX	NO	NO	XX	XX
RURAL NON-CROP LAND	X	X	NO	NO	XX	X	NO	NO	XX	X
METROPOLITAN	XXX	XXX	X	XXX	X	X	XX	XXX	X	XX
SUBURBAN	XXX	XX	X	XX	X	XX	X	X	X	X
STREETS/HIGHWAYS	NO	X	XXX	XXX	X	X	X	XXX	X	NO
URBAN-CONSTRUCTION	NO	NO	NO	NO	XXX	NO	X	NO	XX	NO

NOTES

Background Contribution = level of a given contaminant that would naturally occur, in the absence of human influence.
"X" = pollutants from that category are expected to runoff from that source, where it occurs
X = is a minor source
XX = is an intermediate source
XXX = is a major source
NO = the given pollutant category is not considered to be contributed by the corresponding source.
POSSIBLE ("P") = the given pollutant occurs from the source but does not migrate off-site as a result of existing regulations and adequate control technologies.

DISCUSSION OF KEY NONPOINT SOURCE CATEGORIES

Nonpoint sources of pollution known to impact the Area of Concern include those land uses, both active and passive, which contribute to the sediment load to the river. The watershed is over 800 square miles, and in areas the soil is made up of loose glacial deposits which erode very easily. Ten out of the 19 categories of nonpoint sources reviewed by the Cuyahoga RAP can accelerate erosion which may lead to sedimentation in the Area of Concern.

Active use of the land (for example, farming, the drilling of oil and gas wells, existing residential areas, or the construction of new structures) can accelerate erosion, especially if care is not taken to prevent it.

There are areas in the Cuyahoga River watershed which are not being "used," but are eroding nonetheless. Almost half the acreage in the watershed is not "in use". These are the areas of grass and shrubland, parkland, forestland, or water and wetlands. Included in this category are those areas where the banks of the river and its tributaries are steep and bare of vegetation. Of those areas which are highly eroding (an estimated 25,000 acres or 5% of the watershed), 65% are grasslands, forestlands or parklands.

Sediment which makes it to the river is destructive for several reasons. Sediment covers over the bottom of the river, destroying habitat for fish and other aquatic organisms. Some of the sediment particles which are too buoyant to sink in the flowing river, remain suspended and cause a muddy appearance in the water, and furthermore prevent light from getting through to the life on the river bottom. In addition, sediment often carries with it the contaminants from natural metal deposits, past and current land uses, and atmospheric deposition. Fish and aquatic organisms that filter through sediment for food come into contact with the contaminated sediment particles.

Atmospheric deposition is a nonpoint source which is known to impact Lake Erie. Fallout of air pollution directly to the water's surface contributes over half the cadmium and benzo-a-pyrene, in addition to smaller loads of other metals and organic pollutants, which are found in the lake.[4] Atmospheric deposition may be impacting the Cuyahoga Area of Concern as well. The Cuyahoga RAP has included in its research agenda further research to determine the extent to which atmospheric deposition may be impacting water quality in the Area of Concern.

Hazardous waste sites are a third key nonpoint source category reviewed by the Cuyahoga RAP. These sites, identified by the Ohio EPA, are locations of past or abandoned industrial activities, spills or waste storage where toxic contamination is likely to exist. There are approximately 200 known sites in the watershed and possibly more which have not been identified. The impact to the Area of Concern from the release of pollutants from these sites is largely unknown. However, in other areas of the Great Lakes and the nation, hazardous waste sites such as these have been known to release contaminants which have then polluted the environment and been linked to health problems. The Ohio EPA has given about 40 of these 200 sites in the watershed a priority ranking, and the Cuyahoga RAP has included in its research agenda further investigation of at least these priority sites.

Urban stormwater runoff can carry with it measurable levels of metals, bacteria, PCBs, oil and grease, and trash. A study done in the early 1980s concluded that older cities, like Akron and Cleveland, contributed more pollutants than newer cities. Much of the pollution that is carried in urban runoff was once air borne, but oil from leaky cars and trucks, contamination and debris from abandoned or old industrial yards, sediment from highly traveled, unvegetated open space or abused stream banks, feces from urban animals (dogs, cats, and even geese that congregate at small ponds in urban parks), end up as water pollution. Stormwater runoff from suburban areas can become contaminated in the same way. Additionally, suburban areas can contribute high levels of nutrients where home owners improperly apply fertilizers to their lawns. In both urban and suburban areas, road salt runs off into the water creating toxic conditions for the aquatic life. The disposal of used motor oil, antifreeze, paint thinners, etc., down storm drains further contaminates the water.

So far you have read about point sources of pollution and nonpoint sources of pollution.

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[4] Final Report on Input of Toxic substances from the Atmosphere to Lake Erie, addressed to the Ohio Air Quality Development Authority. August 1989. Battelle, Columbus, Ohio.

Combined sewer overflows (CSOs), sanitary sewer overflows and wastewater treatment plant bypasses are a third source category of water pollution. Combined sewers carry wastewater from homes, businesses and industries along with stormwater to the sanitary sewage treatment plants. During a heavy rainfall, stormwater runoff can cause a dramatic increase in the water flowing through the combined sewers. Special control devices on the combined sewers allow some of the combined wastewater to overflow into streams and rivers so that the pipes don't back up into homes or businesses. Akron and the Northeast Ohio Regional Sewer District have initiated studies to better understand the contribution of CSOs to the water quality problem and to determine appropriate corrective actions.

Because these overflows are a mixture of stormwater and untreated sewage, the pollutants in the overflows come from two sources: the sewage from homes, businesses and industries; and the nonpoint sources running off the land above the point of overflow.

In the Northeast Ohio Regional Sewer District area, which serves metropolitan Cleveland, there are roughly 130 combined sewer outfalls which overflow during periods of heavy rainfall. Roughly 60% of these overflow to the Cuyahoga River system. The remaining 40% overflow directly to Lake Erie in the nearshore Area of Concern. In the Akron service area there are 34 combined sewer outfalls which overflow to the Ohio Canal or Little Cuyahoga River. Both are tributary to the Cuyahoga River. The amount of overflow naturally changes with the amount of rainfall.

Typical pollutants found in combined sewer overflow discharges include microorganisms (bacteria), floatable material, biochemical oxygen demanding material, and suspended solids. However, as combined sewers capture both sanitary sewage and stormwater runoff from residential, commercial and industrial areas, many other pollutants can be found in combined sewer overflow discharges.

Sanitary sewer overflows occur during periods of intense rainfall due to the unintentional infiltration of stormwater into sanitary sewer lines. The sewers become overloaded and would back up, but, like combined sewer overflows, sanitary sewer overflows are designed to occur so that pipes do not back up into homes or businesses. Both Akron and the Northeast Ohio Regional Sewer District are working to eliminate these types of discharges.

Pollutants found in sanitary sewer overflow discharges are very similar to those found in combined sewer overflow discharges. Sanitary sewer overflows are likely to have higher concentrations of sewage, however.

Finally, there are bypasses from sanitary sewage plants. The discharge, in these instances, is the result of a mechanical malfunction or human error at the sanitary sewage plant. The discharge to the stream is untreated or only partially treated sewage that would otherwise be fully treated at the sanitary sewage treatment plant. These occur infrequently and are therefore not considered to be a large contributing factor.

THE PROBLEMS DISCOVERED IN THE CUYAHOGA RAP AREA OF CONCERN

You have just read about the three major types of pollution sources in the Cuyahoga study area: Point Sources, Nonpoint Sources, and Combined Sewer Overflows (which are a mixture of industrial wastewater, sanitary sewerage and nonpoint source pollution, that flows from sewer outfalls into the river or lake before ever reaching the treatment plants).

In order to understand the extent of degradation in the Cuyahoga River ecosystem caused by the sources described above, the Cuyahoga RAP asked a series of questions on the degree of degradation and evaluated the answers. Where insufficient data exist to evaluate the degree of degradation, the Cuyahoga RAP has suggested research studies which would fill those information gaps. The research suggestions that have the highest priority are presented in the Cuyahoga RAP Research Agenda. Some of the studies identified in the Research Agenda are now under way. However, many are not. **It is a RAP goal to find institutions which can carry out the research and to seek funding to facilitate these studies.**

For evaluation purposes the Area of Concern was broken down into three sections:

A) the river between the Ohio Edison Dam - the furthest point upstream - at River Mile 45.1 and the Head of the Navigation Channel at River Mile 5.6;

B) the Navigation Channel which extends from River Mile 5.6 to the mouth (River Mile 0.0); and

C) the nearshore area, which is the lakefront stretch from Edgewater Beach on the west of the Cuyahoga mouth to Wildwood Park, nine miles to the east of the Cuyahoga along Lake Erie.

The problem areas reviewed include Human Health, Fish Populations, Wildlife Populations, Aquatic Organisms other than fish, Recreation, and Socio-economic Uses.

HUMAN HEALTH

1) Are the fish caught in the Area of Concern safe to eat?

In Lake Erie, there is a health advisory in place warning people not to eat carp and channel catfish caught from the lake. These fish have been found with levels of PCBs which exceed standards. These standards were established by the Ohio Department of Health which is the agency responsible for issuing health advisories for the State of Ohio. The Health Department has relied, in part, on guidelines provided by the Food and Drug Administration.

In the Cuyahoga River, fish caught along the entire length of the river below Ohio Edison Dam were found to have elevated levels of PCBs and certain pesticides. None of the contaminants found in the river fish exceeded the established standards. Therefore, no fish consumption advisory has been issued for the river.

Except for PCBs, the levels of contaminants in Cuyahoga River fish are similar to those in fish from other areas studied which were not necessarily impacted by urbanization. Areas studied include the Chagrin River and the Upper Cuyahoga River.

There are no known discharges of PCBs or pesticides from the permitted point source dischargers in the watershed. Known nonpoint source of PCBs include atmospheric deposition and historical dump sites. Because PCBs were once so widely used - in industrial processes (capacitors, transformers and as lubricants elsewhere), as well as the manufacture of pesticides, plastics, inks, paints, etc - they can be found virtually anywhere in at least trace amounts - in urban and industrial site runoff, landfills or streets and highways. Another possible nonpoint are hazardous waste sites, but this remains largely unexplored.

The pesticides which are found in fish tissue at elevated levels, namely DDE and Dieldrin, are no longer manufactured in the United States nor used in agriculture. Heptachlor epoxide, also found in elevated levels, is a byproduct of Heptachlor, which is still in limited use.

The Cuyahoga RAP continues to collect data on the levels of contaminants in fish tissue. The Research Agenda includes the establishment of a long-term monitoring program to evaluate the safety of fish for human consumption. The Agenda also includes surveys to evaluate the types, amount, locations, and preparations of fish being caught for consumption.

2) Are the wildlife caught in the Area of Concern safe to eat?

There are no data to determine whether wildlife other than fish caught in the Area of Concern are safe to eat. The Research Agenda includes tissue studies of wildlife other than fish.

3) Is the water from the Area of Concern safe to drink?

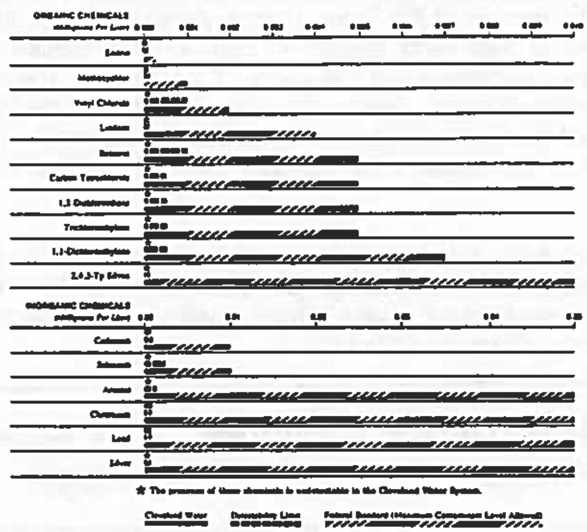
Measured levels of contaminants in the Cleveland finished water supply are well below the current federal standards for safe drinking water. The figure on the top of page 23 illustrates this.

Because Lake Erie is a far more consistent and therefore reliable supply of water, it is not likely that the navigation channel will ever be used as a drinking water supply. The untreated water from the lower river or harbor area is, however, not drinkable, primarily because of the likelihood of bacterial contamination, and one would be advised not to drink the untreated water. The table on the bottom of page 23 is a comparison of untreated Cuyahoga River and lake water at the sites of drinking water intake to the Federal Safe Drinking Water Standards. Only chromium levels in the raw lake water exceeded the health related ("primary") standards on occasion during limited sampling done between 1986 and 1991. Barium in raw water was not tested for.

No public or semi-public water supply exists in the river from the Ohio Edison Dam to the navigation channel. However, surface supplies to individual customers or any potential influence of surface water quality on groundwater in this segment are currently unknown.

Cleveland's finished drinking water is below the maximum contaminant level allowed by federal standards for safe drinking water. In the limited sampling shown in the table at the bottom of the page, the average concentrations of the health related inorganic contaminants in Cleveland area raw water did not exceed the safe drinking water standards.

CLEVELAND FINISHED DRINKING WATER QUALITY VS. FEDERAL STANDARDS



SOURCE: City of Cleveland, Division of Water (1990 Annual Report)

COMPARISON OF CUYAHOGA RIVER AND NEARSHORE AREA UNTREATED WATER TO CLEVELAND TREATED DRINKING WATER AND FEDERAL STANDARDS (M.C.L.)

CONTAMINANT	MAXIMUM CONTAMINANT LEVEL (MCL)	1990 CLEVELAND DRINKING WATER	LAKE SITES AT WATER INTAKES	RIVER SITES WEST THIRD RM 3.26	LOWER HARVARD RM 7.10	OLD ROCKSIDE RM 13.18	BOLANZ RD RM 33.2	OLD PORTAGE RM 40.16
	All Values in mg/l (ppm)							
PRIMARY CONTAMINANTS (HEALTH)								
ARSENIC	0.0500	0.0013 <		0.0030	0.0024	0.0023	0.0030	0.0027
BARIUM	1.0000	0.0150 <						
CADMIUM	0.0100	0.0005	0.01 <	0.0008	0.0010	0.0003	0.0006	0.0006
CHROMIUM	0.0500	0.0003	0.01 <	0.0304	0.0302	0.0302	0.0300 <	0.0300 <
LEAD	0.0500	0.0016	0.01	0.0091	0.0069	0.0057	0.0053	0.0110
MERCURY	0.00200	0.00020 <	0.0002	0.00024 #	0.00010 #		0.00018 #	
NITRATE	10.0000	0.3800	0.36	3.7900 #	3.7500 #		2.5600 #	
SELENIUM	0.0100	0.0023 <		0.0020 <	0.0020 <	0.0030 <		
SILVER	0.0500	0.0002 <		0.0100 #				
SECONDARY CONTAMINANTS (AESTHETICS)								
CHLORIDE	250.0	17.0	22	131.8 *	140.4 *	110.2	96.0 #	130.0
COPPER	1.0000	0.0083	0.02	0.0108	0.0116	0.0109	0.0100 <	0.0095
IRON	0.3000	0.0200	0.1	1.8050 **	2.2690 **	2.5670 **	1.0920 **	1.2030 **
MANGANESE	0.5000	0.0002		0.1331	0.1225	0.1079	0.1150	0.1300
pH	6.5 – 8.5	7.5	7.4 – 8.2 s.u.	7.7	7.7 *	7.9	7.4	7.6
SODIUM	20.0	9.0		61.1 **	93.6 **	72.8 **		
TOTAL DISS. SOLIDS	500.0	167.0	163	524.5 **	522.5 **	461.6 *	422.7	483.4 *
SULFATE	250.0	25.0	34	89.6	85.2	78.7	76.0 #	
ZINC	5.0000	0.0050	0.02	0.1396	0.0489	0.0310	0.0261	0.0435

NOTES
values obtained from Cuyahoga database (1986-1991) because STORET data not available
< less than (below detection limit)
* one or more samples exceed M.C.L., but average does not
** average exceeds M.C.L.

mean values computed using detection limit for samples below detection limit

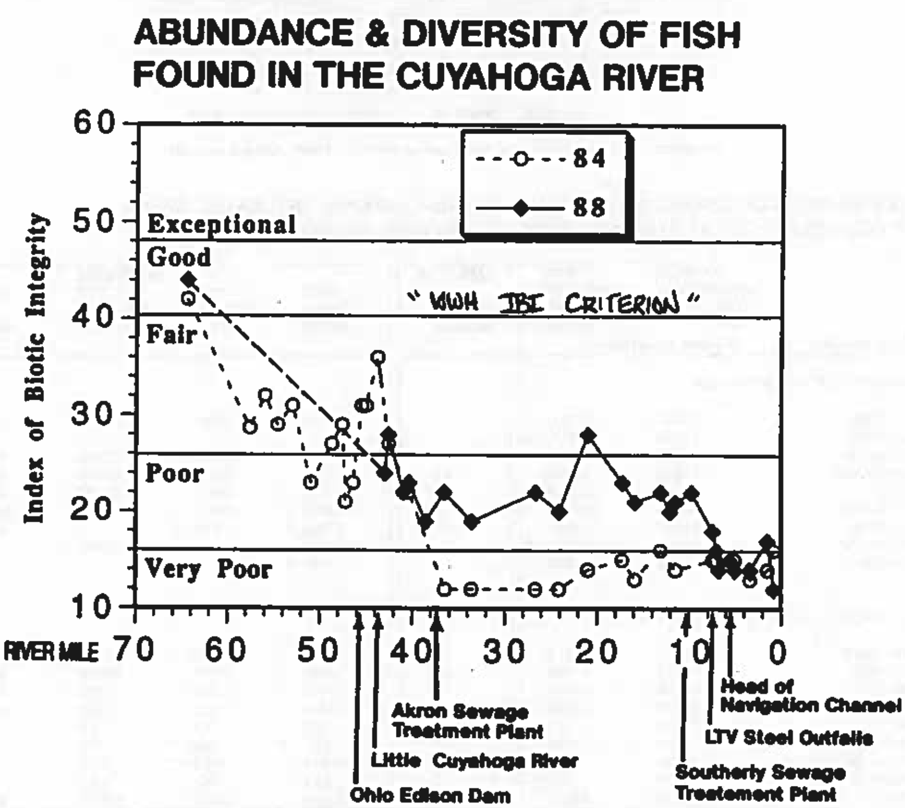
"1990 Cleveland Drinking Water" data obtained from Cleveland Division of Water testing on finished drinking water.
"Lake Sites (Raw Water)" data obtained from NEORSD sampling in Lake Erie, near three water intakes.
Raw water samples contain some suspended solids which carry contaminants. Since suspended solids are removed in the filtration process, the raw water samples will show higher levels of contaminants than the finished water. In addition, the equipment used to analyze the raw water had higher levels of detection, yielding inflated numbers.
All river data obtained from STORET data (1986-1991), except numbers followed by #.

FISH POPULATIONS

4) Does the Area of Concern have healthy populations of fish?

Healthy fish populations are found nowhere in the entire length of the Cuyahoga River below Ohio Edison Dam. Fish data collected by Ohio EPA in 1984 and 1988 were analyzed to evaluate the degree of this problem. The Agency employs several indices, the Index of Biotic Integrity (IBI) being one, to analyze their data and measure the health of the fish populations. This index works by giving a value to the number of fish found at each sample site, the number of different species found, and the ratio of clean-water species to polluted-water species found. It also takes into account the incidence of disease and the quality of the habitat. The value for each category is computed into one overall score. The results of the IBI index scores for the Cuyahoga River are presented in the next figure. It is necessary for the score to fall into the numerical range of "Good" in order to meet the warmwater habit standard which is codified in the Ohio Water Quality Standards.

The following figure shows two things: 1) since 1984 there has been some improvement in the health of the fish populations of the river between the Ohio Edison Dam and the navigation channel, and 2) the fish populations are not healthy enough anywhere in the river below River Mile 45 to meet the warmwater habitat standard of "Good."



Source: Ohio EPA

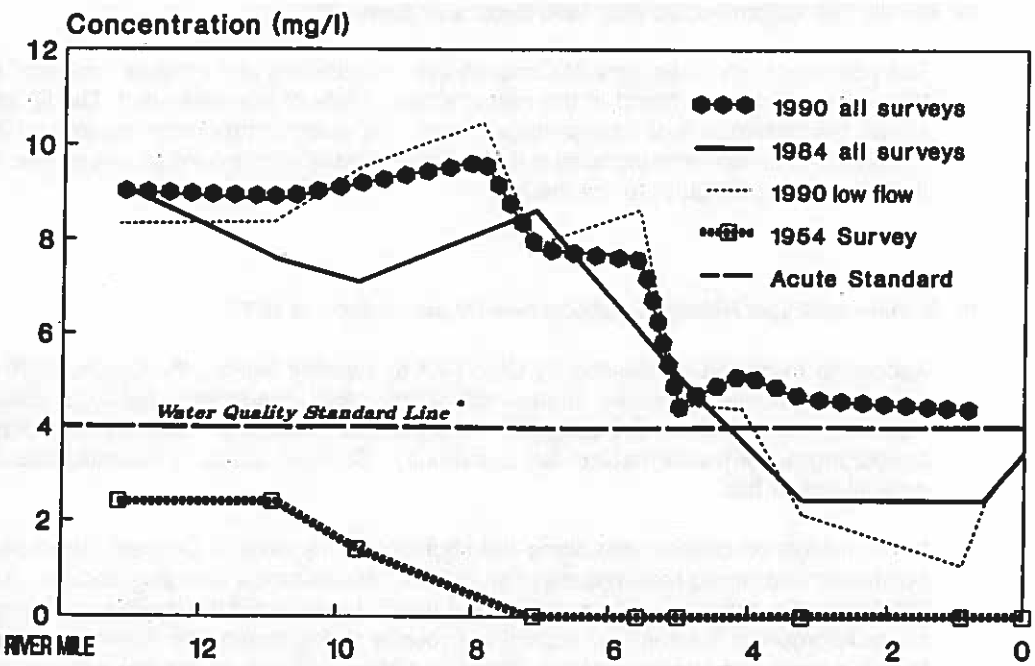
In many places along the river, fish communities improved between 1984 and 1988. Nonetheless, this graph shows that fish communities in the Area of Concern are not meeting the desired value of "Good".

Contaminants which possibly contribute to the reduced diversity and numbers of fish include metals (for example, cadmium, chromium, lead, zinc), chlorides, PCBs, PAHs, and pesticides. There are point and nonpoint sources of the metals and chlorides, but only nonpoint sources of the PCBs, PAHs and pesticides. There are areas of contaminated sediments which are the result of past pollution and may be causing problems for the fish as well.

LOW LEVELS OF DISSOLVED OXYGEN

One very serious problem to fish in the Cuyahoga River, particularly to those fish which would migrate back and forth from the lake, is the low levels of dissolved oxygen found in the navigation channel. The following figure shows the overall improvement in the amount of dissolved oxygen in lower river from 1954 to 1990. However, also shown by this figure is the significant decrease of dissolved oxygen as one moves down the river into the navigation channel then out to the mouth (from left to right in the figure). Demand for oxygen is created by bacteria that cause the decay of organic materials in the water. The bacteria use up oxygen as they break the materials down.

Levels of Dissolved Oxygen in the Lower Cuyahoga River



* *As defined by Ohio law, the lowest amount tolerable to the aquatic life over a brief period of time.*

Source: Ohio EPA

Levels of dissolved oxygen in the lower river have improved significantly since 1954 when it could support virtually no aquatic life. In 1990, the average of dissolved oxygen samples met the acute warmwater habitat standard. Under 1990 low flow conditions, however, dissolved oxygen fell below the standard.

There are many situations and conditions which contribute to the low levels of dissolved oxygen in the navigation channel. The river is naturally slow as it moves through the navigation channel. Combined with the great depth of the channel, there is little opportunity for the natural re-oxygenation of the water. In the summer, during days of low river flow, the 1990 dissolved oxygen levels were almost as low as the 1954 average levels (refer back to the figure on page 25).

In addition, there is a large load of oxygen demanding material to the navigation channel. This material competes with the fish for the available oxygen, and the wastes usually win. There are many sources of the material, including several large industrial and municipal waste treatment plants in the navigation channel and upstream. There are nonpoint sources of oxygen demanding material as well. Leaf litter, grass clippings and feces from areas where animals are concentrated are a few of the materials which, when they decay in the river, demand oxygen. Home or small commercial sanitary sewage systems which are improperly maintained or are failing can create large loads of oxygen demanding material. These loads can be a local problem to smaller tributaries. In the nearshore area, increasing nutrient levels (phosphorus and nitrogen) decrease available oxygen. Nutrients provide for increased plant growth or algal blooms. When the plants die, their decay also requires oxygen.

5) Are the fish deformed; do they have tumors or lesions?

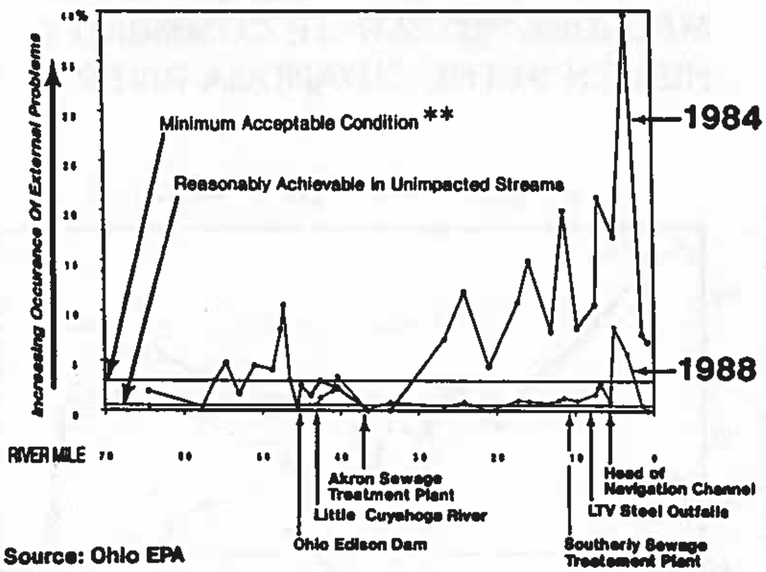
The percent of fish in the Area of Concern that have tumors and external problems is higher than the percent of tumors found in the nonurbanized areas of the watershed. The figure on page 27 shows the decrease in the percentage of fish with external problems caught in 1984 and 1988. However it also shows an increase in the number of external problems as one moves down the river (left to right in the figure) to the mouth.

6) Is there sufficient habitat to support healthy populations of fish?

According to criteria established by Ohio EPA to evaluate habitat, the Cuyahoga River above the navigation channel generally scores sufficiently high to support healthy populations of fish. However, the scores in the navigation channel fall below the minimally acceptable range for supporting a warmwater habitat fish community. Suitable habitat is essential to support healthy populations of fish.

In the navigation channel and along the shoreline in the Area of Concern, sheet piling, concrete bulkheads and riprap have reduced fish habitat. Maintenance dredging and the turbulence from freighter traffic constantly disrupt the habitat there. Upstream of the navigation channel, sediments cover appropriate feeding and spawning grounds and eliminate the diversity of the stream bed. Clearing trees and shrubs from the banks and shore, as well as cooling water discharges, have increased the temperature of the river.

OCCURANCE OF DEFORMITIES, ERODED FINS, LESIONS & TUMORS ON CUYAHOGA RIVER FISH *



Source: Ohio EPA

* This is only a measure of external problems. The Cuyahoga RAP declaration of impairment includes the rate of incidence of internal tumors in fish as well.

** 3% = 75th. percent of all Ohio Reference Site Data

Between 1984 and 1988 the occurrence of external problems on fish decreased. In 1988, however, the occurrence of problems exceeded the minimum acceptable condition in several places along the river in the Area of Concern.

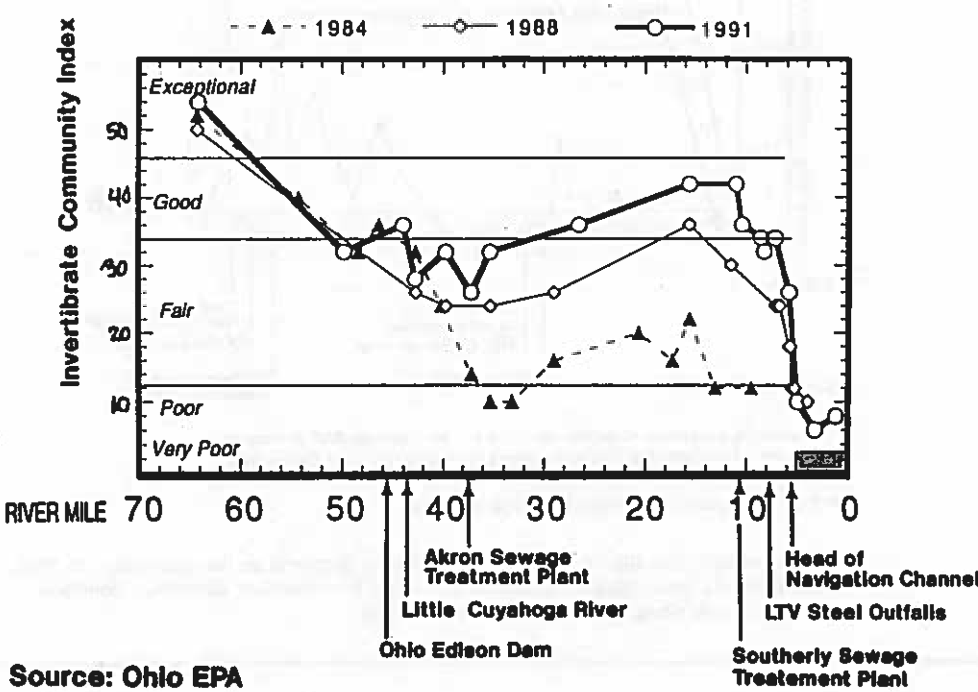
AQUATIC ORGANISMS

This category includes macroinvertebrates, phytoplankton and zooplankton. Macroinvertebrates are animals that live at least part of their life on or close to the bottom of water bodies. They have external skeletons and are large enough to see without the aid of a microscope. Plankton are organisms that float in bodies of water. They are generally too small to be seen without a microscope. "Phyto-" means plant, and "Zoo-" means animal. These tiny aquatic organisms form the base of the food chain. They are an important source of food for fish, and thus it is important to have healthy populations of each. These organisms are also good indicators of the water quality itself.

7) Does the Area of Concern have healthy populations of macroinvertebrates?

The populations of macroinvertebrates are reduced in places along the river from the Ohio Edison Dam to the head of the navigation channel, throughout the navigation channel and in the nearshore area. The following figure shows the overall increase in the populations over the short 4-year period between 1984 and 1988. However, health of the populations must rate "good" or better in order to meet the warmwater habitat standards set by Ohio law. The figure shows that only one site in 1988 met that guideline.

MACROINVERTEBRATE COMMUNITY HEALTH IN THE CUYAHOGA RIVER



Source: Ohio EPA

Macroinvertebrate populations have improved since 1988 when only one site (River Mile 16) met the desired value of "Good." In 1991, upstream of the navigation channel, most sites rated in the range of "Good."

These organisms spend part or all of their life on the bottom of the river, in contact with the substrate and they tend not to move far from one spot. The health of the macroinvertebrate populations is therefore considered to be a good indicator of the substrate quality in the immediate area. They are better indicators of water quality than the zooplankton or phytoplankton which float freely in the water column and are more susceptible to the flow of the river and lake, and to wind and weather patterns. Toxic conditions that might be problematic to the healthy populations of these latter two groups of organisms are overshadowed by these other effects.

Contaminants which possibly contribute to the reduced populations of macroinvertebrates include metals (for example, cadmium, chromium, lead, zinc), chlorides, PCBs, PAHs and pesticides. Habitat is significantly reduced in the navigation channel where turbulence from freighter passage disturbs the substrate daily, and routine dredging removes the substrate annually.

The RAP Research Agenda includes sediment bioassays at harbor areas like the Cuyahoga's to evaluate the effects of local sediments on aquatic life.

8) Does the Area of Concern have healthy populations of zooplankton?

There are insufficient data to evaluate the health of the zooplankton populations in the Area of Concern.

9) Does the Area of Concern have healthy populations of phytoplankton?

Though limited data suggest that healthy populations of phytoplankton do not exist in the Area of Concern, the data are both limited and dated.

WILDLIFE (other than fish and other aquatic organisms)

10) Does the Area of Concern have healthy wildlife populations?

There are insufficient data to determine the extent to which wildlife populations have been reduced or degraded. The RAP Research Agenda includes the establishment of a sentinel species to signal environmental problems.

11) Are the offspring deformed, do they suffer from birth defects, or are there other reproductive problems?

Insufficient data exist to evaluate the degree to which deformities, birth defects or reproductive problems occur in the Area of Concern. The RAP research agenda includes tissue studies of wildlife other than fish.

12) Is there sufficient habitat to support healthy wildlife populations?

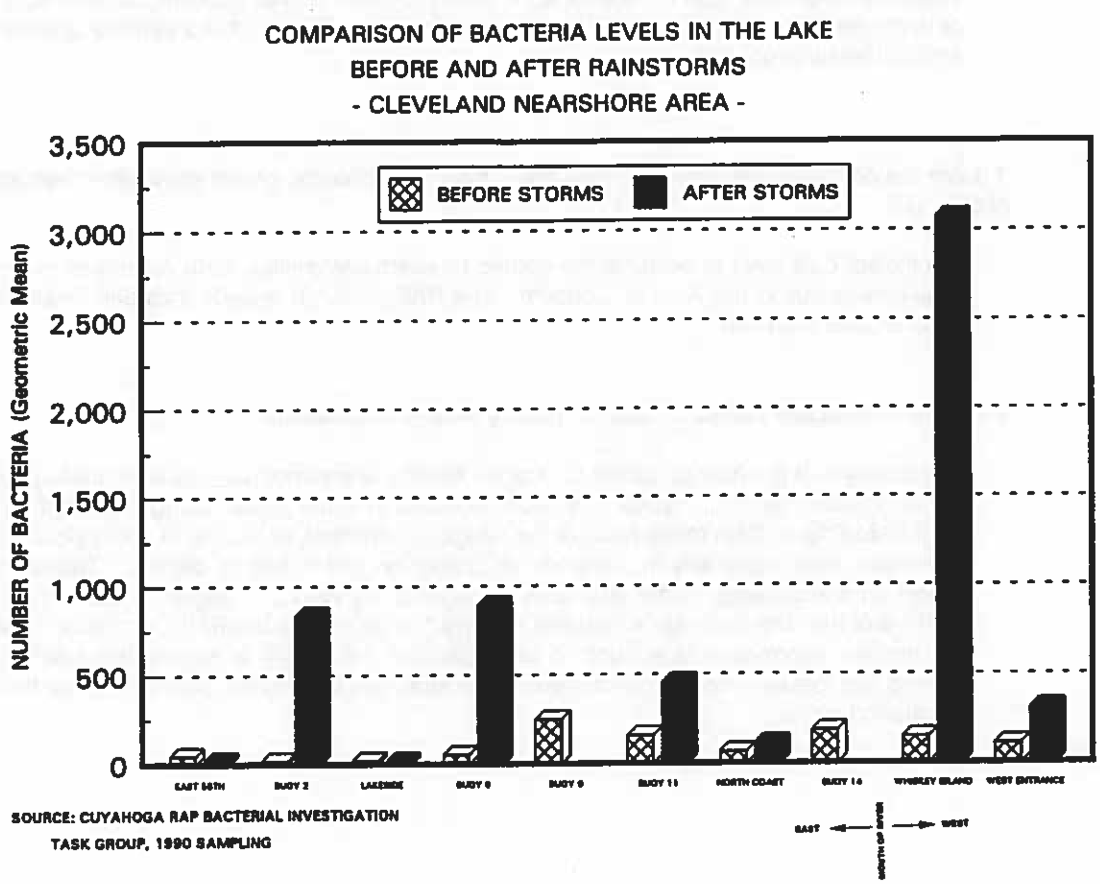
The quality and quantity of habitat to support healthy animal populations is degraded throughout the navigation channel. Habitat has been degraded in some places along the length of the river from Ohio Edison Dam to the head of the navigation channel, as well as in some places along the nearshore area, especially in the areas of population and industrial centers. This evaluation is based on a knowledge of the land uses throughout the Area of Concern in addition to informal surveys of the river such as "windshield surveys." Nonetheless the RAP Committee believes that the present information is enough to conclude that the quality of habitat has been degraded, leaving the present habitat insufficient to support healthy animal populations in those areas mentioned above.

RECREATION

13) Are the bathing beaches in the Area of Concern safe for swimming?

In 1990, a Cuyahoga RAP Task Group sampled bacteria levels in the nearshore area between the west entrance of the harbor and the East 55th Street Pier. Although the RAP data are limited to five months of sampling and only two significant rain events, these observations can be made. During dry weather, bacteria levels from the 1990 sample locations usually met the water quality criteria for recreational uses which involve water contact. For several days after a storm, bacteria levels in the nearshore area are likely to exceed criteria established for safe bathing. The RAP did not sample at the two public bathing beaches which lie within the Area of Concern: Edgewater Beach and Euclid Beach next to Wildwood Park, both on Lake Erie, although these beaches are sampled by the Ohio Department of Health weekly during the swimming season. Studies done in the early 1980s of bacteria levels at those locations as well as the preliminary results of a present study of the entire lakeshore in the Area of Concern indicate that the pattern found in the 1990 RAP study holds for the public beaches as well.

The following figure of 1990 RAP sampling locations in the Cleveland Harbor shows a general pattern of increase in levels of bacteria after a rainstorm.



SOURCE: CUYAHOGA RAP BACTERIAL INVESTIGATION TASK GROUP, 1990 SAMPLING

Sources of the bacteria include combined sewer overflows and sanitary sewer overflows. There are large nonpoint sources of bacteria as well, including runoff from urban and suburban lands.

14) Is the water in the river safe for canoeing and other water-contact sports?

For up to 3 days after a storm, bacteria levels in the entire length of the river below the Ohio Edison Dam are likely to exceed criteria established for safe water contact. The figures on page 32 of the bacteria levels in the river as it winds through the Cuyahoga Valley National Recreation Area and the navigation channel show the dramatic increase in the levels of bacteria after a large rainstorm. During dry weather, bacteria levels usually meet the water quality criteria for safe recreational contact. A model of bacteria travel in the river under different weather conditions is currently being developed to help determine the most appropriate times to monitor bacteria levels and to post warnings.

Sources of the bacteria include combined sewer overflows and sanitary sewer overflows. There are large nonpoint sources of bacteria as well, including home sewage systems, urban and suburban land, and animal feedlots.

15) Is there sufficient access for fishing and other activities along the water in the Area of Concern?

Access to the water goes hand in hand with water quality when evaluating the degree to which recreational uses of the resource have been impaired. Improvements in water quality alone will not revive the opportunities for recreation on the Cuyahoga River and along the Cleveland lakefront. There must be access to the water to fully realize its potential for recreation. It is part of the RAP Research Agenda to understand more fully the current levels of recreational activity, the degree to which various activities are impaired, and the potential for growth of recreational uses in this area.

Access to the river for fishing, canoeing or other similar activities is limited in some places along the river. From Old Rockside Road to the head of the navigation channel there is no public access at all. Access to the river in the Flats area is primarily through restaurants and nightclubs. Access to the lake in the nearshore area is more varied: there are several fishing piers, waterfront museums, picnic areas, and private marinas. However, in the ten miles of lakefront under consideration, this is also determined to be limited access.

An additional item on the Research Agenda is to define the geographic distribution of fishing activities and to determine whether a concern about pollution affects fishing activity for recreation or for food.

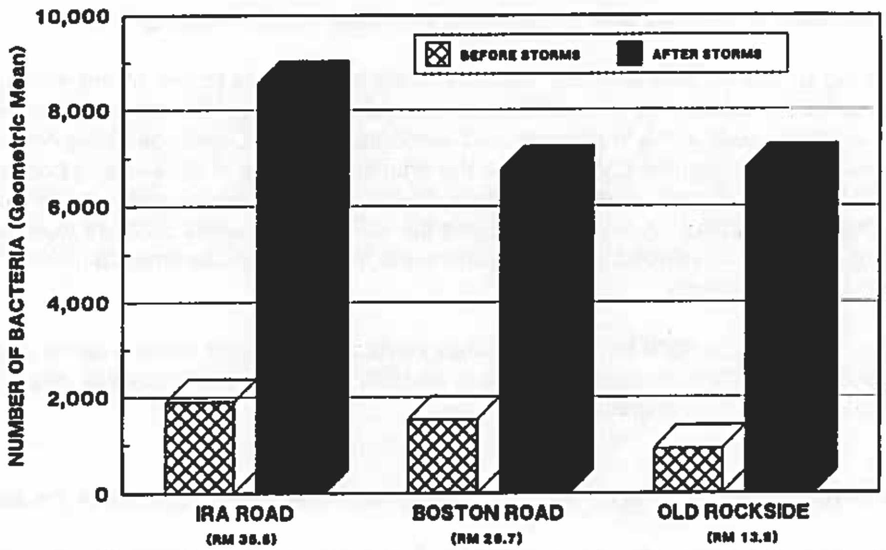
16) Is the aesthetic quality of the water in the Area of Concern acceptable?

Though within the Area of Concern lie some very scenic areas like a 50-square mile national park, the aesthetic quality of the river and Cleveland lakefront area in the Area of Concern is degraded by floating debris and public and private littering. In the lower river, visible outfall pipes and discolored water are also aesthetic problems. Though quantitative data are limited and scientific evaluation methodologies are not available, this conclusion is the consensus of the RAP Committee. The RAP Research Agenda does include the quantification of amounts and, of particular concern, the exact sources of debris.

These figures show the significant increase in bacteria levels in the river following a rain storm.

COMPARISON OF BACTERIA LEVELS IN THE RIVER BEFORE AND AFTER RAIN STORMS

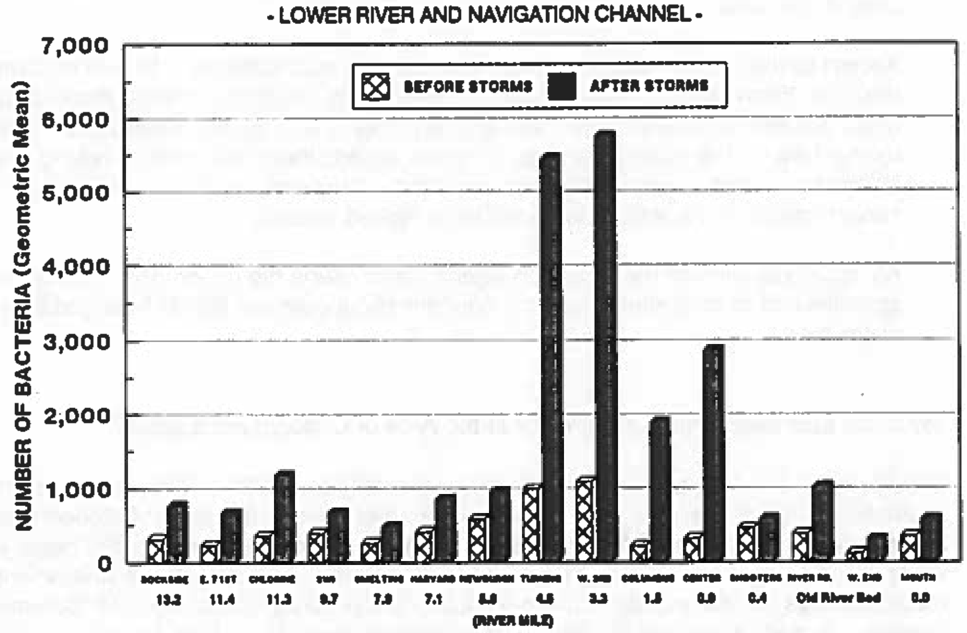
- CUYAHOGA VALLEY NATIONAL RECREATION AREA -



SOURCE: CUYAHOGA RAP BACTERIAL INVESTIGATION TASK GROUP, 1990 sampling

COMPARISON OF BACTERIA LEVELS IN THE RIVER BEFORE AND AFTER RAIN STORMS

- LOWER RIVER AND NAVIGATION CHANNEL -



SOURCE: CUYAHOGA RAP BACTERIAL INVESTIGATION TASK GROUP, 1990 SAMPLING

SOCIO-ECONOMIC USES

17) Can the sediments dredged from the navigation channel and the nearshore area be disposed of safely and in a cost-efficient manner?

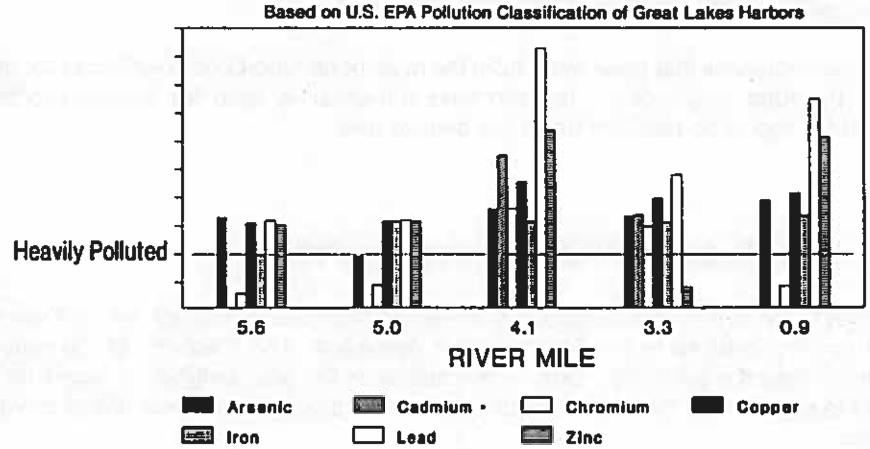
The Cuyahoga River is annually dredged to maintain commercial navigation. Roughly 92% of the sediment dredged from the navigation channel and Cleveland Harbor must be disposed of in specialized landfills because of its "heavily polluted" status. This poses a cost not only for dredging, but also for building and maintaining disposal sites. The U.S. Environmental Protection Agency established the criteria by which the sediments are classified. The remaining 8% is clean enough by U.S. EPA guidelines to be dumped into the open lake.

The large volume of sediment which is generated in the watershed upstream of the navigation channel is relatively clean as it floats into the channel. As sediment particles come into contact with the dilute concentrations of contaminants in the water column there, they bind to the contaminants and settle to the bottom of the channel. The more sediments that enter the channel, the more the contaminants bind onto the particles as they settle out, creating concentrated deposits of contaminated sediments.

The following figure illustrates the contaminant levels of the sediment which is dredged. Sediments contaminated beyond the "heavily polluted" guideline must be landfilled at confined disposal facilities. Those pollutants which exceed standards in Cuyahoga sediments include arsenic, cadmium, chromium, copper, iron, lead, zinc, cyanide and oil and grease. There are both point and nonpoint sources of these contaminants.

RELATIVE CONTAMINATION OF SEDIMENT IN THE CUYAHOGA RIVER NAVIGATION CHANNEL

Based on U.S. EPA Pollution Classification of Great Lakes Harbors



* - No criteria established for Cadmium

Data Compiled by OHIO EPA

The heavy volume of the smallest particles in the Cuyahoga River sediment, those being clay and silt particles, may pose a problem for the fish habitat if disposed of in the open lake. For this reason, the dredged sediments may never by qualified for open lake disposal, regardless of how "clean" they are.

18) Are there nuisance algal blooms or problems of decreased water clarity which can be attributed to human-induced eutrophication (the addition of pollutants to the water which act to nutrify plant and algae growth or cloud the water beyond the level which would occur naturally)?

The data are insufficient to evaluate the levels of algae found in the entire river, though levels of phosphorus found in the navigation channel are high enough to cause eutrophication in an open lake environment. Water clarity in the navigation channel is poor, but this is due more to suspended solids than to blooms of algae. Heavy boat traffic may also contribute to the cloudy appearance of the water.

In the nearshore area, data on the eutrophic condition are dated and the monitoring of variables has been inconsistent. However, the abundance of individual cells of phytoplankton and the presence of fish species that would indicate eutrophic conditions lead to the conclusion that the nearshore area is eutrophic. The degree to which contributions from the Cuyahoga watershed give rise to the current condition in the nearshore is not known.

19) Is the flavor of fish or wildlife taken from the Area of Concern tainted by pollutants?

There are insufficient data to evaluate whether fish and wildlife flavor are tainted. However, there are very few small sources of the contaminants thought to cause tainting of flavor, namely phenolic compounds, in the watershed. Furthermore, although no formal survey has been undertaken, no complaints have been registered to date about the flavor of the fish that are caught and consumed.

20) Must the industrial or agricultural operations which draw water from the Area of Concern treat the raw water prior to use, thus incurring additional costs?

Of those industries that draw water from the river, none report additional costs for using raw water from the Area of Concern. In each case the water is used for cooling processes, and the industries report no need for treatment prior to use.

CHEMICAL WATER QUALITY CRITERIA VIOLATIONS

The entire length of the river to the navigation channel has been designated for use as a warmwater habitat by Ohio EPA under provisions of the Federal Clean Water Act. The chemistry of the water must remain good enough to support aquatic life. Ohio EPA establishes the use designation based on what the river should be able to support and then sets the standards for the quality of the water based on what the aquatic life can tolerate.

The following contaminants have exceeded the warmwater habitat acute standards criteria at least once during routine sampling between 1986 and 1991: cadmium, chromium, copper, iron, lead, zinc, oil/grease, and cyanide. These violated the standard for the highest amount tolerable to aquatic life over a short period of time (that is, 24, 48 or 96 hours). Levels of dissolved oxygen also fell below the minimum tolerable during the routine sampling (refer back to the figure on page 25 – the "water quality standard" line).

WHAT WE DO NOT KNOW

There has been a large amount of data gathered, but still there are many pieces of information which are needed to fully answer all the Stage One questions. For some human and biological uses there is old or incomplete information, and for a few other uses, there is presently little or no information at all.

The Cuyahoga RAP Committee recognizes that more research needs to be done, and thus they have developed a research agenda. If you would like to review the research agenda, it is contained in Chapter 7 of the full Stage One Report. The Cuyahoga RAP has a database which is also available for research purposes, upon request.

The unknowns should not prevent the development of remedial actions for those problems which have been identified. There are many remedial projects which we can work on while information is collected on the unknowns. In this way, the Stage One research projects become part of the Stage Two process, and information is recorded in updates of the report as it becomes available. An effort early in Stage Two will be made to review the socio-economic issues and institutional arrangements that affect the RAP by either contributing to the problem or already providing remediation.

WHERE DO WE GO FROM HERE

The Stage One Report is currently in its public review draft stage. Once the public has had an opportunity to comment on this draft, the Cuyahoga RAP Committee will review the public comments and incorporate them into a final draft, which will then be submitted to Ohio EPA and the International Joint Commission. The International Joint Commission will critique the Stage One Report for its compliance with the Great Lakes Water Quality Agreement.

The Cuyahoga RAP Committee will be moving on to Stage Two while the Stage One Report is being critiqued. Stage Two begins the process of creating remedial options to correct the problems identified in Stage One.

HOW CAN YOU BECOME MORE INVOLVED?

This is a draft of the Stage One Report. The Cuyahoga RAP Committee has reviewed this draft and is submitting it to the public for its review and comments. Once you have had an opportunity to review the findings and make any comments, the RAP Committee will review these comments and incorporate them into a final draft prior to submitting it to Ohio EPA and the International Joint Commission. We anticipate its submittal to Ohio EPA and the IJC this spring.

The Cuyahoga RAP Committee would like to know from you if there are any problems or pollution sources that have not been addressed. Does the proposed research agenda address the most important gaps in the Stage One information?

If you have suggestions or would like to comment on this summary or any part of the report, please send them in writing to:

The Cuyahoga River Remedial Action Plan
Fourth Floor Atrium Office Plaza
668 Euclid Avenue
Cleveland OHIO 44114-3000

Please include your phone number and address. We may need to contact you, and we would like to place you on our mailing list. You will then be informed of future RAP workshops, public hearings and other important events.

DESCRIPTION OF THE STAGE ONE REPORT

The purpose of this Public Review Summary is to summarize the key findings documented in the Stage One Report. Should you desire more in depth information, complete reference copies have been made available at libraries and agencies throughout the watershed. Additionally you may request copies of brief sections. The report is described below to help you identify sections of the full report you may want to review.

The Stage One Report is currently in two volumes. The first volume is the report itself. It contains 10 chapters and is roughly 500 pages long. The chapters are further described below. The second volume contains the supporting appendices. There are 17 appendices which contain the 30 background reports and additional data used in compiling the Stage One Report. The second volume is approximately 900 pages in length.

Chapter One is the Public Review Summary reprinted here.

Chapter Two describes the RAP process, the committee organization, and the goals and issues for Stage One.

Chapter Three provides the environmental setting for the Area of Concern and focuses on natural features, land use and water quality conditions.

Chapters Four and Five are the heart of the document. Chapter Four addresses the question: what beneficial uses are impaired and to what degree and extent are they impaired? Chapter Five addresses the question: what are the sources and causes of pollution that are impairing these uses, and more specifically what are the contaminants of concern in the Cuyahoga River Area of Concern?

Chapter Six summarizes technical studies that have been completed in support of the Stage One effort.

Chapter Seven sets forth the Stage One research priorities and agenda.

Chapter Eight summarizes ongoing water quality management activities.

Chapter Nine summarizes committee efforts for broader public involvement.

Chapter Ten lists those who have participated in the development of the RAP in all its phases to date.

WHERE TO FIND COMPLETE COPIES OF THE STAGE ONE REPORT

Reference copies of the Draft Stage One Report have been placed in the locations listed below. Please call the contact person ahead of time to insure the availability of the copy.

AKRON	ADDRESS	CONTACT NAME AND NUMBER
Akron Public Library	55 South Main St.	Joyce McKnight/762-7621
Akron Public Utilities	65 South High St.	Kathy McCauley/375-2627
NEFCO	969 Copley Rd.	Joe Hadley/836-5731
BRECKSVILLE		
Brecksville Library	9089 Brecksville Rd.	Catherine Wilmer/526-1102
CLEVELAND		
Cleveland Public Library	325 Superior Ave.	Joan Clark/623-2955
Cuyahoga County Planning Commission	323 Lakeside Ave.	Jan Rybka/443-3730
NOACA/CRCPO	668 Euclid Ave.	Mary Beth Binns/241-2414
NEORSD	3826 Euclid Ave.	Lester Stumpe/881-6600
COLUMBUS		
Ohio EPA, Columbus	1800 Watermark Dr.	Pat Bulzan/(614)644-2865
CUYAHOGA FALLS		
Taylor Memorial Library	2015 Third St.	John Bender/928-2117
KENT		
Kent Free Library	312 West Main St.	Van Victoria/673-4893
MAPLE HEIGHTS		
Maple Heights Regional Library	5225 Library Lane	Art Grady/475-5000

MAYFIELD

Mayfield Regional Library	6080 Wilson Mills Rd.	Joanne Greenlee/473-0350

PARMA

Parma Regional Library	7335 Ridge Rd.	Diana Femley/885-5362

SHAKER HEIGHTS

Shaker Lakes Regional Nature Center	2900 South Park Blvd.	Marcia Mauter/321-5935

TWINSBURG

Ohio EPA, NE Ohio	2110 Aurora Rd.	Lily Aaron/963-1129

If you would like to obtain photo copies of brief sections of the report, please call Mary Beth Binns, Environmental Planning Coordinator, at (216) 241-2414 extension 253, or send a postcard to the address below.

WHOM TO CONTACT FOR MORE INFORMATION:

Mary Beth Binns, Environmental Planning Coordinator
Cuyahoga River Community Planning Organization
Fourth Floor Atrium Office Plaza
668 Euclid Avenue
Cleveland, Ohio 44114-3000

(216) 241-2414, EXTENSION 253

WE NEED HELP GETTING THE MESSAGE OUT!

If you would like to volunteer at a future RAP function, at our booth or with large mailings, please contact Jan Rybka, Public Involvement Coordinator, at (216) 443-3730.

ABBREVIATIONS AND EXPLANATION OF TERMS*

Abbreviations

AOC - Area of Concern
BOD - Biochemical Oxygen Demand
CSO - Combined Sewer Overflow
CVNRA - Cuyahoga Valley National Recreation Area
EPA - Environmental Protection Agency
GLWQA - Great Lakes Water Quality Agreement
IBI - Index of Biotic Integrity
ICI - Invertebrate Community Index
IJC - International Joint Commission
NEORSD - Northeast Ohio Regional Sewer District
NOACA - Northeast Ohio Areawide Coordinating Agency
NPDES - National Pollution Discharge Elimination System
NPS - Nonpoint Source
OEPA - Ohio Environmental Protection Agency
PCB - Polychlorinated Biphenyls
POTW - Publicly Owned Treatment Plant (see also WWTP)
RAP - Remedial Action Plan
RM - River Mile
STP - sewage treatment plant (see also WWTP)
WWTP - wastewater treatment plant (see also STP)

Explanation of Terms

AREA OF CONCERN (AOC) - a geographic area of the Great Lakes which is identified by the International Joint Commission as having serious and persistent water pollution problems.

BASIN - see River Basin

BIOCHEMICAL OXYGEN DEMAND (BOD) - a measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. Effluents with large amounts of organic waste have a high BOD, and the bacteria which break it down will use up large amounts of dissolved oxygen during decomposition. In this way, BOD depletes the supply of dissolved oxygen which the fish and other aquatic life need to survive.

BIOLOGICAL CRITERIA - an expected level of biological community health that varies according to the use designation assigned to a water body (see "CRITERIA").

BENEFICIAL USE - a potential use of a water body by human and/or animal populations living in or near that body. The Great Lakes Water Quality Agreement identifies 14 specific beneficial uses which are to be evaluated in each Remedial Action Plan. Beneficial uses include but are not limited to: fish and wildlife consumption; drinking water supply; fish and wildlife habitat and community health; recreation; and other economic uses.

COMBINED SEWER - a sewer that collects both sewage and stormwater and carries the combined flow to the wastewater treatment plant.

COMBINED SEWER OVERFLOW (CSO) - a discharge point of untreated wastewater from a combined sewer to a river, stream or lake. The untreated wastewater is a combination a raw sewage and stormwater which the combined sewer usually carries to the wastewater treatment plant. CSOs happen during or shortly after a heavy rainfall when the capacity of the combined sewer is exceeded because of the extra flow of water from rainfall.

CONVENTIONAL POLLUTANT - a category of water pollutants which includes nutrients, substances which consume oxygen upon decomposition, materials which produce an oily sludge deposit, and bacteria. Conventional pollutants include phosphorus, nitrogen, chemical oxygen demand, biochemical oxygen demand, oil and grease, volatile solids, and total and fecal coliform. Other categories of water pollutants include but are not limited to metals, pesticides, volatile organic compounds, and PCBs.

CRITERIA - numerical limits of pollutants or numerical indices of biological communities established to protect specific water uses.

CUYAHOGA VALLEY NATIONAL RECREATION AREA (CVNRA) - a large park (roughly 50 square miles in area) located between Akron and Cleveland and managed by the National Park Service, in cooperation with other entities for natural preservation, history, cultural arts and outdoor recreation purposes similar and compatible with the National Park Service. The area offers, among many things, hiking and riding trails, ski and picnic areas, and historic and outdoor education centers. The Cuyahoga River roughly bisects the park, and many of the scenic areas within the park include a view of the river. This stretch of river is included in the Cuyahoga RAP Area of Concern.

DISSOLVED OXYGEN - oxygen dissolved in water, necessary to support aquatic life.

ECOSYSTEM - the interacting system of biological communities, i.e., plants and animals including humans, and its nonliving environment.

EFFLUENT - a discharge of pollutants into the environment, partially or completely treated or completely untreated. Generally used in regard to discharges to waters.

ESTUARY - an area where two bodies of water meet, typically where a river meets a lake, bay, or sound. The physical dynamics, and biological and chemical properties of the estuary are complex because they are influenced by the forces behind both the river and the more open body of water.

GREAT LAKES BASIN ECOSYSTEM - the interacting components of air, land, water, and living organisms, including man, within the drainage basin of the St. Lawrence River at or upstream from the point at which this river becomes the international boundary between Canada and the United States (from Article 1 of the 1978 Great Lakes Water Quality Agreement).

GREAT LAKES WATER QUALITY AGREEMENT - a treaty between Canada and the United States first signed in 1978, then amended in 1987, with the goal of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.

HALF-LIFE - as defined by Annex 12 of the Great Lakes Water Quality Agreement, the time required for a substance to diminish to one-half of its original concentration in a lake or water body.

IMPAIRMENT - damage to, or reduction in, any of the beneficial uses of the water and surrounding land in an Area of Concern, as specified by Annex 2 of the Great Lakes Water Quality Agreement. Beneficial uses include but are not limited to: fish and wildlife consumption; drinking water supply; fish and wildlife habitat and community health; recreation; and other economic uses. Impairments include failure to attain any use criteria in the Ohio Water Quality Standards.

INDEX OF BIOTIC INTEGRITY (IBI) - The Index of Biotic Integrity is a measure of fish community health. It is determined by Ohio EPA through the sampling and ranking of fish occurring within a stream segment with respect to the pollution-tolerance levels of the different species. It also takes into account incidence of disease and quality of the habitat.

INVERTEBRATE COMMUNITY INDEX (ICI) - The Invertebrate Community Index is a measure of invertebrate community health, developed by Ohio EPA for the macroinvertebrate community which lives on, in, or closely associated with the bottom of the stream or river. Species are sampled and then ranked according to their abundance, diversity and tolerance to contaminants, considering the availability of suitable habitat. Macroinvertebrates have external skeletons and are large enough to see without the aid of a microscope. Sludge worms and the larvae of mayflies and caddisflies are examples of macroinvertebrates which can live in the Cuyahoga River.

INTERNATIONAL JOINT COMMISSION (IJC) - a body of persons established by the Boundary Waters Treaty of 1909 between Canada and the United States to address issues concerning the shared water resources of the Great Lakes basin. It is the body responsible for overseeing the implementation of the Great Lakes Water Quality Agreement. Members are appointed by the United States and Canadian governments.

LOADINGS - total mass of a pollutant discharged to a water body over a specified time, for example, tons of lead per year.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) - a permit system limiting municipal and industrial discharges, administered by U.S. EPA and the states. Established by the authority of Section 404 of the Federal Water Pollution Control Act of 1972 (the "Clean Water Act").

NONPOINT SOURCE (NPS) - the origin of water pollution from broad areas, through erosion, urban runoff, agricultural runoff, etc. Nonpoint source pollution can be contrasted with point source pollution.

NUTRIENT - material that is necessary for growth, principally phosphorus and nitrogen. Nutrients in the water in excess can cause plant overgrowth, or algal blooms. When these aquatic plants die and decompose, the bacteria which break them down compete with the fish and other aquatic animals for dissolved oxygen, which they need to survive.

OUTFALL - the end of the pipe, or mouth of a sewer, drain, or conduit, where wastewater or drainage empties into the receiving waters.

PERSISTENT TOXIC SUBSTANCES - a substance which remains in the environment and which, in sufficient amounts in or on an organism can cause death, disease, mutation, deformity, or malfunction in the organism or its offspring. Annex 12 of the Great Lakes Water Quality Agreement defines "persistent toxic substance" as any toxic substance with a half-life in water of greater than eight weeks. Annex 1 of the Great Lakes Water Quality Agreement (as amended in 1987) lists 23 pesticides, metals and other substances and compounds which are considered to be "persistent".

POINT SOURCE - the origin of water pollution from a municipal treatment plant or an industrial facility, POLYCHLORINATED BIPHENYLS (PCBs) - a family of chemical compounds having the properties of low flammability and volatility and high polarity (dielectric constant). PCBs were used widely for a variety of purposes. Past applications include use as hydraulic fluids, heat exchange and dielectric fluids; plasticizers for plastics; coating extenders for pesticides; and as an ingredient of caulking compounds, adhesives, paints, printing inks, and carbonless copying paper. The use of PCBs has been banned in the U.S. since the late 1970s. However, they are "persistent" toxic substances and can still be found in river-bottom sediments, fish flesh, and air.

REMEDIAL ACTION PLAN (RAP) - a plan required by the International Joint Commission (IJC) for Areas of Concern (AOC) which outlines the causes of water quality impairments, the possible solutions to those impairments, and the means by which those solutions will be implemented.

RIVER BASIN - the total land area drained by a river and its tributaries.

RIVER MILE - location along a stream segment as measured in miles from the mouth of the stream.

SUBSTRATE - the base on which an organism lives.

SUSPENDED SOLIDS - solid material suspended in the water.

TOXIC SUBSTANCES - those compounds which, in sufficient amounts in or on an organism can cause death, disease, mutation, deformity, or malfunction in the organism or its offspring. These include organochlorines such as DDT, mirex, PCBs, hexachlorbenzene, trichlorotoluene, aldrin, dieldrin, endrin, heptachlor epoxide, chlordane, lindane, toxaphene, and methoxychlor. Other organic substances such as toluene, dioxin, phthalate esters, furans, and styrenes are also toxic substances. Toxic metals include arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc. This list is by no means complete.

VIRTUAL ELIMINATION - a policy of the Canadian and U.S. governments toward the purpose of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. Specifically the Article II of the 1987 Amendments to the Great Lakes Water Quality Agreement states that it is a policy that "...the discharge of any or all persistent toxic substances be virtually eliminated."

WARMWATER HABITAT - the Water Quality Use Designation which is typical for this region, as defined in the Ohio Water Quality Standards. These are waters capable of supporting and maintaining a balanced, integrated, adaptive community of warmwater aquatic organisms. Warmwater habitat fish include, but are not limited to, bass, crappies, sunfish, catfish, and may include certain suckers, minnows, perch, and darter species.

WATER QUALITY STANDARD - a criterion or objective for a specific water use that is accompanied by numerical chemical criteria for protecting that designated use and incorporated into enforceable regulations. It includes the attainment of biocriteria like the IBI and the ICI.

WATERSHED - see River Basin

MEASUREMENT UNITS

meter	m	1 m = 3.281 feet
gram	g	1000 g = 1 kg = 2.205 pounds
liter	L	1 L = 0.2642 gallons
kilogram	kg	1,000 grams
milligram	mg	0.001 grams
microgram	ug	0.000001 grams
nanogram	ng	0.000000001 grams
milliliter	mL	0.001 liters
milligram per liter	mg/L	part per million (ppm)
microgram per liter	ug/L	part per billion (ppb)
nanogram per liter	ng/L	part per trillion (ppt)
microgram per gram	ug/g	part per million (ppm)
milligram per kilogram	mg/kg	part per million (ppm)
microgram per kilogram	ug/kg	part per billion (ppb)
nanogram per kilogram	ng/kg	part per trillion (ppt)

* Many thanks go to those who compiled the sources from which we borrowed these definitions and explanations of terms. The sources include: 1983 and 1989 Reports on Great Lakes Water Quality (Great Lakes Water Quality Board of the IJC); Lower Green Bay Remedial Action Plan (Wisconsin Department of Natural Resources); Great Lakes Area of Concern Fact Sheets (The Center for the Great Lakes); Water Quality Trends and Conditions in the NOACA Region (Northeast Areawide Coordinating Agency); A Glossary of Selected Aquatic Ecological Terms (U.S. Army ARRADCOM); A Primer on Wastewater Treatment (U.S. EPA); and Common Environmental Terms (U.S. EPA).

JURISDICTION	1990 POPULATION	PEOPLE PER ACRE
CUYAHOGA COUNTY		
BEACHWOOD CITY	10,677	3.8
BEDFORD CITY	14,822	4.9
BEDFORD HEIGHTS CITY	12,131	4.4
BRATENAHL VILLAGE*	1,356	2.1
BRECKSVILLE CITY	11,818	0.9
BROADVIEW HEIGHTS CITY	12,219	1.5
BROOKLYN CITY	11,706	4.3
BROOKLYN HGTS VILLAGE	1,450	1.2
BROOK PARK CITY	22,865	4.7
CLEVELAND CITY	505,616	10.2
CLEVELAND HEIGHTS CITY*	54,052	10.4
CUYAHOGA HGTS VILLAGE*	682	0.3
EAST CLEVELAND CITY*	33,096	16.5
GARFIELD HEIGHTS CITY	31,739	7.0
GLENWILLOW VILLAGE	455	0.3
HIGHLAND HEIGHTS CITY*	6,249	1.9
INDEPENDENCE CITY	6,500	1.1
LINNDALE VILLAGE	159	3.6
LYNDHURST CITY*	15,982	5.7
MAPLE HEIGHTS CITY	27,089	8.4
NEWBURGH HGTS VILLAGE	2,310	6.6
NORTH RANDALL VILLAGE	977	2.0
NORTH ROYALTON CITY	23,197	1.8
OAKWOOD VILLAGE	3,392	1.6
ORANGE VILLAGE	2,810	1.3
PARMA	87,876	7.1
PARMA HEIGHTS CITY	21,448	8.4
RICHMOND HEIGHTS CITY*	9,611	3.4
SEVEN HILLS CITY	12,339	4.1
SHAKER HEIGHTS CITY*	30,831	7.7
SOLON CITY	18,548	1.5
SOUTH EUCLID CITY*	23,866	8.3
UNIVERSITY HEIGHTS CITY*	14,790	12.8
VALLEY VIEW VILLAGE	2,137	0.6
WALTON HILLS VILLAGE	2,371	0.6
WARRENSVILLE HGTS CITY	15,745	6.5
WARRENSVILLE TWP (HIGHLAND HILLS)	1,934	1.0
COUNTY SUBTOTAL	1,054,845	5.5
GEAUGA COUNTY		
AUBURN TOWNSHIP	3,298	0.2
AQUILLA VILLAGE	360	3.3
BURTON TOWNSHIP	2,838	0.2
BURTON VILLAGE	1,349	2.0
CLARIDON TOWNSHIP	2,656	0.2
HAMBDEN TOWNSHIP	3,311	0.2
HUNTSBURG TOWNSHIP	2,642	0.2
MIDDLEFIELD VILLAGE	1,898	2.4
MONTVILLE TOWNSHIP	1,682	0.1
MUNSON TOWNSHIP	5,775	0.4
NEWBURY TOWNSHIP	5,611	0.3
TROY TOWNSHIP	1,903	0.1
COUNTY SUBTOTAL	33,323	0.2

*Nearshore Community; not within the Cuyahoga Watershed

JURISDICTION	1990 POPULATION	PEOPLE PER ACRE
SUMMIT COUNTY		
AKRON CITY	223,019	5.6
BATH TOWNSHIP	9,015	0.6
BOSTON TOWNSHIP	1,879	0.1
BOSTON HEIGHTS	733	0.1
CUYAHOGA FALLS	48,950	3.0
FAIRLAWN	5,779	2.2
HUDSON TOWNSHIP	11,969	0.9
HUDSON	5,159	2.0
LAKEMORE	2,684	2.8
MACEDONIA	7,509	1.1
MOGADORE	2,967	2.9
MUNROE FALLS	5,359	3.1
NORTHFIELD CENTER TWP	3,982	1.4
NORTHFIELD VILLAGE	3,624	5.3
PENINSULA	562	0.3
REMINDERVILLE	2,163	1.5
RICHFIELD TOWNSHIP	5,010	0.3
RICHFIELD VILLAGE	3,117	0.6
SAGAMORE HILLS TOWNSHIP	6,503	0.9
SILVER LAKE	3,052	3.4
SPRINGFIELD TOWNSHIP	14,773	1.6
STOW	27,702	2.5
TALLMADGE	14,870	1.7
TWINSBURG TOWNSHIP	1,896	0.2
TWINSBURG	9,606	1.3
COUNTY SUBTOTAL	421,882	2.1
PORTAGE COUNTY		
AURORA TOWNSHIP	9,192	0.0
BRADY LAKE	490	2.6
BRIMFIELD TOWNSHIP	7,554	0.5
FRANKLIN TOWNSHIP	6,478	0.5
HIRAM TOWNSHIP	1,888	0.1
KENT	28,835	6.1
MANTUA	1,178	1.4
MANTUA TOWNSHIP	4,418	0.3
MOGADORE	1,041	
RANDOLPH TOWNSHIP	4,970	0.3
RAVENNA TOWNSHIP	8,961	0.5
RAVENNA	12,069	3.9
ROOTSTOWN	6,612	0.4
SHALERSVILLE TOWNSHIP	5,270	0.3
SUFFIELD TOWNSHIP	6,312	0.4
STREETSBORO+S.B.K.	10,143	0.6
COUNTY SUBTOTAL	115,411	0.6
WATERSHED TOTAL	1,625,461	2.3

Communities discharging to the Cuyahoga watershed via the Northeast Ohio Regional Sewer District's sewage collection system include: Berea, Gates Mills, Lakewood, Mayfield Heights, Mayfield Village, Middleburg Heights, Olmsted Falls, Pepper Pike, Riveredge Township, and Strongsville.

CHAPTER 2
BACKGROUND

2.1 REMEDIAL ACTION PLAN

An Area of Concern is a localized area of persistent pollution within the Great Lakes basin. These Areas of Concern are designated by the International Joint Commission if one or more of fourteen beneficial uses of the water ecosystem are impaired. The lower Cuyahoga River and harbor area in Lake Erie in Cleveland, Ohio is one of forty-three areas in the Great Lakes basin now declared Areas of Concern by the International Joint Commission (Figure 2-1).

The US-Canadian Great Lakes Water Quality Agreement (GLWQA) as amended in 1987 calls upon the eight Great Lakes Basin States (and in Canada the Province of Ontario) to prepare Remedial Action Plans (RAP) in Areas of Concern. The State of Ohio Environmental Protection Agency has the lead responsibility to prepare a RAP for the Cuyahoga River Area of Concern. But the development and implementation of the RAP require the concerted efforts of many public agencies at all levels of government. Municipalities and/or local public agencies own and operate public waste treatment facilities and are also responsible in large measure for stormwater runoff problems. Municipalities own and operate water treatment facilities. They are also responsible for land use decisions which are the source of many beneficial use impairments. County level and regional public agencies have responsibilities in the area of regional environmental planning. State agencies, for their part, including the Ohio EPA, the Ohio Department of Natural Resources and the Ohio Department of Health, are responsible for environmental regulations, protection of land and water resources, and protection of public health. Federal agencies such as the U.S. Environmental Protection Agency which administers national environmental laws, the National Park Service which administers a significant land area in the Cuyahoga River Valley between Akron and Cleveland - the Cuyahoga Valley National Recreation Area - and the US Army Corps of Engineers which has responsibility for dredging operations in the Cuyahoga River shipping channel, all play a part.

These and other public agencies at all levels of government must work together on the environmental problems in the Cuyahoga River Area of Concern, which after all are a shared common legacy.

In September 1988, the Ohio EPA Director appointed a local planning group to assist the Ohio EPA in the preparation of the Cuyahoga RAP. This local planning group was named the Cuyahoga River Remedial Action Plan Coordinating Committee, (CCC) and includes thirty-five members representing local public agencies, state and federal agencies, industries and private commercial groups (Exhibit 2-1). The Ohio EPA designated the CCC to develop the Cuyahoga RAP and submit it to Ohio EPA for subsequent submittal to the International Joint Commission. The CCC thus was given a plan development role, not simply a public advisory role (Figure 2-2). The mission statement of the CCC and the scope of the Plan, as approved by the CCC on December 14, 1989 can be found in Exhibit 2-2.

The Ohio EPA has provided technical staff support to the CCC in drafting the Plan. Staff support to the CCC has also been provided by the Northeast Ohio Areawide Coordinating Agency performing the CCC Secretariat function and technical planning support, the Cuyahoga River Community Planning Organization, and contributed staffing of member organizations.

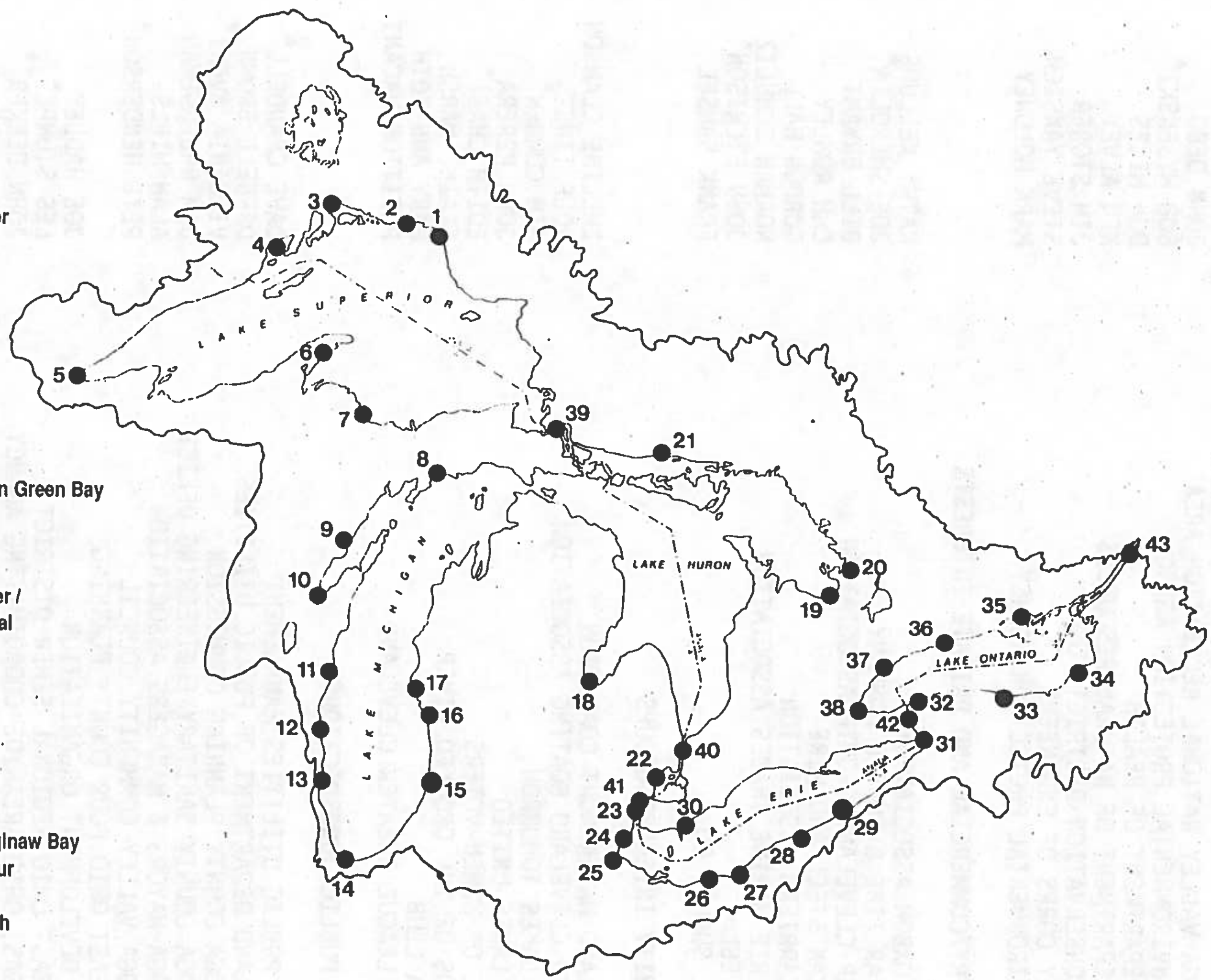
The ultimate objective of any RAP is the restoration of beneficial uses that are impaired in the Area of Concern. The fourteen beneficial uses to be restored are outlined in the GLWQA. These include unrestricted consumption of fish and wildlife and drinking water, restoration of aquatic and terrestrial biotic communities and their habitats, and unrestricted recreational and commercial uses, among others (Exhibit 2-3).

The initial stage of the RAP requires (1) a comprehensive evaluation of the character and extent of impairments to these fourteen beneficial uses in the Area of Concern (AOC). The IJC has provided explicit guidance, called "Delisting Criteria for Areas of Concern," to assist in this evaluation effort (Exhibit 2-4). The initial planning stage also requires (2) an identification of in-stream (water column, sediment and habitat) conditions causing the impairments, and (3) an identification of sources contributing to the in-stream conditions. These three components comprise the problem assessment phase of the RAP and are designated "Stage 1" of the RAP (Figure 2-3). A Stage 1 report is to be submitted to the IJC prior to beginning the next phase.

This report constitutes the Stage 1 Report of the Cuyahoga Remedial Action Plan.

Figure 2–1

AREAS OF CONCERN IN THE GREAT LAKES BASIN



Lake Superior

1 Peninsula Harbour
2 Jackfish Bay
3 Nipigon Bay
4 Thunder Bay
5 St. Louis Bay / River
6 Torch Lake
7 Deer Lake - Carp Creek / River

Lake Michigan

8 Manistique River
9 Menominee River
10 Fox River / Southern Green Bay
11 Sheboygan River
12 Milwaukee Estuary
13 Waukegan Harbor
14 Grand Calumet River / Indiana Harbor Canal
15 Kalamazoo River
16 Muskegon Lake
17 White Lake

Lake Huron

18 Saginaw River / Saginaw Bay
19 Collingwood Harbour
20 Severn Sound
21 Spanish River Mouth

Lake Erie

22 Clinton River
23 Rouge River
24 River Raisin
25 Maumee River
26 Black River
27 Cuyahoga River
28 Ashtabula River
29 Presque Isle Bay
30 Wheatley Harbour

Lake Ontario

31 Buffalo River
32 Eighteen Mile Creek
33 Rochester Embayment
34 Oswego River
35 Bay of Quinte
36 Port Hope
37 Metro Toronto
38 Hamilton Harbour

Connecting Channels

39 St. Marys River
40 St. Clair River
41 Detroit River
42 Niagara River
43 St. Lawrence River (Cornwall / Massena)

SOURCE: International Joint Commission, 1991

EXHIBIT 2-1
CUYAHOGA REMEDIAL ACTION PLAN COORDINATING COMMITTEE
(JUNE, 1992)

CHAIRMAN: GREG STUDEN*

STATE AND FEDERAL AGENCIES

CUYAHOGA VALLEY NATIONAL RECREATION AREA	JOHN DEBO
OHIO ENVIRONMENTAL PROTECTION AGENCY	BOB WYSENSKI*
OHIO DEPARTMENT OF HEALTH	DON MILES
OHIO DEPARTMENT OF NATURAL RESOURCES	KEN ALVEY
SOIL CONSERVATION DISTRICT, USDA	JIM STORER
US ARMY CORPS OF ENGINEERS	STEVE YAKSICH
US ENVIRONMENTAL PROTECTION AGENCY	MARK MOLONEY

INDUSTRY/COMMERCIAL AND PRIVATE INTERESTS

FLATS OXBOW ASSOCIATION	KATHY KELLUMS
GOODYEAR TIRE & RUBBER COMPANY	JOE SMERGLIA*
GREATER CLEVELAND GROWTH ASSOCIATION	BILL BRYANT
AMERICAN STEEL AND WIRE	CAM ROWLEY
LAKE CARRIERS ASSOCIATION	GORDON HALL
LAKE ERIE MARINE TRADES ASSOCIATION	NORMAN SCHULTZ
LTV STEEL	JOHN ETCHISON*
SAMSEL SUPPLY CO.	FRANK SAMSEL

COMMUNITY INTEREST GROUPS

CLEVELAND WATERFRONT COALITION	EMELINE CLAWSON
GREATER CLEVELAND BOATING ASSOCIATION	ROLF TINGE
GREAT LAKES TOMORROW	JIM COWDEN*
GREAT LAKES UNITED	JOHN PERERA
LEAGUE OF WOMEN VOTERS	EDITH CHASE*
FRIENDS OF THE CROOKED RIVER	ELAINE MARSH
SIERRA CLUB	MARY ANN TOTH
URBAN LEAGUE GREATER CLEVELAND	POSITION VACANT

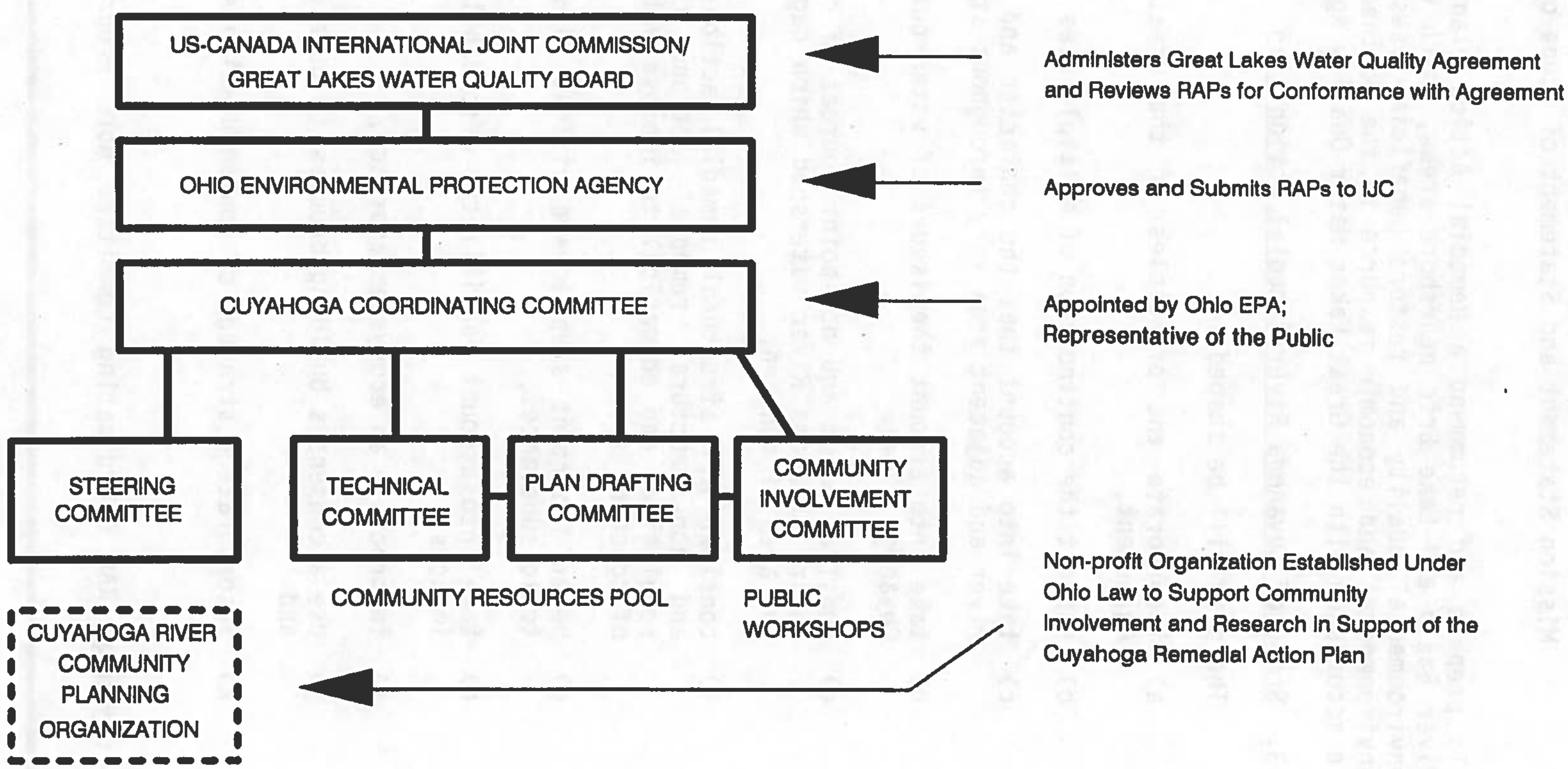
LOCAL PUBLIC JURISDICTIONS

AKRON PUBLIC UTILITIES MANAGEMENT	DAVE CRANDELL*
CLEVELAND DEPARTMENT OF PUBLIC UTILITIES	DARNELL BROWN
CUYAHOGA COUNTY PLANNING COMMISSION	VIRGINIA AVENI*
CUYAHOGA COUNTY SANITARY ENGINEERING OFFICE	JIM BRUEGGEMAN
CUYAHOGA MAYORS & MANAGERS ASSOCIATION	ALAN MILLS
CUYAHOGA VALLEY COMMUNITY COUNCIL	PETE HENDERSON*
NORTHEAST OHIO FOUR COUNTY PLANNING AND DEVELOPMENT ORGANIZATION	JOE HADLEY
NORTHEAST OHIO REGIONAL SEWER DISTRICT	LES STUMPE*
NORTHEAST OHIO AREAWIDE COORDINATING AGENCY	JOHN BEEKER**
SUMMIT COUNTY SANITARY ENGINEERING OFFICE	JEFF LINTERN

*MEMBER STEERING COMMITTEE
**SECRETARY

FIGURE 2-2:

ORGANIZATION AND ROLE OF THE CUYAHOGA RAP COORDINATING COMMITTEE



SEPTEMBER 1991

EXHIBIT 2-2

Mission Statement and Statement of Scope of Plan

"To prepare and recommend a Remedial Action Plan for the Cuyahoga River Basin and Lake Erie nearshore areas, which will enhance their environmental quality and restore beneficial uses and value as an environmental and economic resource to the Northeast Ohio community in accordance with the Great Lakes Water Quality Agreement."

3. Scope of Cuyahoga River Remedial Action Plan

The plan will be shaped to:

a) incorporate the principles of the Great Lakes Water Quality Agreement,

b) support the continuation of multiple uses of the Cuyahoga River,

c) take into account that the character and potential uses of the river and adjacent area vary throughout stretches of the river,

d) take into account the issues of water quality standards in the Cuyahoga River,

e) consider point and non-point sources of contaminants within the entire Cuyahoga River watershed which degrade water quality in the area of concern,

f) consider all structural remedial actions (bricks and mortar) and non-structural remedial actions (management processes, regulations and education) to improve water quality in the area of concern,

g) be an important step toward virtual elimination of persistent toxic substances,

h) take into account feasibility, affordability and socio-economic impacts,

i) incorporate an ecosystem approach,

j) use a consensus building process to develop a supportable plan, and

k) incorporate a strategy of implementation staged over time.

SOURCE: Cuyahoga RAP Coordinating Committee Work Program, Approved December 1989.

EXHIBIT 2-3

GREAT LAKES
WATER QUALITY AGREEMENT
Annex 2(1)(c)

Beneficial Use Impairments

(i) Restrictions on fish and wildlife consumption;

(ii) Tainting of fish and wildlife flavour;

(iii) Degradation of fish and wildlife populations;

(iv) Fish tumors or other deformities;

(v) Bird or animal deformities or reproduction problems;

(vi) Degradation of benthos;

(vii) Restrictions on dredging activities;

(viii) Eutrophication or undesirable algae;

(ix) Restrictions on drinking water consumption, or taste and odour problems;

(x) Beach closings;

(xi) Degradation of aesthetics;

(xii) Added costs to agriculture or industry;

(xiii) Degradation of phytoplankton and zooplankton populations; and

(xiv) Loss of fish and wildlife habitat.

EXHIBIT: 2-4

GUIDELINES FOR RECOMMENDING THE LISTING & DELISTING OF GREAT LAKES AREAS OF CONCERN

USE IMPAIRMENT	LISTING GUIDELINE	DELISTING GUIDELINE	RATIONALE	REFERENCE
RESTRICTIONS ON FISH AND WILDLIFE CONSUMPTION	When contaminant levels in fish or wildlife populations exceed current standards, objectives or guidelines, or public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must be due to contaminant input from the watershed.	When contaminant levels in fish and wildlife populations do not exceed current standards, objectives or guidelines, and no public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must be due to contaminant input from the watershed.	Accounts for jurisdictional and federal standards; emphasizes local watershed sources.	Adapted from Mack 1988
TAINTING OF FISH AND WILDLIFE FLAVOR	When ambient water quality standards, objectives, or guidelines, for the anthropogenic substance(s) known to cause tainting, are being exceeded or survey results have identified tainting of fish or wildlife flavor.	When survey results confirm no tainting of fish or wildlife flavor.	Sensitive to ambient water quality standards for tainting substances; emphasizes survey results.	See American Public Health Association (1980) for survey methods
DEGRADED FISH AND WILDLIFE POPULATIONS	When fish and wildlife management programs have identified degraded fish or wildlife populations due to a cause within the watershed. In addition, this use will be considered impaired when relevant, field-validated, fish or wildlife bioassays with appropriate quality assurance/quality controls confirm significant toxicity from water column or sediment contaminants.	When environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical and biological habitat present. An effort must be made to ensure that fish and wildlife objectives for Areas of Concern are consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals. Further, in the absence of community structure data, this use will be considered restored when fish and wildlife bioassays confirm no significant toxicity from water column or sediment contaminants.	Emphasizes fish and wildlife management program goals; consistent with Agreement and Great Lakes Fishery Commission goals; accounts for toxicity bioassays.	Adapted from Manny and Pacific, 1988; Wisconsin DNR 1987; United States and Canada, 1987; Great Lakes Fishery Commission 1980
FISH TUMORS OR OTHER DEFORMITIES	When the incidence rates of fish tumors or other deformities exceed rates at unimpacted control sites or when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers.	When the incidence rates of fish tumors or other deformities do not exceed rates at unimpacted control sites and when survey data confirm the absence of neoplastic or preneoplastic liver tumors in bullheads or suckers.	Consistent with expert opinion on tumors; acknowledges background incidence rates.	Adapted from Mac and Smith, 1988; Black 1983; Baumann et al. 1982
BIRD OR ANIMAL DEFORMITIES OR REPRODUCTIVE PROBLEMS	When wildlife survey data confirm the presence of deformities (e.g. cross-bill syndrome) or other reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species.	When the incidence rates of deformities (e.g. cross-bill syndrome) or reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species do not exceed background levels in inland control populations.	Emphasizes confirmation through survey data; makes necessary control comparisons.	Adapted from Kubiak 1988; Miller 1988; Wiemeyer et al. 1984
DEGRADATION OF BENTHOS	When the benthic macroinvertebrate community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity (as defined by relevant, field-validated, bioassays with appropriate quality assurance/quality controls) of sediment-associated contaminants at a site is significantly higher than controls.	When the benthic macroinvertebrate community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when toxicity of sediment-associated contaminants is not significantly higher than controls.	Accounts for community structure and composition; recognizes sediment toxicity; uses appropriate control sites.	Adapted from Reynoldson 1988; Henry 1988; IJC 1988

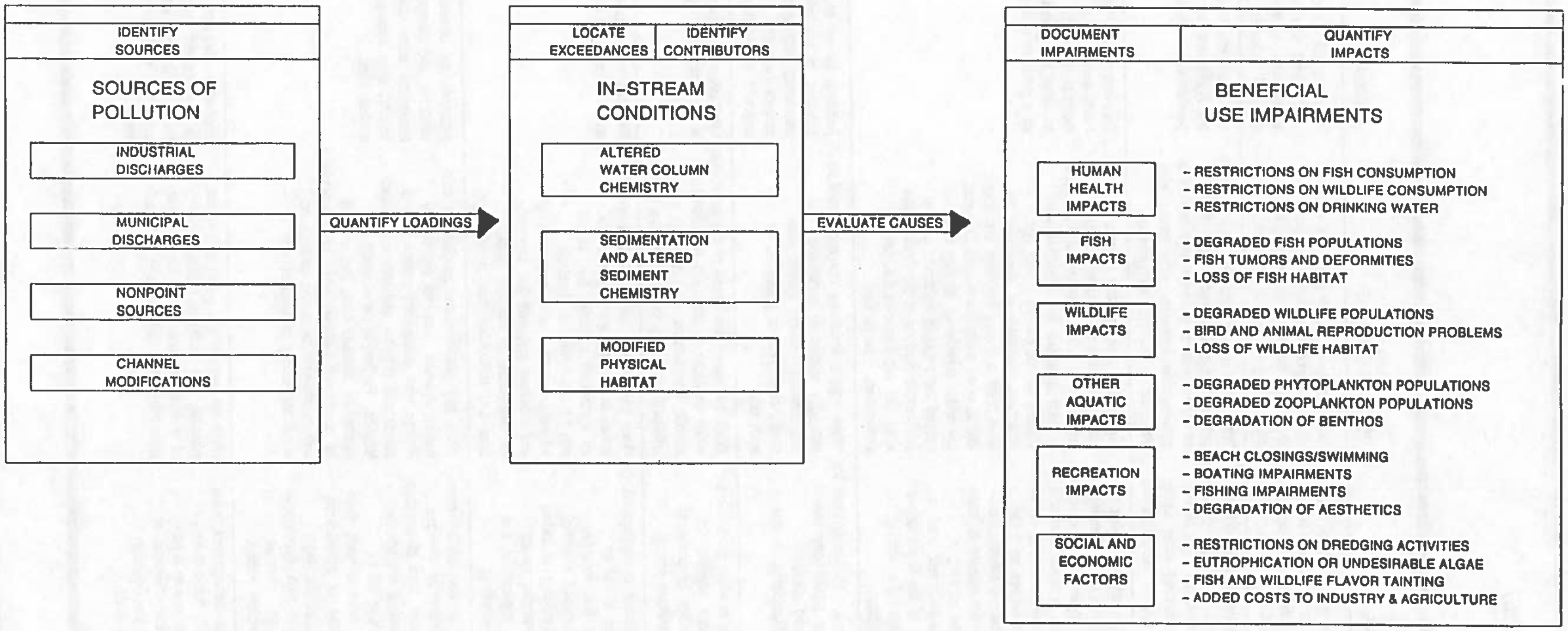
SOURCE: International Joint Commission, "FOCUS", Vol.16:1

GUIDELINES *(cont.)*

USE IMPAIRMENT	LISTING GUIDELINE	DELISTING GUIDELINE	RATIONALE	REFERENCE
RESTRICTIONS ON DREDGING ACTIVITIES	When contaminants in sediments exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.	When contaminants in sediments do not exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.	Accounts for jurisdictional and federal standards; emphasizes dredging and disposal activities.	Adapted from IJC 1988
EUTROPHICATION OR UNDESIRABLE ALGAE	When there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication.	When there are no persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation decreased water clarity, etc.) attributed to cultural eutrophication.	Consistent with Annex 3 of the Agreement; accounts for persistence of problems.	United States and Canada, 1987
RESTRICTIONS ON DRINKING WATER CONSUMPTION OR TASTE AND ODOR PROBLEMS	When treated drinking water supplies are impacted to the extent that: 1) densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances exceed human health standards, objectives or guidelines; 2) taste and odor problems are present; or 3) treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e. settling, coagulation, disinfection).	For treated drinking water supplies: 1) when densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances do not exceed human health objectives, standards or guidelines; 2) when taste and odor problems are absent; and 3) when treatment needed to make raw water suitable for drinking does not exceed the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e. settling, coagulation, disinfection).	Consistency with the Agreement; accounts for jurisdictional standards; practical; sensitive to increased cost as a measure of impairment.	Adapted from United States and Canada, 1987
BEACH CLOSINGS	When waters, which are commonly used for total-body contact or partial-body contact recreation, exceed standards, objectives, or guidelines for such use.	When waters, which are commonly used for total-body contact or partial-body contact recreation, do not exceed standards, objectives, or guidelines for such use.	Accounts for use of waters; sensitive to jurisdictional standards; addresses water contact recreation; consistent with the Agreement.	Adapted from United States and Canada, 1987; Ontario Ministry of the Environment 1984
DEGRADATION OF AESTHETICS	When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum).	When the waters are devoid of any substance which produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum).	Emphasizes aesthetics in water; accounts for persistence.	Adapted from the Ontario Ministry of the Environment 1984
ADDED COSTS TO AGRICULTURE OR INDUSTRY	When there are additional costs required to treat the water prior to use for agricultural purposes (i.e. including, but not limited to, livestock watering, irrigation and crop-spraying) or industrial purposes (i.e. intended for commercial or industrial applications and noncontact food processing).	When there are no additional costs required to treat the water prior to use for agricultural purposes (i.e. including, but not limited to, livestock watering, irrigation and crop-spraying) and industrial purposes (i.e. intended for commercial or industrial applications and noncontact food processing).	Sensitive to increased cost and a measure of impairment.	Adapted from Michigan DNR 1977
DEGRADATION OF PHYTOPLANKTON AND ZOOPLANKTON POPULATIONS	When phytoplankton or zooplankton community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when relevant, field-validated, phytoplankton or zooplankton bioassays (e.g. Ceriodaphnia; algal fractionation bioassays) with appropriate quality assurance/quality controls confirm toxicity in ambient waters.	When phytoplankton and zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters.	Accounts for community structure and composition; recognizes water column toxicity; uses appropriate control sites.	Adapted from IJC 1987
LOSS OF FISH AND WILDLIFE HABITAT	When fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to a perturbation in the physical, chemical, or biological integrity of the Boundary Waters, including wetlands.	When the amount and quality of physical, chemical, and biological habitat required to meet fish and wildlife management goals have been achieved and protected.	Emphasizes fish and wildlife management program goals; emphasizes water component of Boundary Waters.	Adapted from Manny and Pacific, 1988

FIGURE 2-3

FIRST STAGE OF THE RAP PROCESS:
ESTABLISHING CAUSES OF USE IMPAIRMENTS



Once the Stage 1 effort is completed, measures for reducing sources of pollution contributing to impaired uses are identified. Taken as a whole these measures are expected overtime to lead to the full restoration or remediation of impaired beneficial uses in the AOC. This program of identifying, evaluating and recommending remedial measures is designated "Stage 2 of the RAP." The Cuyahoga Coordinating Committee currently expects to begin Stage 2 of the Cuyahoga RAP in late 1991.

The RAP process will be an ongoing effort. This ongoing effort, designated Stage 3 of the RAP involves a continuing surveillance of the implementation of remedial measures to confirm that beneficial uses in the AOC are being restored.

2.2 Organization

2.2.1 Cuyahoga RAP Coordinating Committee

The Cuyahoga RAP Coordinating Committee (CCC) and its subcommittees have provided the organizational structure for developing the Stage 1 Report. The role of the CCC and its subcommittees are described in this section.

For the first year of its existance, the CCC met every 1 to 2 months to organize the process and develop a work plan. A work plan was adopted by the CCC at the end of that year in December 1989 (Appendix L). Since the adoption of the work plan, the CCC has met about every four to six months to oversee progress in Stage One planning. The CCC approves the Stage One Report for submittal to the Ohio EPA.

Since 1989 the detailed planning work of the CCC has been carried out by four subcommittees

- Steering Committee
- Technical Committee
- Community Involvement Committee
- Plan Drafting Committee

Broader public participation has been actively pursued on an ongoing basis in the work of all the committees including the Plan Drafting Committee, Community Involvement Committee and Technical Committee. See Chapter 10.

2.2.2 Steering Committee

Members of the Steering Committee were elected by the Coordinating Committee following guidelines of Ohio EPA to assure that the balance of viewpoints on the CCC were carried over to the Steering Committee.

The Steering Committee's primary role is to facilitate the Coordinating Committee oversight effort by setting meeting agendas and providing a forum for shaping issues for Coordinating Committee consideration, debate and decision.

The Steering Committee coordinated the drafting of a Coordinating Committee Mission statement, work program, and committee organization plan for carrying out the work program.

The Steering Committee also proposed a working delineation of the Cuyahoga RAP study area to include an impact area (Area of Concern) and a source area. The impact study area consists of the Cuyahoga River from the Ohio Edison Dam (RM 45.1) in Summit County to the River's Mouth (RM 0.0). It also includes the nearshore area of Lake Erie from Edgewater Park (two miles west of the Cuyahoga) to Wildwood Park (ten miles east of the Cuyahoga). The source study area consists of all areas potentially contributing to pollution in the impact study area. In practice, for some pollution source categories this has meant the entire Cuyahoga River Watershed (Figure 2-4).

The mission statement, work program, organization plan and the working delineation of the RAP study area were approved by the Coordinating Committee at its December 1989 meeting.

After discussion with the members of the Coordinating Committee, the Steering Committee established a nonprofit organization under Ohio law to facilitate broader scope and involvement in the Cuyahoga RAP process. This organization, the Cuyahoga River Community Planning Organization, defines its role as augmenting the efforts and financial resources of local, regional and state public agencies committed to the planning effort. The activities of the CRCPO are discussed further below.

2.2.3 Technical Committee

The Technical Committee has coordinated ongoing field investigations of public and private entities participating in the Remedial Action Plan. In addition, it initiated additional field work to address major information gaps identified for the Stage 1 effort. This additional field work has included:

1. The collection and analyses of fish tissue in the river and nearshore areas. This work aims at determining whether an impairment exists with respect to human consumption of fish from the Cuyahoga AOC.

2. The collection and analyses of fecal coliform samples, also in the river and nearshore areas. This work investigates the degree and extent of elevated levels of bacteriological contamination to determine whether an impairment exists with respect to full and partial body contact recreation in the Cuyahoga AOC.

3. The analysis of debris in the river and nearshore areas. This work aims at developing a quantification scheme for determining degree of impairment and consequently, the amount of improvement.

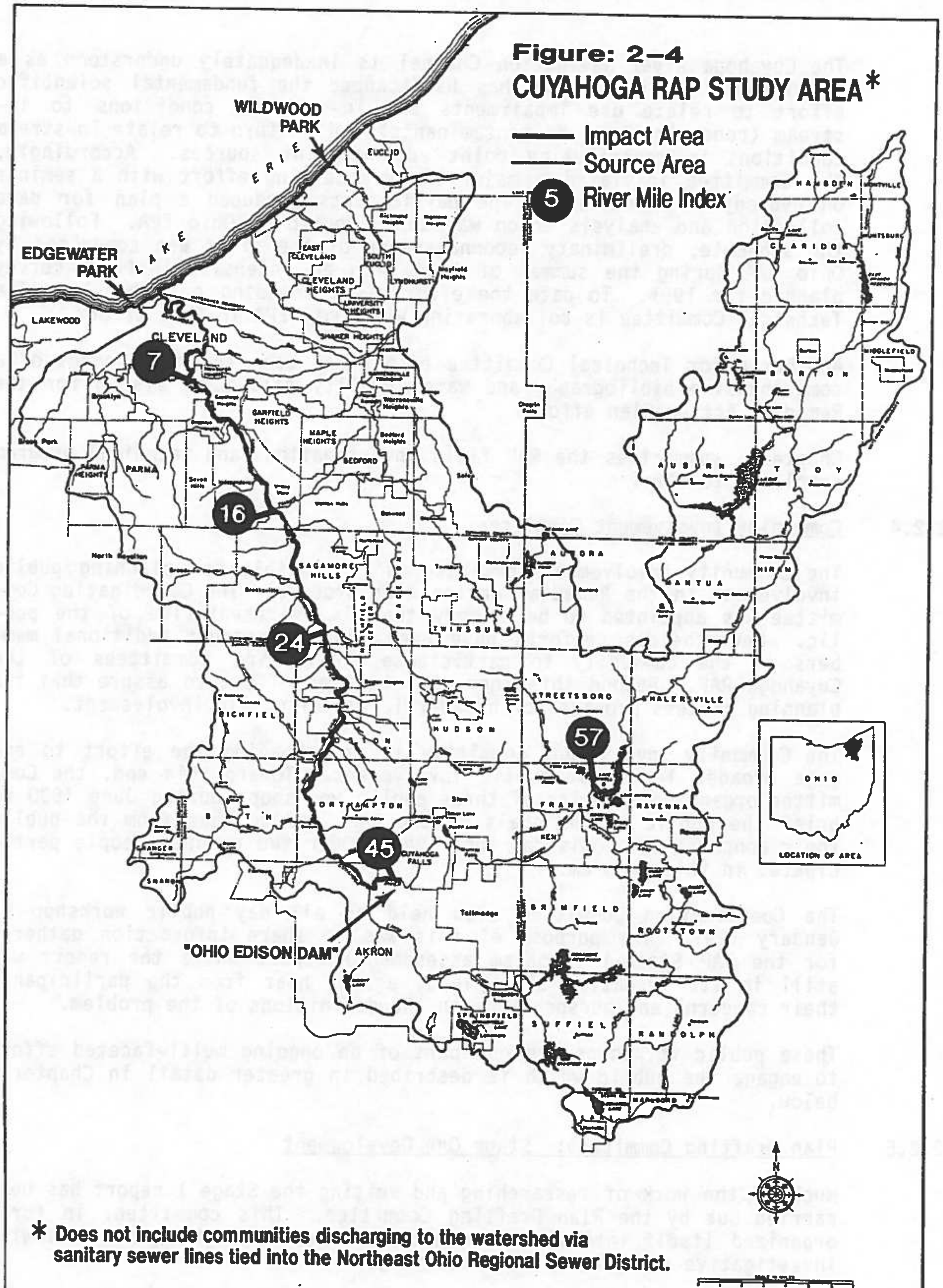


Figure: 2–4
CUYAHOGA RAP STUDY AREA*

* Does not include communities discharging to the watershed via sanitary sewer lines tied into the Northeast Ohio Regional Sewer District.

The Cuyahoga River Navigation Channel is inadequately understood as a hydrodynamic system. This has handicapped the fundamental scientific effort to relate use impairments and in-sediment conditions to in-stream (concentrations of contaminants) and in turn to relate in-stream conditions to contributing point and nonpoint sources. Accordingly, the Committee initiated a major river modelling effort with a seminar on hydrodynamic modeling. The participants produced a plan for data collection and analysis which was then adopted by Ohio EPA. Following the schedule, preliminary reconnaissance of the river was conducted by Ohio EPA during the summer of 1990 with an intensive instream survey planned for 1991. To date the effort is proceeding on schedule. The Technical Committee is collaborating with Ohio EPA in this effort.

Another major Technical Committee effort has been the development of a comprehensive bibliography and water quality data base system for the Remedial Action Plan effort.

Chapter 6 summarizes the RAP field investigations and technical program completed to date.

2.2.4 Community Involvement Committee

The Community Involvement Committee is responsible for planning public involvement in the Remedial Action Plan process. The Coordinating Committee was appointed to be a body that is representative of the public. Nevertheless, efforts have been made to recruit additional members of the community to participate in working committees of the Cuyahoga RAP. Beyond this there has been an effort to assure that the planning process provide for broader levels of public involvement.

The Community Involvement Committee is spearheading the effort to engage broader levels of public involvement. Toward this end, the Committee organized a series of three public workshops during June 1990 to brief the public on the goals of the RAP, and to hear from the public their concerns and goals for the river. Over two hundred people participated in this program.

The Coordinating Committee also held an all day public workshop in January 1991. The purpose of this was to share information gathered for the RAP Stage 1 (problem assessment) report while the report was still in its formative stage, and, again, hear from the participants their concerns and perspectives on the definitions of the problem.

These public workshops are one part of an ongoing multi-faceted effort to engage the public which is described in greater detail in Chapter 8 below.

2.2.5 Plan Drafting Committee: Stage One Development

Much of the work of researching and writing the Stage 1 report has been carried out by the Plan Drafting Committee. This committee, in turn, organized itself into six subcommittees which were given the following investigative assignments, respectively:

Biota Impairments	Fish and wildlife populations and habitat, eutrophication, phyloplankton, zooplankton, benthos.
Toxics Consumption	Restrictions on fish and wildlife consumption, drinking water, and sediments.
Recreation Impairments	Recreational uses and impairments: swimming, boating, fishing, hiking, etc.
Socio-Economic	Socio-economic issues, Institutional issues, and Ecosystem approach.
Point Sources	Public and industrial treatment plants, combined sewers, stormwater outfalls.
Nonpoint Sources	Erosion, sediment, hazardous waste sites, landfills, septic tanks, urban runoff, etc.

Subcommittees were responsible for producing a series of background reports documenting the character of problems in the Area of Concern. These are incorporated as Appendices to this report. These reports in turn provided the foundation for drafting Chapters Four and Five of the present report. (See Chapter 10 for the membership and participants of the Plan Drafting Committee.)

2.2.6 Cuyahoga River Community Planning Organization

As noted above, the Cuyahoga RAP Steering Committee with the encouragement of Ohio EPA formed a nonprofit organization under Ohio law in 1989 - the Cuyahoga River Community Planning Organization (CRCPO). The purpose of the CRCPO is to support the goals of the Remedial Action Plan with additional resources for planning, and to develop and support programs of public involvement, education and research. The CRCPO program has been supported with grants from the George Gund Foundation, the Cleveland Foundation, and the USEPA administered 319 program for nonpoint sources. These grants, combined with both member and non-member contributions, support a program that includes:

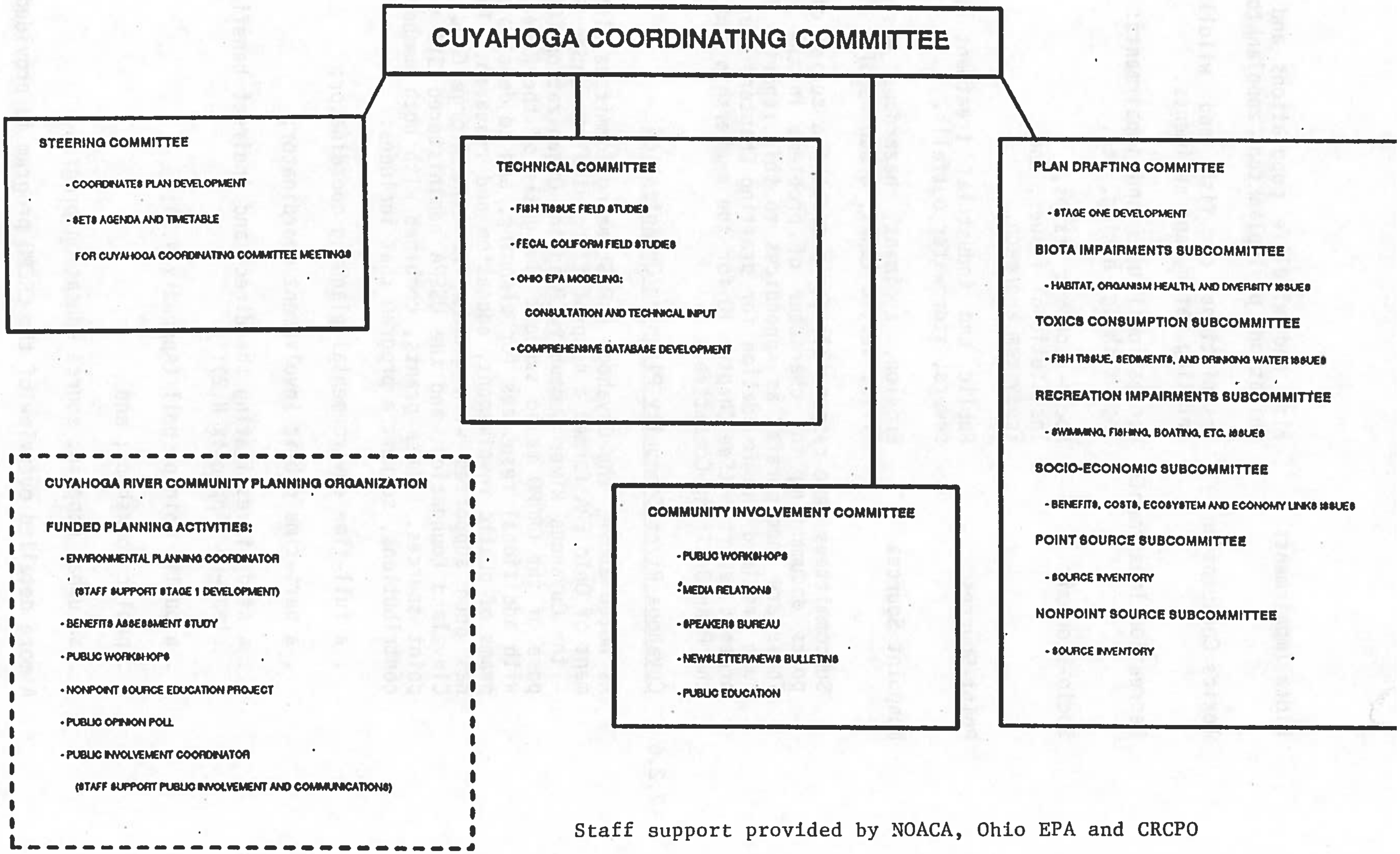
- a full-time environmental planning coordinator;
- a part-time public involvement coordinator;
- a study investigating the direct and indirect benefits of the river clean-up (Appendix N.2);
- a public opinion poll (Appendix N.2);
- public workshops; and
- an urban nonpoint source education program.

A more detailed overview of the CRCPO program is provided in Appendix N.

Figure 2-5 summarizes roles of the Cuyahoga Coordinating Subcommittees.

Figure: 2–5

ROLES OF THE CUYAHOGA COORDINATING COMMITTEE SUBCOMMITTEES



Staff support provided by NOACA, Ohio EPA and CRCPO

2.3 Goals of the Remedial Action Plan

The goals of the Cuyahoga River Remedial Action Plan are framed by the Great Lakes Water Quality Agreement. (See especially "Annex 2-General Principles of Remedial Action Plans," reprinted as Exhibit 2-5. These goals have been further refined and incorporated as a "Mission Statement and Statement of the Scope of the Plan," adopted by the Coordinating Committee on December 14, 1989 (Exhibit 2-2). (Note: the full text of Work Program is incorporated as Appendix L.)

2.3.1 Ecosystem Approach

The Great Lakes Water Quality Agreement defines the Great Lakes Basin Ecosystem as "the interacting components of air, land, water and living organisms, including humans within the drainage basin..." The ecosystem approach includes several important core ideas whose application distinguish Remedial Action Plans from other watershed planning models. These include:

- focusing on human health impacts and biotic system impacts in the range of uses to be restored,
- addressing the source management problem from the broadest perspective to include land uses and other human influences on the system,
- taking into account the multi-media pathways of contaminant sources, transport and fate,
- making remediation strategies compatible with sustainable economic development, to include strategies of pollution prevention, source reduction, and explicit linkages to community economic development plans,
- following a principle in the adoption of remedial actions of minimizing the transfer of contaminants from one medium to another, and
- recognizing that core adverse behaviors are deeply rooted in Western culture.

An important challenge of the RAP process is to characterize the problem in ecosystem terms, set ongoing research priorities that advance an understanding of the interaction among air, land, water and organisms, and identify measures for remediation that are comprehensive and sustainable.

EXHIBIT 2-5

General Principles of Remedial Action Plans

(a) Remedial Action Plans and Lakewide Management Plans shall embody a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern or in open lake waters.

(b) Such Plans shall provide a continuing historical record of the assessment of Areas of Concern or Critical Pollutants, proposed remedial actions and their method of implementation, as well as changes in environmental conditions that result from such actions, including significant milestones in restoring beneficial uses to Areas of Concern or open lake waters. They are to serve as an important step toward virtual elimination of persistent toxic substances and toward restoring and maintaining the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem.

(c) The Parties, State and Provincial Governments, and the Commission have identified Areas of Concern and the development of Remedial Action Plans for them has begun. Furthermore, the Parties and State and Provincial Governments have begun developing lakewide strategies for Lakes Ontario and Michigan. By incorporating an Annex for Remedial Action Plans and Lakewide Management Plans in this Agreement, the Parties intend to endorse and build upon these existing efforts.

(d) Point source impact zones exist in the vicinity of some point source discharges. Pending the achievement of the virtual elimination of persistent toxic substances, the size of such zones shall be reduced to the maximum extent possible by the best available technology so as to limit the effects of toxic substances in the vicinity of these discharges. These zones shall not be acutely toxic to aquatic species, nor shall their recognition be considered a substitute for adequate treatment or control of discharges at their sources.

(e) The Parties, in cooperation with State and Provincial Governments, shall ensure that the public is consulted in all actions undertaken pursuant to this Annex.

SOURCE: Great Lakes Water Quality Agreement, Annex 2.

2.3.2 Restoration of Beneficial Uses

Closely related to, indeed embodying, this ecosystem concept is the explicit Great Lakes Water Quality Agreement RAP goal of restoring beneficial uses that are impaired. As noted above, fourteen impairments of beneficial uses have been identified ranging from restrictions on fish and wildlife consumption, to degradation of fish and wildlife populations and habitat, to drinking water restrictions, beach closings, to added costs to industry or agriculture.

The Coordinating Committee reflects this goal of restoration of beneficial uses in its Statement of Goals by acknowledging that there are both environmental and economic benefits to cleaning up the Area of Concern and that long term economically sustainable growth is dependent on environmental restoration. It also views this goal as a challenge of designing a strategy that accommodates multiple, potentially conflicting, uses of the river and nearshore area.

2.3.3 Public Consultation

Public consultation in the development of the RAP is one of the "general principles" set forth in Annex 2 of the Great Lakes Water Quality Agreement. The Science Advisory Board of the IJC has identified means by which this general principle can be carried out including:

- public communication and education,
- timely public involvement in each stage of the RAP's development, and
- innovative approaches for stakeholder cooperation in the execution of the plan.

The Coordinating Committee has responded to this challenge by a number of steps including public workshops and briefings, periodic newsletters and persistent efforts to directly engage stakeholders in the plan's development. See Chapter 9 for more information on the public involvement element of the RAP.

2.3.4 Virtual Elimination of Toxics

According to the GLWQA Annex 2, Remedial Action Plans are to serve "as an important step toward virtual elimination of persistent toxic substances and toward restoring and maintaining the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem."

The intent of this objective is to protect human health and the health of the aquatic ecosystem by minimizing exposures to toxic contaminants. The challenge here is to develop strategies that ameliorate the legacy of contaminants previously discharged into the environment as well as reduce and systematically eliminate new inputs from human waste streams. Zero discharge of persistent toxic contaminants from the source is the long-term goal, but toxic contaminant sources include the gamut of point and nonpoint sources and airborne deposition.

2.4 Remedial Action Plan Elements

Annex 2 of the Great Lakes Water Quality Agreement states that "The Remedial Action Plans shall be submitted to the Commission for review and comment at three stages:

Stage 1:

When a definition of the problem has been completed under sub-paragraphs 4(i) and (ii):

(i) A definition and detailed description of the environmental problem in the Area of Concern, including a definition of the beneficial uses that are impaired, the degree of impairment and the geographic extent of such impairment;

(ii) A definition of the causes of the use impairment, including a description of all known sources of pollutants involved and an evaluation of other possible sources;

Stage 2:

When remedial and regulatory measures are selected under sub-paragraphs (iii), (iv), (v), and (vi);

(iii) An evaluation of remedial measures in place;

(iv) An evaluation of alternative additional measures to restore beneficial uses;

(v) A selection of additional remedial measures to restore beneficial uses and a schedule for their implementation;

(vi) An identification of the persons or agencies responsible for implementation of remedial measures; and

Stage 3:

When monitoring indicates that identified beneficial uses have been restored under sub-paragraphs 4(vii) and (viii).

(vii) A process for evaluating remedial measure implementation and effectiveness; and

(viii) A description of surveillance and monitoring processes to track the effectiveness of remedial measures and the eventual confirmation of the restoration of uses."

2.4.1 Stage One Document Elements

This report is the Stage 1 Report of the Cuyahoga River Remedial Action Plan. It embodies the problem definition for the Cuyahoga River Area of Concern with respect to the following:

- for the Environmental Setting - See Chapter 3,
- for the definition of degree and extent of use impairments - See Chapter 4, and
- for the definition of sources and causes of impairment - See Chapter 5.

This report also describes:

- field investigations undertaken to determine the degree and extent of certain impairments for which information is lacking - See Chapter 6,

- research priorities for fully achieving a comprehensive statement of impairments, and sources and causes of impairment - See Chapter 7,

- existing water quality management programs - See Chapter 8, and

- the Community Involvement Program - See Chapter 9.

2.4.2 Subsequent Stages of the Planning Process

Stage 2 of the Remedial Action Plan, which commences with submittal of Stage 1, will set forth the remedial measures and programs necessary to restore currently impaired uses in the Cuyahoga River Area of Concern. It is expected that Stage 2 will embody an agenda and timetable for implementation for a range of structural and non-structural measures that run the gamut from public education programs to waste treatment control.

Stage 3 of the Remedial Action Plan will be an ongoing phase of monitoring and evaluation to confirm that remediation measures that are implemented do achieve the plan goals.

2.5 Review Process

The Coordinating Committee has convened public workshops twice to date to review and comment on plan goals and objectives (in June 1990), and for problem identification by the public and to review and comment on preliminary findings of the Stage 1 investigations (January 1991). With the release of this document the Coordinating Committee is inviting comment on our definition of the Cuyahoga River Area of Concern's problems. Public comments will be reviewed by the Committee and incorporated with our Stage 1 submittal to Ohio EPA and the International Joint Commission. A public meeting is also planned to hear public comment.

2.6 Intended Use of Stage 1

The purpose of Stage 1 is to document in as comprehensive a manner as possible the impairment of beneficial uses in the Area of Concern. Producing this report has required a degree of cooperation and consensus among all levels of government, as well as among private and community-based stakeholder groups. Reaching agreement on the nature of the problems we face in the Area of Concern is the necessary first step toward finding the solutions to them.

. for the Environmental Setting - See Chapter 3,
. for the definition of causes and extent of use impairments - See Chapter 5, and
. for the definition of sources and causes of impairment - See Chapter 5.

This report also describes:

. field investigations underway to determine the degree and extent of certain impairments for which information is lacking - See Chapter 6,

. research priorities for fully achieving a comprehensive statement of impairments, and sources and causes of impairment - See Chapter 7

. existing water quality management programs - See Chapter 8, and

. the Community Involvement Program - See Chapter 9.

Subsequent Stages of the Planning Process 2.5.2

Stage 2 of the Remedial Action Plan, which commences with submittal of Stage 1, will set forth the remedial measures and programs necessary to restore beneficially uses recognized in the Cuyahoga River Area of Concern. It is expected that Stage 2 will identify an agenda and timetable for implementation for a range of structural and non-structural measures that can be drawn from public education programs to wastewater treatment control.

Stage 3 of the Remedial Action Plan will be an ongoing phase of monitoring and evaluation to confirm that remediation measures that are implemented do achieve the plan goals.

Review Process 2.6

The Coordinating Committee has convened public workshops twice to date to review and comment on plan goals and objectives (in June 1990), and for problem identification by the public and to review and comment on preliminary findings for the Stage 1 investigations (January 1991). With the release of this document the Coordinating Committee is inviting comments on the definition of the Cuyahoga River Area of Concern's problems. Public comments will be reviewed by the Committee and incorporated with the Stage 1 submittal to Ohio EPA and the International Joint Commission. A public meeting is also planned to hear public comment.

Intended Use of Stage 1 2.7

The purpose of Stage 1 is to document in as comprehensive a manner as possible the impairment of beneficial uses in the Area of Concern. Producing this report has required a degree of cooperation and consensus among all levels of government, as well as among private and community-based stakeholder groups. Reaching agreement on the nature of the problems we face in the Area of Concern is the necessary first step toward finding the solutions to them.

CHAPTER 3
ENVIRONMENTAL SETTING

3.0 Science Applications International Corporation (SAIC) Report

In June 1987, Science Applications International Corporation (SAIC) (McLean, Virginia) published the Cuyahoga River Remedial Action Plan (the SAIC report). The SAIC report was prepared under contract with the Great Lakes National Program Office (GLNPO) of USEPA, in accordance with the Guidance for Preparing an Area of Concern Remedial Action Plan (SAIC 1985). When the Cuyahoga Coordinating Committee was appointed in late 1988, the SAIC report was available to provide background information.

The guidance document and the SAIC report for the Cuyahoga River Area of Concern reflect International Joint Commission (IJC) guidelines for RAP content and format established prior to the 1987 amendments of the Great Lakes Water Quality Agreement. Though RAP reporting requirements were altered somewhat by the 1987 amendments, it was appropriate, nonetheless, to use some of the background information supplied in the SAIC report as a point of departure. Incorporated into Chapter 3 of the Stage One Report is as much of the background information from the SAIC report as was determined by a CCC task group review process to be reasonably complete and accurate. See Chapter 9 for a list of those individuals asked to review and comment on sections of the SAIC report.

3.1 Location of the Area of Concern

3.1.1 Location of the Cuyahoga River Basin

The Cuyahoga River basin is located in northeast Ohio. The Cuyahoga River meets Lake Erie in downtown Cleveland. Figure 3-1 shows the relationship of the Cuyahoga River basin to the Lake Erie basin.

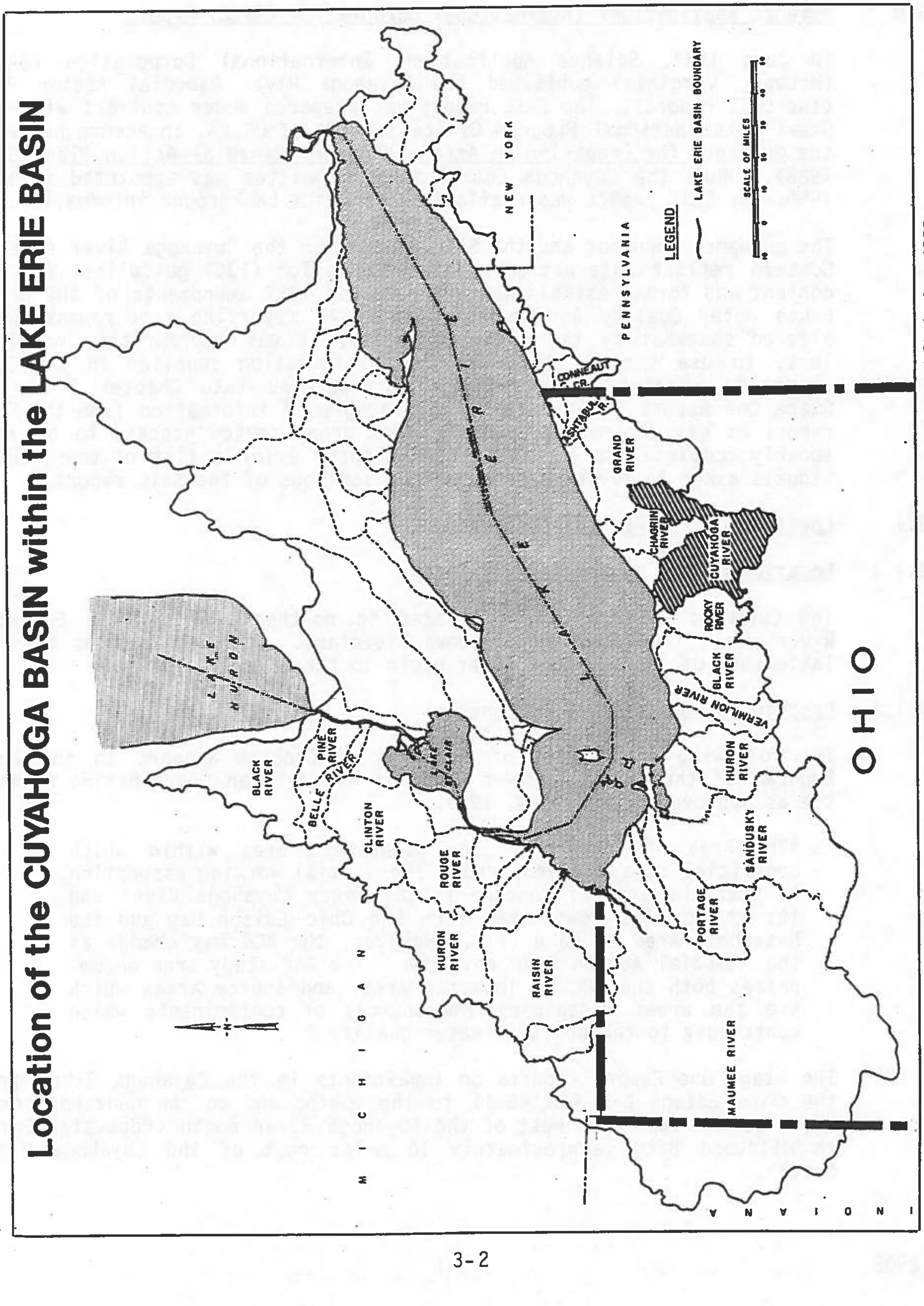
3.1.2 Description of the Area of Concern

The following description of the Area of Concern appears in the Work Program of the Cuyahoga River Remedial Action Plan Coordinating Committee as approved December 14, 1989:

> "The Area of Concern is the geographic area within which beneficial uses are impaired. The initial working assumption is that the area of concern is the lower Cuyahoga River and its tributaries downstream from the Ohio Edison Dam and the Nearshore Area of Lake Erie. However, the AOC may change as the Remedial Action Plan develops. The RAP study area encompasses both the AOC or impacted area, and source areas which are the areas containing the sources of contaminants which contribute to the degraded water quality."

The Stage One Report reports on impairments in the Cuyahoga River from the Ohio Edison Dam (RM 45.1) to the mouth, and to the Nearshore Area from roughly two miles west of the Cuyahoga River mouth (Edgewater Park) to Wildwood Park (approximately 10 miles east of the Cuyahoga River mouth).

Figure 3–1



Location of the CUYAHOGA BASIN within the LAKE ERIE BASIN

MODIFIED FROM: U.S. Army Corps of Engineers, Lake Erie Wastewater Management Study, June 1983

Investigation of the source of contaminants has encompassed the entire Cuyahoga River drainage basin and the basin to the east which drains to the nearshore area of the Area of Concern. Figure 3-2 shows the relationship of these two basins to Lake Erie and highlights the Area of Concern.

The following sections 3.2 through 3.4 are intended to provide the reader with a very detailed picture of the Cuyahoga River basin's natural and cultural characteristics.

3.1.3 THE HISTORICAL CUYAHOGA RIVER ENVIRONMENT

The lower Cuyahoga River and its valley, between the present day sites of Akron and Cleveland, has a long history of use for navigation and travel. For over 2,500 years many Native American tribes shared this important resource for living space, hunting, and transportation on their long journeys between Lake Erie and the Gulf of Mexico. Up through the 1700s, the river was described as "gentle" with "few riffles or swift running places," and "muddy."

William Coates said of the Cuyahoga in 1924:

"The rich bottom lands along the course of the Cuyahoga are very productive and in the early days, before the presence of a great city at its mouth dyed its waters, the stream abounded in fish, which were a great factor in the food supply. We need not go back to the days when the dusky Chippewa (Indians) occupied its banks for this fact. In quite recent years, the mullet, redhorse, bass, catfish, bullhead, sturgeon, shad and other varieties were caught in great numbers. Sturgeon, five, six and seven feet in length, were often the prey of fishermen.

Wild game was attracted to the river banks, sometimes in great numbers, and then the river valley became valuable hunting grounds. Because of the forests and with it the leaves in the summer and the slow melting of snow, the lack of ditches and tile drainage, accompaniment of civilization, the flow of water in the river was more regular throughout the year than it is now. Floods did not rise to such proportions and navigation was not impeded by the low water of the dry season, as in later years."[1]

One naturalist commented (as recently as 1851) that the waters of Lake Erie near the mouth of the Cuyahoga River would literally be "black with fishing boats"; "one could capture near the present Cleveland Harbor as many as 100 bass and walleye in a morning by hook and line."[2]

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1 William Coates, "A History of Cuyahoga County and the City of Cleveland." 1924.

2 Jared Potter Kirtland, in "The Fisheries of the Cleveland Metropolitan Area Including the Lake Erie Shoreline," by Dr. Andrew M. White, for the Water Quality Baseline Assessment for the Cleveland Area - Lake Erie. USEPA, 1975.

Prior to European settlement, the entire area where the Cuyahoga River entered the lake was a large, nearly level plain covered by marsh and swamp. It was only through dredging and breakwall construction in 1825 that the Cuyahoga River marshes became the Cleveland Harbor with a discernable mouth.[3]

After the settling of Cleveland, at the very beginning of the nineteenth century, not quite 200 years ago, the river began to experience an increasing intensity of use. With the completion of the Ohio-Erie Canal linking Cleveland and Akron in 1827, and the Valley Railroad in 1850, Cleveland and Akron communities grew by leaps and bounds. By 1850, Cleveland's population was over 17,000 and ten years later 43,000 people lived in the city.

Although large industrial development and subsequent urbanization meant prosperity for the region, it also brought with it major sources of pollution between Akron and Cleveland. Over the period of roughly 150 years, the Cuyahoga River would be used to support commercial shipping, major steel, rubber and chemical manufacturing processes, and the disposal of human wastes. Drastic deterioration of water quality in the Cleveland area began in earnest in the 1850s.

3.2 Natural Features

3.2.1 Drainage Basin

The Cuyahoga River and its tributaries drain approximately 813.3 square miles of land in the basin.* The Cuyahoga River basin lies mostly within Geauga, Portage, Summit and Cuyahoga Counties.

Several major tributaries flow into the Cuyahoga below the confluence of the East and West Branches in Geauga County. Figure 3-3 shows the major tributaries in the Cuyahoga River basin.

These include:

GEAUGA COUNTY	Bridge Creek Black Brook
PORTAGE COUNTY	Breakneck Creek Congress Lake Outlet Plum Creek

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3 James Bissell, Staff Botanist. "Natural History of Arcola Creek Estuary." Cleveland Museum of Natural History, July 30, 1987.

* Gazetteer of Ohio Streams, ODNR, 1960.

SUMMIT COUNTY	Fish Creek Little Cuyahoga River Mud Brook Sand Run Yellow Creek Furnace Run
CUYAHOGA COUNTY	Brandywine Creek Chippewa Creek Sagamore Creek Tinkers Creek Mill Creek Big Creek

The nearshore area of Lake Erie from Edgewater Beach to Wildwood Park receives flow from the Cuyahoga as well as runoff directly from the basin to the east of the Cuyahoga River, referred to as the "nearshore portion of the Study area."

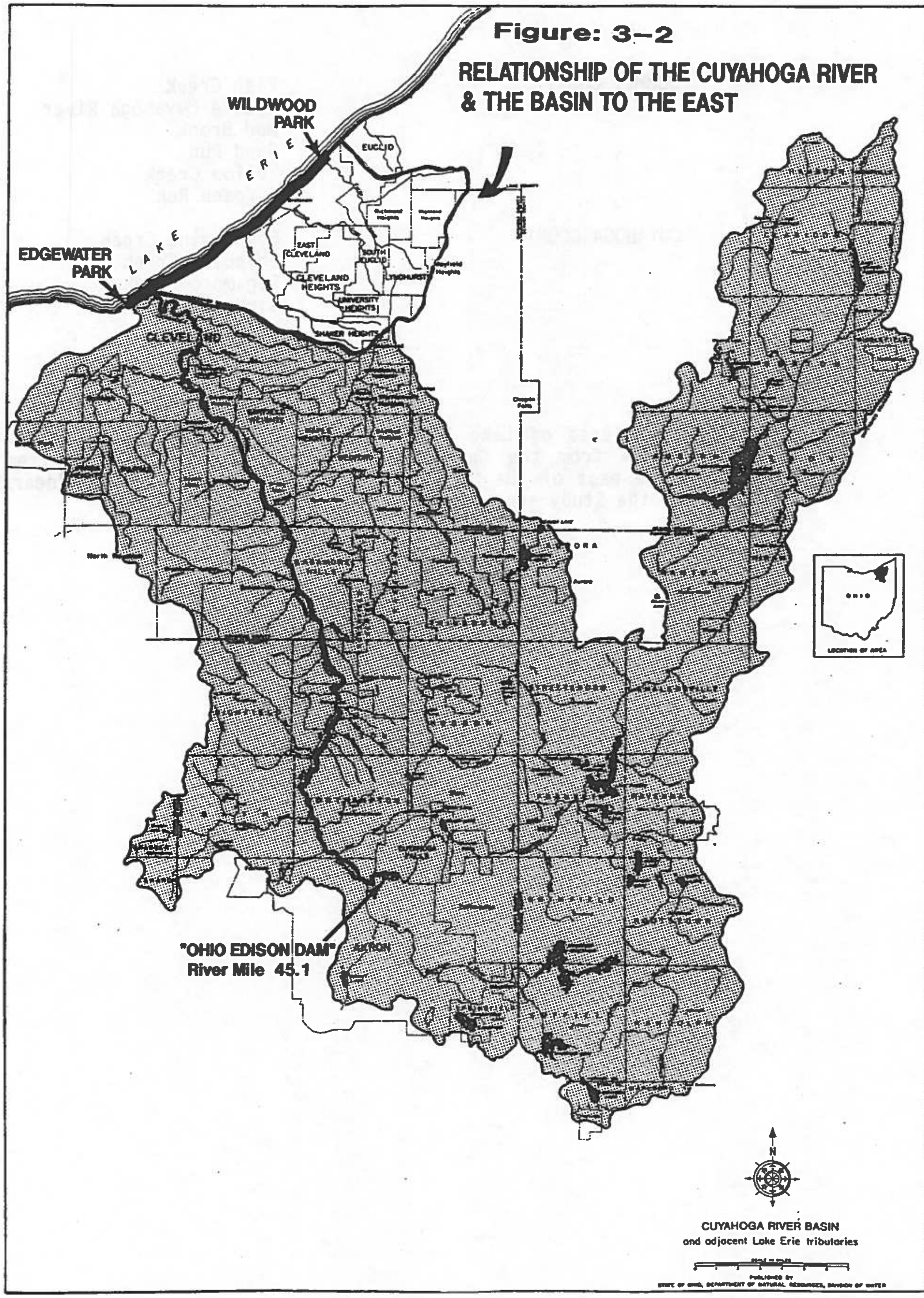
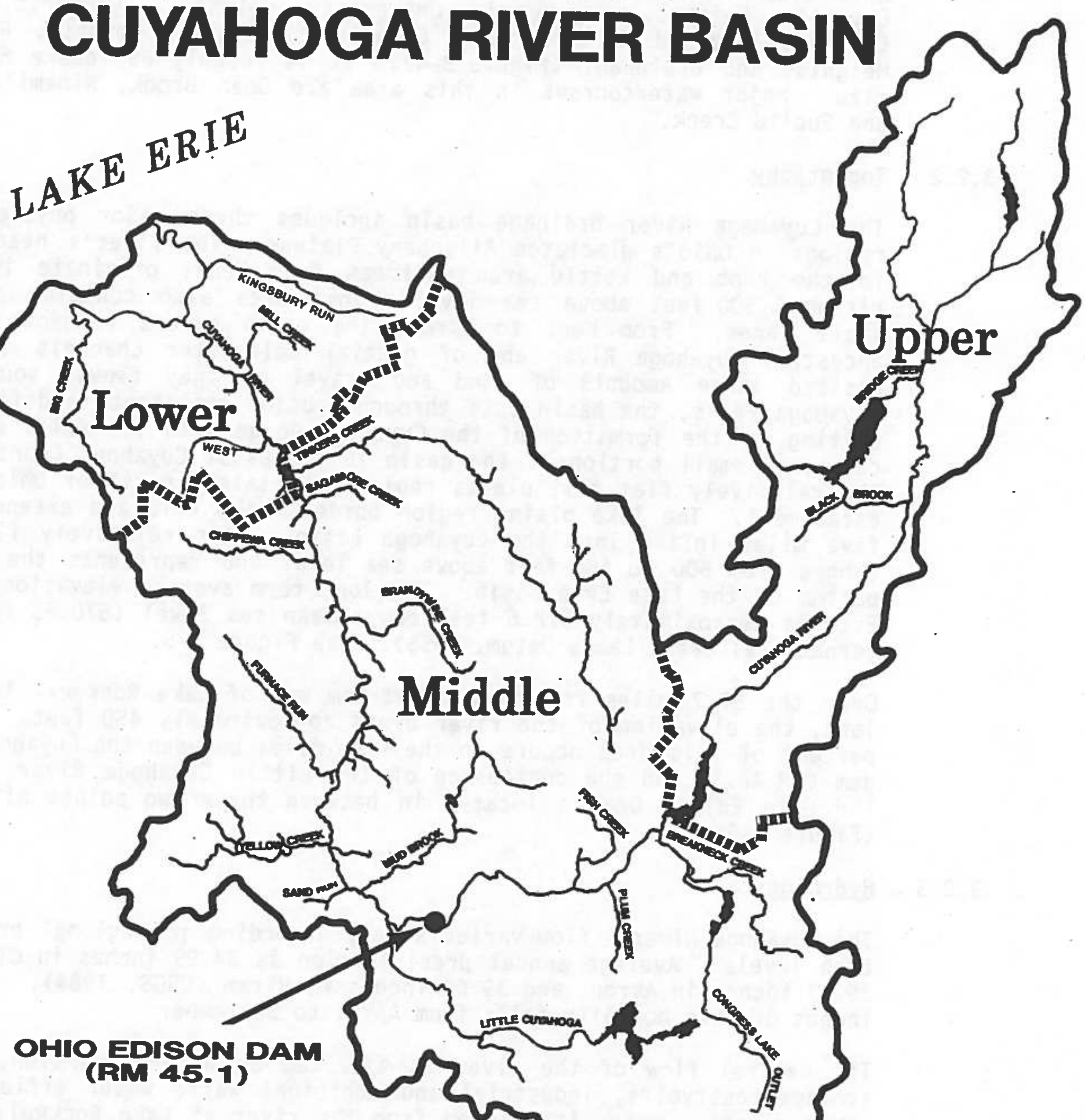


Figure: 3-2
RELATIONSHIP OF THE CUYAHOGA RIVER
& THE BASIN TO THE EAST
WILDWOOD
PARK
LAKE ERIE
EDGEWATER
PARK
EUCLID
EAST
CLEVELAND
SOUTH
EUCLID
LYNDHURST
CLEVELAND
HEIGHTS
UNIVERSITY
HEIGHTS
SHAKER HEIGHTS
CLEVELAND
"OHIO EDISON DAM"
River Mile 45.1
AKRON
OHIO
LOCATION OF AREA
N
CUYAHOGA RIVER BASIN
and adjacent Lake Erie tributaries

Figure: 3–3

MAJOR TRIBUTARIES of the CUYAHOGA RIVER BASIN



SOURCE: Northeast Ohio Areawide Coordinating Agency

This area drains runoff from the Cities of Cleveland, Shaker Heights, Cuyahoga Heights, Beachwood, University Heights, Lyndhurst, South Euclid, Cleveland Heights, East Cleveland, Highland Heights, Richmond Heights, and Bratenahl (Figure 3-4). It is roughly 69 square miles in size. Major watercourses in this area are Doan Brook, Ninemile Creek and Euclid Creek.

3.2.2 Topography

The Cuyahoga River drainage basin includes three major physiographic regions in Ohio's glaciated Allegheny Plateau. The river's headwaters, in the knob and kettle area upstream from Kent, originate in hills rising 1,300 feet above sea level. This area also contains numerous small lakes. From Kent to Akron, the basin covers remnants of the ancestral Cuyahoga River and of glacial melt-water channels that deposited large amounts of sand and gravel as they flowed south. At Cuyahoga Falls, the basin cuts through erosion-resistant sandstone, resulting in the formation of the Cuyahoga Gorge with its falls and cascades. A small portion of the basin in southwest Cuyahoga County is in the relatively flat till plains region immediately north of Ohio's lake escarpment. The lake plains region borders Lake Erie and extends about five miles inland into the Cuyahoga basin. This relatively flat area ranges from 500 to 600 feet above sea level and represents the ancient bottom of the Lake Erie basin. The long term average elevation of Lake Erie is approximately 572.6 feet above mean sea level (570.65 feet, International Great Lakes Datum, 1955). See Figure 3-5.

Over the 57.7 miles from the downstream end of Lake Rockwell to Cleveland, the elevation of the river drops approximately 450 feet. Over 50 percent of this drop occurs in the five miles between the Cuyahoga Falls dam (RM 46.3) and the confluence of the Little Cuyahoga River (RM 42). The Ohio Edison Dam is located in between these two points at RM 45.1 (Figure 3-6).

3.2.3 Hydrology

The Cuyahoga River's flow varies widely according to regional precipitation levels. Average annual precipitation is 34.99 inches in Cleveland, 35.13 inches in Akron, and 39.69 inches in Hiram (USGS, 1984). About 20 inches of this normally falls from April to September.

The natural flow of the river is affected by water diversion, several storage reservoirs, industrial and municipal waste water effluent, and power plants. Water is removed from the river at Lake Rockwell (RM 59) for the City of Akron's water supply, and it is largely returned to the Cuyahoga by Akron's wastewater treatment plant (RM 37.5). Some diversion into the Cuyahoga basin occurs at the Summit Lake system downstream of Lake Rockwell from the Tuscarawas River basin. In 1988, the average daily diversion from the Tuscarawas to the Cuyahoga basin was 28.05 MGD, or 18.12 cfs*.

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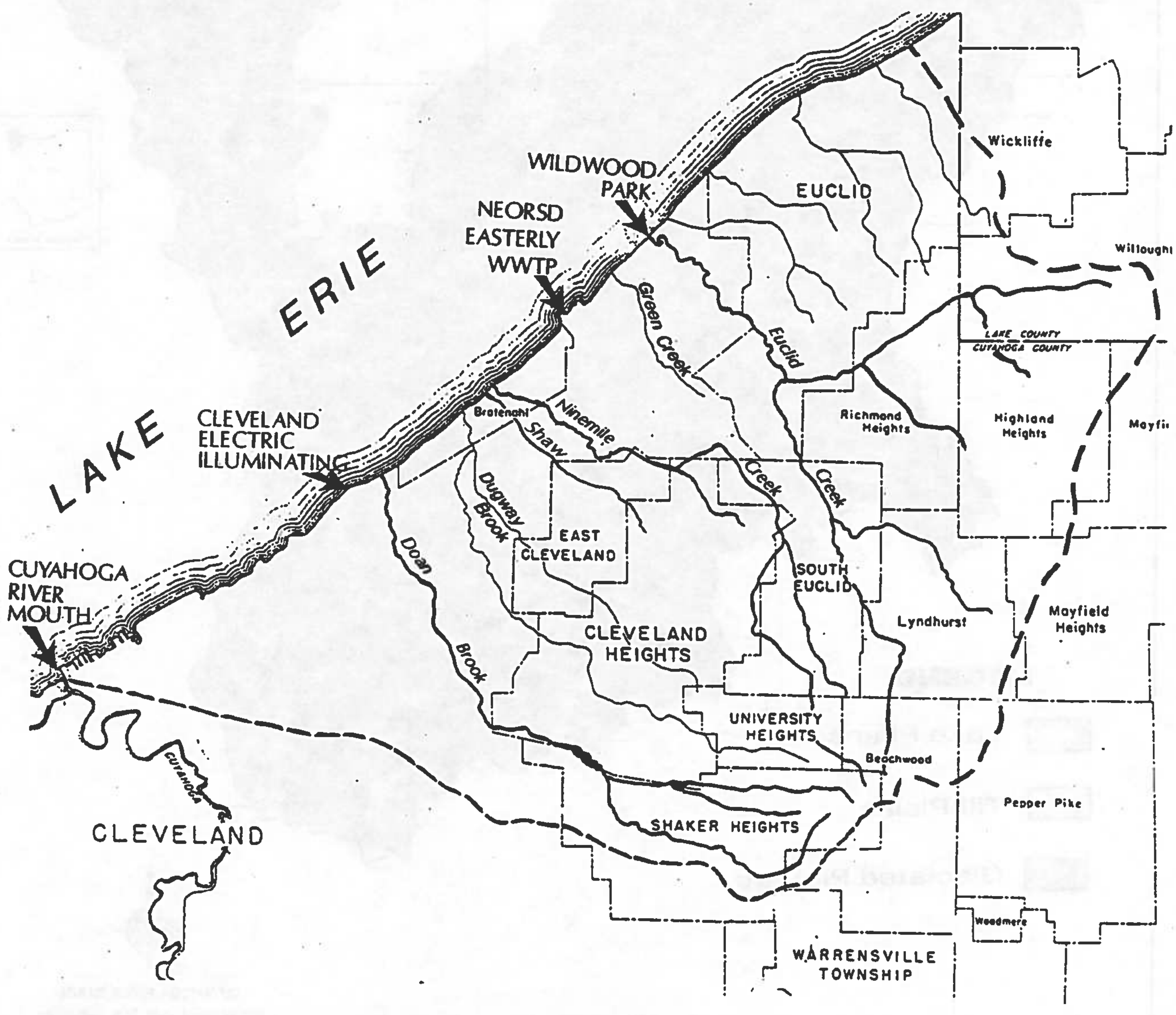
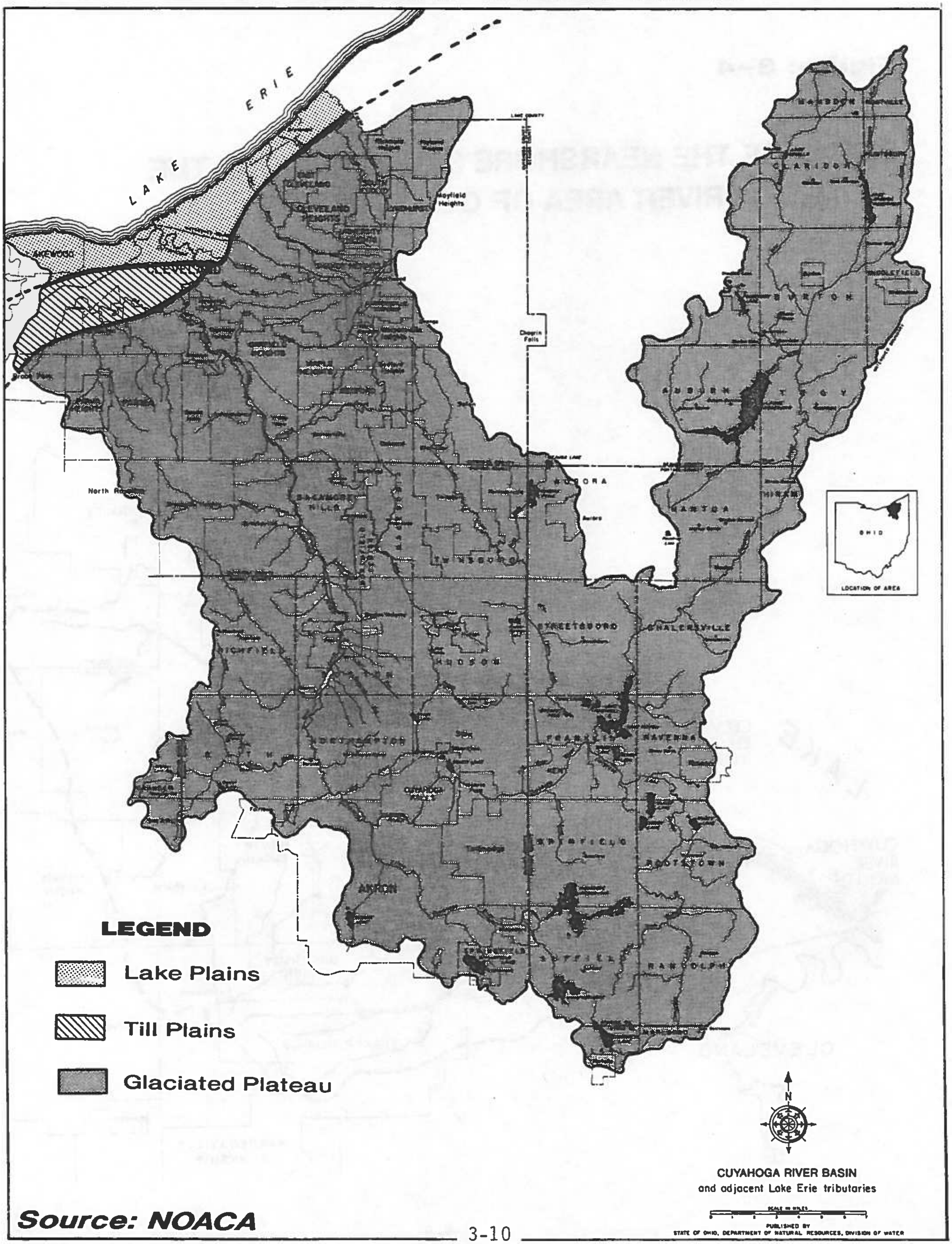
* Richard Bartz, Administrator, Water Resources Department, ODNR October 31, 1990, personal communication.

Figure: 3–4

DETAIL OF THE NEARSHORE STUDY AREA OF THE CUYAHOGA RIVER AREA OF CONCERN



MAJOR PHYSIOGRAPHIC REGIONS IN THE CUYAHOGA RAP STUDY AREA



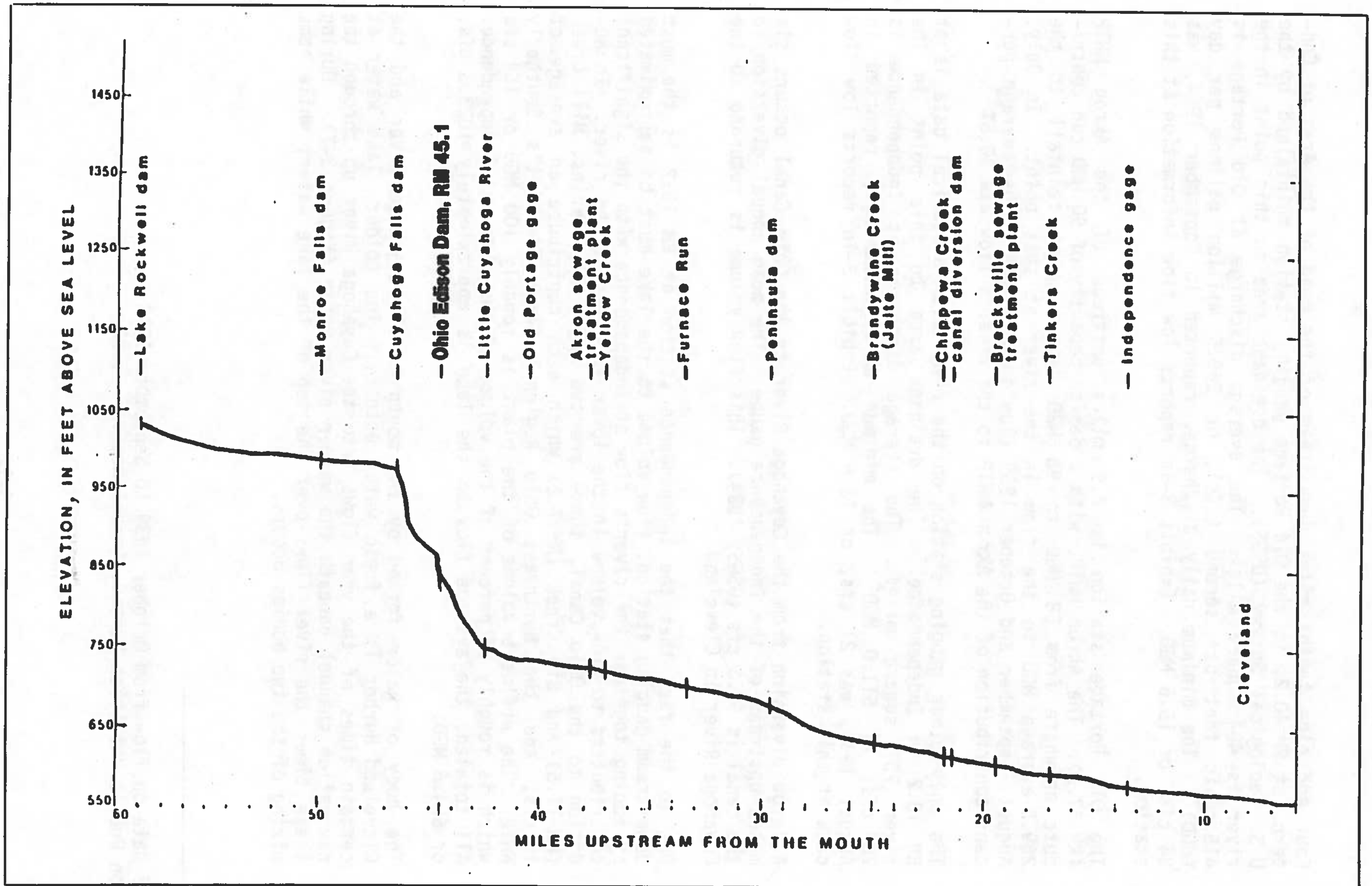


Figure: 3–6

PROFILE OF THE CUYAHOGA RIVER FROM LAKE ROCKWELL TO CLEVELAND, OHIO

SOURCE: Childress, Literature Review & Need for Additional Study of Surface Water Quality in the Cuyahoga Valley National Recreation Area, Ohio. USGS, Columbus, 1984, p.5

Four and nine tenths miles downstream of the head of the Area of Concern, at RM 40.2, is the Old Portage gauging station maintained by the U.S. Geological Survey (USGS). The drainage area to this point in the river is 404 square miles. The average discharge at Old Portage is 415 cubic feet per second (cfs), or 269.5 million gallons per day (MGD)*. The minimum daily discharge, reported in September 1964, was 24 cfs, or 15.6 MGD. Exhibit 3-1a reports low flow information at this station.

The Old Portage station is 2.9 miles upstream of the Akron WWTP (RM 37.3). The Akron WWTP, with a design capacity of 90 MGD can contribute anywhere from 58 MGD to 98 MGD depending on rainfall to the 269.5 average MGD to the flow in the river at that point. In July, August, September and October 1989 (low flow months), the average percent contribution of the Akron WWTP to the river's flow was 38.5%**.

The only other gauging station on the river with historical data is at RM 13.2 in Independence.* The drainage area to this point in the river 707 square miles. The average discharge at Independence is 787 cfs, or 511.0 MGD*. The minimum daily discharge, reported in August 1933, was 21 cfs, or 13.6 MGD. Exhibit 3-1b reports low flow data at this station.

A large diversion from the Cuyahoga River to the Ohio Canal occurs six miles upstream of the Independence gauge. The mean annual diversion to the canal is 62.3 cfs (USGS, 1984). This flow volume is returned to the Cuyahoga River in Cleveland.

Due to the fact that the Independence station at RM 13.2 is the most downstream gauging station, flow volume to the lake must be approximated by adding together the river's flow at Independence with the significant contributers to flow volume in the lower 13 miles of the river. In addition to the Ohio Canal, there are two major tributaries, Mill Creek (RM 11.5) and Big Creek (RM 7.2) which each contribute an average of 10 cfs, and the Northeast Ohio Regional Sewer District's Southerly WWTP. The effluent volume of the plant is roughly 100 MGD or 154 cfs which is roughly 20 percent of the volume of the river at Independence. All totaled, the average flow to the lake is approximately 1023.3 cfs, or 664.5 MGD.

The body of water formed by the mouth of the Cuyahoga River and the Cleveland Harbor is a fresh water estuary. The colder lake water at certain times of the year flows into the Cuyahoga River up through the navigation channel beneath the warmer river water (Figure 3-7). During these times the river flows over the top of the lake water, while some mixing of the two bodies occurs.

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* USGS data on flow from October 1939 to September 1978

** Akron Public Utilities Bureau, Annual Report - 1989

EXHIBIT: 3–1a

CUYAHOGA RIVER BASIN AT OLD PORTAGE, OHIO
RM 40.2

LOCATION: Lat 41°08'08", long 81°32'50", Summit County, Hydrologic Unit 04110002, on right bank 230 ft upstream from North Portage Path bridge at Old Portage, 1.2 mi downstream from Little Cuyahoga River, and 4 mi northwest of Akron City Hall.

DRAINAGE AREA: 404 mi^2.

TRIBUTARY TO: Lake Erie.

DISCHARGE DATA USED: October 1939 to September 1978.

REMARKS: Natural flow of stream affected by diversions, storage reservoirs and power plants. At Lake Rockwell, 17.7 mi upstream from gage, an average of 78 ft^3/s was diverted for municipal supply of city of Akron. Sewage from city enters river 2.9 mi downstream from station. Some diversion from the Tuscarawas drainage into this basin at Portage Lakes.

SELECTED DISCHARGE CHARACTERISTICS: Average discharge: 415 ft^3/s (39 years).
Minimum daily discharge: 24 ft^3/s September 1964.

Magnitude and frequency of low flow for indicated periods

Period	Number of consecutive days	Discharge (ft^3/s) for indicated recurrence interval (years) 2	5	10	20	50
Apr.-Mar.	1	52	36	30	26	22
	7	65	50	44	40	36
	30	82	61	52	47	41
May- Nov.	1	53	37	30	26	22
	7	66	50	44	40	36
	30	83	61	53	47	42
June-Aug.	1	65	45	37	31	26
	7	80	58	50	44	38
	30	108	75	63	54	46
Sept.-Nov.	1	55	37	31	27	24
	7	69	51	45	42	38
	30	95	65	55	49	43
Dec.-Feb.	1	112	63	47	37	28
	7	135	81	63	51	41
	30	218	116	83	63	46
Mar.- May	1	139	91	72	59	47
	7	170	119	100	87	76
	30	350	235	184	149	114

Duration of daily flow for indicated periods

Period	Discharge (ft^3/s) which was equaled or exceeded for indicated percent of time 98	95	90	85	80%	75	70	60	50	40	30	20	10
Apr. - Mar.	48	57	71	85	99	120	130	180	240	340	460	650	970
May - Nov.	46	54	62	72	81	91	100	120	150	200	260	370	570
June - Aug.	47	54	62	74	83	92	100	120	150	180	220	310	470
Sept.- Nov.	44	52	58	64	71	78	86	100	130	160	210	290	460
Dec. - Feb.	53	65	93	120	140	160	190	260	350	450	590	790	1200
Mar. - May	100	140	190	240	290	340	380	470	570	690	830	1100	1400

EXHIBIT: 3-1b

CUYAHOGA RIVER BASIN AT INDEPENDENCE, OHIO
RM RM 13.2

LOCATION: Lat 41°23'43", long 81°37'48", in T.6 N., R.12 W., Cuyahoga County, Hydrologic Unit 04110002, on left bank 240 ft downstream from bridge on Old Rockside Road, 0.8 mi northeast of Independence, and 3.0 mi downstream from Tinkers Creek.

DRAINAGE AREA: 707 mi^2.

TRIBUTARY TO: Lake Erie.

DISCHARGE DATA USED: October 1929 to December 1935, April 1940 to September 1978.

REMARKS: Natural flow of stream affected by diversion, storage reservoirs and power plants. Some diversion from the Tuscarawas drainage into this basin at Portage Lakes. Water diverted into Ohio Canal at Brecksville, 6 mi upstream from station, bypasses station. These records do not include flow in canal except above about 15,000 ft^3/s when channels merge.

SELECTED DISCHARGE CHARACTERISTICS: Average discharge: 787 ft^3/s (44 years).
Minimum daily discharge: 21 ft^3/s August 1933.

Magnitude and frequency of low flow for indicated periods

Period	Number of consecutive days	Discharge (ft^3/s) for indicated recurrence interval (years)				
		2	5	10	20	50
Apr.-Mar.	1	91	57	42	32	23
	7	109	77	63	53	44
	30	133	91	75	64	54
May- Nov.	1	90	56	42	32	23
	7	109	76	62	53	43
	30	132	90	75	64	54
June-Aug.	1	102	62	46	35	25
	7	126	84	67	55	44
	30	174	112	88	73	59
Sept.-Nov.	1	91	59	47	36	27
	7	112	80	68	60	53
	30	151	99	81	71	61
Dec.-Feb.	1	197	113	85	67	51
	7	233	141	109	89	72
	30	404	223	165	129	99
Mar.- May	1	244	153	117	92	70
	7	304	199	158	131	106
	30	636	386	282	211	148

Duration of daily flow for indicated periods

Period	Discharge (ft^3/s) which was equaled or exceeded for indicated percent of time												
	98	95	90	85	80	75	70	60	50	40	30	20	10
Apr. - Mar.	71	93	110	140	160	180	210	290	400	570	810	1200	1900
May - Nov.	62	79	100	110	130	140	150	190	240	310	420	620	1100
June - Aug.	59	79	100	120	130	140	160	190	230	290	370	520	850
Sept.- Nov.	60	75	90	100	110	120	130	160	190	240	320	460	820
Dec. - Feb.	110	140	180	220	260	300	350	460	610	800	1100	1500	2500
Mar. - May	170	220	300	390	480	550	640	800	1000	1200	1500	2000	2800

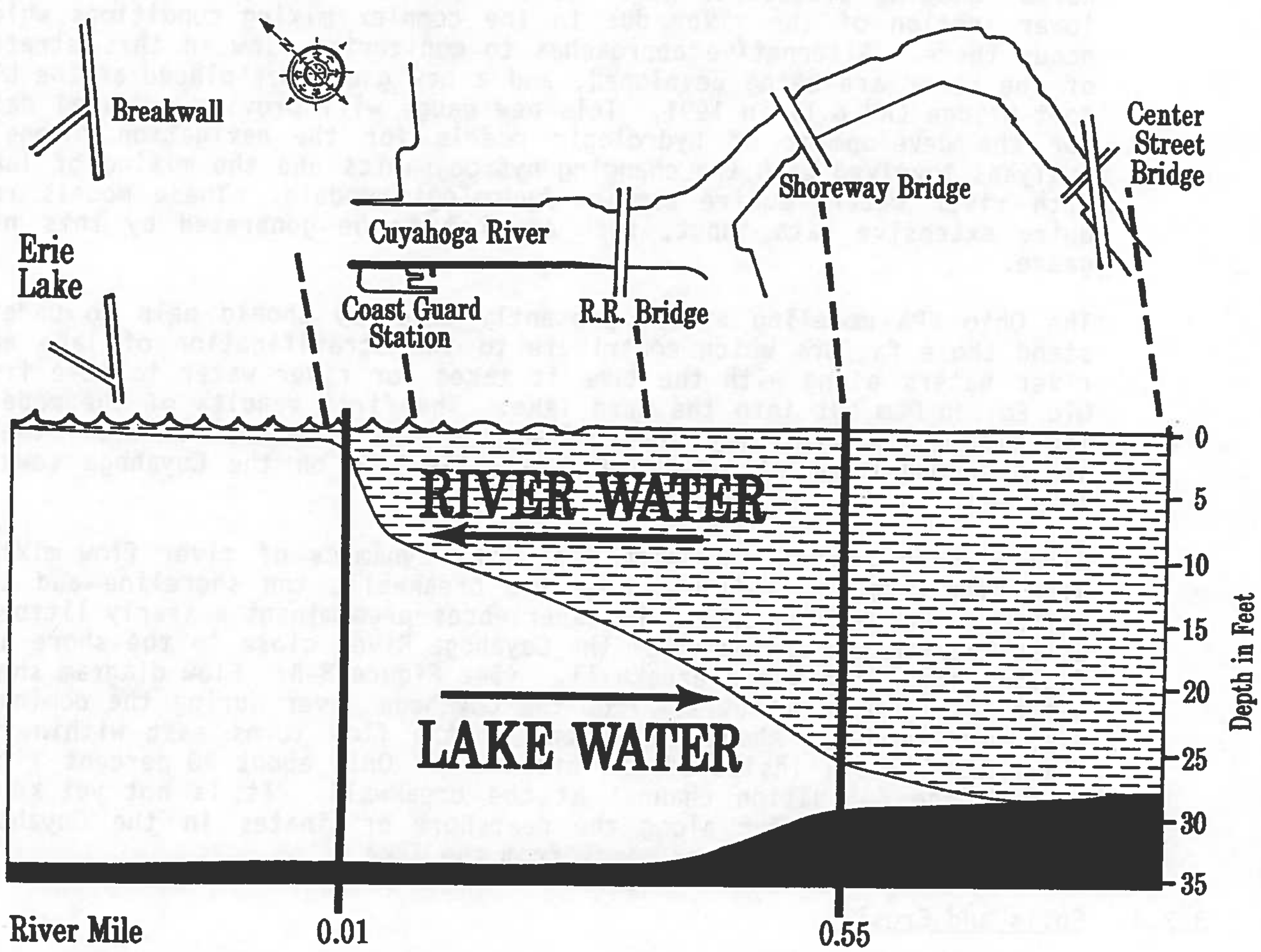

Figure: 3—7

Typical Cross Section of Seasonal Lake Water Intrusion into Cuyahoga River from Conductivity and Dissolved Oxygen Measurement.

SOURCE: City of Cleveland, Water Quality Baseline Assessment for Cleveland Area/ Lake Erie (Vol. 1), 1974, pp.75.

Normal gauging procedures have not allowed for the monitoring of this lower section of the river due to the complex mixing conditions which occur there. Alternative approaches to monitoring flow in this stretch of the river are being developed, and a new gauge was placed at the LTV foot bridge (RM 6.1) in 1991. This new gauge will provide critical data for the development of hydrologic models for the navigation channel. Analyses involved with the changing hydrodynamics and the mixing of lake with river water require complex hydrologic models. These models require extensive data input, such as that to be generated by this new gauge.

The Ohio EPA modeling effort presently underway should help to understand those factors which contribute to the stratification of lake and river waters along with the time it takes for river water to move from Old Edison Dam out into the open lake. The first results of the modeling effort are available for review. During the summer of 1991, there was a second round of extensive data collection on the Cuyahoga toward this end.

With respect to the nearshore area, the dynamics of river flow mixing with lake water is influenced by the breakwall, the shoreline and the nearshore currents. Lake Erie experiences predominant easterly littoral drift keeping the outflow from the Cuyahoga River close to the shore and flowing east within the breakwall. (See Figure 3-8: Flow diagram shows a typical pattern of outflow from the Cuyahoga River during the dominant wind conditions.) About 80 percent of the flow turns east within the Cleveland harbor, inside of the breakwall. Only about 20 percent flows through the navigation channel at the breakwall. It is not yet known how much of the water along the nearshore originates in the Cuyahoga River, is direct runoff, or comes from the lake.

3.2.4 Soils and Erosion

A wide variety of soils are mapped in the Cuyahoga River basin. They include highly, moderately, and slightly erodible soil.

The soils of the upper basin, in Geauga and Portage Counties are moderately erodible. They are characterized by a relatively thick subsoil layer with some clay and a moderate water holding capacity. Major soil associations in this area include the following:

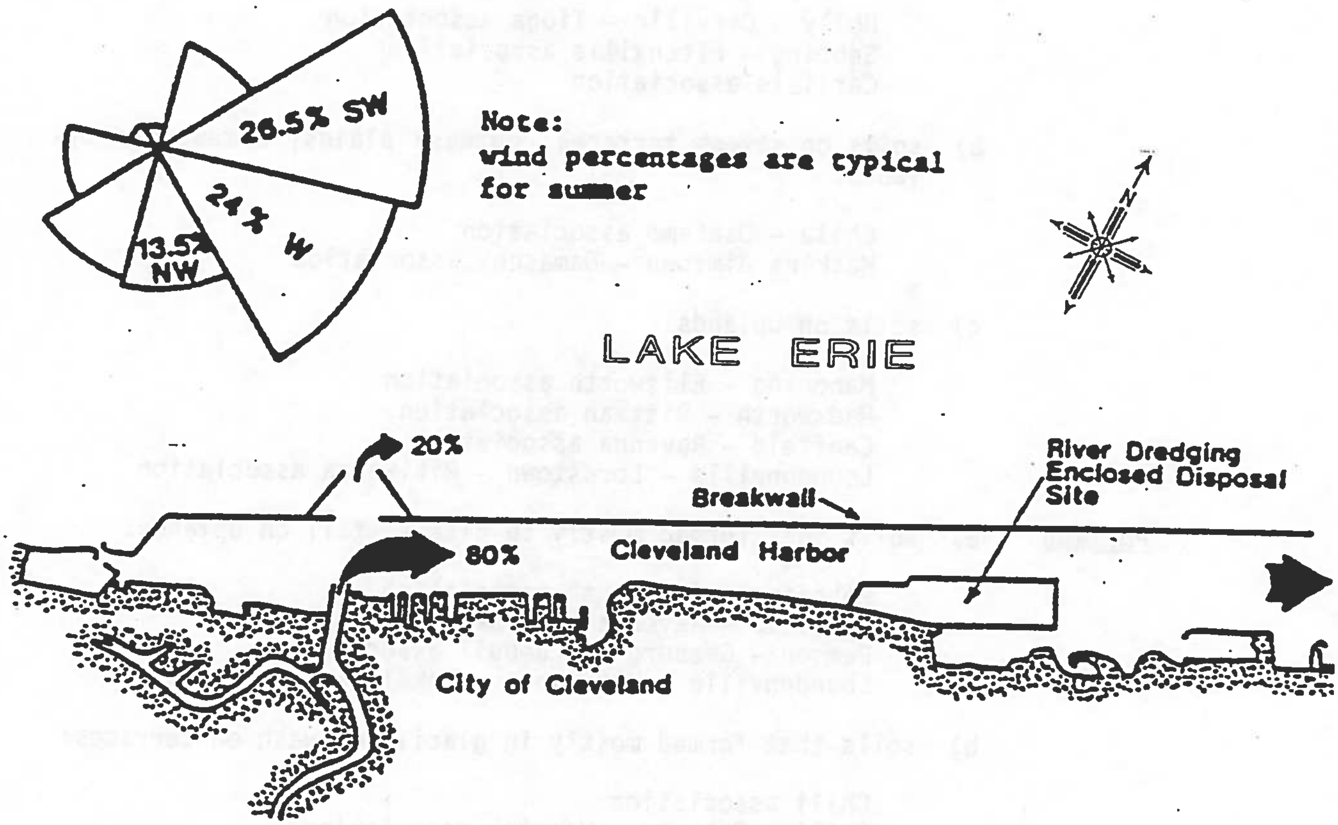

Figure: 3-8

Typical Flow Pattern of the Cuyahoga River with the Dominant Southwest, West and North Wind Directions

SOURCE: City of Cleveland, Water Quality Baseline Assessment for Cleveland Area/ Lake Erie (Vol. I), 1974, pp. 76.

Geauga a) soils on terraces, floodplains, uplands, and in basins of former glacial lakes:

Holly - Orrville - Tioga association
Sebring - Fitchville association
Carlisle association

b) soils on stream terraces, outwash plains, kames, and uplands:

Chile - Oshtemo association
Haskins Jimtown - Damascus association

c) soils on uplands:

Mahoning - Ellsworth association
Wadsworth - Rittman association
Canfield - Ravenna association
Loundonville - Lordstown - Mitiwanga association

Portage a) soils that formed mostly in glacial till on uplands:

Mahoning - Ellsworth association
Canfield - Ravenna - Wooster association
Remson - Geeburg - Trumbull association
Loundonville - Mitiwanga - Dekalb association

b) soils that formed mostly in glacial outwash on terraces:

Chili association
Chili - Oshtemo - Wooster association

c) soils that formed in lacustrine, alluvial, or organic deposits on terraces, flood plains, and glacial uplands:

Sebring - Holly - Caneadea association
Carlisle association

The Cuyahoga basin soils in Summit and Cuyahoga Counties are highly erodible. Generally a silty surface layer predominates to a depth of 6 to 10 inches with a clayey subsoil below. The clayey layer restricts intermittent water percolation and contributes to rapid runoff of surface water which carries away silt, clay, and other particles. Where a vegetative or other protective cover is not established, severe erosion occurs. Major soil associations in this area include:

Summit a) deep soils that formed mostly in glacial fill on uplands:

Mahoning - Ellsworth association
Ellsworth-Mahoning association
Rittman - Wadsworth association
Canfield - Wooster association

b) soils that formed in alluvium, or organic deposits on flood plains and depressions:
Carlisle association
Chagrin - Holly - Lobdell association

c) deep uplands soils that formed mostly in glacial outwash, old alluvium and lacustrine deposites:
Chili association
Glenford - Fitchville association
Sebring - Caneadea association

d) Rough broken land association

Cuyahoga a) moderately deep soils on uplands and lake plains:
Urban land - Mitiwanga association
Brecksville - Hornell association

b) deep soils on beach ridges, outwash terraces and lake plains:
Oshtemo - Urban land - Chili association
Geeburg - Mentor association
Urban land - Elnora - Jimtown association

c) deep soils of uplands and the higher parts of lake plains:
Urban land - Mahoning association
Mahoning - Ellsworth association
Wadsworth - Rittman association

d) deep soils on flood plains and low stream terraces:
Chagrin - Tioga - Euclid association
Urban land association

3.2.5 Wetlands

For many years wetlands were believed to be swampy, insect-infested places with no intrinsic value. They were ditched, drained, and/or filled and then farmed or developed. In the last 10 years our understanding of wetlands has changed, and a national focus on wetlands is increasing:

Wetlands are important natural resources. They can be:

- o more biologically productive than tropical rain forests;
- o the spawning or breeding ground for many game fish, fowl, and animals;
- o aesthetic open spaces; and
- o important historical and cultural resources offering opportunities for education and research.

The remaining wetlands offer many advantages to existing developments and populations, such as:

- o flood water storage, thereby minimizing the peak height and flow velocity of flood waters;
- o acting as barriers to wave produced erosion;
- o water purification/clarification for surface and groundwater through the filtering of sediments and removal of toxics;
- o aiding in the regeneration of groundwater supplies; and
- o being important timber production areas thus providing a resource for continued development.

Over the course of history, as a conservative estimate, development has eliminated well over 50 percent of the nation's wetland resources with every indication that, if allowed to continue unhindered, it would continue to eliminate most of the rest.* Furthermore, a trends report produced in 1990 states that Ohio lost 90% of its wetlands between 1780's and 1980's.**

According to a 1982 Ohio EPA report on Ohio's wetlands,*** a reduction of approximately 50 percent of the remaining Lake Erie basin wetlands occurred between 1954 and 1974. The report also states that seemingly insignificant loss of small portions of wetlands is an important incremental loss to wetlands systems and the functions that they serve.

Quantification of Wetlands in the Cuyahoga River Watershed

The most current information available on the acreage of wetlands in the watershed is the Ohio Wetlands Inventory (OWI) produced by the Ohio Department of Natural Resources' Division of Wildlife between 1989 and 1991 (Refer to Exhibit 3-2)

The OWI identifies areas which are likely to be regulated as wetlands, but the Corps of Engineers is the only agency with the authority to delineate wetlands, under Section 404 of the Clean Water Act. The Corps

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* Exerpted from the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands - An Interagency Cooperative Publication." January 10, 1989. Published by the USACOE, USEPA, USFWS, and USDA-SCS.

** Dahl, T.E. 1990. Wetlands Losses in the United States 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

*** J.H. Albrecht. Ohio's Wetlands; 1982 205(b) Report, Vol. V. Ohio EPA, Division of Water Pollution Control, Section of Surveillance and Standards. January, 1982.

of Engineers uses the National Wetlands Inventory (NWI) maps produced by U.S. Fish and Wildlife Service in the 1970's as preliminary identification of potential wetlands areas. At no time are the maps used as definitive sources of wetlands delineation; at some point during the review process for a Section 404 permit, an on-site investigation is necessary.

The OWI inventory is presented here, rather than the NWI, because most of the OWI data are more current by roughly 10 years. Considering the national rate of wetlands loss and the pace of development in some areas of the Cuyahoga watershed, the OWI data are more likely to represent the actual situation. Also, the OWI data are readily quantifiable, thus we can sum acreages of wetlands easily.

Determining Rate of Loss in the Watershed

The OWI and NWI are two wetlands inventories that cover the entire watershed, however, because the two inventories were not consistent in their definition of wetlands, it is very difficult to compare the OWI and the NWI to determine rate of loss. It is clearly the proverbial "apples to oranges" comparison. For that matter, the rate of loss of wetlands across the nation can only be roughly estimated, not only due to the paucity of national data collected on wetlands over the years, but also due to the inconsistencies in the definition of wetlands.

Although the RAP has no hard data yet to positively determine that the rate of loss of wetlands in the watershed is any different than the national rate, based on the density and pattern of development close to the river and lake, there is reason to suggest that the loss of wetlands could be greater. It is a RAP research need to investigate the rate of loss of wetlands and to verify the extent of remaining wetlands.

The loss of wetlands contributes to several beneficial use impairments, most notably fish and wildlife habitat. The RAP Committee will be considering remedial strategies for protecting and enhancing wetlands during Stage Two.

The following table (Table ~~3-i~~ 3-1) presents the OWI information for the four county area in quantitative form. Draft maps presenting this information can be reviewed at the County Soil and Water Conservation District offices. The information presented in these maps has not yet been field verified.

3.2.6 Sediment Load Estimates and Dredging

In addition to human-induced erosion in the basin, there is a large natural, or background, erosion problem within the Cuyahoga watershed. Accelerated infilling of lakes and reservoirs presents an ongoing problem. Annual maintenance dredging of the navigation channel is essential to the shipping industry and to the customers they serve.

Exhibit 3-2

THE OHIO WETLANDS INVENTORY

SOURCES OF DATA

The Ohio Wetlands Inventory (OWI) is derived from a variety of data sources. Principal sources of information are identified in table 1.

IMAGE PROCESSING

LANDSAT satellite imagery was processed using Thematic Mapper bands 3, 4, and 5 to classify moisture and vegetative differences. Band 1, 2, 3, and 7 were used to classify woodland vegetation. Through a process of "supervised classification," a combination of spectral characteristics and ground truth identification of known wetland classes, spectral signatures were defined and applied to each processed LANDSAT scene, from this the following landuse classes were identified: open water, shallow marsh, wet meadow, shrub-scrub wetland, some farmed wetlands, other vegetation types, and bare soil.

LANDUSE CLASSES DEFINED

The OWI wetland classification scheme is similar to that of Ducks Unlimited's Wetland Inventory Program (Koeln et al. 1987). Open water areas are defined as areas of water without vegetation or emergent plants above the surface. Shallow-marsh areas are defined as areas supporting emergent vegetation that normally maintains surface water for an extended period in spring and early summer, but is often dry in late summer and fall. Wet meadow areas are defined as areas with near continuous moist soil dominated by sedges rather than grasses. Farmed wetland areas are defined as areas where there is evidence of crop production within wetland boarders.

ERROR ASSESSMENT

Imagery for glaciated Ohio counties* are slide reviewed using low level aerial photograph (35 mm) provided by SCS offices, at which time gross errors are corrected in the remote landuse classifications. It is during this processing step that most farmed wetland are identified and added to the inventory, since this landuse class is not easily identified in the previous processing steps. Wetland classification errors in nonglaciated counties are identified from a review of USGS topographic maps. Finally, all reviewed wetland maps are subjected to field verification by SCS personnel. This review process provides two methods of error assessment and correction of the wetland inventory. The final product will be a hardcopy wetland inventory map, rectified to the USGS topographic quadrangle map series for Ohio.

DATA LIMITATIONS

Data limitations exist that are due in part to inherent limitation of remote processing, including misclassification and misregistration errors and in part to potential errors from hardware and software limitations, and humans. Data quality limitations are summarized as follows:

- Satellite TM data has a minimal resolution of 30 by 30 meters (a pixel).
- Soil and landuse provided by OCAP is derived from an 80 meter pixel size.
- Digital line graph data (i.e., roads and streams) are provided at 1:100,000 scale. As map scale is enlarged error increases.
- Quality control errors are possible during error assessment processing and GIS classification editing.

* except Cuyahoga County

Exhibit 3-2, continued

LITERATURE CITED

Keln, G., T. P. Caldwell, D. E. Wesley, J. E. Jacobson. 1987. Wetland Conservation-Ducks Unlimited Wetland Habitat Inventory in EOSAT-Landsat Application Notes 2(2): 1-4.

Table 1. Data sources used in the Ohio Wetland Inventory Project, 1989 to 1992.

Data Sources	Ways of implementation	Information Derived
TM	Image processing	Wetland types
OCAP	Digital data conversion	Soil, Land use
Aerial Slides	Visual error correction	Wetland types, Locations
USGS DLG	Digital data conversion	Roads, Streams, Rail roads
Others	Visual referencing	e.g. USGS topo. quadrangle map SCS soil map ODNR land use map National Wetland Inventory

Note: Following is a full description of the acronyms refered to in Table 1.
TM: LANDSAT Thematic Mapper
OCAP: Ohio Capability Analysis Program
USGS DLG: U.S. Geological Survey Digital Line Graph

TABLE: 3–1

WETLANDS IN THE FOUR COUNTY AREA -

*as identified in OHIO WETLANDS INVENTORY**

	CUYAHOGA (293,506)	SUMMIT (269,175)	PORTAGE (322, 646)	GEAUGA (261,409)
WET WOODS	6,060	13,258	24,611	11,597
OPEN WATER	1,053	3,993	8,566	3,469
SHALLOW MARSH	888	2,858	5,850	4,320
SHRUB AND SCRUB	3,283	3,342	6,485	6,401
WET MEADOW	244	556	4,038	2,807
FARMED WETLAND	11	108	486	119
RIVERS AND STREAMS	4,061	3,679	4,015	4,154
TOTAL ACRES	15,598	27,792	54,051	32,867
Percent of county in wetlands	5 %	10 %	17 %	13%

* Source of data: Ohio Dept. Natural Resources
Division of Wildlife, 1992

The average annual sediment load passing the Independence gauging station is estimated to be 381,000 tons, of which 235,000 tons are in suspension and 146,000 tons are in the form of a bedload (USGS, 1984). Annual maintenance dredging of the Cuyahoga River and outer harbor by the U.S. Army Corps of Engineers averaged 274,000 cubic yards of sediment from 1987 through 1990. 400,000 cubic yards of dredged material were removed in 1990. (The Federal Navigation Channel must be dredged regularly to depths varying between 19 and 28 feet. Dredging extends from the mouth of the river to about 800 feet north of the breakwall pierhead and upstream to RM 5.6.)

3.2.7 Air Quality

Atmospheric conditions in the basin are dominated by the influence of Lake Erie. Prevailing winds are southerly at a mean speed of 10.7 miles per hour. Normal monthly temperatures range from January's 25.5F to July's 71.6F. The Cleveland area is relatively cloudy due to the "lake effect," with only 49 percent of possible sunshine (NOAA 1982).

The Cleveland and Akron areas do not attain certain Federal and State air quality standards. The following table (Table 3-2) illustrates the current extent of nonattainment of National Ambient Air Quality Standards in the Cuyahoga River RAP study area. Unclassifiable area is bounded on the west by I-71 on the north by Conrail tracks, and east by I-77 and on south by Clark Avenue. Cuyahoga County is in nonattainment for ozone, carbon monoxide and particulate matter (PM 10) and a localized area within the county is not classifiable for lead. Geauga, Portage and Summit Counties are in nonattainment for ozone. Counties within the study area are attaining standards for nitrogen oxide and sulfur dioxide.

Atmospheric deposition (the "raining out" of air pollution) is partially responsible for the presence of some toxic substances in Lake Erie. A study released in August 1989* found that atmospheric pathways for input of 13 toxic substances to Lake Erie can account for anywhere between 8 percent and 66 percent of the total loading of these substances to the lake. See Table 3-3 for this summary. The amount of these atmospheric pollutants with anthropogenic sources in the Cuyahoga River basin has not been defined, but much of this pollution may originate in coal burning power plants, coke plants, and blast furnaces in the area.**

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* Final Report on Input of Toxic Substances from the Atmosphere to Lake Erie--to Ohio Air Quality Development Authority. August 1989. Battelle, Columbus, Ohio.

** Confirmed in a telephone interview with Paul Koval, Ohio EPA Air Pollution Control, March, 1991.

TABLE 3-2 **U.S CLEAN AIR ACT NONATTAINMENT AREAS IN THE FOUR COUNTY REGION AS OF 1990**

	OZONE	CARBON MONOXIDE	PARTICULATE MATTER	SULFUR DIOXIDE	NITROUS OXIDE	LEAD
CUYAHOGA	X	X	X			
UNCLASS**						X
GEAUGA	X					
PORTAGE	X					
SUMMIT	X					

** Unclassifiable portion of Cuyahoga County is that area bounded by:

I-71 on the west;
Clark Street to the south;
I-77 on the east; and
Conrail to the north.

SOURCE: USEPA Air Quality Designations and Classifications; Final Rule (56 FR 56693) November 6, 1991

TABLE: 3–3
RELATIVE IMPORTANCE OF ATMOSPHERIC & NON–ATMOSPHERIC INPUTS OF TOXIC SUBSTANCES TO LAKE ERIE

Species	Total Atmospheric Input (kg/yr)	Total Non-atmospheric Input (kg/yr)	Atmospheric Contribution (% of total input)
Mercury	728	2,580	22
PCBs	273	741	27
Hexachlorobenzene	11	110	9
Benzo-a-pyrene	809	425	66
2,3,7,8,-TCDD	0.0172	0.14	11 (a)
2,3,7,8,-TCDF	0.115	0.20	37 (a)
PAHs	9,830	40,960	19 (a)
Lead	250,600	422,000	37
Cadmium	12,329	8,693	59
Arsenic	9,906	117,630	8
Chromium	24,770	117,630	17
Dieldrin	38.7	76.4	34
DDT	30.7	91.9	25

(a) Upper limit.

SOURCE: Battelle, 1989.

3.3 General Land Use Information

3.3.1 The Cuyahoga River Watershed

Patterns of land development in the Cuyahoga River basin have been oriented by the location of Lake Erie, the Cuyahoga River and the Ohio Canal. Historically, specific land uses were influenced by the availability of these bodies of water for supply and transportation. This orientation is still visible today; the basin remains largely in open space with most of the land away from the lakeshore and river banks into the headlands of the basin in open space, forest, agriculture or low density residential development.

The basin's most intensive industrial development is located in the lower basin on the banks of the Cuyahoga from the confluence of Big Creek (RM 7.30) to Lake Erie. Industry continues to be the predominant land use along the banks as far up the river as the I-480 bridge and Mill Creek (RM 11.5). Within the lower basin, industry occupies 12.2 percent of the land area.

The land use along the banks changes dramatically just a little further upstream. The Cuyahoga Valley National Recreation Area (CVNRA), wholly within the middle basin, begins nearby at RM 13.2 and continues for the next 22 miles. CVNRA is the largest park in the basin. The boundaries encompass 32,525 acres. As of October 7, 1991, the Recreation Area owned 17,114 acres. The Recreation Area plans to purchase approximately 5,000 more acres within its boundaries. The remaining land not owned but within the boundaries is considered to be in uses that are compatible with the purposes of the CVNRA.

These percentages are summarized in a 1977 Table of Land Uses which follows (Table 3-4). Since 1977, few changes in the distribution of land uses in the basin have occurred*. Possibly one to two percent of the land uses have changed, and this is most likely to be found in the conversion of grassland to low density residential use in southern Cuyahoga County.

Also a minimal change in the distribution has occurred with the conversion of abandoned warehouses to commercial uses, particularly in the area of the river along the banks close to the mouth, known as "The Flats". A preliminary review of the loss of vacant land in Cuyahoga County by traffic zones in the basin reveals that the large majority of traffic zones lost less than five percent of their vacant land from 1975 to 1990.**

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* Andy Vidra, Northeast Ohio Areawide Coordinating Agency, October, 1990.

** NOACA Zonal Database - Base Land Use File, 1991.

TABLE: 3–4

GENERAL LAND USE SUMMARY FOR THE CUYAHOGA RIVER BASIN

LAND USE CATEGORY	TOTAL ACRES IN THE ENTIRE BASIN	% OF ACRES IN THE ENTIRE BASIN	ACRES IN THE UPPER BASIN (All lands that drain to Lake Rockwell Dam)	% OCCUPYING THE UPPER BASIN	ACRES IN THE MIDDLE BASIN	% OCCUPYING THE MIDDLE BASIN	ACRES IN THE LOWER BASIN (From the confluence of Tinkers Creek with the Cuyahoga River)	% OCCUPYING THE LOWER BASIN
Grass and shrubland	37,865	7.8%	18,732	14.2%	16,480	6.4%	2,653	2.7%
Parkland	36,886	7.6%	3,272	2.5%	28,687	11.1%	4,927	5.1%
Agriculture	68,203	14.0%	40,396	30.6%	26,566	10.3%	1,241	1.3%
Urban vacant	7,578	1.6%	18	0.0%	3,742	1.5%	3,818	3.9%
Under construction	750	0.2%	38	0.0%	269	0.1%	443	0.5%
Intensive livestock operations	54	0.0%	0	0.0%	36	0.0%	18	0.0%
Forestland	130,046	26.7%	43,860	33.2%	72,260	28.1%	13,926	14.4%
Residential: < 1 D.U./acre	23,311	4.8%	8,011	6.1%	11,623	4.5%	3,677	3.8%
1–2 D.U./acre	42,149	8.7%	2,426	1.8%	28,251	11.0%	11,472	11.8%
4–10 D.U./acre	46,411	9.5%	337	0.3%	22,522	8.7%	23,552	24.3%
10–20 D.U./acre	2,217	0.5%	83	0.1%	1,015	0.4%	1,119	1.2%
> 20 D.U./acre	980	0.2%	0	0.0%	536	0.2%	444	0.5%
Outdoor recreation	6,248	1.3%	1,260	1.0%	3,920	1.5%	1,068	1.1%
Indoor recreation	221	0.0%	10	0.0%	167	0.1%	44	0.0%
Institutional and governmental	8,249	1.7%	466	0.4%	3,745	1.5%	4,038	4.2%
Utilities and communications	469	0.1%	26	0.0%	398	0.2%	45	0.0%
Trasnportation facilities	2,425	0.5%	237	0.2%	1,111	0.4%	1,077	1.1%
Industry, wholesale and storage	17,154	3.5%	305	0.2%	5,000	1.9%	11,849	12.2%
Streams, lakes & swamps	18,515	3.8%	10,053	7.6%	7,559	2.9%	903	0.9%
Landfills	752	0.2%	81	0.1%	315	0.1%	356	0.4%
Rail and utility rights of way	2,646	0.5%	201	0.2%	435	0.2%	2,010	2.1%
Mines and quarries	18,311	3.8%	1,755	1.3%	16,000	6.2%	556	0.6%
Major highway rights of way	6,251	1.3%	239	0.2%	3,019	1.2%	2,993	3.1%
Retail and offices	7,560	1.6%	195	0.1%	3,177	1.2%	4,188	4.3%
Regional shopping centers	949	0.2%	0	0.0%	486	0.2%	463	0.5%
Central business districts	246	0.1%	0	0.0%	223	0.1%	23	0.0%
Total (in acres)	486,446	100.0%	132,001	100.0%	257,542	100.0%	96,903	100.0%

Source: Northeast Areawide Coordinating Agency, 1977.

The primary land category in the basin is forestland (27 percent). The second largest land use is residential development (21 percent). Agriculture (14 percent) is third.

The Cleveland Metropolitan area is in the lower basin (See Figure 3-3). Residential development, which occupies 40 percent of the land in the lower basin is moderately dense (between 4 to 10 and 10 to 20 dwelling units per acre). Twenty-three percent (23%) of the lower basin is in forestland, grass or shrubland, water and wetlands, or parklands. The third largest land use is industry, at 12 percent of the lower basin.

The middle basin includes the City of Akron and its suburbs. About half of the middle basin (48 percent) is in forestland, grass or shrubland, water and wetlands, or parklands. Forested land occupies 28 percent of the middle basin, the largest single category. Low density residential development occupies the second largest area of land in the middle basin. Parkland and agriculture occupy the third largest land area.

In the upper basin there are an equal number of acres in agriculture and forestland. Together, these two categories occupy over half the upper basin. Several significant smaller cities, most notably Kent and Cuyahoga Falls, have growing suburbs, but the small amount of residential development is less than one dwelling unit per acre. Fifty-seven percent of the upper basin is in forest land, grass or shrubland, water and wetlands, or parklands.

3.3.2 <u>The Nearshore Study Area</u>

The six small sub-basins which drain directly to the nearshore area of the Cuyahoga RAP Area of Concern cover 69 square miles. Figure 3-9 shows the six sub-basins and the major Lake Erie tributaries draining them. Previously shown in Figure 3-4 are the communities which lie within the nearshore study area.

Approximately 30 percent of the land in the nearshore study area is used for high density residential development. Four of the twelve nearshore area communities have a population density greater than ten people per acre (Cleveland, East Cleveland, University Heights and Cleveland Heights). South Euclid, Shaker Heights and Lyndhurst have more than five people per acre.

Open space, suburban development (low density residential) and commercial development share roughly equal proportions of the nearshore study area, each around 20 percent of the total. The open space is concentrated in the three sub-basins which form the Euclid Creek watershed. There is a fair amount of open space in the Doan Brook watershed as well. Of the 20% of commercial development, much of its exists in the Cleveland portion of the nearshore study area. Euclid Creek and Doan Brook also have substantial amounts of commercial development.

The remaining 10 percent of the nearshore study area consists of highways, industrial development, and agriculture. Industrial development occurs on seven percent of the land in the nearshore area. Agriculture makes up less than one percent of the land use in the nearshore area.

These percentages are summarized in Table 3-5.

3.4 CURRENT LAND AND WATER USES

Presented here is the research provided by the Use Impairment Subcommittees on the extent to which the river and nearshore areas are used. The actual assessment of impairment to any of these beneficial uses is reported in Chapter 4.

3.4.1 Biota and Habitat

The river and nearshore in the Cuyahoga River Area of Concern are used by a spectrum of organisms in the various habitats created, from the sediment at the bottom of the river, up through the water column, to the banks and wetlands associated with the river.

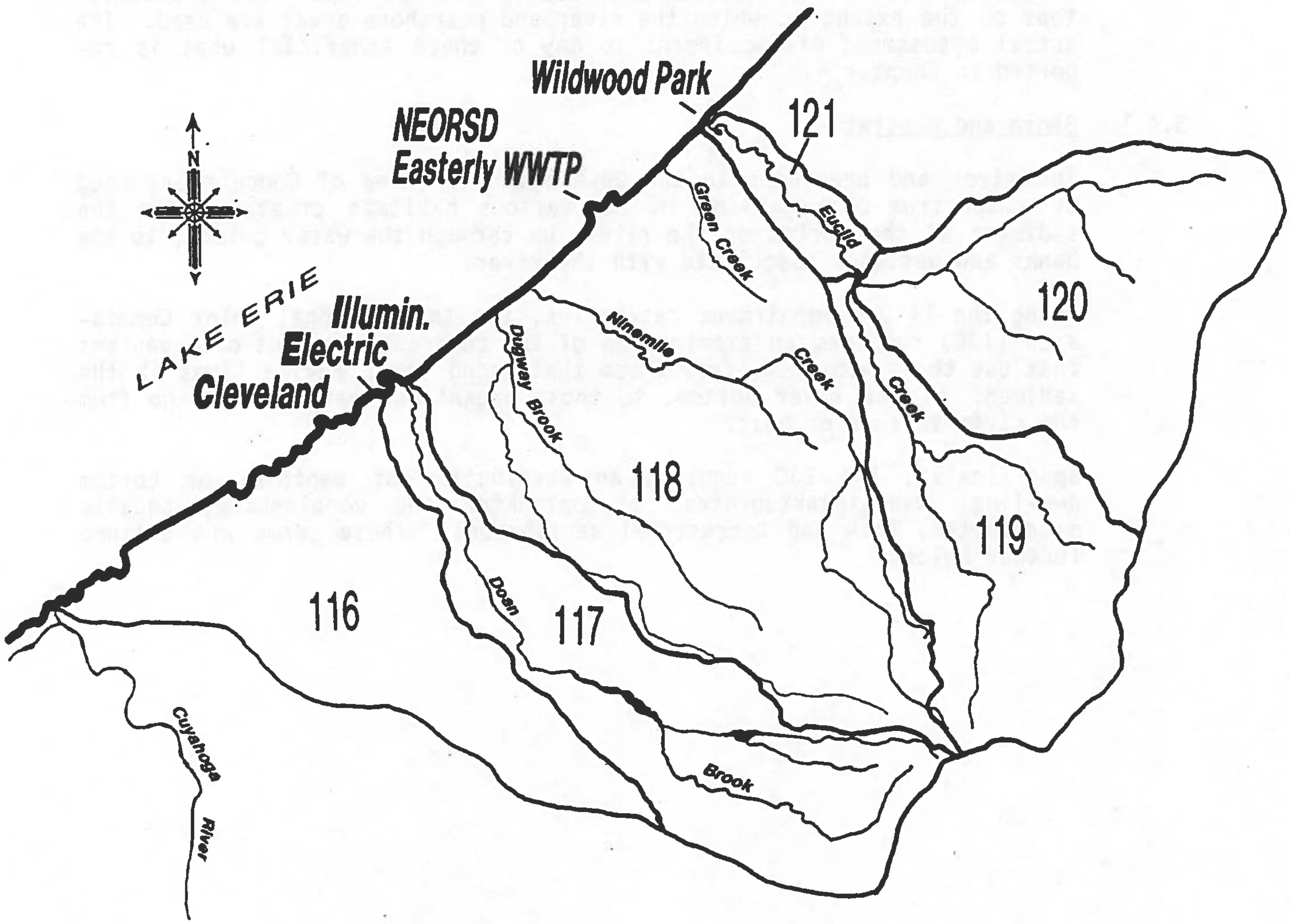
Among the 14 use impairment categories, the International Joint Commission (IJC) requires an examination of the comprehensive set of organisms that use these habitats, from those that spend their entire lives in the sediment on the river bottom, to those organisms that come and go from the river to feed or nest.

Specifically, the IJC requires an examination of benthic (or bottom dwelling) macroinvertebrates, phytoplankton and zooplankton, aquatic macrophytes, fish and terrestrial vertebrates. These terms are defined further below.

Figure: 3–9

NEARSHORE STUDY AREA
Major Tributaries & Sub–basins

(with NOACA numbering scheme)



116 – Cleveland
117 – Doan Brook
118 – East Cleveland
119 – West Branch, Euclid Creek
120 – East Branch, Euclid Creek
121 – Main Stem, Euclid Creek

TABLE: 3–5 GENERAL LAND USE SUMMARY FOR THE NEARSHORE PORTION OF THE STUDY AREA

LAND USE CATEGORY	TOTAL ACRES IN THE NEAR-SHORE AREA	% OF ACRES IN THE AREA	ACRES IN SUB-B 116 (CLEVELAND)	ACRES IN SUB-B 117 (DOAN BROOK)	ACRES IN SUB-B 118 (E. CLEVELAND)	ACRES IN SUB-B 119 (W. EUCLID)	ACRES IN SUB-B 120 (E. EUCLID)	ACRES IN SUB-B 121 (MAIN, EUCLID)
Rural noncrop (1)	9,545	22%	398	1,611	1,579	1,841	3,968	148
Agriculture	220	0%	0	10	0	0	210	0
Suburban (2)	8,949	20%	111	2,325	1,852	2,009	2,612	40
Urban Core (3)	13,783	31%	3,286	973	7,584	1,381	261	299
Industry	3,221	7%	1,608	57	1,153	104	93	207
Commercial (4)	7,674	17%	2,302	1,272	2,542	585	730	242
Major Highway ROW	649	1%	254	59	153	67	75	42
Mines/Quarries	0	0%	0	0	0	0	0	0
Landfills	113	0%	112	0	1	0	0	0
Total (in acres)	44,154	100%	8,071	6,306	14,863	5,986	7,950	978

(1) OPEN SPACE = grassland and shrubland, forestland, rural residential (<1 D.U./acre), parks, cemetaries, outdoor recreation, water, wetlands, and intensive livestock operations.
(2) SUBURBAN = urban vacant, under construction and single family residential (1–2 D.U./acre).
(3) URBAN CORE = single and two family residential (4–10 D.U./acre), multi-family residential (10–20 D.U./acre) and high density residential (>20 D.U./acre).
(4) COMMERCIAL = Indoor recreation, institutional and government, utilities and communications, transportation facilities, rail and utility R.O.W., retail and offices, regional shopping centers, and C.B.D.s.

Source: Northeast Areawide Coordinating Agency, 1977.

DEFINITION

Plankton	-	organisms generally microscopic, that float in bodies of water. "Zooplankton" refers to animal organisms and "phytoplankton" refers to plant organisms.
Benthos	-	all the plants and animals living in, on, or closely associated with the bottom of a body of water. "Benthic macroinvertebrates" refers specifically to those animal organisms with external skeletons that are large enough to see without the aid of a microscope, e.g., sludge worms.
Aquatic Macrophytes	-	those aquatic plants large enough to be seen without the aid of a microscope; "seaweed".
Fish	-	finned, gilled, vertebrates spending their entire life cycle in the water
Terrestrial Vertebrates	-	birds, reptiles and mammals; those organisms free to exist during at least parts of their life cycles out of the water.

The following text reflects the research done by the Cuyahoga RAP Coordinating Committee's Biota Impairments Subcommittee for each identified group of organisms. A brief summary is included here to introduce the environmental parameters investigated for the RAP. Appendix A includes the full detailed reports of this subcommittee.

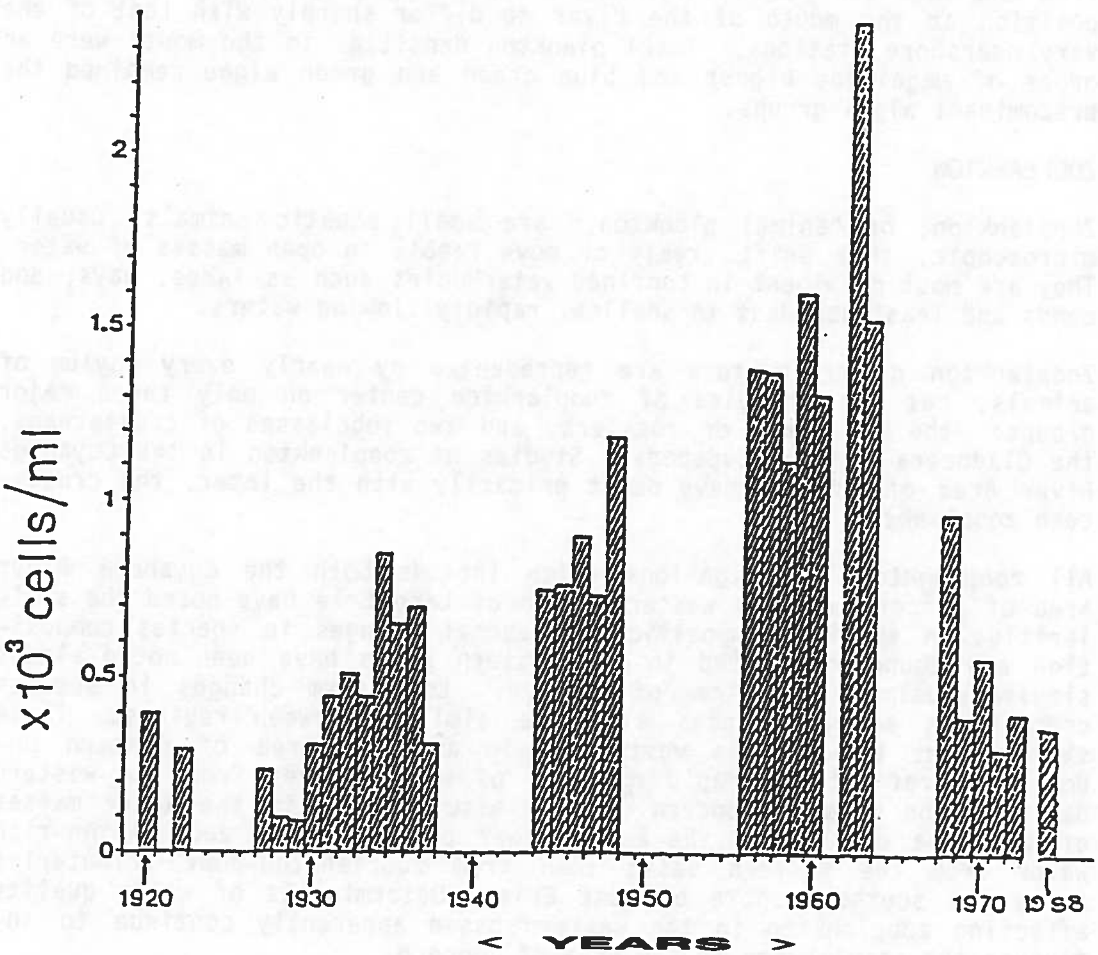
PHYTOPLANKTON

Phytoplankton is the portion of the plankton community composed of algae and cyanobacteria. Major taxa of importance include Chlorophyta, the green algae which possesses Chlorophyll a and Chlorophyll b; Chrysophyta, the major group in Lake Erie being Bacillariophyceae, the diatoms, and Cryptophyceae, the flagellates; and Cyanophyta, the prokayotic blue-green algae.

A very large and consistent increase in the total quantity of phytoplankton and a shift to eutrophic species associations in Lake Erie, including the offshore area of Cleveland, occurred between 1927 and 1964. Since 1983, however, basinwide blooms of algae have been absent, and the open lake phytoplankton have decreased in abundance (see Figure 3-10). Additionally, there has been a reversion to a somewhat more mesotrophic species composition.

Figure: 3–10

Annual Average Phytoplankton Densities In Lake Erie 1920 - 1972



Proceedings of the Conference on Changes in the Biota of Lakes Erie and Ontario

Figure 3-8. Annual average phytoplankton densities in Lake Erie samples collected between 1920 and 1972 from Cleveland's Division Avenue Filtration Plant (Davis 1964; Reitz 1973; from Nichols 1980). Also shown is average phytoplankton density from samples collected in 1988 from Cleveland's Baldwin Filtration Plant (Sgro 1990).

It is not apparent that the phytoplankton of the Lower Cuyahoga River, Cleveland Harbor and the nearshore area have shared in this recovery. The southern nearshore water of Lake Erie, including the Cleveland area, remains in eutrophic condition based on Secchi depth, average total particulate phosphorus and Chlorophyll-a concentrations (see Figure 3-11). The composition of the phytoplankton assemblages and the degree of eutrophication in the Area of Concern is not precisely known because of a lack of a current and consistent data set. There are no data available on phytoplankton above the mouth of the Cuyahoga River in the Area of Concern and no available data on phytoplankton inside the breakwall from the last ten years. A 1978-79 study found the phytoplankton composition at the mouth of the river to differ sharply with that of the very nearshore stations. Total plankton densities in the mouth were an order of magnitude higher and blue green and green algae remained the predominant algal groups.

ZOOPLANKTON

Zooplankton, or "animal plankton," are small aquatic animals, usually microscopic, that drift freely or move feebly in open masses of water. They are most prominent in confined waterbodies such as lakes, bays, and ponds and least abundant in shallow, rapidly flowing waters.

Zooplankton of freshwaters are represented by nearly every phylum of animals, but most studies of zooplankton center on only three major groups: the Rotatoria or rotifers, and two subclasses of crustaceans, the Cladocera and the Cepepoda. Studies of zooplankton in the Cuyahoga River Area of Concern have dealt primarily with the later, the crustacean zooplankton.

All zooplankton investigations which include both the Cuyahoga River Area of Concern and the western basin of Lake Erie have noted the similarities in species composition. Seasonal changes in species composition and abundances noted in the western basin have been noted almost simultaneously in the Area of Concern. Long term changes in species composition and abundances also are similar between regions. These similarities between the western basin and the Area of Concern undoubtedly reflect the rapid movement of water masses from the western basin to the Area of Concern.* They also reflect in the water masses of the Area of Concern the much larger proportion of zooplankton-rich water from the western basin than from zooplankton-poor tributaries along the southern shore of Lake Erie. Determinants of water quality affecting zooplankton in the western basin apparently continue to influence the zooplankton in the Area of Concern.

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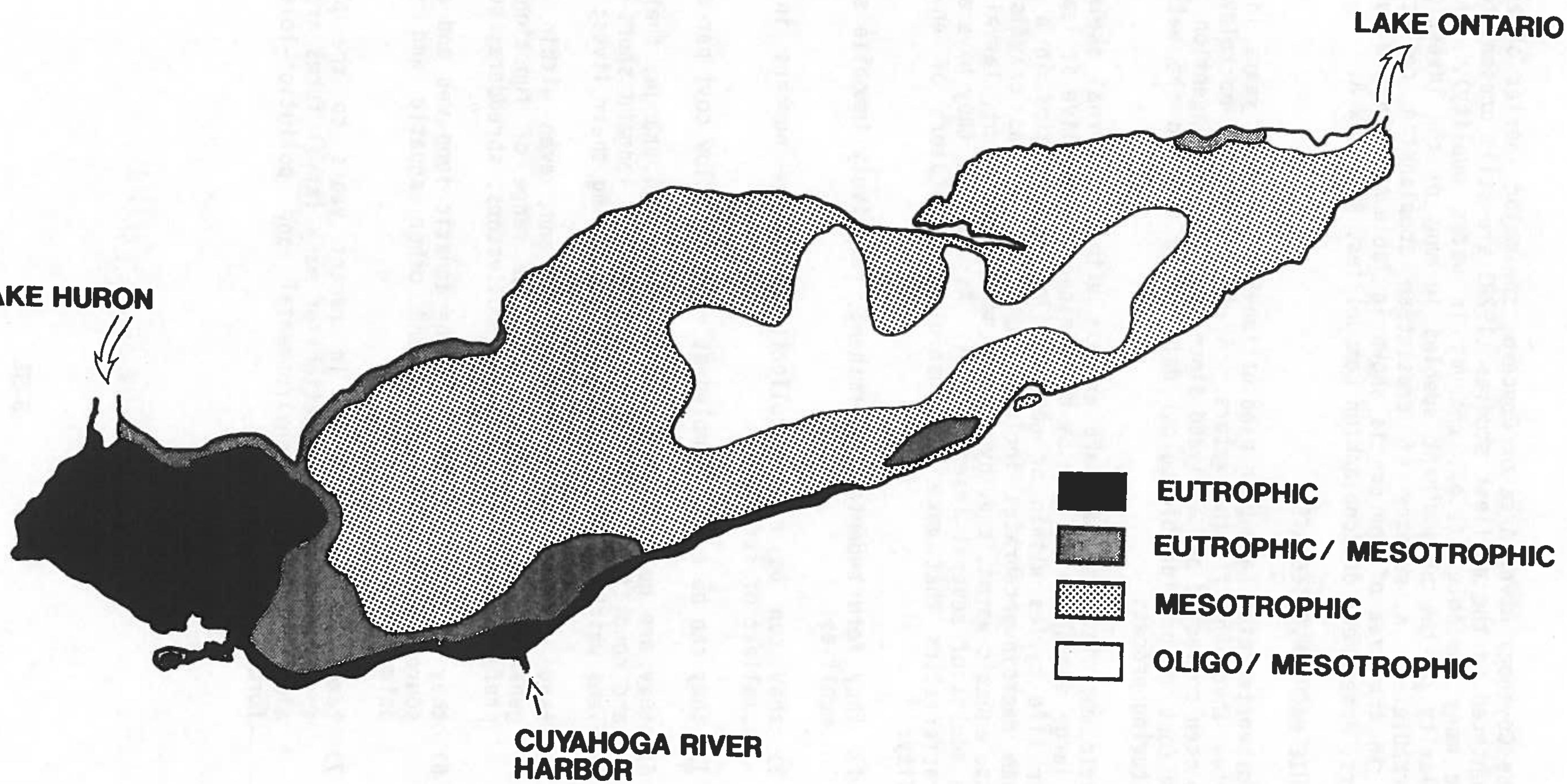
* John Olive, 1990. Assessment of Zooplankton Communities.

Figure: 3–11

LAKE ERIE: Trophic Status of Lake Regions



SOURCE: Herendorf (unpublished) in Kreiger, 1989

In the Cuyahoga River Area of Concern, the major species of zooplankton encountered in the earliest studies (1928) are still present today. Despite many variables (e.g., changes in water quality), "the overall similarity of the predominant species in many of the investigations is remarkable.*" A summary of crustacean zooplankton collected since 1950 in the Area of Concern is shown in Table A2-1 in the subcommittee report, Assessment of Zooplankton Communities, Appendix A.

BENTHIC MACROINVERTEBRATES

Macroinvertebrates have been used nationwide for many years in pollution studies involving flowing waters. At the Ohio EPA, macroinvertebrates have been collected and analyzed since the Agency's inception in 1973 in an effort to provide biological data to be used in the water quality monitoring process.

Aquatic macroinvertebrates are animals without internal skeletons that are large enough to be seen by the unaided eye and live at least part of their life cycles within or upon available substrates in a waterbody. Stream macroinvertebrates include organisms such as crayfish, snails, clams, aquatic worms, and, by far the most predominant, larval forms and some adults of several insect orders. As a group, they have a number of characteristics that make them useful as indicators of environmental quality:

1) they form sedentary, permanent, relatively immobile stream communities;

2) they can be easily collected in large numbers in even the smallest of streams;

3) they can be easily sampled at relatively low cost per sample;

4) they are quick to react to environmental change; their presence and conditions at a site would reflect longand short-term problems which may have occurred there during their lives;

5) they occupy all stream habitats and, even within family and generic groupings, display a wide range of functional feeding preferences (i.e., predators, collectors, shredders, scrapers);

6) they inhabit the middle of the aquatic food web and are a major source of food for fish and other aquatic and terrestrial animals; and

7) taxonomy has developed in recent years to the point where species level identifications of many larval forms are available along with much environmental and pollution-tolerance information.

Benthic macroinvertebrates in Lake Erie include a diverse assemblage of animals. Historically in the central basin the most abundant groups have been the oligochaete worms, midges, and fingernail and pill clams. Macroinvertebrates are important to the ecology of Lake Erie as processors of organic materials on the lake bottom and as a food resource for many fish species.

The benthic macroinvertebrate community in the 1970s indicated the existence of strongly degraded conditions in the harbor and moderately degraded conditions offshore, apparently in response to organic enrichment, although other factors such as low dissolved oxygen in the summer may have played a role. One would have found decreased species diversity and an over-abundance of a few enrichment-tolerant species, primarily oligochaetes at that time.

In the late 1980s, the macroinvertebrate community indicated some improvement in water and sediment quality in the harbor as well as offshore. The evidence is not clear-cut, however, and future surveys on population composition, abundance, and distribution will be needed to confirm that a trend toward a clean-water benthic community is indeed underway.

In the Cuyahoga basin, macroinvertebrate community monitoring has been conducted for ten years at Old Rockside Road in Independence (RM 13.0). Macroinvertebrates have been collected eleven times from 1977 to 1989 at two different sites located within 2.5 miles of this location: Stone Road (RM 14.2) 1977-83, and Hillside Road (RM 15.6) 1984-89. Sampling has been conducted every year for the period of record except 1981 and 1985.

Substantial improvement in the biological health of the Cuyahoga River macroinvertebrate community has occurred in the past few years. During the last three years, communities have prevailed that are similar to warmwater habitat faunas found throughout Ohio in moderately sized streams and rivers.

AQUATIC MACROPHYTES

Algae and macrophytes have not been surveyed in the Cuyahoga River since 1969. At that time there was evidence that the algal and macrophyte species diversity in most of the river below Kent was reduced.

The following conditions were reported in 1969:

Lake Rockwell to Kent Waste Water Treatment Plant upstream of the Area of Concern--six species of aquatic vascular plants and 15 species of algae were found.

Kent WTP to Munroe Falls Dam, upstream of the Area of Concern--in the Kent WTP pool there were frequent algae blooms. No macrophytes were found at the Middlebury Road launching ramp (RM 52-63). Elodea, Lemna, Wolffia, and Sagittaria were found at the Munroe Falls dam.

Akron WTP to Furnace Run--only one species of algae was found.

Canal Diversion dam to Southerly WWTP--the blue-green alga, Oscillatoria, was the only species found.

FISH

Between 1984 and 1988, a considerable improvement occurred in the fish communities in the Cuyahoga River. In 1984, 8,932 fish representing 47 species and 4 hybrids were found in the 49 miles of river sampled. In 1988, 11,972 fish representing 46 species and 11 hybrids were found in the 27 miles sampled. Figure 3-12 compares the number of fish per km over the course of the river and improvements from 1984 to 1988. From this figure, one can see that at almost every point sampled the number of fish found per km is greater in 1988 than in 1984.

FISH HABITAT

Ohio Edison Dam to Peninsula (RM 45.1-26.7): This segment includes a variety of instream habitats. Immediately downstream from the Ohio Edison Dam, the Cuyahoga River flows through a high gradient gorge. The stream has eroded the channel down to bedrock yielding a bed with reduced habitat diversity. This area also receives heated effluent from the Ohio Edison Gorge Powerplant. The stream channel downstream from the Cuyahoga Street in Akron has more natural characteristics with established riffle, pool, run sequences. The substrate includes boulders, cobble and gravel. There is extensive to moderate amounts of stream cover, fast currents and eddies, and maximum pool depths exceeding 40 cm.

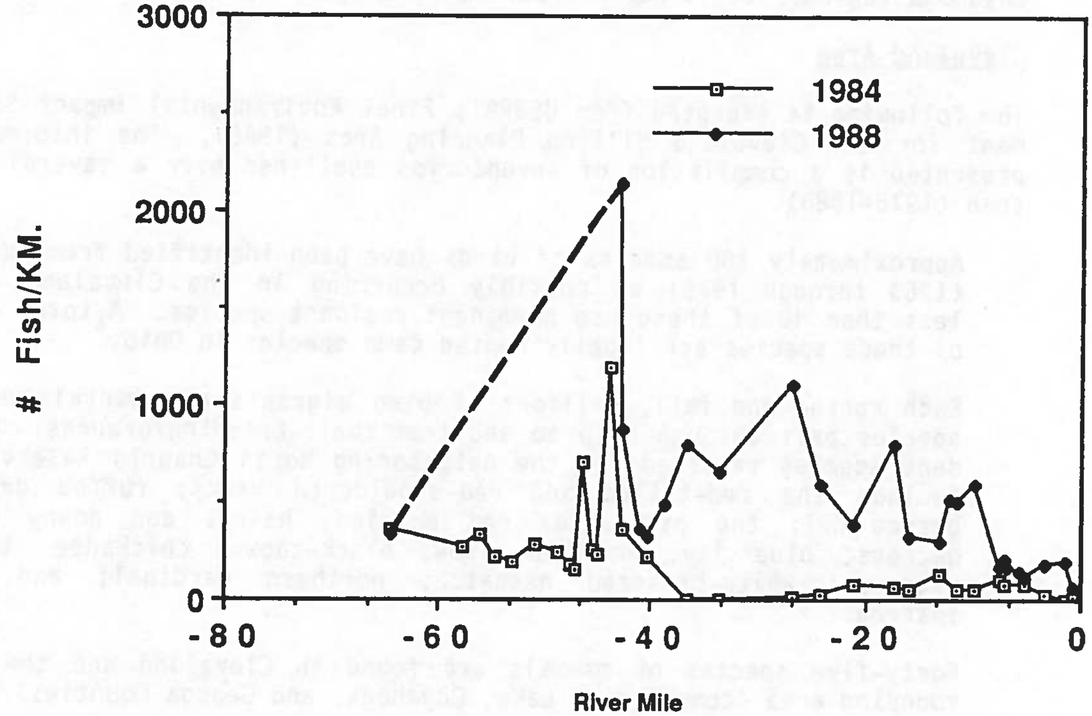
Peninsula to Southerly WWTP (RM 24.1-9.8): In this section of the river can be found heavy to moderate silt cover, sand substrates, and lack of fast current. This segment still meets Ohio EPA's Warmwater Habitat use designation using Ohio's Qualitative Habitat Evaluation Index.

River Mile 7.5 - 7.1: This short segment coincides with the approximate location where the Cuyahoga River flows from the glaciated plateau onto the lake plain and includes the upstream extent of the area influenced by the level of Lake Erie. This transition results in a replacement of glacially deposited sediments with lake deposited sediments as the dominant substrate and a decrease in stream gradient. There is heavy to moderate silt cover sand substrates and the absence of a fast current. This segment still meets Ohio EPA's Warmwater Habitat use designation using Ohio's Qualitative Habitat Evaluation Index.

Navigation Channel: (RM 5.6 to the mouth). In this segment there is reduced habitat diversity, sheet piling, concrete bulkheads, rip rap along the shoreline, etc., maintenance dredging activities and turbulance and sediment resuspension caused by freighters using the navigation channel. These man-made alterations to the river's habitat preclude the attainment of a warmwater habitat fish community.

Figure: 3-12

Longitudinal Trends In The Relative Abundance (#Fish / km.) Of Fish Collected From The Cuyahoga River Mainstream During 1984 & 1988



SOURCE: Ohio EPA, 1990

Nearshore Area: Cleveland Harbor can be characterized into a number of microhabitats, each favored by certain fish species. Available microhabitats can be classified as "open harbor" or "protected" areas. The area opposite the Cleveland Electric Illuminating power plant would typify an open harbor habitat. The protected areas are those such as the Edgewater Marina the East Ninth Street Dock area.

WILDLIFE AND WILDLIFE HABITAT

This section is intended to characterize the present wildlife in the Cuyahoga region. It is not a report on the wildlife trends.

Cleveland Area

The following is exerpted from USEPA's Final Environmental Impact Statement for the Cleveland Hilltop Planning Area (1988). The information presented is a compilation of inventories published over a several year span (1978-1986).

> Approximately 180 species of birds have been identified from surveys (1969 through 1978) as possibly occurring in the Cleveland area; less than 40 of these are permanent resident species. A total of 27 of these species are legally hunted game species in Ohio.*
>
> Each spring and fall, millions of bird migrants of several hundred species pass through Ohio to and from their breeding grounds. Resident species reported for the neighboring North Chagrin Reservation include the red-tailed and red-shouldered hawks; ruffed grouse; barred owl; the pilleated, red bellied, hairy, and downy woodpeckers; blue jay; American crow; black-capped chickadee, tufted titmouse; white-breasted nuthatch; northern cardinal; and song sparrow.**
>
> Forty-five species of mammals are found in Cleveland and the surrounding area (composed of Lake, Cuyahoga, and Geauga Counties).***

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* NEORSD. 1978a. Northeast Ohio Regional Sewer District. Easterly Separate Sewer Segment Wastewater Facilities Plan. volume 1 - Environmental Inventory and Assessment. Prepared by: CH_2M Hill. Project No. L10950.

** Thomson. 1983. Birding in Ohio. Indiana University Press, Bloomington, Indiana. pp. 256.

*** Gottschang. 1981. A Guide to the Mammals of Ohio. Ohio State University Press. pp. 176.

TABLE: 3-6 Mammals with Known Ranges in the Vicinity of Cleveland, Ohio

	Didelphis virginiana	Virginia Opossum
	Sorex cinereus	Masked Shrew
	Sorex fumeus	Smoky Shrew
(a)	Blarina brevicauda	Short-tailed Shrew
	Cryptotis parva	Feast Shrew
	Parascalops breweri	Hairy-tailed Mole
	Scalopus aquaticus	Eastern Mole
	Condylura cristata	Star-nosed Mole
(a)	Myotis lucifugus	Little Brown Bat
	Myotis keenii	Keen's Bat
	Myotis sodalis	Indiana Bat
	Lasionycteris noctivagans	Silver-haired Bat
	Pipistrellus subflavus	Georgian Bat
(a)	Eptesicus fucus	Big Brown Bat
	Lasiurus borealis	Red Bat
	Lasiurus cinereus	Hoary Bat
	Sylvilagus floridanus	Eastern Cottontail
	Jamias striatus	Eastern Chipmunk
	Marmota monax	Woodchuck
	Sciurus carolinensis	Gray Squirrel
	Sciurus nigli	Fox Squirrel
	Tamiasciurus hudsonicus	Red Squirrel
	Glaucomys volans	Southern Flying Squirrel
	Castor Canadensis	Beaver
(a)	Peromyscus maniculatus	Deer Mouse
(a)	Peromyscus leucopus	White-footed Mouse
(a)	Microtus pennsylvanicus	Meadow Vole
	Microtus pinetorum	Woodland Vole
	Ondatra zibethicus	Muskrat
	Synaptomys cooperi	Southern Bog Lemming
	Rattus norvegicus	Norway Rat
	Mus Musculus	House Mouse
	Zapus hudsonius	Meadow Jumping Mouse
(b)	Napaeozapus insignis	Woodland Jumping Mouse
	Canis latrans	Coyote
(a)	Vulpes vulpes	Red Fox
(a)	Urocyon cenereoargenteus	Gray Fox
(a)	Procyon lotor	Raccoon
(b)	Mustela erminea	Ermine
(a)	Mustela nivalis	Least Weasel
(a)	Mustela frenata	Long-tailed Weasel
(a)	Mustela vison	Mink
(b)	Taxidea taxus	Badger
(a)	Mephitis mephitis	Striped Skunk
	Odocoileus virginianus	White-tailed Deer

(a) indicates mammal is very common in the area
(b) indicates the mammal is at the edge of its range in the area

Source: Developed from Gottschang 1981

These species are listed in Table 3-6. A list of 12 salamander, 11 frog and toad, and 13 reptile species of probable occurrence within the "study area" was compiled during the 1978 survey.* Animals associated with the various terrestrial habitats found are reviewed below.**

In the old field habitat, birds regularly observed were flickers, robins, field sparrows, song sparrows, and juncos. During the late spring, black racer snakes will enter similar old fields to sun, and box turtles use these fields to nest. Woodchucks also feed in these types of fields, and voles will favor those areas where vegetation is matter.***

The tangled understory of the brushland communities impedes the movement of large animals, creating a competitive advantage for small-and medium-sized animals. Cottontail rabbits were observed, and opossums and woodchucks were assumed to be present based on numerous burrow sightings and their known habitat preferences. The presence of foxes was ascertained by observation of tracks. Birds observed in brushland habitat include towhees, cardinals, darkeyed juncos, and sparrows. Warblers may use the habitat for breeding in the summer. Other summer residents include at least one species of lizard, several species of harmless snakes, and the box turtle.***

The forested areas provide the greatest diversity of habitat for animals. Fallen limbs and trunks provide the greatest diversity of habitat for animals. Fallen limbs and trunks provide cover for several species of salamanders. Box turtles hibernate in ravines. Holes in tree trunks are used as nesting sites for owls, squirrels, and raccoons. Woodpeckers utilize the trunks for nesting and feeding. Songbirds present in the forest habitat include titmice, fly catchers, creepers, nuthatches, and thrushes.****

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* NEORSD. 1978a. Northeast Ohio Regional Sewer District. Easterly Separate Sewer Segment Wastewater Facilities Plan. volume 1 - Environmental Inventory and Assessment. Prepared by: CH_2M Hill. Project No. L10950.

** Havens and Emerson, Inc. 1986. Hilltop EIS Assistance Project: Survey of Route Description and Construction Effects for the Hilltop Interceptor Alternative. Prepared in Cooperation iwth the Northeast Ohio Regional Sewer District, for review in the Hilltop Area Public Advisory Committee.

*** Havens and Emerson, Inc. 1984. Hilltop Update Review: Hilltop Interceptor Review - Environmental Considerations. Prepared for: Northeast Ohio Regional Sewer District, Cleveland, Ohio.

**** ibid.

Cuyahoga Valley National Recreation Area

"Animal life in the CVNRA is stimulated by the diverse successional communities which arise as agricultural lands are abandoned. Since before 1900, the valley has become increasingly forested. Typical mammals are white-tailed deer, red fox, opossum, raccoon, and muskrat. Amphibians, reptiles, birds, and myriad insects have also been observed and cataloged. In recent years, beaver were repopulated many of the floodplain wetland areas."*

The following is exerpted from a wildlife survey of the Cuyahoga Valley National Recreation Area (1983) by Mssrs. Orr, Mazzer and Waller:**

> An inventory of the amphibians, reptiles, birds, and mammals of the Cuyahoga Valley National Recreation Area (CVNRA) in northeastern Ohio was prepared through field studies from the summer of 1982 to the fall of 1983 and from CVNRA and literature records. Extensive collecting efforts were directed toward habitats thought to support rare and endangered species.
>
> The 19 amphibians recorded for the CVNRA included 10 salamander species, 1 toad species, and 8 frog species. The Spotted Salamander (Ambystoma maculatum) was a new addition to species lists prepared by previous investigators. Included in the herpetofauna is one endangered species, the Spotted Turtle (Clemmys guttata) and two rare species that have been classified as "special Animals" by the Ohio Natural Heritage Program, the Smooth Green Snake (Opheodrys vernalis) and the Red-eared Slider (Pseudemys scripta).
>
> Thirty-one species of mammals were documented as being found within CVNRA boundaries. Although this inventory is thought to be relatively complete, future collecting may yield such species as Keen's Myotis (Myotis keenii), the Silver-haired Bat (Lasionycteris noctivigans), the Hoary Bat (Lasiurus cinereus), the Eastern Pipistrelle (Pipistrellus sabflavus), the Pine Vole (Microtus pinetorum), the Southern Bog Lemming (Synaptomys cooperi), the Deer Mouse (Peromyscus maniculatus) and the Coyote (Canis latrans).
>
> A literature survey plus field research in this study indicates that 150 breeding bird species are found within the CVNRA including 110 regular and 40 irregular species. One-third of these species were found in forested habitats, one-third depended on wet meadow habitats, and one-third were highly dependent on habitats such as oldfields and suburban areas created by disturbances. Because the wetland and disturbances habitats do not share many species in common, one-third of all CVNRA species are highly dependent on these last two habitats together. Of the 150 summer CVNRA species, 104 were encountered and observed in the field during this study.

---

* From Statement for Management, CVNRA National Park Service, United States Department of the Interior, November, 1991.

** Masser, Orr and Waller. 1984. "Wildlife Survey of the Cuyahoga Valley National Recreation Area (CVNRA)."

Noteworthy bird species whose presence in the CVNRA may be considered encouraging and of special interest include the Wood Duck, Turkey Vulture, Broad-winged Hawk, Spotted Sandpiper, Yellow-billed Cuckoo, Belted Kingfisher, Eastern Phoebe, Bank Swallow, Northern Rough-winged Warbler, Praire Warbler, Louisiana Waterthrush, Hooded Warbler, and Yellow-breasted Chat. Twelve bluelisted species which are considered as regular species in the CVNRA are the Least Bittern, American Bittern, Sharp-shinned Hawk, Red-shouldered Hawk, King Rail, Ruby-throated Hummingbird, Hairy Woodpecker, Eastern Meadowlark, and Grasshopper Sparrow. Of these, the King Rail, an endangered species in Ohio, was observed in this study.

3.4.2 Recreation

This section opens with an historical review of recreation in the area. Following this is a presentation of recreational use data. For a more detailed account, refer to Appendix D of this report.

During the first one hundred years or so of use by settlers, the Cuyahoga River was considered to be only a "working" river. The fact that it was covered with oil and other pollutants verified its importance as a transportation medium, disposal conduit and raw material source for industries concentrated on its banks.

The dark brown color of the water which flowed in the early 1900's indicated that it was successfully serving man. Few were interested in using it for recreation.

The lakeshore was similarly ignored for many years. Moses Cleveland (the leader of the settlement party that founded Cleveland) actually set aside an area for public ownership and pleasure. Known as Public Square, this was a commons, reminiscent of New England, though it was located several blocks from the shoreline. This precedent of "looking inland" for public recreation and parkland was to continue until the late 1800s. During this period, shipping and railroads dominated the shorelands.

In 1893, William R. Gordon donated his estate to the City of Cleveland, and Gordon Park was opened. Then in 1936 two square miles of the downtown, including a portion of the lakeshore (actually a landfill and public dump), were used for the Great Lakes Exposition. This continued into 1937, attracting seven million people. Coincidentally 1936 was the first year the Cuyahoga River was reported to have caught fire.

Several planning efforts attempted to open portions of Cleveland's waterfront for public recreation and open space. In 1891 the Park and Boulevard Association considered a park and lakeshore drive system, but nothing happened. In 1941 another group of civic leaders debated other shoreline facilities for recreation. Nothing came of this effort either. A 1949 plan called for expanding Gordon and Edgewater Parks, and a series of regional planning studies followed from 1959 to the early seventies.

During the mid 20th Century, citizens in and around Akron recognized the importance of their riverfront. Gorge, Sand Run and Deep Lock Quarry Metropolitan Parks were all established along the Cuyahoga River between 1929 and 1934.

In 1974, Congress authorized the establishment of the Cuyahoga Valley National Recreation Area (CVNRA). This was the first national recognition of the importance of the river lands, and the park would eventually encompass over 30,000 acres along 22 miles of the river between Akron and Cleveland.

In 1978, the Ohio Department of Natural Resources (ODNR) leased five Cleveland City park areas and assumed their management responsibility. The five city parks, now known as Cleveland Lakefront State Park, included Edgewater Park, East 55th Street Marina, Gordon Park, Euclid Beach and Wildwood Park. In 1979, Cleveland Lakefront State Park was completed, and in 1987 the Cleveland Waterfront Master Plan Update was finalized. The state has since participated in development of the North Coast Harbor on the lake, and future plans call for involvement at Whiskey Island and Nicholson Terminal on the lake and the Flats Oxbow on the river.

The City of Cleveland, in its 1988 plan entitled Cleveland Civic Vision 2000 Downtown Plan, recognized the value of recreation and open space. The plan includes major elements focusing on the river and waterfront.

3.4.2.1 Recreation Facilities

Recreation facilities, whether developments or simply open space, are the link between the public and desirable water-based recreational activities. Fortunately, the Area of Concern possesses a variety of public and private facilities to help meet the demand for water-oriented recreation. More are planned for the near future and the potential exists for others.

Existing, planned and potential recreation facilities which are dependent on or immediately adjacent to the river or lake are discussed below. Similar types are grouped together for ease of discussion.

BOATING FACILITIES

Facilities presently found on the river are intended to serve the lake and are quite close to it. Existing facilities are summarized in Table 3-7.

Considering the numbers of facilities existing or planned, a great deal of unmet demand for boating probably exists in the Area of Concern. Space along both the river and nearshore area is presently limited by other land uses, which is primarily industrial in nature. However, the potential for additional boating support facilities exists.

Table 3-7

Existing Boating Facilities

Site	Launch Ramp	Boat Slip*	Boat Hoist
Edgewater Park	8	6	
Edgewater Yacht Club		370	2
Edgewater Marina		292	1
Channel Park Marina		406	1
Dugway Creek Yacht Club		9	
North Coast Harbor		60	
Lakeside Yacht Club			1
Forest City Yacht Club		161	1
Gordon Shore Boat Club		9	1
East 55th Street Marina		337	
Inner City Yacht Club		144	
Gordon Park	6	4	
Northeast Yacht Club	1	165	1
Wildwood Park	6		
Wildwood Yacht Club		70	
Commodore's Club Marina		1,200	1
Riverfront Yacht Club		20	
Old River Yacht Club		193	
Marina Bay		60	
Totals	21	3,648	9

*including rack storage

SWIMMING BEACHES

The only public swimming beaches in the Area of Concern are at Euclid and Edgewater, units of the Cleveland Lakefront State Park. White City Beach is no longer used. Some private community beaches are located east of Bratenahl. Expansions are planned for both public beaches in the near future.

One potential beach location which has been identified is at the Nicholson Terminal on Lake Erie near Gordon Park. Changes in land uses or creation of land by filling areas could potentially open other areas for beach use.

FISHING FACILITIES

Fishing can occur, informally, anywhere publicly owned land allows access to the water or where private owners do not restrict the use of their property. These access points are difficult, if not impossible, to quantify. Research is needed to provide better information on these facilities.

There are several public areas where fishing is encouraged and provided for in the Area of Concern. Facilities include piers, breakwalls or shorelines which anglers can use along with parking and/or restrooms. These are summarized in Table 3-8. These are all located in either the upper end of the Area of Concern or on the lakeshore. Over twenty miles of the river between Peninsula, Ohio (RM 29.7) and the mouth have no fishing access provided.

Table 3-8

Existing Fishing Facilities

Site	Pier	Breakwall	Shoreline
Edgewater Park	1,000'	3,000'	
Goodtime Boat Pier	1,000'		
East 9th Street Pier	1,100'		
Cleveland Mun. Light Plant			500'
Forest City Yacht Club			500'
East 55th Street Marina		3,000'	
C.E.I. Water Discharge		300'	
Gordon Park	1,000'		
Wildwood Park		900'	3,000'
Deep Lock Quarry			1,000'
Cascade Valley Metro. Park			5,280'

As previously suggested, fishing can occur anywhere water can be accessed. The National Park Service manages over 22 miles of the Cuyahoga River in CVNRA which provide public access for fishing. Facilities such as parking lots or small fishing piers could be provided to help meet additional demand, if recognized. Potential for increased access exists elsewhere throughout the Area of Concern.

TRAIL FACILITIES

All existing trails in the Area of Concern are adjacent to the Cuyahoga River. These are located upstream of RM 13 which is approximately the downstream end of Cuyahoga Valley National Recreation Area. Lengths and uses of these are shown in Table 3-9.

Table 3-9

Existing Trail Facility Summary

Site	Hiking	Equestrian	XXSkiing	Bicycling
Cuyahoga Valley N.R.A.	17.2 mi.	X	X	X
Cleveland Metroparks	3.2 mi.	X	X	X
Deep Lock Quarry	14.4 mi.			
Cascade Valley	3.4 mi.			
Gorge Metro. Park	3.6 mi.			

"X" indicates that a trail or portion of it will be used for multiple activities.

Obviously, the potential for additional trails throughout the Area of Concern is almost limitless. The most apparent gap in the recreation and trails system exists between RM 13 and 2. This is the area from the northern boundary of Cuyahoga Valley National Recreation Area to the Flats in the downtown.

This 9-mile segment of the river is heavily industrialized. Significant open space exists but is not publicly accessible, particularly between Harvard Avenue (RM 7.1) and Warner Road. This open space must be made accessible before the potential of this portion of the river can be exploited for recreational use.

ACTIVE SPORTS FACILITIES

There are a number of facilities for active sports near enough to the lake or river to be impacted by water quality conditions. These are summarized in Table 3-10.

Table 3-10

Existing Sports Facilities

Site	Sports Fields	Tennis Courts	Golf	Ice Skating
Gordon Park	7B,2F,2S*			
Brandywine Country Club			1RP	
Pine Valley Sports			1D,1P	
Valley View Golf Club			3R	
Cascade Valley	2B			
Gorge Metro. Park				1

* Numbers show existing facilities. B=Baseball Diamond, F=Football Field, S=Soccer Field, D=Driving Range, P=Putt-putt Golf, RP=Par 3 Golf, and R=9 Hole Golf Courses.

No plans for additional athletic facilities in the Area of Concern have been identified. Similarly, no discussions of potential developments have been noted. However, as always, any open space has the potential for development for such endeavors.

PASSIVE PURSUITS

Passive recreation which occurs in the Area of Concern includes dining in outdoor restaurants, riding cruise ships and picnicking. Special events such as the Riverfest sponsored by B.P. America, car races and sailing regattas commonly occur on public lands and waters in the Area of Concern. In addition, the parkland or open space allows many passive pursuits such as viewing the scenery, observing wildlife or simply being outdoors. Identified facilities which provide for such activities are listed in Table 3-11.

Table 3-11

Summary of Facilities for Passive Activities

Site	Parkland	Outdoor Dining
Cleveland Lakefront State Park	435 acres	
Private Marinas and Yacht Clubs	X	
Cleveland Mun. Light Pier	X	
C.E.I. Water Discharge	X	
Cuyahoga River/Flats		13 restaurants
Settler's Landing	1 acre	
Heritage Park I	1 acre	
Heritage Park II	1 acre	
Cuyahoga Heights Park	<1 acre	
Columbus Road Park	<1 acre	
Cuyahoga Valley N.R.A.	33,000 acres	
Cleveland Metroparks	4,878 acres	
Cascade Valley	89 acres	
Gorge Metro. Park	205 acres	

Future plans for the Area of Concern include tours on a rail trolley and purchase of additional open space. Areas where open space would be acquired or expanded include Whiskey Island, the Flats/Oxbow, and Wildwood Park. In addition, expansion of open-air dining facilities in the Flats area is expected.

3.4.2.2 Recreational Use Data

Some recreational use data for the Cuyahoga River Area of Concern is available. Estimates of trail use in the Cuyahoga Valley National Recreation Area have been generated by counting cars parked at trailheads. In 1988, at least 200,000 people used the trails in CVNRA. To present an overview of other types of recreation in the Area of Concern, regional data are used. The best and most currently available data are presented below (Table 3-12).

Table 3-12

Summary of Annual Use at Cleveland Lakefront State Park

Activity	Numbers of Participants
Boating	188,000
Swimming	275,000
Fishing	435,000
Viewing Scenery and Wildlife	6,000,000

SOURCE: 1986 Ohio Statewide Comprehensive Outdoor Recreation Plan

3.4.3 Socio-Economic Information

The Socio-economic Subcommittee was initially created to address issues in the basin of water supply and industrial uses of riverwater for processing and cooling. The scope of the committee has expanded to address issues of aesthetics, dredging, and industrial and commercial use of the navigation channel, and any other economic or social status that is a result of the current condition or uses of the river.

The total population of those governmental units (within Cuyahoga, Geauga, Summit and Portage Counties) that lie partially or wholly within the Cuyahoga River basin or the eastern Lake Erie direct basin draining into the Area of Concern is approximately 1,678,000. Those governmental units of Cuyahoga County contribute sixty-six percent of the total population, or roughly 1,169,000 people. Twenty-five percent of the basin's population lives in Summit County, seven percent in Portage and two percent in Geauga.

Table 3-13 summarizes the changes in population from 1980 to 1990 in each of the jurisdictions making up the Cuyahoga basin and Cleveland East basin. The density of population (persons per acre) in any given governmental unit is also displayed where data were available. The population of the basin declined from 1980 to 1990 by 3.8 percent.

Both Cleveland and Akron have central business districts located near their riverside or lakeside industrial areas. The older business districts of the region's smaller communities also tend to be adjacent to the river, with new suburban and strip-type development occurring away from the river.

Recently, several areas in Cleveland's industrial valley, particularly in "The Flats", have been redeveloped for commercial use. The presence of the river and lakeshore has been a significant factor in this development which includes open-air riverside dining areas, specialty shops (in, for example, the case of Public Square in the Central Business Dis- trict which overlooks the river), marinas, boat liveries and many yacht clubs.

The Cleveland and Akron Metropolitan areas are homes to distinctive industrial communities. Cleveland's industrial base has historically been comprised of steel manufacturing, metal fabricating, non-electrical machinery, and transportation equipment (including autos). Akron is best known for and continues to be dominated by rubber and plastics industries. Older industrial facilities along the Cuyahoga, originally requiring large amounts of water for power or cooling, are located directly on the river banks. Heavy industry areas in Cleveland are concentrated near Lake Erie and the Cuyahoga Valley's dock facilities. Almost the entire length of the lower Cuyahoga River's banks (from Tinkers Creek to the mouth) currently supports industrial uses.

TABLE: 3–13

CUYAHOGA RIVER REMEDIAL ACTION PLAN
POPULATION CHANGE (1980–1990) AND POPULATION DENSITY OF THE CUYAHOGA AOC

JURISDICTION	ACRES	APPROX % AREA OF BASIN	POPULATION 1980	POPULATION 1990	PERCENT CHANGE In population from 1980 to 1990	1990 POP–DENSITY People/acre
CUYAHOGA COUNTY						
BEACHWOOD CITY	2,823.81	1.48%	9,983	10,677	7.0%	3.8
BEDFORD CITY	3,050.50	1.60%	15,056	14,822	–1.6%	4.9
BEDFORD HEIGHTS	2,763.00	1.45%	13,214	12,131	–8.2%	4.4
BRATENAHL VILLAGE	643.07	0.34%	1,485	1,356	–8.7%	2.1
BRECKSVILLE CITY	12,650.42	6.63%	10,132	11,818	16.6%	0.9
BROADVIEW HEIGHTS CITY	8,000.56	4.19%	10,920	12,219	11.9%	1.5
BROOKLYN CITY	2,712.77	1.42%	12,342	11,706	–5.2%	4.3
BROOKLYN HEIGHTS VILLAG	1,171.69	0.61%	1,653	1,450	–12.3%	1.2
BROOKPARK CITY	4,823.84	2.53%	26,195	22,865	–12.7%	4.7
CLEVELAND CITY	49,547.41	25.97%	573,822	505,616	–11.9%	10.2
CLEVELAND HEIGHTS CITY	5184.52	2.72%	56,438	54,052	–4.2%	10.4
CUYAHOGA HEIGHTS VILLAG	2,107.82	1.10%	739	682	–7.7%	0.3
EAST CLEVELAND CITY	2,005.31	1.05%	36,957	33,096	–10.4%	16.5
GARFIELD HEIGHTS CITY	4,559.13	2.39%	34,938	31,739	–9.2%	7.0
GLENWILLOW VILLAGE	1,753.16	0.92%	492	455	–7.5%	0.3
HIGHLAND HEIGHTS CITY	3,206.03	1.68%	5,739	6,249	8.9%	1.9
INDEPENDENCE CITY	5,973.92	3.13%	6,607	6,500	–1.6%	1.1
LINNDALE VILLAGE	44.10	0.02%	129	159	23.3%	3.6
LYNDHURST CITY	2,791.31	1.46%	18,092	15,982	–11.7%	5.7
MAPLE HEIGHTS CITY	3,229.74	1.69%	29,735	27,089	–8.9%	8.4
NEWBURGH HEIGHTS VILLAG	348.57	0.18%	2,678	2,310	–13.7%	6.6
NORTH RANDALL VILLAGE	484.67	0.25%	1,054	977	–7.3%	2.0
NORTH ROYALTON	13,248.17	6.94%	17,671	23,197	31.3%	1.8
OAKWOOD VILLAGE	2,120.67	1.11%	3,786	3,392	–10.4%	1.6
ORANGE VILLAGE	2,242.82	1.18%	2,376	2,810	18.3%	1.3
PARMA CITY	12,415.86	6.51%	92,548	87,876	–5.0%	7.1
PARMA HEIGHTS CITY	2,544.72	1.33%	23,112	21,448	–7.2%	8.4
RICHMOND HEIGHTS CITY	2,844.73	1.49%	10,095	9,611	–4.8%	3.4
SEVEN HILLS	3,011.37	1.58%	13,650	12,339	–9.6%	4.1
SHAKER HEIGHTS	3,987.03	2.09%	32,487	30,831	–5.1%	7.7
SOLON CITY	12,386.92	6.49%	14,341	18,548	29.3%	1.5
SOUTH EUCLID	2,890.90	1.52%	25,713	23,866	–7.2%	8.3
UNIVERSITY HEIGHTS	1,156.22	0.61%	15,401	14,790	–4.0%	12.8
VALLEY VIEW VILLAGE	3,555.61	1.86%	1,576	2,137	35.6%	0.6
WALTON HILLS VILLAGE	4,202.07	2.20%	2,199	2,371	7.8%	0.6
WARRENSVILLE HEIGHTS	2,432.89	1.28%	16,565	15,745	–5.0%	6.5
WARRENSVILLE TOWNSHIP	1,895.51	0.99%	1,640	1,934	17.9%	1.0
SUBTOTAL	190,810.84		1,141,560	1,054,845	–7.6%	5.5

TABLE 3-13 (cont.)

CUYAHOGA RIVER REMEDIAL ACTION PLAN
POPULATION CHANGE (1980-1990) AND POPULATION DENSITY OF THE CUYAHOGA AOC

JURISDICTION	ACRES	APPROX %AREA OF BASIN	POPULATION 1980	POPULATION 1990	PERCENT CHANGE In population from 1980 to 1990	1990 POP-DENSITY People/acre
GEAUGA COUNTY						
AUBURN TOWNSHIP	18,916	12.92%	2,351	3,298	40.3%	0.17
AQUILLA VILLAGE	110	0.08%	355	360	1.4%	3.27
BURTON TOWNSHIP	14,964	10.22%	2,779	2,838	2.1%	0.19
BURTON VILLAGE	664	0.45%	1,401	1,349	-3.7%	2.03
CLARIDON TOWNSHIP	14,487	9.89%	2,457	2,656	8.1%	0.18
HAMBDEN TOWNSHIP	14,331	9.79%	2,934	3,311	12.8%	0.23
HUNTSBURG TOWNSHIP	15,435	10.54%	2,201	2,642	20.0%	0.17
MIDDLEFIELD VILLAGE	783	0.53%	1,997	1,898	-5.0%	2.42
MONTVILLE TOWNSHIP	15,722	10.74%	1,722	1,682	-2.3%	0.11
MUNSON TOWNSHIP	16,582	11.33%	5,222	5,775	10.6%	0.35
NEWBURY TOWNSHIP	17,952	12.26%	5,337	5,611	5.1%	0.31
TROY TOWNSHIP	16,464	11.25%	1,735	1,903	9.7%	0.12
SUBTOTAL	146,410		30,491	33,323	9.3%	0.23
SUMMIT COUNTY						
AKRON CITY	39,808	19.94%	237,177	223,019	-6.0%	5.60
BATH TOWNSHIP	14,464	7.25%	8,476	9,015	6.4%	0.62
BOSTON TOWNSHIP	10,951	5.49%	1,460	1,879	28.7%	0.17
BOSTON HEIGHTS	6,893	3.45%	781	733	-6.1%	0.11
CUYAHOGA FALLS	16,320	8.18%	43,710	48,950	12.0%	3.00
FAIRLAWN	2,688	1.35%	6,100	5,779	-5.3%	2.15
HUDSON TOWNSHIP	14,144	7.09%	8,050	11,969	48.7%	0.85
HUDSON	2,618	1.31%	4,615	5,159	11.8%	1.97
LAKEMORE	960	0.48%	2,744	2,684	-2.2%	2.80
MACEDONIA	6,808	3.41%	6,571	7,509	14.3%	1.10
MOGADORE	1,024	0.51%		2967		2.90
MUNROE FALLS	1,728	0.87%	4,731	5,359	13.3%	3.10
NORTHFIELD CENTER TW	2,942	1.47%	4,294	3,982	-7.3%	1.35
NORTHFIELD VILLAGE	679	0.34%	3,913	3,624	-7.4%	5.34
PENNINSULA	1,773	0.89%	604	562	-7.0%	0.32
REMINDERVILLE	1,487	0.75%	1,960	2,163	10.4%	1.45
RICHFIELD TOWNSHIP	16,655	8.34%	4,941	5,010	1.4%	0.30
RICHFIELD VILLAGE	5,056	2.53%		3117		0.62
SAGAMORE HILLS TOWNS	7,322	3.67%	7,189	6,503	-9.5%	0.89
SILVER LAKE	896	0.45%	2,915	3,052	4.7%	3.41
SPRINGFIELD TOWNSHIP	9,472	4.75%	16,125	14,773	-8.4%	1.56
STOW	10,944	5.48%	25,303	27,702	9.5%	2.53
TALLMADGE	8,640	4.33%	15,269	14,870	-2.6%	1.72
TWINSBURG TOWNSHIP	8,010	4.01%	1,257	1,896	50.8%	0.24
TWINSBURG	7,322	3.67%	7,632	9,606	25.9%	1.31

TABLE 3-13 (cont.)

CUYAHOGA RIVER REMEDIAL ACTION PLAN
POPULATION CHANGE (1980-1990) AND POPULATION DENSITY OF THE CUYAHOGA AOC

JURISDICTION	ACRES	APPROX %AREA OF BASIN	POPULATION 1980	POPULATION 1990	PERCENT CHANGE In population from 1980 to 1990	1990 POP-DENSITY People/acre
PORTAGE COUNTY						
AURORA CITY	14,912	8.11%	8,177	9,192	12.4%	0.62
BRADY LAKE	192	0.10%	470	490	4.3%	2.55
BRIMFIELD TOWNSHIP	14,208	7.73%	7,152	7,554	5.6%	0.53
FRANKLIN TOWNSHIP	13,056	7.10%	5,288	6,478	22.5%	0.50
HIRAM TOWNSHIP	15,424	8.39%	1,681	1,888	12.3%	0.12
KENT	4,736	2.58%	26,164	28,835	10.2%	6.09
MANTUA	866	0.47%	1,041	1,178	13.2%	1.36
MANTUA TOWNSHIP	17,026	9.26%	4,377	4,418	0.9%	0.26
MOGADORE				1,041		
RANDOLPH TOWNSHIP	18,624	10.13%	5,093	4,970	-2.4%	0.27
RAVENNA TOWNSHIP	16,448	8.94%	9,195	8,961	-2.5%	0.54
RAVENNA	3,072	1.67%		12,069		3.93
ROOTSTOWN	16,960	9.22%	6,585	6,612	0.4%	0.39
SHALERSVILLE TOWNS	17,642	9.59%	5,268	5,270	0.0%	0.30
SUFFIELD TOWNSHIP	14,656	7.97%	6,211	6,312	1.6%	0.43
STREETSBORO+S.B.K	16,061	8.73%	9,256	10,143	9.6%	0.63
SUBTOTAL	183,881		95,958	115,411	20.3%	0.63
BASIN TOTAL	720,706	100%	1,683,826	1,625,461	-3.8%	2.25

Employment in the Cleveland metropolitan region has historically focused on the manufacturing industries.* The four principal industries are primary metals, including steel, metal fabricating, non-electrical machinery, and transportation equipment (including autos). In 1970, 36 percent of the local employment was in manufacturing. Although this percentage dropped to 23 percent in 1988, relative to the U.S. the region remains a significant manufacturing center. In 1988, manufacturing accounted for 18 percent of the U.S. work force.

Total employment in the Cleveland area peaked at 1,015,000 jobs in 1979, after which the local economy fell to a low of 911,000 in 1983. During that time, manufacturing employment declined by 25 percent, double the national rate.

From 1983 to 1988 the Cleveland region added 85,000 new jobs, of which 45,600 (more than half) were in services. While manufacturing picked up nationally, it fell another 1.9 percent in the Cleveland area. Interestingly, despite its reputation as a manufacturing center, Cuyahoga County is the only county in the Cleveland region with more employment in services than manufacturing. Employment in retail trade is just below that in manufacturing. As of 1988, Geauga County had the highest concentration of manufacturing employment in the region (35 percent). At the same time, Geauga had very high rate of total employment expansion (3.2 percent) from 1987 to 1988 for the region.

Regional growth is occurring, but not as rapidly as other regions in the state nor as rapidly as the nation. Furthermore, the expansion of the Northeast Ohio economy is being propelled by forces that are more national than local.

SHIPPING

There are industries at sixteen sites on the Cuyahoga River which currently pay $18 million in city and county taxes and are dependent on waterborne commerce for delivery or shipment of their products (Table 3-14). These industries employ over 10,000 employees with an annual payroll in excess of $360 million. Table 3-15 is a list of customers served by business dependent on Cuyahoga Waterborne commerce.

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* NOACA, 1990. Employment in Northeast Ohio: 1988; Regional and County Trends. (March 1990).

Table 3-14

BUSINESSES DEPENDENT ON WATERBORNE COMMERCE

LTV Steel	Cereal Food Processors
River Dock, Inc.	Osborne Co.
Mid-Continent Coal and Coke	International Salt
Cleveland Builder's Supply	Medusa Cement
Ontario Stone	Huron Cement
United Concrete	Osterland Co.
Clifton Concrete	Sand Products Corp.
Marathon Oil	Cleveland Trinidad Paving Co.

SOURCE: Lake Carriers Association, February, 1991

Table 3-15

CUSTOMERS SERVED BY BUSINESSES DEPENDENT ON CUYAHOGA WATERBORNE COMMERCE

State of Ohio	Iroquois Salt of Canada
State of Michigan	Kroger Co.
Cuyahoga County	Lake Erie Asphalt
City of Cleveland	LTV
City of Chicago	Moritz Concrete
Metro Parks	National Bakers
Alcral Builders Supply	National Engineering & Contracting Co.
Allega Cement	Ohio Bulk Transfer Co.
Boyas Excavating	Osborne Building Supplies
R.P. Carbone	Schwebels
C.E.I.	R.W. Sidley
Cleveland Builders Supply	Southeast Aggregate
Cleveland Cement Contractors	Strohman's
Collinwood Shale	United Ready Mix
Cuyahoga Road Products	Westview Concrete Corp.
E.F. Donnelly	White Ready Mix
Great Lakes Construction	
Albert Higley Co.	
Horvitz Co.	Most Major Auto and Appliance Companies
Hough Bakery	Manufacturers throughout the United States

SOURCE: Lake Carriers Association, February, 1991

Shipping in the mid-1980s is down from levels in the 1960s and 1970s. Table 3-16 shows Cuyahoga and Old River Bed vessel traffic in recent years. The table shows the thousands of tons of products moved through the river and the numbers of transits (a trip up and down the river is two transits). There is an average of five commercial vessel transits on the Cuyahoga River each day of the shipping season. Compared with other Lake Erie ports, the Cuyahoga Riverway supports the largest portion of the asphalt, tar and pitch business, and a very large portion of the coke and petroleum coke business on the lake.

Table 3-16

Cuyahoga and Old River Bed vessel traffic in recent years in thousands of tons is as follows:

Year	Iron Ore	Stone	Cement	Sand & Salt	Grain	Liquid Bulk	Total	Transits*
1982	3,727	1,386	235	612	83	N/A	6,042	770
1983	4,989	1,226	248	450	68	N/A	6,981	840
1984	5,207	1,443	386	676	60	N/A	7,772	960
1985	5,521	1,838	322	738	65	N/A	8,484	992
1986	4,817	3,064	402	885	54	N/A	9,223	1,106
1987	5,745	3,528	541	798	75	163	10,850	1,350
1988	6,016	3,681	630	773	59	83	11,242	1,400
1989	5,647	3,363	501	1,098	70	158	10,837	1,476
1990	5,703	3,642	560	1,263	9	187	11,364	1,500

*A trip up and down the river is two transits.

NOTE: 1982-1986 totals are for U.S. vessels only; in 1986 Canadian vessels carried an additional 1,402,000 tons of stone, sand, sand salt in 1942 additional transits. 1987-1989 totals include Canadian vessels.

SOURCE: Waterborne Commerce of the United States Published by the U.S.ACOE Waterborne Commerce Statistics Center, Box 61280, New Orleans, LA 70161, in Lake Carriers Association, February, 1991.

The shipping industry relies on the fact that the lower Cuyahoga River is dredged. According to the U.S. Army Corps of Engineers (ACOE), the agency responsible for maintaining the federal navigation channel, 400,000 cubic yards of dredged material were removed from the Cuyahoga Port in 1990. The ACOE expends approximately $2.0 to $3.0 million annually on Cleveland's maintenance. This includes the cost of disposal, most of which goes to the confined disposal facility at a cost of $5.00 per cubic yard.

WATER SUPPLY

Upstream of the Ohio Edison Dam (RM 45.1), two cities, Akron and Cuyahoga Falls, rely on the Cuyahoga River. The City of Akron draws an average of 46 MGD (with a maximum of 63 MGD for their drinking water) from Lake Rockwell on the Upper Cuyahoga River and returns it as effluent from the city's sewage treatment plant. The City of Cuyahoga Falls relies on recharge from the river to fill its wells along the banks from which it draws drinking water. No public drinking water is drawn from the middle or lower reaches of the river.

The City of Cleveland's water is drawn from four intakes that are located in Lake Erie's central basin between two and four miles north of Cleveland Harbor (also outside the Area of Concern). From west to east the latitude/longitude, distances from shore, and raw water intake capacities are shown below:

Cleveland Crown:	41°31'8"/81°52'46"; 2.46 miles; 140 MGD
Cleveland Division:	41°32'50"/81°45'50"; 3.79 miles; 200 MGD
Cleveland Baldwin:	41°32'54"/81°45'2"; 3.22 miles; 200 MGD
Cleveland Nottingham:	41°32'5"/81°37'2"; 3.41 miles; 200 MGD

Some communities in the middle and upper parts of the Cuyahoga basin draw water supplies from groundwater. The extent to which the flow from the Cuyahoga recharges any of these groundwater supplies is not yet known.

Some industrial water supplies for processing and cooling are still drawn from the river. In 1985, 51 industries operating in the Cuyahoga River basin below the Ohio Edison dam reported surface water or groundwater consumptive water use. There are only four companies presently registered to withdraw water from the Area of Concern. A company must be registered if it draws more than 100,000 gallons per day. Goodyear Tire and Rubber, American Steel and Wire, and LTV Steel draw water from the Cuyahoga River. Cleveland Electric Illuminating Company draws water from the nearshore area.

WASTE DISPOSAL

The Cuyahoga River and its tributaries receive wastewater discharges from publicly owned sewage treatment plants and industries. In addition to these direct dischargers permitted by Ohio EPA, hundreds of industries in the region discharge effluent to the river indirectly through local publicly owned treatment plants (POTPs). For many of those industries discharging to the POTPs, pretreatment of their waste is required.

In terms of volume and loadings, the largest municipal effluent dischargers are the Cleveland Southerly Wastewater Treatment Plant (RM 10.8) and the City of Akron (RM 37.3). Southerly discharges an average of 120 MGD and Akron an average of 70 MGD. Other major municipal dischargers (daily effluent greater than 1 MGD) are Kent, Solon, Summit County District's Fishcreek facilities, Ravenna, Bedford, Bedford Heights, Twinsburg, Middleburg Heights, Streetsboro, Aurora Westerly and Euclid.

The major industrial wastewater dischargers (based on chemical components of the effluent) to the Cuyahoga River are LTV Steel (RM 4.5-6.8), Harshaw Chemical (RM 7.3), Hulkill Chemical Corporation (RM 16.4), Zaclon (RM 4.4), and American Steel and Wire (RM 8.4).

Figure 3-13 locates these major permitted dischargers in the watershed.

Several oil storage facilities are also permitted to discharge small amounts of wastewater to the Cuyahoga mainstem. Toxic loadings from several other industrial discharges to the lower Cuyahoga's tributaries and to the middle Cuyahoga River may affect the Area of Concern.

The effluent from two wastewater treatment plants enter the Area of Concern in or near the nearshore area. Northeast Ohio Regional Sewer District's Westerly sewage treatment plant is located at the western end of the nearshore area, between Cleveland Harbor and Edgewater State Park. It discharges beyond the breakwall through a multi-port outfall. NEORSD also operates the Easterly treatment plant, located to the east of the nearshore area.

One power plant discharges cooling water to the Area of Concern, the Cleveland Electric Illuminating company (4.5 miles east of the Cuyahoga River mouth).

For a complete list of dischargers to the Cuyahoga River and nearshore area, refer to Chapter 5 of this report.

In addition to these permitted discharges in the river, several billion gallons per year of mixed sanitary wastewater (including some industrial) and stormwater are discharged to the river through combined sewer overflows (CSOs). The total amount of stormwater and wastewater discharged to the river from CSOs* has not been conclusively determined, although both the City of Akron and the Northeast Ohio Regional Sewer District (NEORSD), have undertaken studies to generate those figures.

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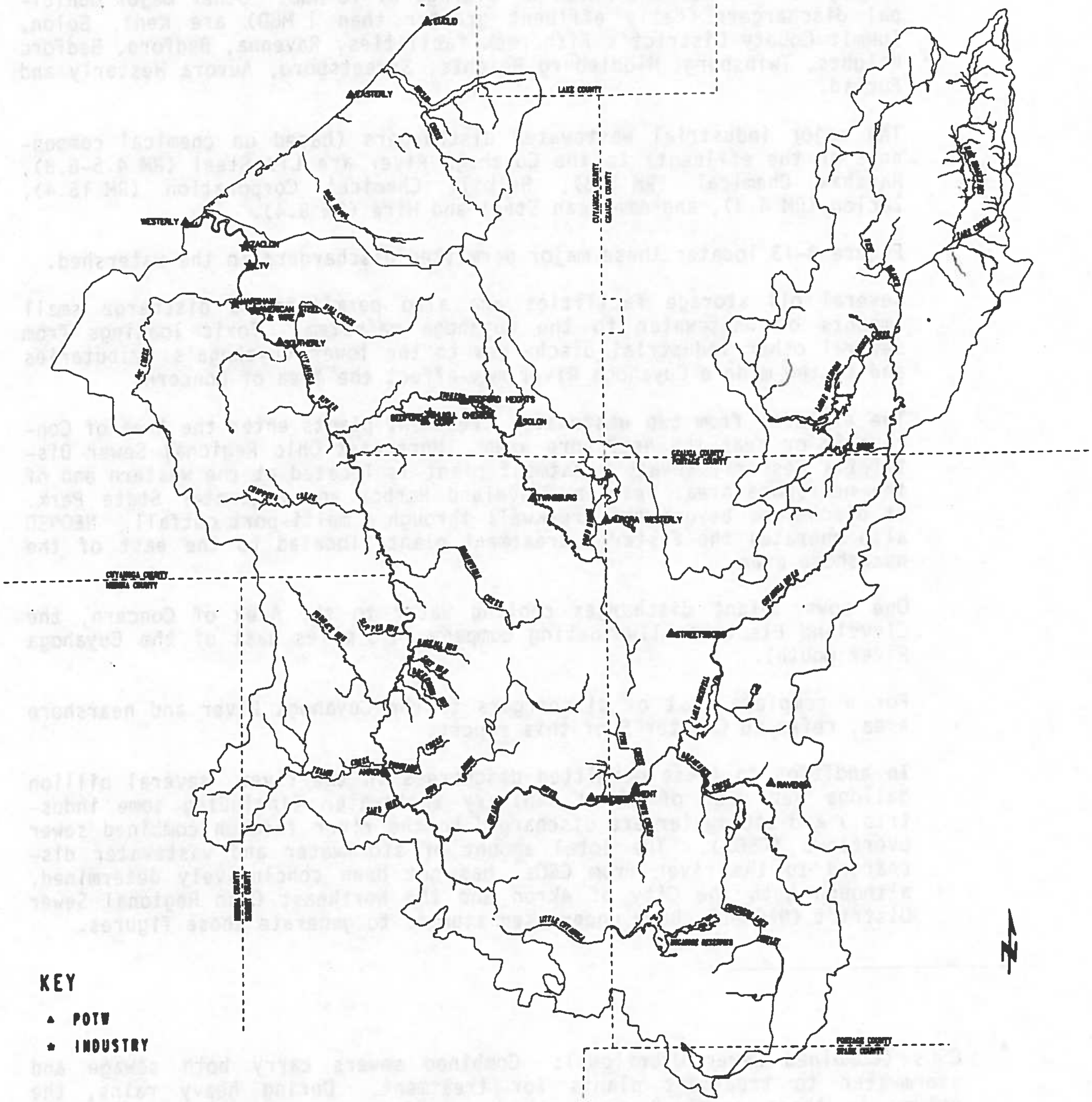
* CSOs (Combined Sewer Overflows): Combined sewers carry both sewage and stormwater to treatment plants for treatment. During heavy rains, the volume in these combined sewer lines can increase, causing back up and flooding. Regulators have been built into these combined sewers to allow some of the volume to be released to the streams untreated. This event is referred to as a CSO.

MAJOR* PERMITTED DISCHARGERS IN THE CUYAHOGA RAP STUDY AREA



KEY

▲ POTW

★ INDUSTRY

* POTW'S - annual average flow greater than 1.0 mgd
INDUSTRY - point system based on toxic pollutant potential, wastewater volume, individual pollutant loadings, potential public health impacts and expected effects of the discharges on the water quality standards in the receiving stream.

** American Steel and Wire recycles most of its process water and discharges infrequently

The banks of the river, especially in the industrial areas of its lower reach, have been used historically as stock pile storage areas and dumping grounds for miscellaneous wastes, including toxic industrial chemicals. Industries along the Cuyahoga's banks have used the banks to bury wastes such as foundry sands and old refractory materials. The extent of leaching from these old dumps into the river remains unknown.

AESTHETICS

Erosion of hillsides and stream banks, contamination of the waterway by natural debris, as well as the effects of trash, solids and odor from sanitary discharges and improper dumping can be found throughout the Area of Concern today. Debris borne by separate and combined sewers also contribute to the dirty appearance of the water. Most of the problems to aesthetics are exacerbated by storms and high flow conditions.

Sources regularly increase turbidity, add detergents, and color the water. Detergents, garbage and wastes make their way from households through improperly functioning on-site wastewater treatment systems, package plants and improper connections to storm sewers into the river. Improper disposal of oil, occasional spills, and wash off from urban streets creates the characteristics rainbow sheen on the water's surface. Illegal dumping of yard waste and trash, and the disposal of garbage from those who live near or come to enjoy the river contribute to the river's degraded appearance.

It is not yet known to what extent these problems reduce the social or economic value of the river. However, more information will be gained through a benefits assessment study to take place during the second stage of the RAP.

RECREATION

There is consensus that recreation does contribute to the region's economy. Some of the ways in which it contributes follow. With respect to boating, there are 14 marinas with 21 launch ramps and 3,648 dock spaces along Cleveland's shoreline. Over 100,000 of the 380,000 registered Ohio boaters in 1989 used Lake Erie as their primary boating area. Several fishing charter services now operate out of the Area of Concern. These include one at Wildwood State Park and several from the Cuyahoga River near the downtown. More information specific to the Cuyahoga River and Nearshore Area will be gained through a public opinion poll and benefits assessment study to take place in the second stage of the RAP process.

3.5 Water Quality Standards

The Cuyahoga River in the Area of Concern (from RM 45.10 to RM 5.6) is designated for use as warmwater aquatic life habitat, agricultural and industrial water supply and primary contact recreation. In addition, Bath Road to Rockside Road, North Main Street in Akron to the Ohio Edison Dam, and Troy-Burton Township line in Geauga County to SR-14, are designated as state resource waters (Chapter 3745 of the Ohio Administrative Code):

> "State resource waters" are surface waters of the state that lie within national, state and metropolitan park systems, wetlands, and wildlife refuges, areas, and preserves, and also include wild, scenic and recreational rivers, publicly owned lakes and reservoirs and waters of exceptional recreational or ecological significance (e.g., waters which provide a habitat for identified threatened or endangered species) as determined by the Director of Ohio Environmental Protection Agency. Present ambient water quality in state resource waters will not be degraded for all substances determined to be toxic or to interfere with any designated use as determined by the Director of Ohio Environmental Protection Agency. All other substances shall be limited to the criteria associated with each designated use, as outlined in rules 3745-1-07 and 3745-1-32 of the Administrative Code. Areas that do not meet general water quality standards as defined in rules 3745-1-07 to 3745-1-32 of the Administrative Code shall not be degraded as stated above for all such classified areas.

Table 3-17 illustrates the use designations by stream segment.

Warmwater Habitat waters are defined in Chapter 3745-1-07 of the Ohio Administrative Code as "waters capable of supporting reproducing populations of fish, normally referred to as warmwater species, and associated vertebrate and invertebrate organisms and plants on an annual basis." (See Appendix F for Warmwater Habitat chemical standards.)

The lower 5.6 miles of the Cuyahoga River in the Area of Concern (the navigation channel) do not have an official use designation or set of standards in Ohio Water Quality Standards, Chapter 3745 of the Ohio Administrative Code. In May 1991 USEPA published in the Federal Register a finding of deficiency in Ohio Standards with regards to the lack of a designated use and appropriate standards for the navigation channel. USEPA has given Ohio EPA until September 30, 1991 to adopt a water quality standard use designation and associated criteria for the navigation channel.

USE ATTAINABILITY ANALYSIS

To come into compliance with the federal Clean Water Act, Section 101(a)(2), Ohio EPA must designate the navigation channel as (at least) warmwater habitat, which is the minimum "fishable/swimmable" use (as set forth in the Clean Water Act) in Ohio Standards, or provide a use attainability analysis and designate at least Limited Resource water use, which is the minimum of all uses in Ohio Standards. (See Appendix F for Limited Resource Use chemical standards.)

At present there is insufficient information on attainability to make a determination of use for the navigation channel. Ohio EPA has been gathering data for a use attainability analysis since 1986, and in 1990, Ohio EPA with assistance from USEPA, the Northeast Ohio Regional Sewer District and LTV Steel initiated an intensive data collection effort as part of the Cuyahoga River RAP process. Ohio EPA is scheduled to complete this study by mid 1992, propose a use designation by late 1992, and adopt the final standards in January 1993. Refer to Chapter 6 for a description of Ohio EPA's efforts on this project.

Said Don Schregardus, Director of Ohio EPA, in a statement to the press on May 7, 1991, "We realize the navigation channel lacks a use designation. We have established a workplan and schedule to adopt an appropriate set of standards. However, taking action at this time simply to meet USEPA's deadline is not in the best interest of Ohio and those living in the Cleveland area. We intentionally delayed adopting the use designation to collect the information needed to make an informed decision."

TABLE: 3-17

CUYAHOGA RIVER USE DESIGNATIONS / CHAPTER 3745 OF THE OHIO ADMINISTRATIVE CODE

Stream Segment	Use Designations: Aquatic Life Habitat: State Resource Water	Aquatic Life Habitat: Warmwater	Aquatic Life Habitat: Exceptional Warmwater	Aquatic Life Habitat: Seasonal Salmonid	Aquatic Life Habitat: Coldwater	Aquatic Life Habitat: Nuisance Prevention	Water Supply: Public	Water Supply: Agricultural	Water Supply: Industrial	Recreation: Bathing Waters	Recreation: Primary Contact	Recreation: Secondary Contact	Comments
Cuyahoga River - Entirety of Ship Channel (Newburgh and South Shore (N&SS) RR bridge to mouth, including the old river channel													The standards for this stream segment are reserved until a field assessment is performed.
- Cleveland Southerly STP to the N&SS RR bridge		*						*	*		*		
- Bath Road to Rockside Road	*	*						*	*		*		
- North Main Street in Akron to Edison Dam	*	*						*	*		*		
- Troy-Burton Township line in Geauga County to S.R. 14	*	*						*	*		*		
- Headwaters to Lake Rockwell		*						*	*		*		
- All other segments		*						*	*		*		

SOURCE: OHIO EPA NEDO, DWQPA. Cuyahoga River Water Quality Study of Portage, Summit & Cuyahoga Counties: 1984,87 & 88.

CHAPTER 4
DEFINITION OF THE PROBLEM

4.0 INTRODUCTION

This chapter provides the information called for in subparagraph 4(i) of Annex 2 of the Great Lakes Water Quality Agreement:

> A definition and detailed description of the environmental problem in the Area of Concern, including a definition of the beneficial uses that are impaired, the degree of impairment and the geographic extent of such impairment.

Fourteen beneficial uses are set forth in the GLWQA ranging from biological uses to human uses of the water resource (Exhibit 2-2).

These uses are evaluated in the Cuyahoga River Area of Concern* with the application of criteria provided by the International Joint Commission (Exhibit 2-3).

This chapter is organized by the 14 beneficial uses. Each beneficial use category is addressed in seven steps. The <u>first</u> step identifies the criteria employed in evaluating whether an impairment exists. As noted above, the IJC has established general criteria for each of the 14 categories. In several cases, Ohio EPA or the CCC has identified specific criteria or further clarified the IJC criteria. The <u>second</u> step characterizes the type of data utilized. The <u>third</u> step is a declaration of the impairment. This addresses the degree of impairment and the geographic extent of impairment. The <u>fourth</u> step states how confident the Committee is in making that declaration and spells out what the uncertainties are behind the declaration. <u>Fifth</u>, the contaminants that are involved in causing the impairment (contaminants of concern) are listed if they are known. Research suggestions that may be important in reducing the uncertainties behind the declaration of impairment are documented in Appendix M. Research priorities can be found in Chapter 7. <u>Finally</u>, committee and other source reports that are being used to assess the impairment are identified.

The Plan Drafting Committee developed procedures for the consistent evaluation of beneficial use impairments. The first of these was the seven step outline mentioned above which provides a systematic method for appraising the information base available to evaluate beneficial use impairments. The second was a memorandum setting forth decision rules

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* The Area of Concern includes the Cuyahoga River from the Ohio Edison Dam (RM 45) in Summit County to the River's Mouth (RM 0) and the Lake Erie nearshore area from Edgewater Park (SLM 1190) on the west to Wildwood Park on the east (SLM 1178).

for consistent use of terminology in characterizing the degree and extent of an impairment and degrees of uncertainty concerning impairments. The third was a procedure for consistent documentation of review and comment and revision of committee technical reports. The fourth was a method for review, evaluation and utilization of comments generated at public workshops. Each of these procedures was developed within the Plan Drafting Committee and all are documented in Appendix K.

Table 4-1 summarizes current findings concerning impairments of beneficial uses in the Cuyahoga River Area of Concern. In Table 4-1 the Area of Concern is divided into three sections: (a) Cuyahoga River Ohio Edison Dam to Head of Navigation (RM 45.1 to 5.6); (b) Cuyahoga River Navigation Channel (RM 5.6 to 0); and (c) Lake Erie Nearshore Area (Edgewater Park to Wildwood Park). In some detailed discussions of beneficial uses that follow, Section a of the Area of Concern is delineated further.

Declaration of Impairment

An impairment is declared "known" if evaluation criteria or standards are unambiguous and sufficient data exists that meet generally accepted scientific standards. An impairment is declared "probable" if unambiguous standards are not available but there is a consensus of best professional judgement and sufficient scientifically creditable data exist. An impairment is declared "possible" if scientifically creditable data are limited but there is a consensus of best professional judgement. An impairment is declared "unknown" if neither condition holds.

In those instances where data are insufficient to make a declaration of impairment, the Committee has established objectives for a research program to address the information gaps. The framework and objectives for a research program are presented in Chapter Seven of this report.

TABLE 4-1: SUMMARY OF CURRENT FINDINGS CONCERNING IMPAIRMENTS OF BENEFICIAL USES, November 1991

USE IMPAIRMENTS EVALUATED/ CHAPTER 4 PAGE REFERENCE	GREAT LAKES WATER QUALITY AGREEMENT REFERENCE	OHIO EDISON DAM TO HEAD OF NAVIGATION CHANNEL (River Miles 45.1 to 5.6)	NAVIGATION CHANNEL (River Miles (5.6 to 0.0)	NEARSHORE AREA (Edgewater to Wildwood)
HUMAN HEALTH				
Restrictions on Fish Consumption/ pp 4-13	i(1)	Unknown*	Unknown*	Impaired
Restrictions on Wildlife Consumption/ p 14	i(2)	Unknown	Unknown	Unknown
Restrictions on Drinking Water Consumption or Taste and Odor Problems/ pp 44-50	ix	Unknown	Not applicable	Not applicable
FISH				
Degraded Fish Populations/ pp 16-21	iii(1)	Impaired	Impaired	Unknown**
Fish Tumors and Other Deformities/ pp 24-28	iv	Impaired in some places	Impaired	Impaired
Loss of Fish Habitat/ pp 84-86	xiv(1)	Not Impaired	Impaired	Probably Impaired
WILDLIFE				
Degraded Wildlife Populations/ pp 22-23	iii(2)	Unknown	Unknown	Unknown
Bird or Animal Deformities or Reproductive Problems/ p 29	v	Unknown	Unknown	Unknown
Loss of Wildlife Habitat/ pp 87-88	xiv(2)	Impaired in some places	Impaired	Impaired in some places
AQUATIC ORGANISMS (other than fish)				
Degraded Phytoplankton Populations/ pp 77-80	xiii(1)	Possibly impaired	Possibly impaired	Possibly impaired
Degraded Zooplankton Populations/ 81-83	xiii(2)	Unknown	Unknown	Unknown
Degradation of Benthos/ pp 30-34	vi	Impaired in some places	Possibly impaired**	Impaired
RECREATION				
Beach Closings; Swimming/ pp 51-57	x(1)	Impaired periodically	Impaired periodically	Impaired periodically
Boating Impairments***/ pp 57-65	x(2)	Impaired periodically	Impaired periodically	Impaired periodically
Fishing Impairments***/ pp 65-68	x(3)	Not impaired from 45.1-13.3	Not impaired	Not impaired
SOCIO-ECONOMIC FACTORS				
Degradation of Aesthetics, Including Recreation Impairments/ pp 69-74	xi	Impaired	Impaired	Impaired
Restrictions on Dredging Activities/ pp 35-38	vii	Not Impaired	Impaired in some places	Impaired
Eutrophication or Undesirable Algae/ pp 39-43	viii	Unknown	Probably Impaired	Impaired
Tainting of Fish and Wildlife Flavor/ p 15	ii	Unknown	Unknown	Unknown
Added Costs to Agriculture or Industry/ pp 75-76	xii	Not impaired	Not impaired	Not impaired

* Under active investigation
** Evaluation Standard Lacking
*** Impairment definition amplified by Cuyahoga RAP Committee

4.1 USE IMPAIRMENTS EVALUATED

i.1 RESTRICTIONS ON FISH CONSUMPTION

<u>Impairment Evaluation Criteria Employed</u>

According to the International Joint Commission, an impairment exists "when contaminant levels in fish populations exceed current standards, objectives or guidelines, or when public health advisories are in effect for human consumption of fish. Contaminant levels in fish must be due to contaminant input from the watershed."

<u>Characterization of Types of Data Utilized</u>

Data are available from the 1989 sampling and analysis effort of the Cuyahoga RAP Fish Tissue Work Group. This group began a three year sampling effort in 1989 to determine whether consumable fish caught from the Cuyahoga River Area of Concern pose a significant risk to human health. This group developed the Cuyahoga RAP protocol for fish tissue collections and analysis. Six sites on the Cuyahoga River and one reference site on the Chagrin River were sampled in October 1989. These sites and an additional eight sites, including five reference sites, were identified as important sampling locations for the three year study. These sites are listed below (numeric references are consistent with maps on subsequent pages):

1 (R)	Lake Erie near Lakewood
2	Lake Erie near Edgewater Pier
3	Lake Erie east of river mouth
4	Lake Erie near East 55th storm sewer
5	Lake Erie near eastern breakwall
6	Lake Erie near Wildwood Park
7 (R)	Lake Erie near Willowick
8	Cuyahoga River at Harvard Avenue
9	Cuyahoga River near State Route 82
10	Cuyahoga River downstream of Akron WWTP
11	Cuyahoga River upstream of Akron WWTP
12	Cuyahoga River at the Ohio Edison Dam Pool
13 (R)	Cuyahoga River at State Route 303, Shalersville
15 (R)	Chagrin River at Daniels Park

(R) = Reference sites

Figures 4-1 and 4-2 show sites sampled in 1989. Figures 4-3 through 4-5 show the sites sampled in 1990. Analysis results of the 1990 fish tissue are not yet available.

Attempts were made to collect composite samples of the largest size classes of two bottom-dwelling species and two "sport fish" species at each site. The bottom dwellers represent worst-case risk through human consumption due to greater sediment contact and generally higher fat content, and the sport fish represent most likely human consumption. The sport fish offer a worst-case scenario because they occupy a higher trophic status which can result in more biomagnification through the food chain of pollutants in their tissue. Fillets were analyzed with the skin left on to again reflect the worst-case "likely" human consumption.

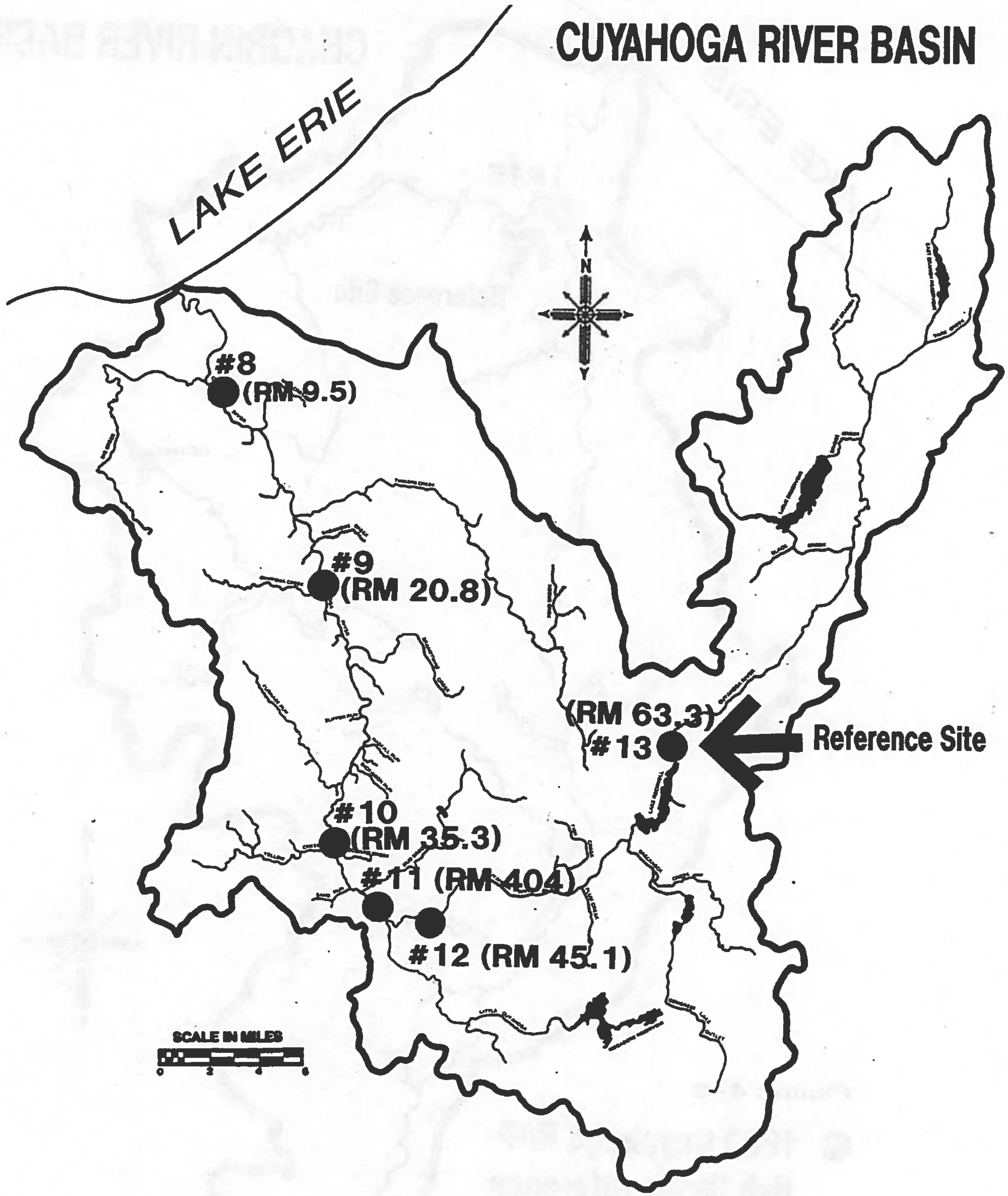


Figure: 4-1

● **1989 Cuyahoga RAP fish tissue sampling locations.**

"#" Refers to list of reference sites in preceding pages

SOURCE: Cuyahoga RAP Fish Tissue Task Group

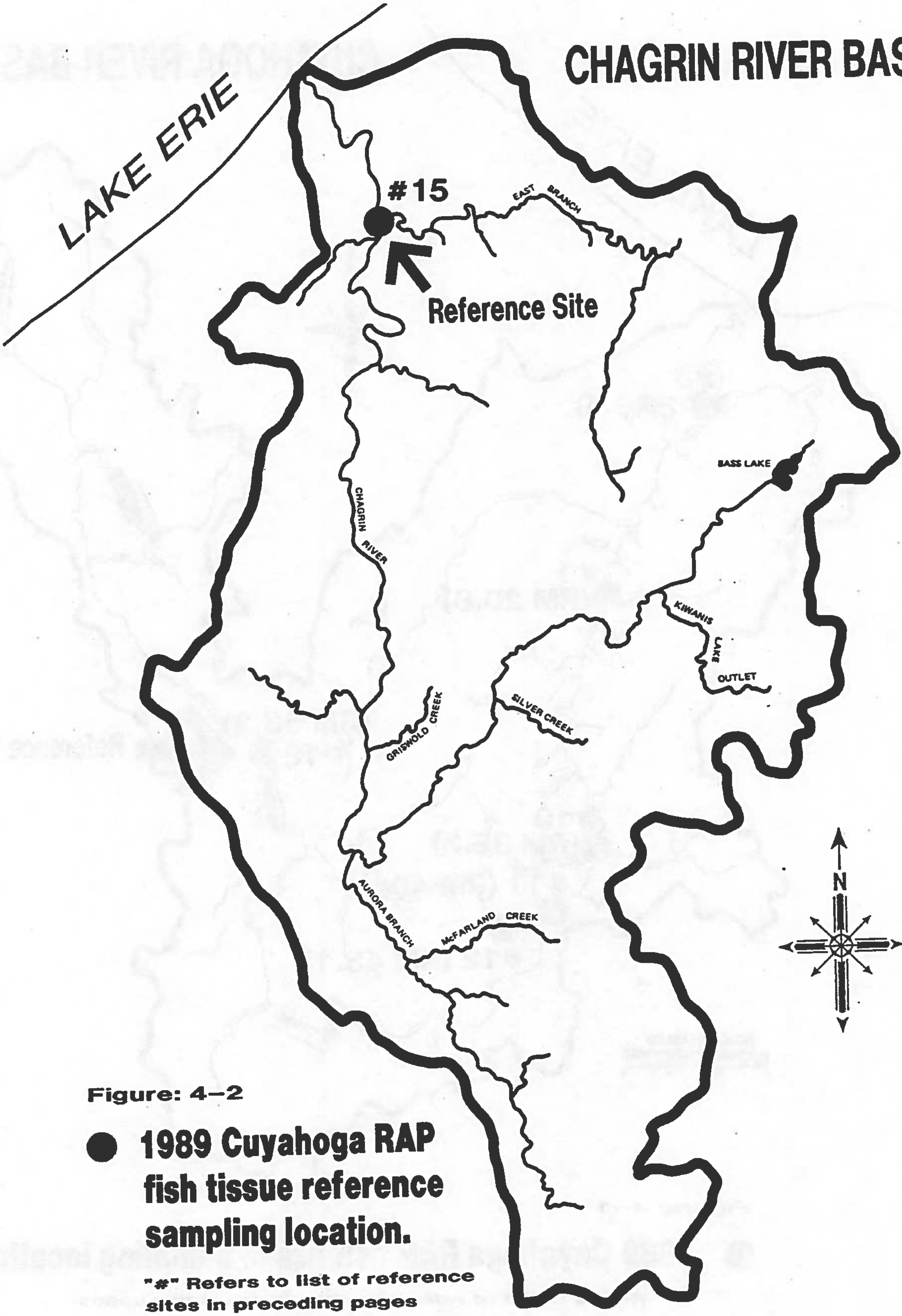


Figure: 4–2

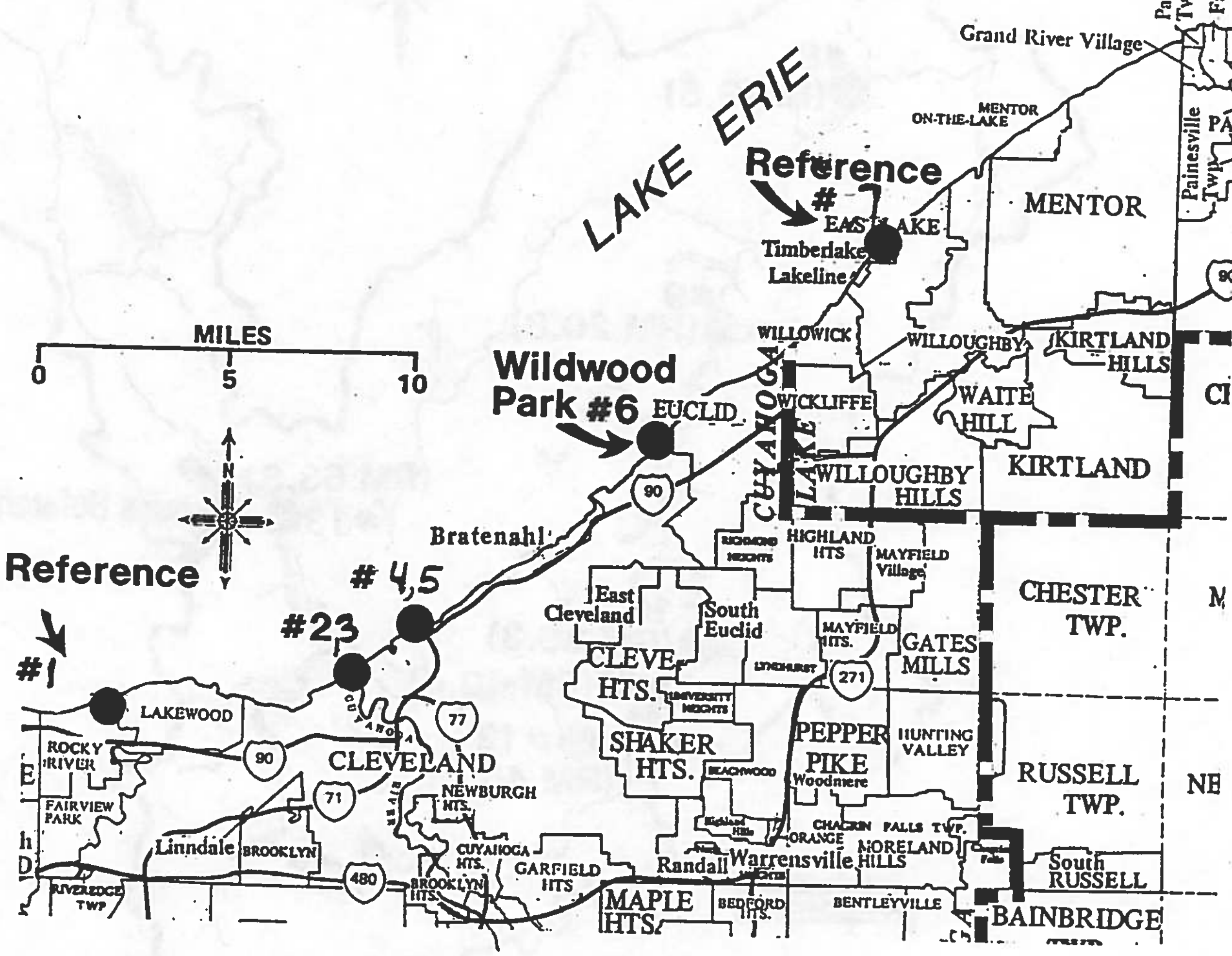
● **1989 Cuyahoga RAP fish tissue reference sampling location.**

"#" Refers to list of reference sites in preceding pages

SOURCE: Cuyahoga RAP Fish Tissue Task Group

Figure: 4–3

1990 CUYAHOGA RAP FISH TISSUE SAMPLE LOCATIONS



"#" Refers to list of reference sites in preceding pages

SOURCE: Cuyahoga RAP Fish Tissue Task Group

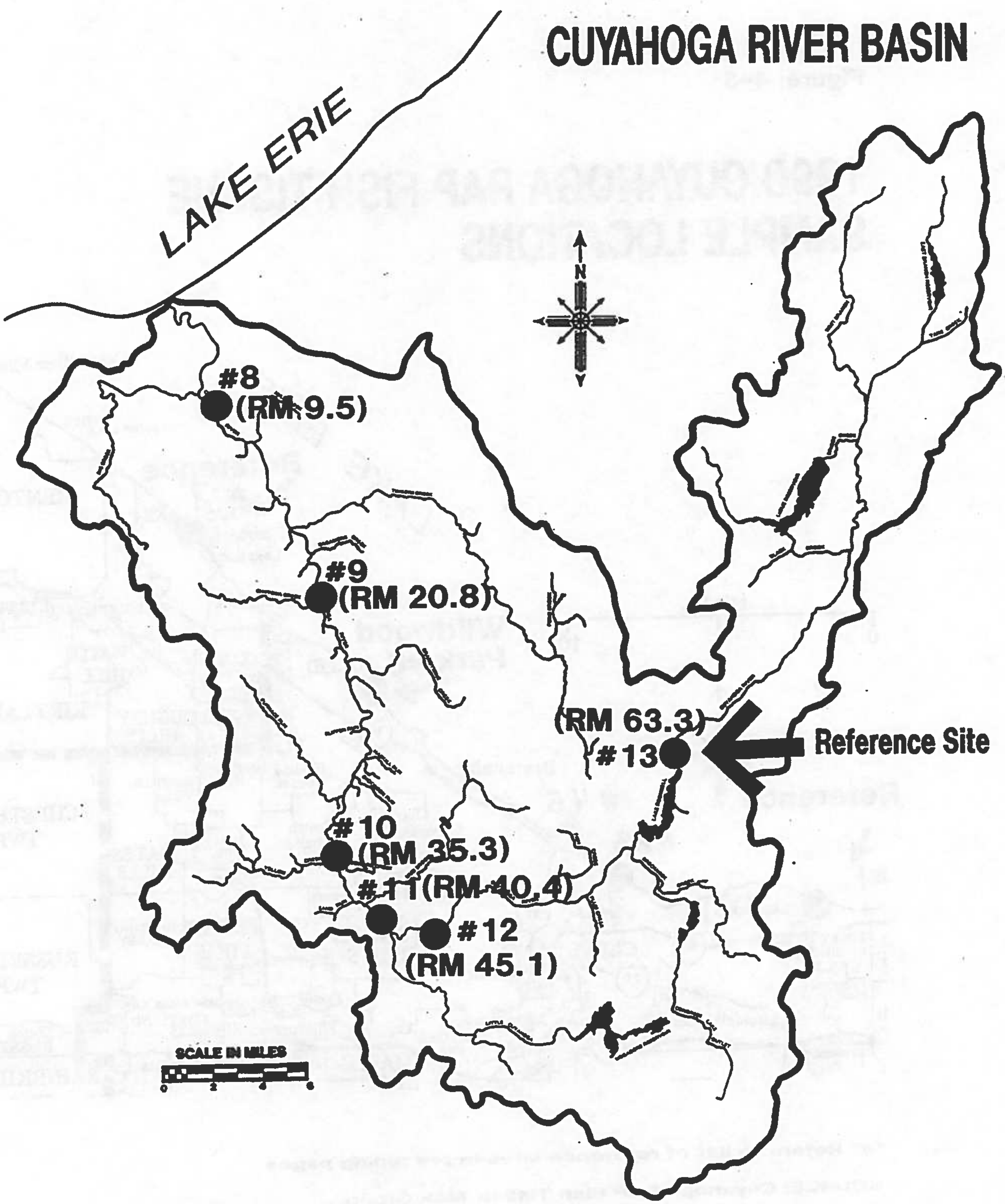


Figure: 4–4

● **1990 Cuyahoga RAP fish tissue sampling locations.**

"#" Refers to list of reference sites in preceding pages

SOURCE: Cuyahoga RAP Fish Tissue Task Group

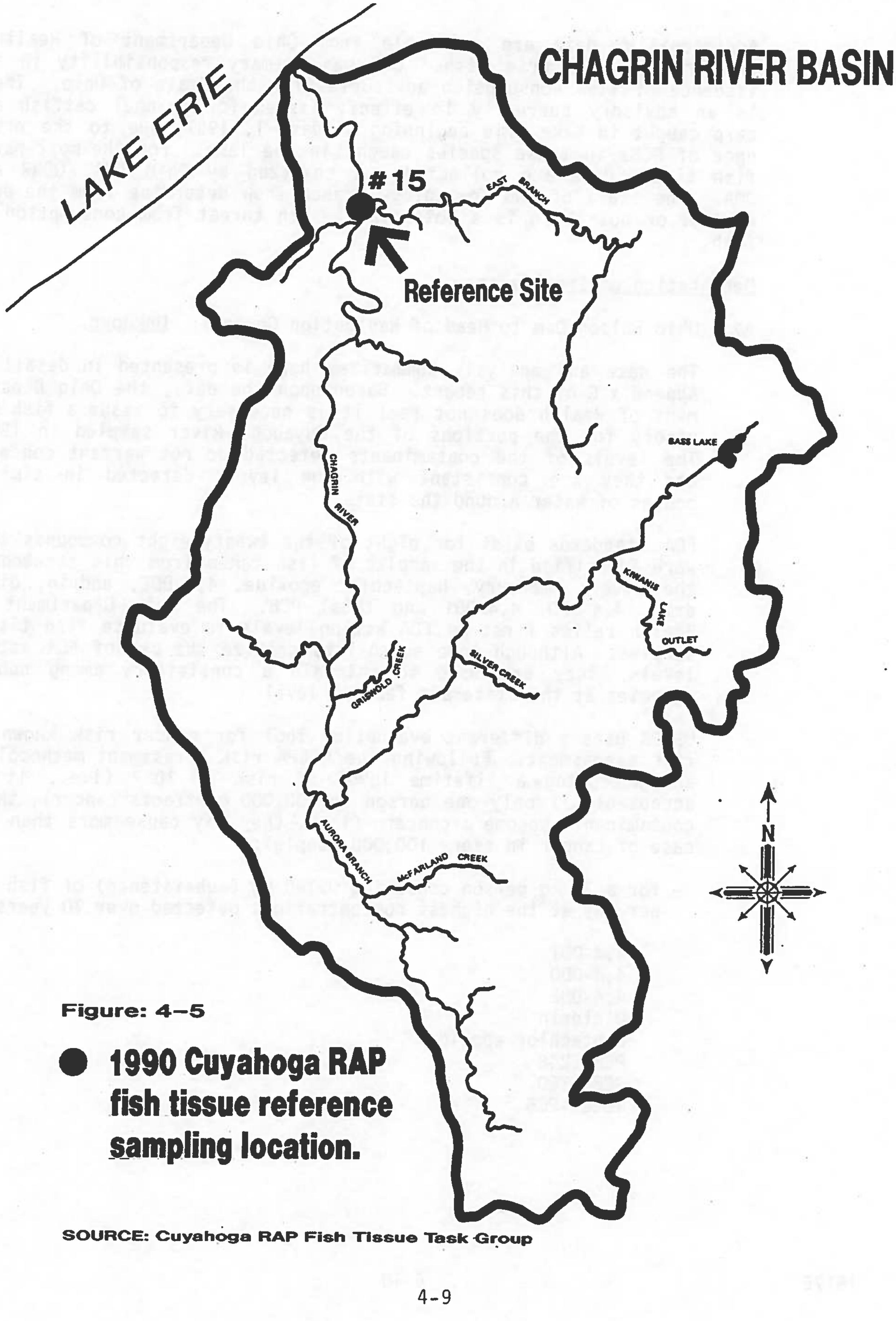


Figure: 4–5

● 1990 Cuyahoga RAP fish tissue reference sampling location.

SOURCE: Cuyahoga RAP Fish Tissue Task Group

Additionally, data are available from Ohio Department of Health's analysis of Lake Erie fish. ODH has primary responsibility in the issuance of fish consumption advisories for the State of Ohio. There is an advisory currently in effect, issued for channel catfish and carp caught in Lake Erie beginning January 1, 1987, due to the presence of PCBs in those species caught in the lake. For the most part, fish tissue data are collected and analyzed by Ohio EPA, ODNR and ODA. The staff of ODH Toxicology Branch then determine from the data whether or not there is a potential health threat from consumption of fish.

Declaration of Impairment

A) Ohio Edison Dam to Head of Navigation Channel: Unknown.

The data and analysis summarized here is presented in detail in Appendix C of this report. Based upon the data, the Ohio Department of Health does not feel it is necessary to issue a fish advisory for the portions of the Cuyahoga River sampled in 1989. The levels of the contaminants detected do not warrant concern, and they are consistent with the levels detected in similar bodies of water around the state.

FDA standards exist for eight of the twenty-eight compounds that were identified in the samples of fish taken from this stretch of the river: mercury, heptachlor epoxide, 4,4-DDE, endrin, dieldrin, 4,4-DDD, 4,4-DDT and total PCB. The Ohio Department of Health relies first on FDA action levels to evaluate fish tissue samples. Although some scientists critize the use of FDA action levels, they are used to maintain a consistency among public agencies at the state and federal level.

USEPA uses a different evaluation tool for cancer risk known as risk assessment. Following the USEPA risk assessment methodology and accepting a lifetime level of risk of 10^{-5} (i.e., it is acceptable if only one person in 100,000 contracts cancer), these contaminants become a concern (i.e., they may cause more than one case of cancer in every 100,000 people):

- for a 70 kg person consuming 0.140 kg (subsistence) of fish per day at the highest concentrations detected over 70 years,

  4,4-DDT
  4,4-DDD
  4,4-DDE
  Dieldrin
  heptachlor epoxide
  PCB-1248
  PCB-1260
  Total PCB

- for a 70 kg person consuming 0.020 kg (moderate)* of fish per day at the highest concentrations detected over 70 years,

  4,4-DDE
  Dieldrin
  heptachlor epoxide
  PCB-1248
  PCB-1260
  Total PCB

(Refer to Tables C1-6 and C1-7 for all contaminants assessed using this methodology.)

B) Navigation Channel: Unknown.

Fish from the navigation channel have not been sampled.

C) Nearshore Area: Impaired for channel catfish and carp, based on ODH's fish consumption advisory for Lake Erie, effective since January 1, 1987.

1990 RAP Fish Tissue Sample sites included the Nearshore Area. Results of the 1990 sampling will be available in early 1992.

Confidence or Uncertainties

Degree of confidence in the declaration of impairment is limited by a paucity of data. Data based on fish caught in the river are limited. A comprehensive analysis of a 1989 sample population from six sites on the river above River Mile 7 was done. Fish samples were collected in late summer of 1990, but these have not yet been analyzed. The 1990 sample sites for a repeat analysis of a comprehensive list of contaminants included the nearshore Lake Erie.

A major difficulty in assessing potential health effects of fish with small amounts of chemicals is the lack of standards for most of the compounds identified. Commercial fish are regulated by the U.S. Food and Drug Administration. FDA tolerance levels are based on average consumption and may not protect children, pregnant women or individuals who consume large amounts of contaminated fish.

A source of uncertainty in the declaration of impairment arises at the point of interpreting the results of the analysis. Interpretation of the results can be direct, as in the ODH analysis. The level of any contaminant found in fish tissue is compared directly to an FDA action level. If the level of any contaminant in the fish tissue is higher than the action level, an advisory is issued.

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* Moderate consumption is approximately midway between "average" and "recreational" consumption.

Another method of interpretation is to calculate the risk a person would incur by eating a specified amount of the contaminated fish over time. This method, known as risk assessment, is presently used by USEPA to evaluate the effects of many naturally and unnaturally occurring contaminants on human health and the environment. After factoring in a series of assumptions, a plausible risk of concern is derived. If the level of risk from consuming the specified amount of contaminated fish is greater than some accepted level of risk, an advisory may be issued. Acceptable levels of risk may be different for various segments of the population (e.g., pregnant women and children may have a lower acceptable level of risk than adult males.)

Risk assessment is often critized on one hand for being too conservative in its assumptions, and on the other hand for not being conservative enough in addressing the risk of cancer to children or other sensitive populations. Risk assessment does not address all potential health risks. Despite the imperfect methodology, however, it does provide a useful means of assessing relative risk among the many cancer causing substances and other health effects.

These two approaches to interpretation can result in different conclusions. As for the interpretation of fish tissue sampling results, the Cuyahoga RAP fish tissue sampling report (Appendix C) reports both interpretations, along with the benefits and concerns related to each.

Another concern which is not addressed in risk assessment or FDA action levels is the possible interactions between a number of different compounds which are all below the given standard. While none of the individual contaminants alone may pose a threat, the combined effect of several or many lower level contaminants is unknown.

<u>Factors Contributing to Impairment</u>

Polychlorinated biphenyls (PCBs) is the class of contaminants of concern which set ODH's fish consumption advisory into effect on January 1, 1987. Channel catfish and carp caught in Lake Erie may have PCB concentrations exceeding the FDA guidelines for commercial sale of fish. The FDA action level for PCBs is 2.0 ppm in the edible portion of the fish.

The 1989 fish tissue samples were analyzed for a comprehensive list of contaminants. See Appendix C for this list and the associated detection limits. The following contaminants were found or tentatively identified in the 1989 fish tissue samples:

Volatile Organic Compounds - VOCS

- 1, 1, 1, Trichloroethane
- Hexanal
- 2, Octyne
- Octanal
- Heptanal
- 1, Octen-3 ol
- Trichlorofluoromethane
- Octane
- Benzene, 1, 3, 5 - Trimethyl-
- Nonanal
- 2-Hexanone

Pesticides

- gamma-BHC
- delta-BHC
- Heptachlor expoxide
- 4,4-DDE
- Endrin
- Endrin Aldehyde
- Endosulfan II
- Dieldrin
- 4,4-DDD
- 4,4-DDT

Polychlorinated Biphenyls - PCBs

- PCB 1248
- PCB 1260

Heavy Metals

- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Zinc

The following contaminants of concern are found in unacceptable levels using the USEPA Risk Assessment Methodology and an "acceptable" level of risk of 10^{-5}:

- heptachlor epoxide
- 4,4-DDE
- Dieldrin
- PCB-1248
- PCB-1260
- Total PCB
- 4,4-DDT
- 4,4-DDD

<u>Research Needs and Ideas Identified in the Subcommittee Reports</u>

See Appendix M.

<u>Committee Reports Consulted</u>

Fish Tissue Evaluation: Cuyahoga River 1989 Data (Appendix C)

i.2 RESTRICTIONS ON WILDLIFE CONSUMPTION

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when contaminant levels in wildlife populations exceed current standards, objectives or guidelines, or when public health advisories are in effect for human consumption of wildlife. Contaminant levels in wildlife must be due to contaminant input from the watershed."

No clear set of standards, objectives or guidelines are known to exist for contaminant levels in area wildlife tissue.

Characterization of Types of Data Utilized

There is no information available concerning contaminant levels in wildlife tissue in the Area of Concern. Therefore, no effort to connect tissue contamination to sources within the watershed has been made.

Declaration of Impairment

Because of the lack of standards and information specific to the Cuyahoga River Area of Concern, the impairment is unknown.

Confidence or Uncertainties

Not applicable.

Factors Contributing to Impairment

None have been identified.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

None available.

ii. TAINTING OF FISH AND WILDLIFE FLAVOR

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when ambient water quality standards, objectives, or guidelines for the anthropogenic substances known to cause tainting are being exceeded, or survey results have identified tainting of fish or wildlife flavor."

Characterization of Type of Data Utilized

No standards, objectives or guidelines have been established for tainting of flavor in the Area of Concern. There is no information available concerning the tainting of fish or wildlife flavor within the Cuyahoga River Area of Concern. No complaints have been received by Ohio EPA or Ohio Department of Health concerning impaired flavor of fish or wildlife. No surveys to identify tainting of fish or wildlife flavor have been undertaken.

Declaration of Impairment: Unknown.

Because of the lack of both standards and data, the impairment in the Area of Concern is unknown.

Confidence or Uncertainties

According to United States Department of Agriculture and the Ohio Department of Agriculture, there are no standard protocols for determining tainting of flavor in foods.

There is a consensus of best professional judgement that tainting of flavor is not likely to be a major problem in the Cuyahoga River Area of Concern.

Factors Contributing to Impairment

These are unknown since there is no information concerning the tainting of fish or wildlife flavor, although it should be noted that tainting of flavor has been attributed to the presence of phenolic compounds in other Great Lakes Areas of Concern. It has also been documented that the results of eutrophication, i.e., increased algal growth, can cause tainting of fish flesh.*

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

None available.

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* Carlson, Robert. 1990. Eutrophication of the Cuyahoga River and the Lake Erie Nearshore. See Appendix A.

iii.1 DEGRADED FISH POPULATIONS

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when fish management programs have identified degraded fish populations due to a cause within the watershed. In addition, this use will be considered impaired when relevant, field validated, fish bioassays with appropriate quality assurance/quality controls confirm significant toxicity from water column or sediment contamination."

The principal measures of overall fish community health and well-being used by Ohio EPA are multi-metric indices, the Index of Biotic Integrity (IBI) and the Modified Index of Well-being (MIwb)*.

Refer to Appendix F for detailed descriptions of these indices and for a full citation of the Ohio EPA manuals from which they come.

Multi-metric indices permit a more accurate and sensitive evaluation of community responses to environmental stress than the traditional approach to biological monitoring, which includes the listing of the number of species collected and discussions of trends in numerical abundance and biomass (length and weight) of the fish.

The following qualifications are attached to indices scores:

Evaluation of Population	Index of Biotic Integrity	Modified Index of Well Being
Exceptional	greater than 48	greater than 9.5
Good	40 - 48	8.6 - 9.5
Fair	26 - 40	6.5 - 8.6
Poor	16 - 26	5 - 6.5
Very Poor	below 16	below 5

To meet Warm Water Habitat (WWH) life use designation criteria, the IBI should be 40 or higher. The MIwb should be 8.7 or greater. These cutoffs hold for fish caught by the boat sampling method, which was used for most of the Cuyahoga River fish populations sampling.

A comparison of the 1984 and 1988 data reveals that considerable improvement has occurred in the fish communities of the river in the intervening years.

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* The Index of Well-being is based on structural attributes of the fish community whereas the Index of Biotic Integrity additionally incorporates functional characteristics. Structural characteristics include numbers of fish, fish biomass, the total number of species, etc. Functional characteristics include the proportions of sensitive species to tolerant species, omnivors to insectivors, pioneers to long standing, stable species, etc.

Characterization of Types of Data Utilized

The primary source of data utilized is the Ohio EPA Fish Community Surveys from 1984-1988. This is considered by Ohio EPA to be a sound scientific data base, sufficient for the assessment of the impairment from the Ohio Edison Dam to the mouth of the river.

This database contains data from the following numbers of sites in the respective years:

1984	31 sites in the river
1985	19 sites in the river
1986	9 sites in the river
1987	22 sites in the river
1988	25 sites in the river

Information on fish communities in the nearshore area is limited to an historical review of available literature. Most recent studies reviewed include a sampling by Dr. Andrew White in 1986 and a survey of a limited area - the proposed confined disposal facility waters known as "Burke East" in fall 1988 and spring 1989, performed by the U.S. Fish and Wildlife Service. The last surveys prior to these were performed in 1975.

Declaration of Impairment

Figures 4-6 and 4-7 display the results of the data analysis using the indices.

A) Ohio Edison Dam to Head of Navigation: Impaired.

This stretch of the river is designated by Ohio EPA for warm water habitat use. As such, the fish communities must meet the IBI and MIwb criteria for fish communities of warm water habitat. Yet no stretches of this segment consistently met these criteria from 1984 to 1988.

In the upstream portion of the Area of Concern, sampling in the gorge (RM 43.0 and 42.8) in 1984, 1986 and 1988 revealed a trend of gradual decline. In 1986-87, the site just above the Little Cuyahoga experienced a drop in fish community scores, followed by an improvement but not enough to meet warm water habitat criteria. Below the Little Cuyahoga to the Akron WWTP, no collections achieved warm water habitat scores over the entire sampling period.

Though in the segment from Akron WWTP (RM 37.5) to NEORSD Southerly WWTP (RM 10.8) fish communities have shown general improvement during the years sampled, attainment of warm water habitat (WWH) criteria has yet to be achieved.

Fish communities in the stretch from NEORSD Southerly WWTP to the head of the Navigation channel have shown a modest improvement each year sampled, but attainment of WWH criteria has yet to be achieved.

B) Navigation Channel: Impaired.

Fish sampling conducted in the Navigation Channel during 1984-1988 yielded indices scores in the very poor and poor range with modest improvement only in MIwb scores over than four year sampling period. Poor quality habitat and low dissolved oxygen are major causitive factors of the degraded fish populations here.

An inadequate collection methodology contributes to the low number of fish actually collected. The IBI and MIwb do not apply to the Navigation Channel (modified deepwater areas) in part because these indices rely on electrofishing as a fish collection methodology, which is ineffective when reaching for fish at depths which occur in the channel.

C) Nearshore Area: Unknown.

No index is available to evaluate this section of the Area of Concern and no recent data are available. The IBI and MIwb apply to riverine habitats and do not apply to the harbor, nearshore, or open lake habitats. 1975 data revealed that many species of fish once found in Lake Erie were now rare or had disappeared entirely. Smaller, more focused surveys were done in 1986 and 1988-89, but 1975 was the last comprehensive sampling.

Confidence or Uncertainties

According to Ohio EPA, the data bases utilized to judge this impairment from Ohio Edison Dam to the mouth are considered scientifically sound and adequate.

There is less confidence in the judgement of impairment of the nearshore area where different sampling techniques may be responsible for differing results. Part of the difference between White's 1975 findings and the 88/89 studies of the U.S. Fish and Wildlife Service may be due to the White's use of a variety of sampling techniques and numerous sites sampled at various times during the year which yielded a more robust data base.

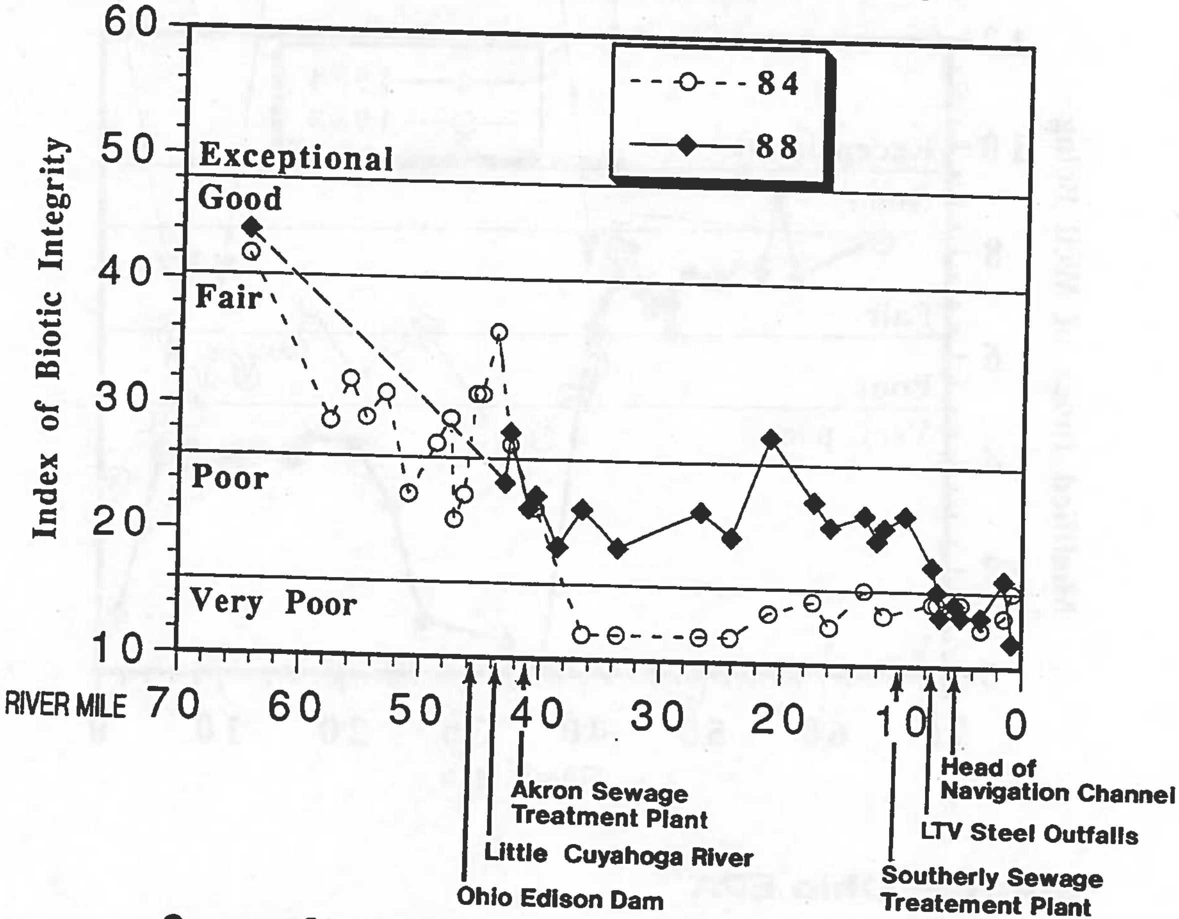
Factors Contributing to Impairment

Ohio Edison Dam to Akron WWTP

Raw sewage leaks, combined sewer overflows, urban runoff, and increased thermal loads were reported to be responsible for depressed fish community performance in the middle section of the river. Poor quality water discharged from the Little Cuyahoga River currently prevents the section of the Cuyahoga between the Little Cuyahoga and the waste water treatment plant from attaining warm water habitat criteria. Sources include combined sewer overflows, urban runoff, stormsewers and several points sources.

Figure: 4–6

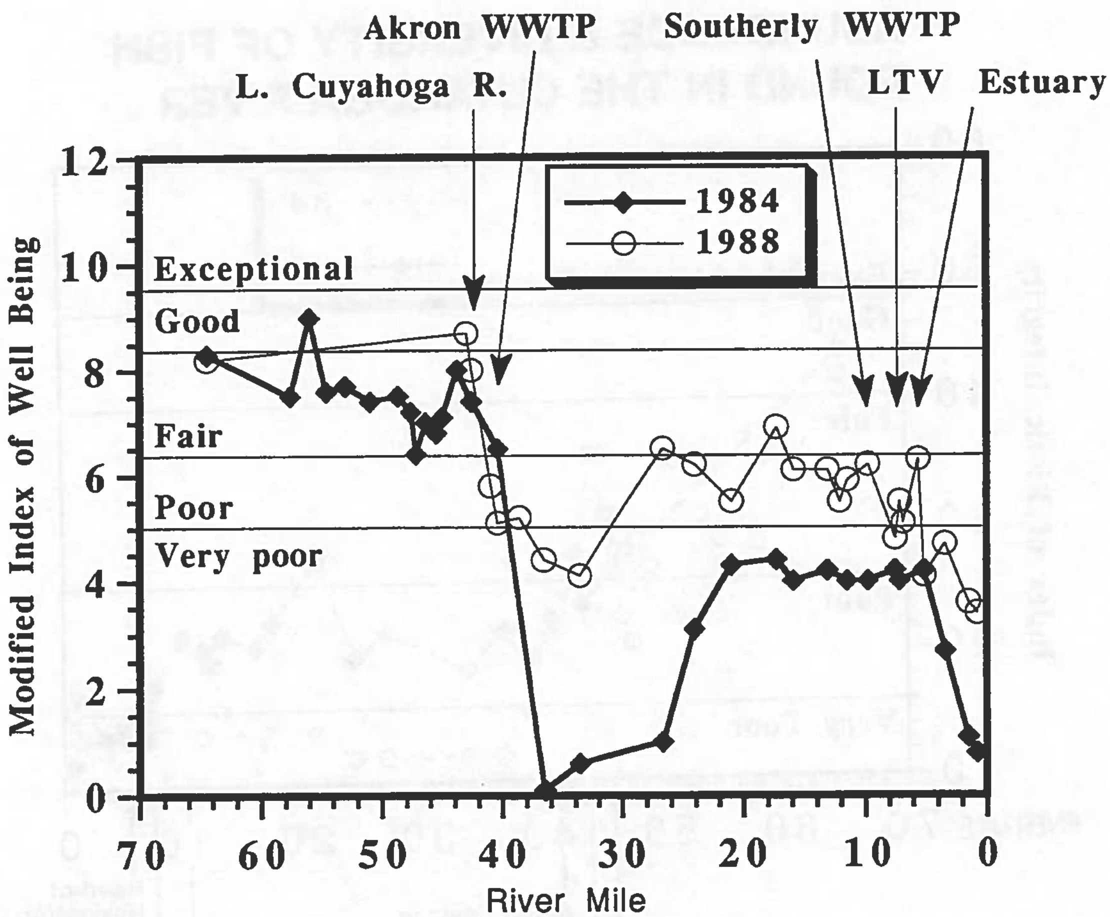
ABUNDANCE & DIVERSITY OF FISH FOUND IN THE CUYAHOGA RIVER



Source: Ohio EPA

Figure: 4–7

ABUNDANCE & DIVERSITY OF FISH FOUND IN THE CUYAHOGA RIVER, 1984 & 1988



Source: Ohio EPA

Akron WWTP to Southerly WWTP

Though a great deal has been done to remove toxicity problems of the Akron WWTP, community indices scores continued to remain in the very poor range in 1988. This indicates that there are residual impacts, though no specific contaminants have been identified as producing a toxicity responsible for depressed fish communities. Corrections have been made to Akron's water treatment facility and pretreatment program, and fish communities are expected to continue to improve as a result.

Southerly WWTP to Navigation Channel

Though indices scores are in the poor to very poor range, no specific contaminants have been identified as responsible for depressed fish communities.

Navigation Channel to Mouth

Combined sewer overflows and wastewater from the LTV Company's coking facility (approximately RM 5) have created problems to fish communities in the past. Correction of these problems is in progress and should improve the water quality in this section. The low levels of dissolved oxygen in the navigation channel is a major problem to the fish. This condition is particularly acute during the summer months. Biochemical oxygen demand, sediment oxygen demand and long time of travel (slow current) with no natural reaeration are factors and contaminants causing low dissolved oxygen conditions during summer months. No specific contaminants have been identified as directly responsible for depressed fish communities. Reduced habitat diversity (i.e., sheet piling, concrete bulk heads, riprap along the shoreline, etc.), maintenance dredging activities, and the turbulence and sediment resuspension caused by freighters using the navigation channel substantially reduce the potential of the fish community.

Nearshore Area

The change in species distribution among fish populations has been attributed not only to increasing nutrient levels, but also to clearing of the land and building of dams, causing siltation and a blockage of spawning streams. Other ways in which fish habitat has been altered (causing a decline in numbers and diversity) include bulkheading, sheet-piling, riprap, and dredging. For a more complete discussion of habitat, see Use Impairment xiv.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

1) Fish Community Trends in the Cuyahoga River: 1984-1988 (Appendix A)

2) Fish Population Trends in the Cleveland Nearshore Area (An Historical Review of Available Literature) (Appendix A)

iii.2 DEGRADED WILDLIFE POPULATIONS

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when wildlife management programs have identified degraded wildlife populations due to a cause within the watershed. In addition, this use will be considered impaired when relevant, field validated, wildlife bioassays with appropriate quality assurance/ quality controls confirm significant toxicity from water column or sediment contaminants."

Characterization of Type(s) of Data Utilized

Data consulted include unpublished observations of area biologists and several published surveys in one delimited area of the Area of Concern.

Unfortunately, a rather extensive search of the literature has uncovered little data on changes in wildlife populations throughout the Area of Concern and their potential causes. Moreover, most work done in the Area of Concern is limited to enumeration and descriptions of the various animal populations on the banks of the Cuyahoga, with a focus in the CVNRA area. Such accounts are helpful in illustrating the diversity and general health of the area. However, the possibilities of any pathologies and possible pollution-related causes have not been addressed.

Declaration of Impairment

A) Ohio Edison Dam to Head of Navigation Channel: Unknown.

Although 1975 and 1984 survey data exist, no data have been collected since that time for comparison. Field data indicate "presence only" of species in a limited geographic area.

No outstanding animal pathologies have been reported from 1969 to date in the park area. On the other hand, no information on the pollution tolerance of the species found has been assembled. Furthermore, no formal search for pathologies has been undertaken.

Therefore, no data exist linking degradation to contaminants in the watershed.

B) Navigation Channel: Unknown.

There are no studies or systematic data for this area.

Personal communications indicate that bird diversity is somewhat depressed. However, no cause has been investigated.

C) Nearshore Area: Unknown.

There are no studies or data for this area.

Confidence or Uncertainties

There is no confidence in a link between degradation in wildlife populations and contaminant sources in the watershed. Though contaminants known to cause degradation in other areas are present in the river at low levels, the data base is insufficient to indicate if these compounds are impacting the wildlife populations in the Area of Concern. Furthermore, no recent studies of wildlife diversity and population counts have been done for the Area of Concern as a whole.

Factors Contributing to Impairment

Mutagenic and teratogenic effects of pollutants such as mercury, cadmium, and certain organics have been documented. It has been well documented that wastes such as PCBs and hexachlorobenzene can cause reproductive failure in birds (Gilman 1978-Great Lakes Biota Literature Review, Dec. 1986), and mercury has been implicated in both reproductive and behavioral changes in gulls in Lake Ontario (Fox 1978-Great Lakes Biota Lit. Review Dec. 1986). Many of these compounds at low levels are found in the Cuyahoga River.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

Terrestrial Vertebrate Populations: Population Survey Data (Appendix A)

iv. FISH TUMORS OR OTHER DEFORMITIES

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when the incidence rates of fish tumors or other deformities exceed rates at unimpacted control sites or when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers."

Ohio EPA has developed a metric known as "DELT Anomalies*," where occurrences of external problems such as tumors or other external deformities are recorded and compared against those observed at non-impacted reference sites in the same ecoregion.

External anomalies in the Cuyahoga River should occur in less than one-half percent of the population in order to match conditions at non-impacted reference sites. An occurrence of anomalies between one-half and three percent is considered to reflect a moderate deviation from the non-impacted reference sites. An occurrence of external tumors or other deformities in more than three percent of the population indicates severe environmental stress.

It should be noted that in addition to measuring for DELT anomalies, data need only confirm the presence of neoplastic or pre-neoplastic liver tumors in bullheads or suckers to indicate that an impairment exists, whether or not DELT anomalies have been found in significant numbers.

Characterization of the Type(s) of Data Utilized

A sound scientific data base is available, and is considered adequate for the assessment of this impairment. The primary sources of data utilized include:

a) Numerous research studies (1987, 1988, 1989) on the relationship of polynuclear aromatic hydrocarbons (PAHs) to the incidence of liver tumors in fish.

b) Ohio EPA Fish Community Surveys with DELT anomalies assessment: 1984 (31 sites), 1985 (19 sites), 1986 (9 sites), 1987 (13 sites), 1988 (23 sites).

Declaration of Impairment

See Figure 4-8 for a summary of external anomalies over the course of the river from Hiram Rapids to the mouth.

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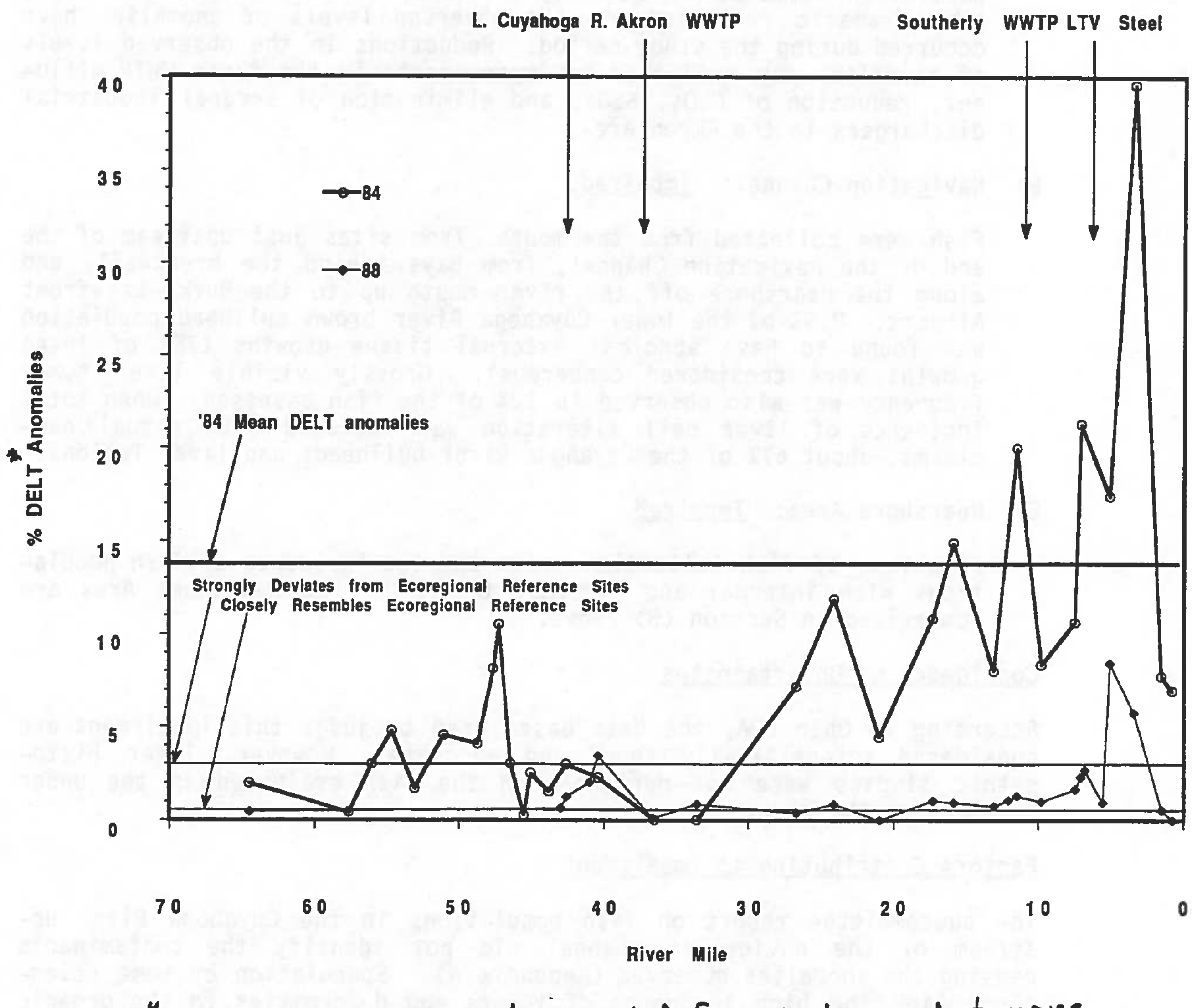
* The DELT metric provides one number which represents the proportion of fish sampled that show signs of Deformities, Eroded Fins, Lesions, and External Tumors. See Appendix F for addition information and a citation.

Figure: 4-8

A Comparison of External Anomalies in Cuyahoga River Fish from Hiram Rapids (RM 70) to the Mouth:
1984 & 1988, Ohio EPA Data Survey



*"DELT" includes deformities, eroded fins, lesions and tumors

A) Ohio Edison Dam to Head of Navigation Channel: Impaired in Some Places.

Ohio EPA in its decision rules, uses the expression "deviate moderately" to describe the condition of the fish in this area. There is no decision yet on the magnitude of the impairment.

In this section of the river, an average of 1.12% of the fish population exhibited external anomalies during 1988 Ohio EPA Surveys. Levels between 0.5% and 3.5% are considered to deviate moderately from the reference site. Only one of the 15 sites (RM 40.4 at 3.4%) exceeded the 3.0% level which is considered an indication of severe environmental stress. With levels as high as 25.9% of the fish population impacted as recently as 1985, it can, however, be said that dramatic reductions in the observed levels of anomalies have occurred during the study period. Reductions in the observed levels of anomalies may be linked to improvements in the Akron WWTP effluent, reduction of CSOs, SSOs, and elimination of several industrial dischargers in the Akron area.

B) Navigation Channel: Impaired.

Fish were collected from the mouth, from sites just upstream of the end of the Navigation Channel, from bays behind the breakwall, and along the nearshore off the river mouth up to the Burke Lakefront Airport. 8.9% of the lower Cuyahoga River brown bullhead population was found to have abnormal external tissue growths (75% of these growths were considered cancerous). Grossly visible liver tumor frequency was also observed in 12% of the fish assessed. When total incidence of liver cell alteration was included with actual neoplasms, about 67% of the Cuyahoga River bullheads had liver lesions.

C) Nearshore Area: Impaired.

Locations of fish collection sites and the incidence of fish populations with internal and external tumors in the Nearshore Area are summarized in Section (B) above.

Confidence or Uncertainties

According to Ohio EPA, the data bases used to judge this impairment are considered scientifically sound and adequate. However, liver histopathic studies were not performed on the fish evaluated in the upper portions of the river.

Factors Contributing to Impairment

The subcommittee report on fish populations in the Cuyahoga River upstream of the navigation channel did not identify the contaminants causing the anomalies observed (Appendix A). Speculation by some scientists link the high incidence of tumors and deformities to the organic toxicant that was discharged by the Akron Wastewater Treatment Plant in 1984, believed to be a phthalate-related compound. Since 1984, effluent bioassays and improving in-stream populations of fish and benthic macroinvertebrates suggest that this source of toxicity has been greatly reduced.

Polynuclear aromatic hydrocarbons (PAHs) are believed to be the compounds most responsible for producing the carcinogenic/mutagenic responses observed in the brown bullhead populations of the lower Cuyahoga River and in Cleveland Harbor. Evidence of the PAH cause/effect link is presented in Exhibit 4-1.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports and Other Reports Consulted

1) Fish Tumors and Other Deformities (Appendix A).

2) Longitudinal Trends in the Incidence of External Anomalies in the Cuyahoga River Fish (Appendix A).

3) Baumann, Paul. Abstract of Presentation on Liver Tumors in Brown Bullheads, in Proceedings of the Workshop on Cause-Effect Linkages. International Joint Commission, Council of Great Lakes Managers. 1989.

EXHIBIT 4-1

Abstract of Presentation on
Liver Tumors in Brown Bullheads
to the Council of Great Lakes Research Managers, 1989
by
Paul Baumann
U.S. Fish and Wildlife Service, Columbus, Ohio

Populations of certain fish species in certain locations in the Great Lakes basin exhibit a high incidence of tumors. The brown bullhead, which is relatively pollution tolerant, has been used by several researchers to monitor the frequency of liver tumors and to investigate the causes. Polynuclear aromatic hydrocarbons are carcinogenic compounds and are frequently present in waters where bullheads show elevated incidences of liver tumors. The hypothesis is advanced that the incidence of liver tumors in brown bullheads is caused by exposures to high levels of polynuclear aromatic hydrocarbons, particularly from coking operations associated with steel production.

In terms of time order, little is known about the onset of the disease. Though detailed knowledge is available on the dates of the construction of the coking facilities, little is known about the annual production or thus about the likely exposures of fish to polynuclear aromatic hydrocarbons. There is, however, strong time-order information relating to the closure of the coking facilities and the recent decline in the frequency of liver tumors in brown bullheads.

Information on the coincidence of high or low exposures to polynuclear aromatic hydrocarbons and high or low frequency of liver tumors, respectively, supports a causal relationship in terms of strength of association. There are, however, certain locations such as St. Marys River where there is a high tumor frequency and low PAH and other locations such as Presque Ile where there are high PAHs and low tumor frequency. Further research is needed to understand these exceptions perhaps in terms of availability of PAHs, or of the role of alternative etiological agents. The incidence of tumors at reference sites is between 0-2%. However, the incidence in the Cuyahoga River is about 20% and in the Black River up to 60%. Thus, the relative risk in the highly contaminated locations is 10 to 30-fold increase.

In terms of specificity for the causal association of liver tumors and exposure to PAHs, the evidence is not strong. Virtually any compound that is a known carcinogen in mammals is a liver carcinogen in fish. Thus, there is neither specificity in the causes or the effect and this criterion is indeterminate in relation to the hypothesis.

Different investigators working in different locations at different times on different species, including tom cod, bowfin, English sole and rock sole have found consistent relationships between tumor frequency and exposures to polynuclear aromatic hydrocarbons. There are, however, few Great Lakes studies that are adequately designed in terms of numbers of samples, randomization and reliable histopathology. Thus, much more field work is required before the consistency on replication criterion can be satisfied.

The strongest evidence exists in relation to the coherence criterion. The new information, that brown bullheads exposed to polynuclear aromatic hydrocarbons have an increased incidence of liver tumors, coheres with existing knowledge about the carcinogenic properties of these compounds. There are plausible pathways whereby brown bullheads are exposed to polynuclear aromatic hydrocarbons released from coking operations. Wild brown bullheads metabolize benzo-*a*-pyrene to carcinogenic metabolites and aromatic DNA adducts have been found in their livers. There are statistically significant relationships between exposures to PAHs and the incidences of liver tumors.

v. BIRD OR ANIMAL DEFORMITIES OR REPRODUCTIVE PROBLEMS

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when wildlife survey data confirm the presence of deformities (e.g., cross-bill syndrome) or other reproductive problems (e.g., egg shell thinning) in sentinel wildlife species.

Characterization of the Type(s) of Data Utilized

Data utilized include the unpublished observations of area biologists and two published surveys.

Declaration of Impairment

A) Ohio Edison Dam to Head of Navigation Channel: Unknown.

No animal pathologies have been reported from 1969 to the present, there is also no scientific data base to indicate if chick mortality, eggshell thinning or other similar problems exist and are related to contaminants in the watershed.

B) Navigation Channel: Unknown.

There is no scientific data base to indicate if bird or animal deformities or reproductive problems exceed rates at control sites.

C) Nearshore Area: Unknown.

There is no scientific data base to indicate if bird or animal deformities or reproductive problems exceed rates at control sites.

Confidence or Uncertainties

Information obtained regarding the observations of individuals seems reliable. However, no studies have been organized to identify, if any, reproductive problems, problems of eggshell thinning, or chick mortality.

Factors Contributing to Impairment

Mutagenic and teratogenic effects of pollutants such as mercury, cadmium, and certain organics have been documented in other areas. Also wastes such as PCBs and hexachlorobenzene can cause reproductive failure in birds. Many of these compounds are found at low levels in the Cuyahoga River.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

1) Terrestrial Vertebrate Populations: Population Survey Data (Appendix A).

vi. DEGRADATION OF BENTHOS

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when the benthic macroinvertebrate community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. In addition, this will be considered impaired when toxicity (as defined by relevant, field validated, bioassays with appropriate quality assurance/quality controls) of sediment-associated contaminants at a site is significantly higher than controls."

The Ohio EPA, in setting the state's water quality standards, has adopted the Invertebrate Community Index (ICI) for the Erie Ontario Lake Plain ecoregion as a method for measuring diversity in the free flowing sections of the river.* The ICI was applied to the free flowing sections of the river as the criterion to judge impairment.

An ICI score of 34 is needed to indicate attainment of warm water habitat criteria. An ICI score between 30 and 32 indicates an area of insignificant departure from warm water habitat criteria. A score of 28 clearly indicates non-attainment of criteria.

For measuring diversity in the navigation channel and the nearshore areas, a "trophic condition index" and several other indices were applied by Ohio EPA. Formal impairment limits have not been established for these indices.

Sediment bioassay results were evaluated for the navigation channel and inner harbor, applying percent mortality criteria established by Aqua Tech Environmental Consultants, Inc. Formal impairment limits have not been established for the bioassay results.

Characterization of the Type(s) of Data Utilized

A sound scientific data base was available and is considered adequate for determining benthic community impairment. A summary of the key sources of data utilized includes:

Community Structure Surveys:
- Ohio EPA, 1977 through 1989 annual trends (1 site per year);
- Ohio EPA, 1984, 1986, 1987, 1988 (16 to 21 sites per year); and
- Krieger-Heidelberg College, 1978, 1979, 1988, 1989 (15 sites per year).

Bioassay Toxicity Surveys:
- Aqua Tech Environmental Consultants, 1986 (19 sites)

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* The Invertebrate Community Index (ICI) is a modification of the Index of Biotic Integrity (IBI - see Appendix F), developed by Ohio EPA. It consists of ten structural (number and size of individuals) and functional (variety and proportions of species) community metrics.

Declaration of Impairment

Figure 4-9 summarizes the trend in ICI levels over the course of the river from Hiram Rapids to the mouth in 1984, 1988 and 1991.

Figure 4-10 relays the improvements in the ICI scores at the Independence monitoring station from 1976 to 1990.

A) Ohio Edison Dam to Head of Navigation Channel: Impaired in some locales.

Significant improvements in the benthic community have occurred since 1984 throughout this stretch of river. In 1988, only one site sampled met the warmwater habitat criterion. In contrast, only three sites (of fourteen sampled) between RM 45 and RM 5.6 were below 32 (attaining the warmwater habitat criterion).

B) Navigation Channel: Possibly Impaired.

The Ohio ICI criteria for expected performance in Lake Erie tributary mouths have not yet been established, and therefore attainment goals are not clearly defined. However, the benthic communities observed were considered poor and not up to biological performance levels observed in other Lake Erie River mouths.

Bioassay studies conducted in 1986 indicated sediment-induced toxicity to mayfly larvae to be in the moderate range.

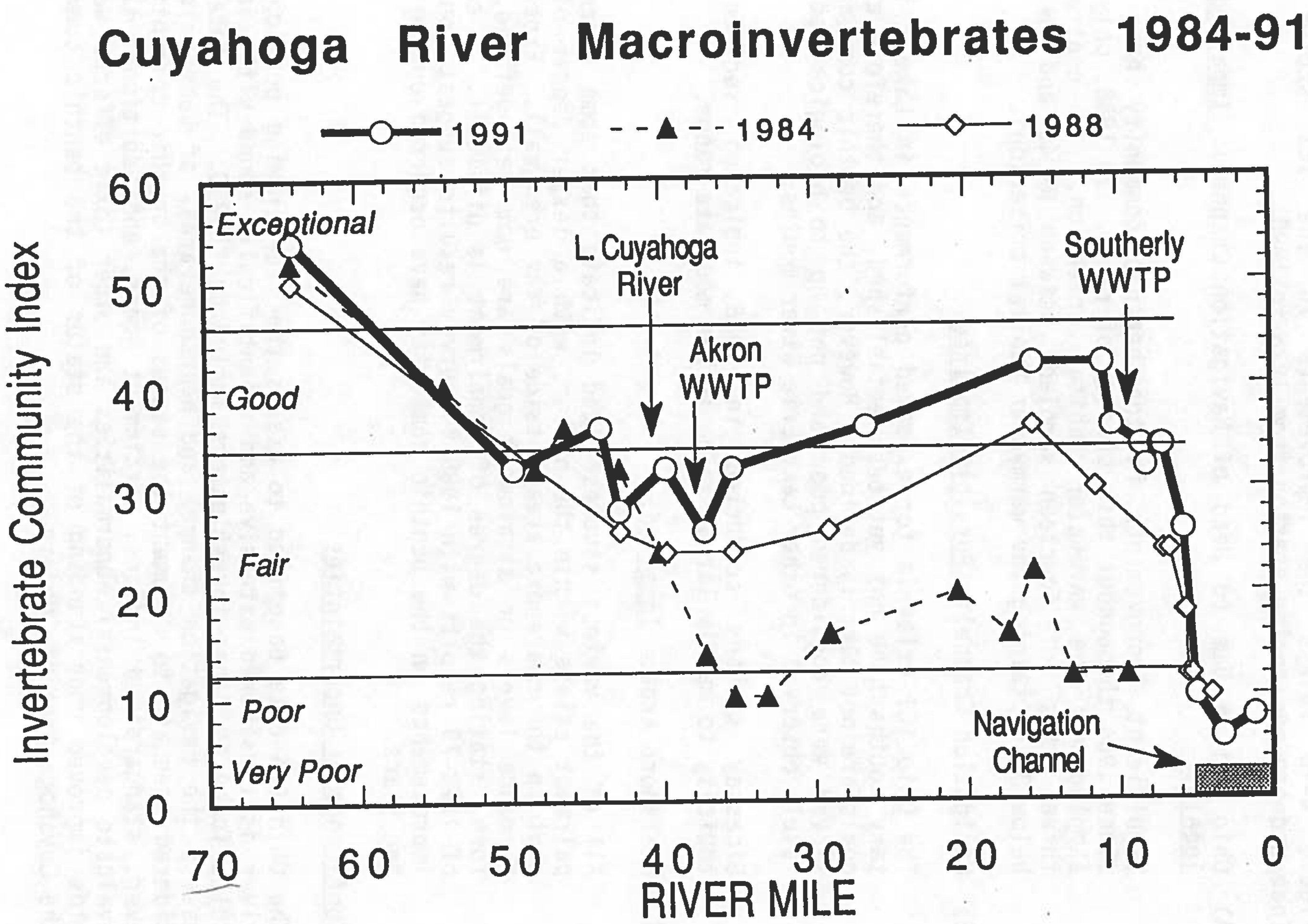
C. Nearshore Area: Impaired.

All of the various studies cited indicate that some degree of impairment exists within the harbor, with a lesser degree of impairment in the nearshore area outside of the breakwall. Expected performance levels or attainment goals are not well-defined. Therefore, stating the degree of impairment is difficult. A comparison of 1978-79 results with 1988-89 survey results suggest considerable improvements in the benthic community have occurred during the past ten years.

Confidence or Uncertainties

The Ohio EPA data base used to assess the free-flowing portions of the river is considered extensive and scientifically sound with similar results found by other investigators including NEORSD. The data used to assess the navigation channel and nearshore areas of Lake Erie is considered adequate to document the status of the benthic community. However, standardized indices, attainment goals, and additional studies to evaluate developmental abnormalities and other toxic effects would provide improved understanding of the status of the benthic community in the Cuyahoga Area of Concern.

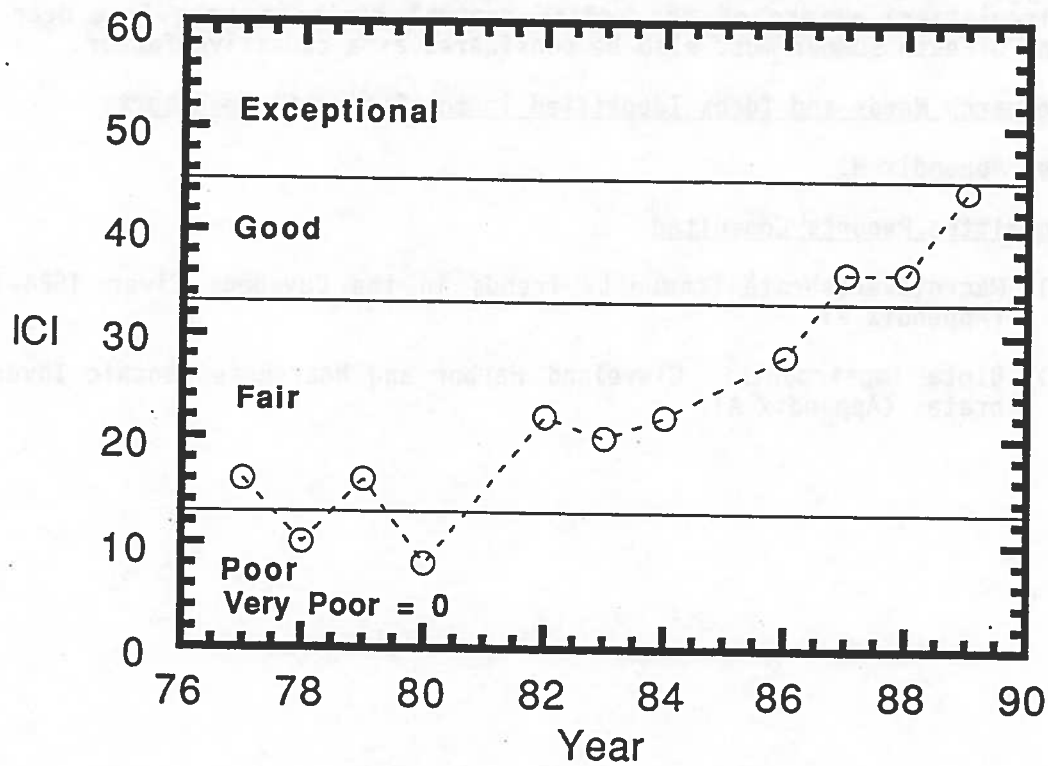
FIGURE 4-9



NOTE: Figure supplied by Ohio EPA, but the Plan Drafting Committee has not yet reviewed the data.

Figure: 4—10

Invertebrate Community Index Scores at the Independence Monitoring Station (RM 13.2): *1976 - 1990, Ohio EPA Data Survey*



Factors Contributing to Impairment

The structure (numbers and biomass of individuals) and composition (species diversity attributes) of the macroinvertebrate community suggest that toxicity and nutrient enrichment are responsible for the decline in benthic populations in the river and navigation channel. Specific compounds responsible for the toxicity cannot be discerned, but it is suspected that it is due to sporadic releases from point sources and combined sewers overflows, or to a lingering sediment toxicity condition. Causes of poor population performance in the navigation channel are further impacted by annual dredging, extreme turbulence from shipping activities, low oxygen levels, and lack of suitable habitat structure. In the nearshore area, organic enrichment (i.e., sewage) seems to be the primary factor causing impairment. Toxic materials in the sediments, including iron, zinc, arsenic, manganese, PCBs, toluene, and PAHs, may also be exerting impacts, but these influences seem to be camouflaged by the much stronger influences of organic enrichment. Low oxygen levels experienced by the hypolimnic (lower-most layer, non-circulating) waters of the entire central basin of Lake Erie near the end of each summer must also be considered as a causative factor.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

1) Macroinvertebrate Community Trends in the Cuyahoga River 1984-1988 (Appendix A).

2) Biota Impairments: Cleveland Harbor and Nearshore Benthic Invertebrates (Appendix A).

vii. RESTRICTIONS ON DREDGING ACTIVITIES

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when contaminants in sediment exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities."

Most of the sediments dredged from the Cuyahoga Area of Concern are subject to restrictions on disposal because of their classification by USEPA as "heavily polluted".* At present only a small amount of dredged material from the sandy shoals at the extreme upstream end of the navigation channel have no restrictions on disposal (30,000 cubic yards of a total 400,000 cubic yards dredged annually). Annually about 300,000 cubic yards of this sediment are dredged from the Cuyahoga River Federal Navigation Channel (the mouth up to RM 5.8), 75,000 cubic yards are dredged from the East Outer Harbor, and 25,000 cubic yards are dredged from the West Outer Harbor. Anecdotal information suggests that the quantity and composition of the Cuyahoga River sediment over the last ten years has changed. Over the last ten years there has been a significant reduction in the amount of sediment (a decrease from between 800,000 and 1,000,000 cubic yards around 1980 to between 300,000 and 400,000 cubic yards), as well as an increased amount of sandy and granular material in the sediment (an increase from between 5,000 and 10,000 around 1980 to between 30,000 and 50,000 cubic yards).

Because the sediments are classified as "heavily polluted", their disposal is restricted to a confined disposal facility (CDF). The active facility in the Cleveland area currently is Site 14 (Figure 4-10). The "heavily polluted" classification is not the most serious; if the sediments were classified as "hazardous," then their disposal would be limited to a facility permitted under the Federal Resource Conservation and Recovery Act (RCRA), and if they were "toxic" (i.e., if the PCB concentration were greater than 50 parts per million), their disposal would be regulated by the Toxic Substances Control Act (TSCA).

Open-lake disposal of clean sediment may nonetheless impact fish habitat and littoral drift. Any proposal to place the large quantity of clean silts and clays found in the Cuyahoga dredged material in the off-shore area of Lake Erie would still require scrutiny from environmental officials.

Data on trends in the quality of Cuyahoga River sediment show the following: an increase in Total Kjeldahl Nitrogen and chemical oxygen demand downstream of Tinker's Creek (RM 16.4); significant improvements in Total Phosphorus, cyanide, oil and grease, chemical oxygen demand and heavy metals detected in the navigation channel sediments; and a decline in heavy metals (lead, zinc, cadmium and chromium), Total Phosphorus, and chemical oxygen demand detected in harbor sediments (1972-1986).

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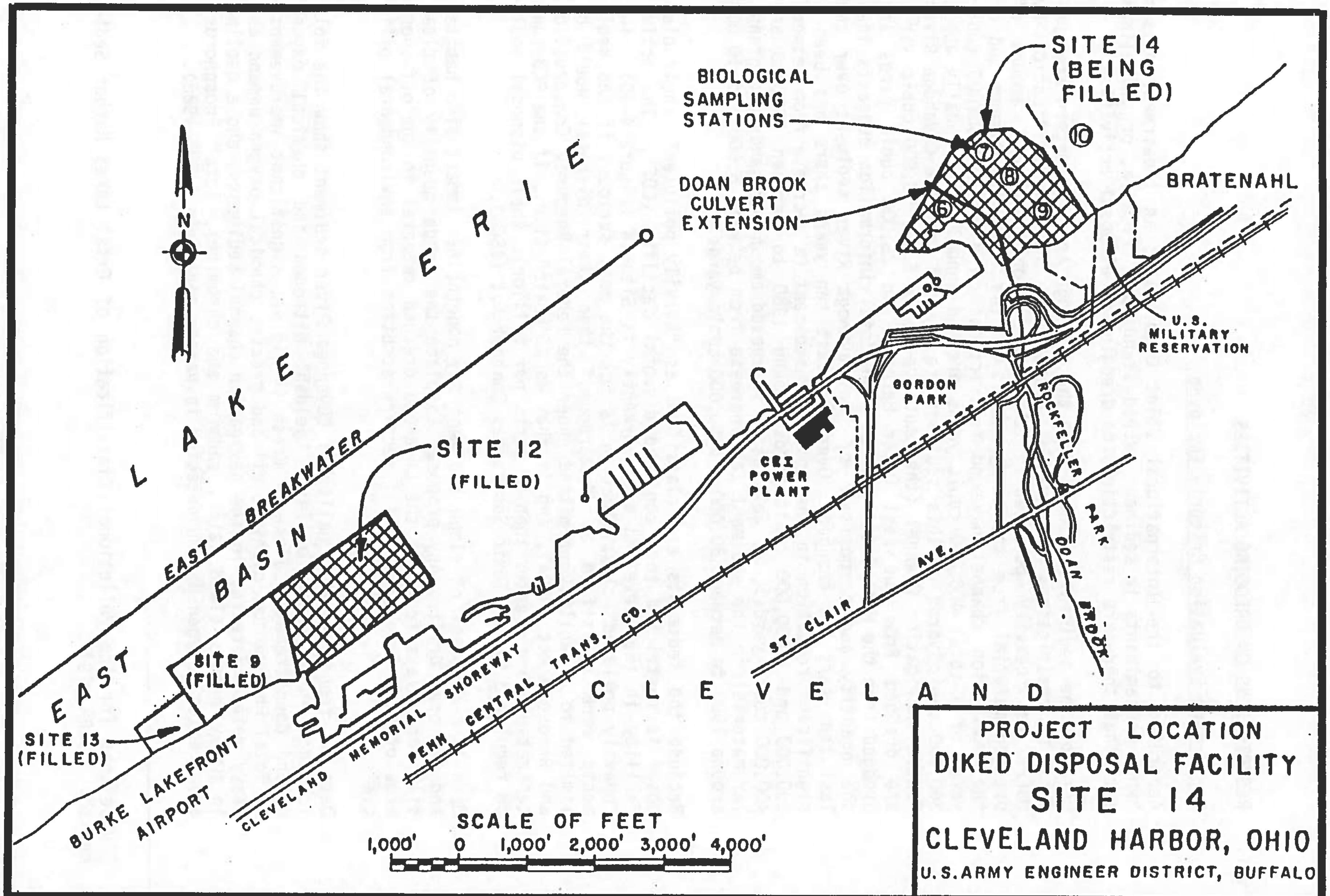
* "Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments". USEPA, 1977.

Combined Disposal Facilities in the Cleveland, Ohio Area.



Source: Final Environmental Statement, Diked Disposal Facility, Site No. 14, Lake Erie, Cleveland Harbor, Cleveland, Ohio. U.S. Army Corps of Engineers, Buffalo District, December, 1975, p. 2. Map updated by authors, 1990.

Over the same period, in the navigation channel, Total Kjeldahl Nitrogen and volatile solids sediment concentrations did not improve. In the harbor, oil and grease, Total Kjeldahl Nitrogen and volatile solids sediment concentration have not declined significantly.

Concentrations of PCBs in the navigation channel remained low, and while PAH concentrations were lower than the mean for nine Great Lakes fish tumor sites where PAHs are suspected to cause fish tumors, the low concentrations found in the navigation channel may be due to annual dredging. Prior to dredging, PAHs have been found at levels an order of magnitude larger, which indicates that there is a continuing source of PAHs to the lower portion of the Cuyahoga River and suggests that dredging aids in their removal from the settled portion of the river.

See Section 4.3 for a detailed review of the Cuyahoga River sediment data.

Characterization of Types of Data Utilized

The federal Environmental Impact Statements (EIS) for current dredging activities were available but dated (1974 and 1975). Preparation of the dredging report was somewhat hampered because more current information in the draft EIS for the proposed new confined disposal facility (CDF) known as Burke East and proposed expansion of the existing CDF were unavailable. The EIS for the proposed expansion only was recently released by the Army Corps of Engineers (ACOE) and is now available for review. Also consulted were:

- 1985-86 Ohio EPA and 1986, 1989 and 1990 ACOE data;

- several ACOE studies including a 1984 study of the impacts of current beach nourishment activities and a 1986 sampling program study;

- Ohio EPA and Ohio Department of Natural Resources files on dredging, sediment quality, and sediment disposal;

- available studies conducted in 1984 and 1986 by area universities of the local economic impact of shipping activity.

- statistics on commercial shipping in Cleveland Harbor from the Cleveland Port Authority, and on shipping in the Cuyahoga River and Old River Bed from the Lake Carriers' Association.

A concerted effort was made to supplement the existing information through the use of telephone interviews with officials of the Ohio Department of Natural Resources (ODNR), Ohio EPA and dredging contractors working for the ACOE and other private businesses, but the inherent weaknesses of this method are recognized.

Declaration of Impairment

Navigation Channel and Old River Bed (RM 5.6 to RM 0.0, the mouth at the old Coast Guard Station) and East and West Outer Harbor: Impaired.

Dredging takes place in the lower 5.6 miles (the Federal Navigation Channel) and portions of the Cleveland Harbor for commercial navigation purposes.

Disposal of nearly all dredged sediments is restricted. Sediments still generally exceed the USEPA heavily polluted criteria for Great Lakes Harbors. (See Cuyahoga RAP report on Cuyahoga River Sediment Quality, Appendix B.)

Confidence or Uncertainty

There is a high degree of confidence in the declaration that, in general, Cuyahoga River and Nearshore Area sediments presently exceed the USEPA "heavily polluted" criteria for Great Lakes harbors (see Section 4.3). There is also a high degree of confidence that the dredged sediments will continue to face restrictions on disposal, in part because of the fine-grained nature of the sediment. However, the USEPA is currently reviewing its criteria for sediment classification. Any changes in those criteria may lead to a reclassification of the Cuyahoga River sediments, but such changes are not likely to occur for several years.

Factors Contributing to Impairment

In general, the dredged portion of the Harbor and the Cuyahoga River has high contaminant levels of arsenic, barium, copper, lead, nickel, zinc, and oil and grease, and moderate levels of ammonia, cadmium, and chromium. Other contaminants found include PCBs, PAHs, phthalates (plasticizers), benzene and toluene.

A 1986 ACOE report concluded that much of the sediment in the Federal Navigation Channel may originate in the Cleveland Metropolitan area, but added that sources of pollution upstream from the navigation channel in the Cuyahoga Falls, Akron and Kent areas, must also be taken into account.

See RAP report on Cuyahoga River Sediment Quantity, Appendix B for a discussion of the extent to which the sediments exceed various standards and guidelines.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

1) Cuyahoga River Sediment Quality (Appendix B).

2) Restrictions on Dredging Activities as a Use Impairment (Appendix E).

viii. EUTROPHICATION OR UNDESIRABLE ALGAE

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when there are persistent water quality problems (e.g., dissolved oxygen depletion of bottom waters, nuisance algae blooms, decreased water clarity, etc.) which are attributed to cultural eutrophication".

Eutrophication is the ecological process in which a body of water is enriched with nutrients, causing a significant increase in the rate of plant growth. Those plants that cause the greatest concern are algae, which can grow prolifically to cause a number of problems in waters polluted by nutrients. Algae blooms are often unsightly; they can produce discoloration and a bad taste in drinking water; they increase the cost of water treatment; and upon death and decay, they impose an oxygen demand on the water that can deoxygenate a river or lake causing fish kills and other problems. (Thomas Dunne and L.B. Leopold, 1978, Water in Environmental Planning, W.H. Freeman and Co.)

Cultural eutrophication is the human-induced speeding up of the natural process. Impairment resulting from eutrophication could be measured by the degree to which dissolved oxygen depletion, nuisance algae blooms, decreased water clarity, etc. impair boating, fishing, drinking water, industrial and agricultural uses, or species diversity.

According to the Ohio Lake Condition Index (LCI)*, a lake is classified as hypereutrophic (very eutrophic) if the total phosphorus concentration in the lake exceeds 75 mg per M^3 or the algal pigment, chlorophyll a, exceeds 40 mg per M^3. These levels have not been adopted by Ohio EPA. Other regional definitions of hypereutrophy cite a variety of levels of phosphorus and chlorophyll a. There is a poor correlation between algae and phosphorus in the river, due in part to the fact that the water residence time is too short for the algae to develop sizeable populations.

Characterization of the Type(s) of Data Utilized

Information in this section comes from the Ohio EPA and the IJC guidance document, state water quality surveys, survey data and published reports, and personal communications.

There are little consistent data available for eutrophication-related variables. Indices used for determining trophic state have been developed for lakes rather than streams, but could provide some insight if consistent and frequent monitoring of the river were done.

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* Davic, R.D. and J.E. DeShon. 1989. The Ohio Lake Condition Index: A new multiparameter approach to lake classification. Lake and Reservoir Management 5.1-8.

Because phosphorus loadings are influenced by rain events and instream flows, data on phosphorus loadings must be accompanied by weather conditions and river volumes. There is an inadequate amount of historical data that consistently includes all parameters.

As far as impairments to boating, swimming and aesthetics in the Area of Concern, little information on eutrophication-related variables has been gathered.

Declaration of Impairment

A) Ohio Edison Dam to Head of Navigation Channel: Unknown.

Little can be said about the present trophic state of this section of the river, due in part to a lack of standards or an index for free-flowing streams. No consistent monitoring of eutrophication-related variables such as total phosphorus, algae chlorophyll, or algae species has been done. Algae and macrophytes have not been surveyed since the 1960s.

Data from 1970's show the Cuyahoga River to be highly eutrophic. Carlson and Fritz (1978) applied six different water quality indices to five sites within this river segment. Although the values varied somewhat, the indices scores labeled the water quality as "eutrophic" or "hypereutrophic". There is also evidence (1960s) of reduced macrophyte and algal species diversity in most of the Cuyahoga River below Kent, but it cannot be ascertained whether this loss of species was due to eutrophication or toxicity.

Phosphorus levels in the river remain high although recent trends show a decrease of phosphorus and ammonia.

Ohio EPA surveys from 1984, 1987, and 1988 found few dissolved oxygen violations in this segment of the River, indicating a dramatic improvement from the conditions that existed prior to the 1980's.

B) Navigation Channel: Probably Impaired.

Severe oxygen depletion occurs throughout warm weather. However, most of the biological oxygen demand is probably produced by sewage rather than dying algal mats. Water clarity in this section of the river is poor, due more to heavy boat traffic and dredging activities than to blooms of algae. Regardless of in-stream effects, phosphorus levels measured are high enough to cause eutrophication in an open lake environment.

C) Nearshore Area: Impaired.

Little consistent monitoring of eutrophication-related variables such as Total Phosphorus, algal chlorophyll, or algal species has been done for the Area of Concern and, therefore, data on trends of trophic state do not exist. According to a 1984 survey done by the Argonne National Laboratories*, the southern nearshore waters of Lake Erie remain in eutrophic condition based on secchi depth, average total particulate phosphorus, and chlorophyll-a concentration. High phytoplankton cell abundance and eutrophic associations of fish and plankton species persist.

The following map (Figure 4-12) shows the trophic status of Lake Erie regions. The Cleveland nearshore area is depicted as eutrophic.

A conversation with the President of the Edgewater Yacht Club in the Area of Concern revealed a problem to boaters from algae growth. For the first time in 20 years, algae growth during the summer of 1990 created a problem to boaters in the vicinity of the Club's marina. The algae, which grows from the bottom, wraps around boat propellers and prevents movement. The President indicated that if it happened again this summer, the Club may have to rent a harvester to eliminate this problem. What caused the algae to return in large quantities has not been investigated.

<u>Confidence or Uncertainties</u>

With the exception of Ohio EPA's dissolved oxygen surveys, the data used to assess the trophic state of the river is dated, inconsistent, and based on few samples. Data on trophic state of the navigation channel do not exist, nor are there adequate amounts of consistent data to evaluate what the impact currently is from cultural eutrophication on the nearshore area.

<u>Factors Contributing to Impairment</u>

The underlying cause of eutrophication is nutrient enrichment, primarily phosphorus loading. A direct correlation between phosphorus loading and chlorophyll concentration have been measured in Lake Erie. Also of concern are biological oxygen demand, suspended solids and nitrogen compounds. Both point and nonpoint sources contribute phosphorus to the river. There has been a major effort to reduce phosphorus loads from large municipal waste water treatment plants. Yet concentrations of phosphorus in the river are still high. Other possible sources of phosphorus include smaller sewage treatment plants, and a variety of nonpoint sources.

Sources in addition to permitted dischargers are being investigated for their contributions of suspended solids, nitrogen compounds, BOD, and other eutrophication-related contaminants.

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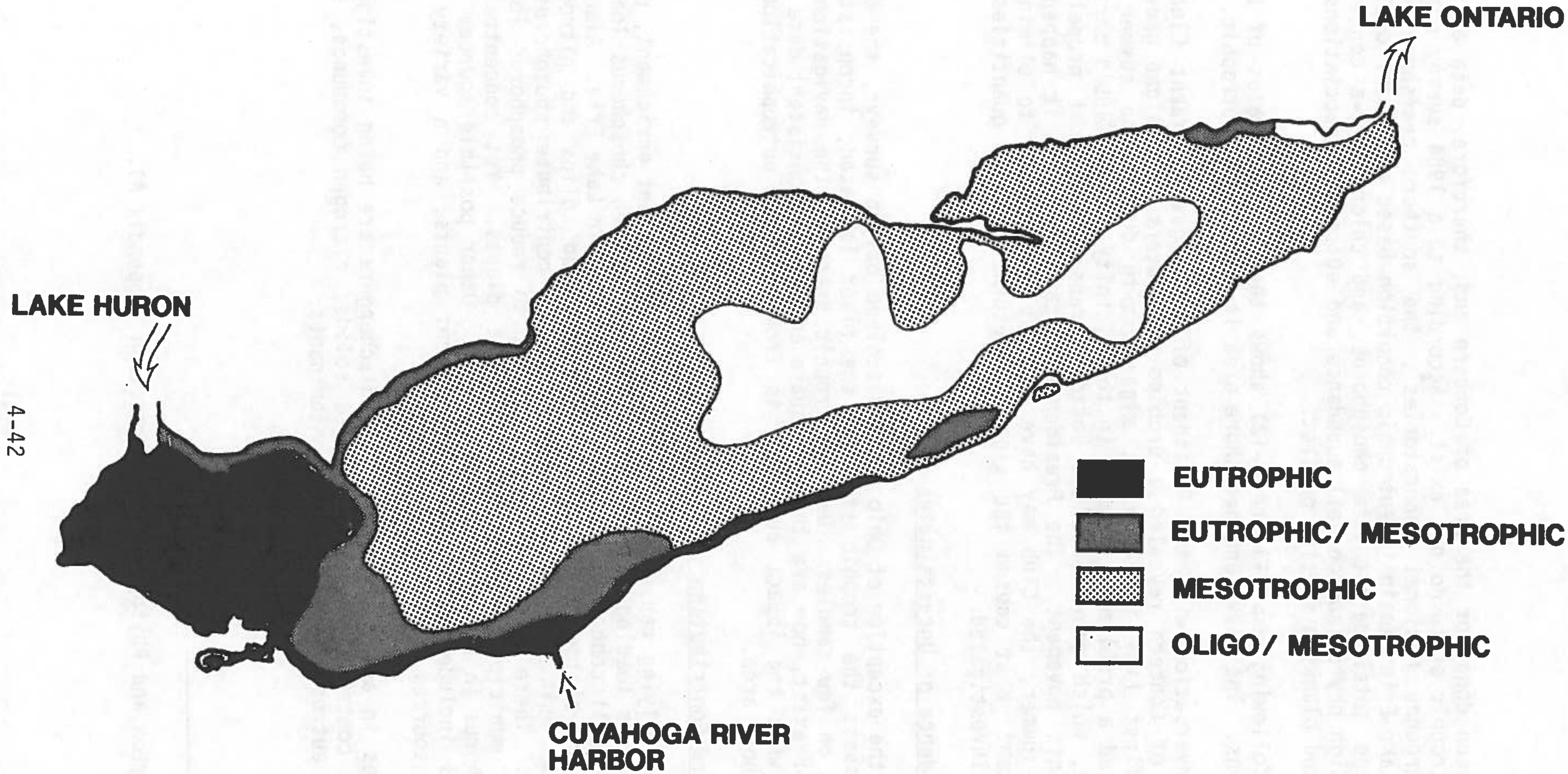
* In Periphyton and Phytoplankton Degradation (Appendix A).

Figure: 4–12

LAKE ERIE: Trophic Status of Lake Regions



SOURCE: Herendorf (unpublished) in Kreiger, 1989

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports and Additional Data Sources Consulted

1) Eutrophication or Undesirable Algae: Socio-economic Impacts (Appendix E).

2) Eutrophication of the Cuyahoga River and the Lake Erie Nearshore (Appendix A).

3) Phytoplankton Degradation (Appendix A).

4) Assessment of Zooplankton Communities (Appendix A).

5) Ohio EPA NEDO. Cuyahoga River Chemical Water Quality Study of Portage, Summit, and Cuyahoga Counties: 1984, 1987 and 1988.

6) Telephone interview with Will Sibley, President of Edgewater Yacht Club, March 1991.

7) Carlson, Robert E. 1990. "Are hypereutrophic lakes impaired?" Ohio Shoreliner, 4(i):3-5.

8) Ohio EPA. 1985. State of Ohio Phosphorus Reduction Strategy for Lake Erie.

ix. RESTRICTIONS ON DRINKING WATER CONSUMPTION OR TASTE AND ODOR PROBLEMS

Impairment Evaluation Criteria Employed

According to the International Joint Commission, where water is drawn for consumption from an Area of Concern, an impairment exists "when the treated drinking water supplies are impacted to the extent that: 1) densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances exceed human health standards, objectives or guidelines; 2) taste and odor problems are present; or 3) treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e., settling, coagulation, disinfection)."

Characteristics of the Type of Data Utilized

Residents in the Cleveland area are provided with water produced by the City of Cleveland which draws its water from four intakes located two to four miles north of the shoreline, considerably outside the Area of Concern.

Data available from the City of Cleveland include the following for the finished water.

1. monthly nitrate samples
2. daily turbidity samples
3. quarterly volatile organic compounds (VOC) samples for one year
4. annual metal samples
5. annual synthetic organic compounds (SOC) samples
6. quarterly trihalomethane samples
7. annual radiological samples

The following two figures illustrate the quality of the City of Cleveland's finished water (Figure 4-13 and 4-14).

Plankton records were kept from 1986 to 1989. Other raw water data may be available.

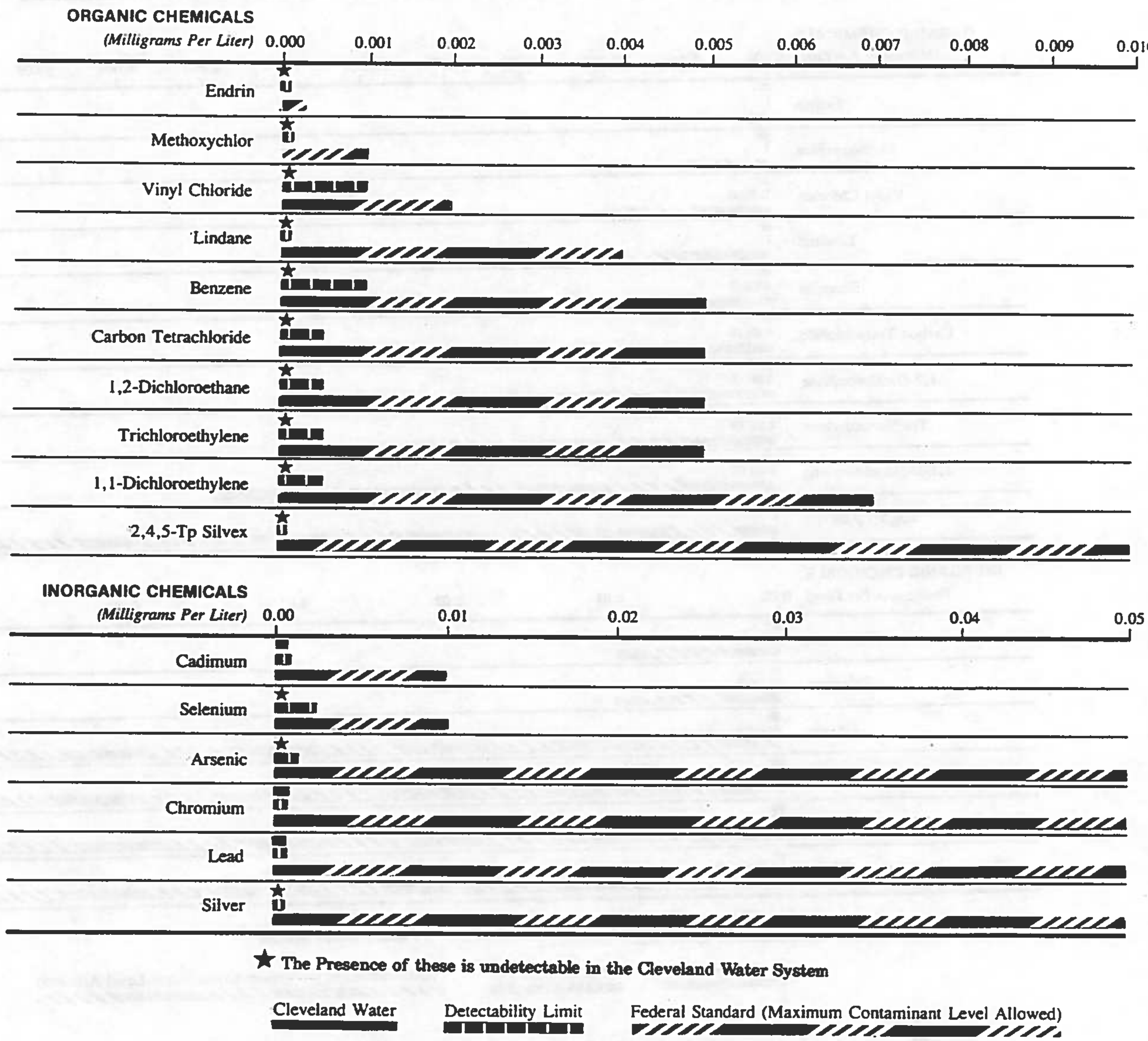
Residents in the Akron area are provided with water produced by the City of Akron which draws its water from reservoirs in the Upper Cuyahoga River basin, well above the Area of Concern.

Declaration of Impairment

As noted above, drinking water for the regional system of the City of Cleveland is fed by four intakes located two to four miles north of the shoreline. The Crown intake is about nine miles west of the mouth of the river, and the Nottingham intake is about eight miles northeast of the river mouth. The Division and Baldwin intakes are about four miles northwest of the mouth of the river.

FIGURE: 4–13a

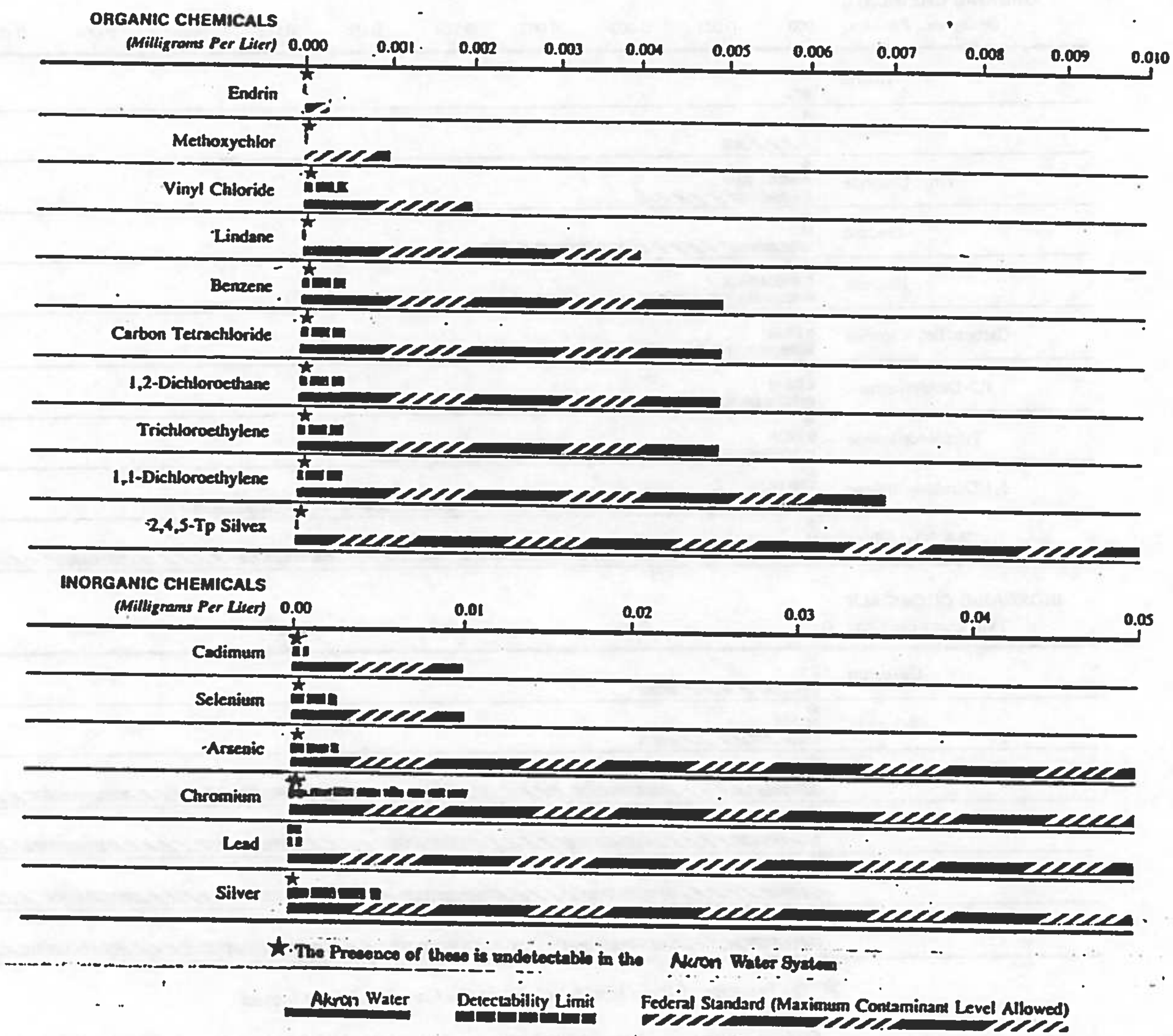
DRINKING WATER QUALITY COMPARISON
Cleveland Water Vs. Federal Standards



SOURCE: City of Cleveland, Division of Water (1990 Annual Report)

FIGURE: 4-13b

DRINKING WATER QUALITY COMPARISON
AKRON WATER Vs. Federal Standards



SOURCE: City of Akron Public Utilities Bureau, 1992.

NOTE: The lab that Akron hired generally reports lower detectability levels for organics and higher detectability limits for the inorganics than Cleveland's lab reports. Specifically, both cities report that all organics on this list are below the detection limits (DL). Akron's DL is lower than Cleveland's for the first 5 chemicals, equal for the next four, and also lower for the last chemical. Cleveland reports detectable CADMIUM, Akron none. Cleveland reports detectable CHROMIUM, Akron none. Both cities report detectable LEAD. Akron's DL for ARSENIC, CHROMIUM, and SIVER are higher than Cleveland's; other DLs are equal. For additional data on Akron drinking water, refer to Appendix I.4 of the Stage One Report.

FIGURE: 4–14

Average Chemical Values for the Cleveland Water System — 1990 Summary

INORGANIC CHEMICALS
ALL VALUES IN MG/L (PPM)
(unless otherwise stated)

CONTAMINANT	M.C.L. LEVELS	CLEVELAND WATER LEVELS
Primary Contaminants		
Arsenic (total)	0.0500	< 0.0013
Barium (total)	1.0000	< 0.0150
Cadmium (total)	0.0100	0.0005
Chromium (total)	0.0500	0.0003
Fluoride	4.0000	0.9800
Lead (total)	0.0500	0.0016
Mercury (total)	0.0020	< 0.0002
Nitrate-Nitrogen	10.0000	0.3800
Selenium (total)	0.0100	< 0.0023
Silver (total)	0.0500	< 0.0002
Secondary Contaminants		
Chloride	250.0	17.0
Color (Color Units)	15.0	2.0
Copper (total)	1.0000	0.0083
Corrositivity	non-corrosive	slightly corrosive
Iron	0.3000	0.0200
Manganese	0.5000	0.00022
Odor (Taste and Odor)	3	1-2
pH (Standard Units)	6.5-8.5	7.5
Sodium	20.0	9.0
Total Dissolved Solids	500	167
Sulfate	250	25
Zinc (total)	5.0000	0.0050

INORGANIC CHEMICALS (continued)
ALL VALUES IN MG/L (PPM)
(unless otherwise stated)

CONTAMINANT	M.C.L. LEVELS	CLEVELAND WATER LEVELS
Radionuclides: Values in Picocuries Per Liter		
Gross ALPHA	15	< 3
Gross BETA	50	< 4
Inorganic Physical Characteristics: Values in Nephelometric Turbidity Units		
Turbidity	1*	0.22

(* Monthly Average)

Other Values for the Cleveland Water System

Alkalinity, Stability	90.0
Alkalinity, Total	83.0
Aluminum	< 0.6000
Antimony (total)	< 0.0200
Beryllium (total)	< 0.0050
Chlorine, Free	1.0
Chlorine, Total	1.2
Calcium	29.6
Cobalt	< 0.0070
Cyanide (total)	< 0.0200
Hardness	120.0
Hardness (Grains/gallon)	7.0
Magnesium	7.8
Nickel (total)	0.2800
pH, Stability in Standard Units	7.9
Phosphorus	< 0.0100
Silica	0.5800
Specific Conductance	250 micromho/cm. @ 25 C
Thallium (total)	< 0.1000

ORGANIC CHEMICALS
ALL VALUES IN MG/L (PPM)
(unless otherwise stated)

CONTAMINANT	M.C.L. LEVELS	CLEVELAND WATER LEVELS
Organic Chemicals		
Alachlor	NO MCL	< 0.00005
Endrin	0.0002	< 0.00005
Lindane	0.0040	< 0.00002
Methoxychlor	0.0010	< 0.00003
Metalachlor	NO MCL	< 0.00020
Toxaphene	0.1000	< 0.00010
2,4-D	0.1000	< 0.00020
2,4,5-TP (Silvex)	0.0100	< 0.00002
Microbiological: Number of Colony forming units per 100 ml.		
Total Coliform	1*	< 1
Volatile Organic Chemicals		
Benzene	0.0050	< 0.0010
Carbon Tetrachloride	0.0050	< 0.0005
p-Dichlorobenzene	0.7500	< 0.0010
1,1-Dichloroethylene	0.0070	< 0.0005
1,2-Dichloroethane	0.0050	< 0.0005
1,1,1-Trichloroethane	0.2000	< 0.0005
Trichloroethylene	0.0050	< 0.0005
Vinyl Chloride	0.0020	< 0.0010
Total Trihalomethanes (Four Quarter running average)	.1000	.0312

Unregulated Organic Chemicals: Monitoring Required
All Values in MG/L (PPM)

CONTAMINANT	CLEVELAND WATER LEVELS
Bromobenzene	< 0.002
Bromomethane	< 0.010
n-Butylbenzene	< 0.002
sec-Butylbenzene	< 0.002
tert-Butylbenzene	< 0.002
Chlorobenzene	< 0.001
Chlorodibromomethane	< 0.005
Chloroethane	< 0.010
Chloromethane	< 0.010
o-Chlorotoluene	< 0.001
p-Chlorotoluene	< 0.001
1,2-Dibromoethane	< 0.002
Dibromomethane	< 0.001
1,2-Dibromo-3-Chloropropane	< 0.001
1,3-Dichlorobenzene	< 0.002
m-Dichlorobenzene	< 0.001
Dichlorodifluoromethane	< 0.001
1,1-Dichloroethane	< 0.005
cis 1,2-Dichloroethene	< 0.005
trans 1,2-Dichloroethene	< 0.005
1,1-Dichloropropane	< 0.001
1,2-Dichloropropane	< 0.005
1,3-Dichloropropane	< 0.001
2,2-Dichloropropane	< 0.002
cis 1,3-Dichloropropene	< 0.005
trans 1,3-Dichloropropene	< 0.005
Ethyl Benzene	< 0.010
Hexachlorobutadiene	< 0.009
Isopropylbenzene	< 0.002
p-Isopropyltoluene	< 0.002
Naphthalene	< 0.002
n-Propylbenzene	< 0.001
Styrene	< 0.001
1,1,1,2-Tetrachloroethane	< 0.0005
1,1,2,2-Tetrachloroethane	< 0.005
Tetrachloroethylene	< 0.005
Toluene	< 0.005
1,2,3-Trichlorobenzene	< 0.005
1,2,4-Trichlorobenzene	< 0.002
1,1,2-Trichloroethane	< 0.005
Trichlorofluoromethane	< 0.010
1,2,3-Trichloropropane	< 0.002
1,2,4-Trimethylbenzene	< 0.002
1,3,5-Trimethylbenzene	< 0.002
m-Xylene	< 0.001
o-Xylene	< 0.002
p-Xylene	< 0.002

Additional Unregulated Organic Chemicals: NO Monitoring Required
All Values in MG/L (PPM)

CONTAMINANT	CLEVELAND WATER LEVELS
Acrolein	< 0.100
Acrylonitrile	< 0.100
Aldrin	< 0.002
Alpha-BHC	< 0.003
Beta-BHC	< 0.004
Bromoform	< 0.010
Chlordane	< 0.015
Chloroethyl-2 Vinyl Ether	< 0.005
Chloroform	< 0.005
DDD-4,4	< 0.002
DDE-4,4	< 0.003
DDT-4,4	< 0.003
Delta-BHC	< 0.004
1,2-Dichlorobenzene	< 0.002
1,4-Dichlorobenzene	< 0.002
Dichlorobromomethane	< 0.005
1,2-Dichloroethane	< 0.005
Dieldrin	< 0.002
2,4-Dinitrotoluene	< 0.012
Endosulfan I	< 0.010
Endosulfan II	< 0.010
Endosulfan sulfate	< 0.006
Endrin aldehyde	< 0.004
Gamma-BHC	< 0.003
Hexachlorobenzene	< 0.006
Hexachloroethane	< 0.009
Methyleme Chloride	< 0.010
Nitrobenzene	< 0.001
PCB-1016	< 0.050
PCB-1221	< 0.050
PCB-1232	< 0.050
PCB-1242	< 0.050
PCB-1248	< 0.050
PCB-1254	< 0.050
PCB-1260	< 0.050
Pentachlorophenol	< 0.030
Phenol	< 0.003
Phenols (4-AAP)	0.012
2,3,7,8-TCDD	< 0.001
2,4,6-Trichlorophenol	< 0.030

A) Ohio Edison Dam to Head of Navigation: Impairment Unknown.

No public or semi-public water supply exists in this segment. However, this does not consider a surface supply to individual customers or any potential influence of surface water quality on groundwater in this segment. The existence of an impairment is unknown.

B) Navigation channel: Not Applicable.

Inasmuch as raw water is drawn from Lake Erie well beyond the Area of Concern and there are no restrictions on Cleveland's produced water, an impairment evaluation based on the IJC listing criterion is not applicable.

C) Nearshore Area: Not Applicable.

For the same reasons as stated above, an impairment evaluation based on the IJC listing criterion is not applicable.

This is not to say that the untreated water from the navigation channel or harbor area is drinkable, and one would be advised not to drink the untreated water. The likely presence of bacteria makes the water unsafe to drink. The following table provides a comparison of lower Cuyahoga River and nearshore area raw water to the Cleveland finished drinking water and Federal Safe Drinking Water Standards. Although limited, these data show no exceedances in the river of the standard "maximum contaminant level" for health related (primary) contaminants. Chromium exceeds the M.C.L. in the nearshore area. Aesthetic related (secondary) standards are exceeded for iron, sodium and total dissolved solids. All organic contaminants sampled were below detection limits and, therefore, not comparable.

Lake Erie is a far more consistent and, therefore, reliable source of drinking water. For this reason, it is not likely that the lower river will ever be used again as a drinking water supply.

Confidence or Uncertainty

The reliability and robustness of the drinking water data from the City of Cleveland are good, conforming to monitoring requirements of the Safe Drinking Water Act and Ohio law.

Factors Contributing to Impairment

The absence of impairments implies no contaminants of concern.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports or Other Sources Consulted

City of Cleveland, Division of Water. 1989 Annual Report.

FIGURE 4–15
COMPARISON OF CUYAHOGA RIVER AND NEARSHORE AREA RAW WATER TO CLEVELAND FINISHED DRINKING WATER AND FEDERAL DRINKING WATER STANDARDS

INORGANIC CHEMICALS
All Values in mg/l (ppm)

CONTAMINANT	MAXIMUM CONTAMINANT LEVEL	EVELAND FINISHED WATER	LAKE SITES	RIVER SITES: WEST THIRD RM 3.26	LOWER HARVARD RM 7.10	OLD ROCKSIDE RM 13.18	BOLANZ RD. RM33.2	OLD PORTAGE RM 40.15
PRIMARY CONTAMINANTS (HEALTH)								
ARSENIC	0.0500	0.0013 <		0.0030	0.0024	0.0023	0.0030	0.0027
BARIUM	1.0000	0.0150 <						
CADMIUM	0.0100	0.0005	0.01 <	0.0008	0.0010	0.0003	0.0006	0.0006
CHROMIUM	0.0500	0.0003	0.01 <	0.0304	0.0302	0.0302	0.0300 <	0.0300 <
LEAD	0.0500	0.0016	0.01	0.0091	0.0069	0.0057	0.0053	0.0110
MERCURY	0.00200	0.00020 <	0.0002	0.00024 #	0.00010 #		0.00018 #	
NITRATE	10.0000	0.3800	0.38	3.7900 #	3.7500 #		2.5600 #	
SELENIUM	0.0100	0.0023 <		0.0020 <	0.0020 <	0.0030 <		
SILVER	0.0500	0.0002 <		0.0100 #				
SECONDARY CONTAMINANTS (AESTHETICS)								
CHLORIDE	250.0	17.0	22	131.8 *	140.4 *	110.2	96.0 #	130.0
COPPER	1.0000	0.0083	0.02	0.0108	0.0116	0.0109	0.0100 <	0.0095
IRON	0.3000	0.0200	0.1	1.8050 **	2.2690 **	2.5670 **	1.0920 **	1.2030 **
MANGANESE	0.5000	0.0002		0.1331	0.1225	0.1079	0.1150	0.1300
pH	6.5 – 8.5	7.5	7.4 – 8.2	7.7	7.7 *	7.9	7.4	7.6
SODIUM	20.0	9.0		81.1 **	93.6 **	72.8 **		
TSS	500.0	167.0	163	524.5 **	522.5 **	461.6 *	422.7	483.4 *
SULFATE	250.0	25.0	34	89.6	85.2	78.7	76.0 #	
ZINC	5.0000	0.0050	0.02	0.1396	0.0489	0.0310	0.0261	0.0435

Note: Raw water samples contain some suspended solids which carry contaminants. Since suspended solids are removed in the filtration process, the raw water samples will show higher levels of contaminants than the finished water. In addition, the equipment used to analyze the raw water had higher levels of detection, yielding inflated numbers. (figure contined on the next page)

FIGURE 4-15, continued
COMPARISON OF CUYAHOGA RIVER AND NEARSHORE AREA RAW WATER TO CLEVELAND FINISHED DRINKING WATER
AND FEDERAL DRINKING WATER STANDARDS

OTHER INORGANICS – NO M.C.L.							
ALKALINITY, TO	83.0	88.6	111.5	117.1	118.0	133.0 #	
ALUMINUM	0.6000 <		1.0750	0.8860	0.7640	0.6700	0.4550
ANTIMONY	0.0200 <						
BERYLLIUM	0.0050 <						
CALCIUM	29.6		63.8	62.9	61.7	65.1	66.7
COBALT	0.0070 <						
CYANIDE	0.0200 <		0.0470	0.0060	0.0050		
HARDNESS	120.0	112.5	221.5	225.4	222.1	233.0	228.4
MAGNESIUM	7.8		14.0	14.6	14.4	14.2	15.0
NICKEL	0.2800	0.0130	0.0400 <	0.0410	0.0450	0.0400 <	0.0400 <
PHOSPHOROUS	0.0100 <	0.0360	0.1800	0.2470	0.2540	0.2130	0.1200
SILICA	0.5800						
SPECIFIC CONDUCT.	250.0	253.2	806.5	817.2	724.5	683.0	734.3
THALLIUM	0.1000 <						

\# values obtained from Cuyahoga database (1986-1991) because STORET data not available
< less than (below detection limit)
* one or more samples exceed M.C.L., but average does not
** average exceeds M.C.L.
mean values computed using detection limit for samples below detection limit

"1990 Cleveland Finished Water" data obtained from Cleveland Division of Water testing on finished drinking water.
ee water intakes.
All river data obtained from STORET data (1986-1991), except numbers followed by #.

DID NOT COMPARE: FLUORIDE – not normally present in natural water, added to drinking water AND CHLORINE – not normally present in natural water, added to drinking water
COLOR – no measurements available in river water
CORROSITIVITY – normally only measured in finished drinking water
ODOR – no measurements available in river water
RADIONUCLIDES – no measurements available in river water
TURBIDITY – no measurements in lake or river for comparison
pH, stability – compared pH, standard units
TOTAL COLIFORM – values are irrelevant since all raw water must be disinfected

FIGURE 4-15, continued
COMPARISON OF CUYAHOGA RIVER AND NEARSHORE AREA RAW WATER TO CLEVELAND FINISHED DRINKING WATER AND FEDERAL DRINKING WATER STANDARDS

ORGANIC CHEMICALS
All Values in mg/l (ppm)

CONTAMINANT	MAXIMUM CONTAMINANT LEVEL	CLEVELAND 1990 FINISHED WATER	CUYAHOGA MOUTH RM 0.01	CENTER STREET RM 0.92	LOWER HARVARD RM 7.10	OLD ROCKSIDE RM 13.18	MILL CREEK	INNER HARBOR @ E.55th	EUCLID CREEK
ALACHLOR	NO M.C.L.	0.00005 <							
ENDRIN	0.00020	0.00005 <	0.01000 <	0.000002 <+			0.01000 <	0.01000 <	0.01000 <
LINDANE	0.00400	0.00002 <							
METHOXYCHLOR	0.00100	0.00003 <	0.00100 <	0.000012 <			0.00100 <	0.00100 <	0.00100 <
METALACHLOR	NO M.C.L.	0.00020 <							
TOXAPHENE	0.10000	0.00010 <	0.00100 <				0.00100 <	0.00100 <	0.00100 <
2,4-D	0.10000	0.00020 <							
2,4,5-TP (SILVEX)	0.01000	0.00002 <							
VOLATILE ORGANICS									
BENZENE	0.00500	0.00100 <	0.01000 <	0.00050 <	0.00050 <	0.00050 <	0.00100 <	0.01000 <	0.01000 <
CARBON TETRACHLORID	0.00500	0.00050 <	0.01000 <	0.00050 <	0.00050 <	0.00050 <	0.00050 <	0.01000 <	0.01000 <
p-DICHLOROBENZENE	0.75000	0.00100 <					0.00100 <		
1,1-DICHLOROETHYLENE	0.00700	0.00050 <	0.01000 <		0.00050 <	0.00050 <	0.00050 <	0.01000 <	0.01000 <
1,2-DICHLOROETHANE	0.00500	0.00050 <	0.01000 <	0.00050 <	0.00050 <	0.00050 <	0.00050 <	0.01000 <	0.01000 <
1,1,1-TRICHLOROETHANE	0.20000	0.00050 <	0.01000 <	0.00050 <	0.00050 <	0.00050 <	0.00050 <	0.01000 <	0.01000 <
TRICHLOROETHYLENE	0.00500	0.00050 <	0.01000 <		0.00050 <	0.00050 <	0.00050 <	0.01000 <	0.01000 <
VINYL CHLORIDE	0.00200	0.00100 <	0.01000 <	0.00050 <+			0.00100 <	0.01000 <	0.01000 <
TOTAL TRIHALOMETHANE	0.10000	0.03120							

< less than (below detection limit)
+ based on four samples at this site (see sampling sources in Appendix B.4)

(for values of unregulated organic chemicals, please refer to Appendix B.4)

x. RECREATION IMPAIRMENTS, INCLUDING BEACH CLOSINGS

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when waters, which are commonly used for total body contact or partial body contact recreation, exceed standards, objectives, or guidelines for such use."

The Committee enlarged this beneficial use category to encompass three recreational uses:

1. Beach closings; swimming
2. Boating impairments; primary contact water sports
3. Fishing impairments

(For impairment to trail use, sports facilities, picnicking and other passive recreational uses, see Use Impairment XI.)

Without access to the river and nearshore area, the potential for recreational use of the water would go unrealized. Improved access goes hand-in-hand with water quality to relieve these beneficial uses of their "impaired" status. Access to the river and nearshore area for fishing, canoeing, swimming or other similar activities is limited in many areas of the Area of Concern. Along one eight-mile stretch of the river north of the National Park to the navigation channel, there is no public access at all. Access in the area below is also limited almost exclusively to commercial development (restaurants and bars). The situation in the nearshore area is better, but still access here is limited.

1. Beach Closings; Swimming

In this section we address impairments to swimming. In the Area of Concern, designated public swimming beaches are provided only in the nearshore area on Lake Erie (See Figure 4-16). In order to protect this recreational use, Ohio EPA has established "bathing water" standards on Lake Erie. This use impairment is, therefore, only evaluated in the nearshore area.

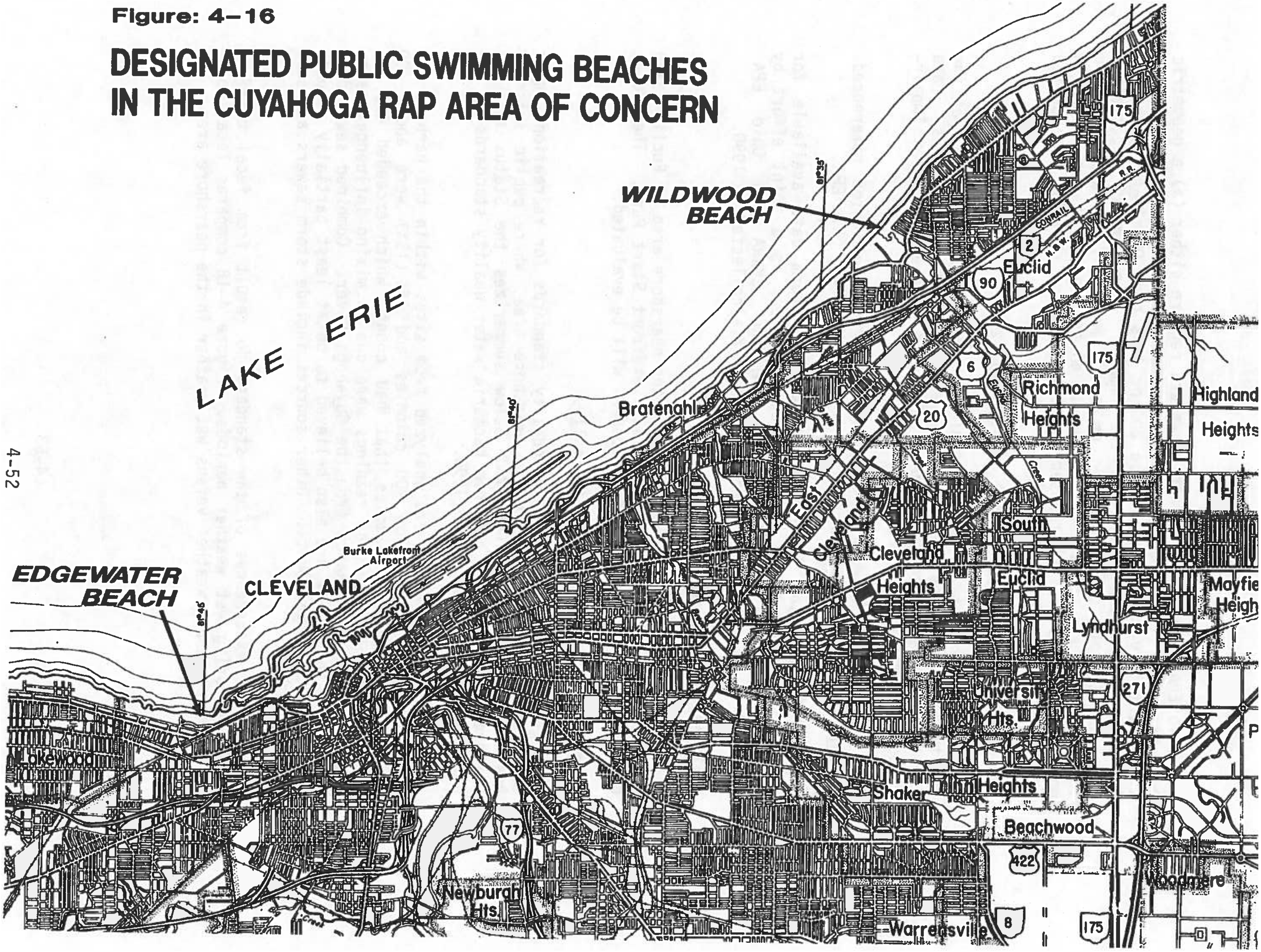
Bathing waters are waters that, during the recreation season, are suitable for swimming where a lifeguard and/or bathhouse facilities are present and additional such areas where the water quality is approved by the director.

Standards which must be met are much stricter for bathing waters than for waters of most other recreational uses. This is because swimmers are more likely to be concentrated and spend more time in bathing waters since these are formally designated swimming areas.

Informal swimming does occur in the river and navigation channel. Because swimmers are less concentrated and swimming is not the primary recreational use of these waters, less restrictive standards apply (see discussion on Boating Impairments in the next section).

Figure: 4–16

DESIGNATED PUBLIC SWIMMING BEACHES IN THE CUYAHOGA RAP AREA OF CONCERN



The Ohio EPA standards for bathing waters require either (a) a geometric mean for fecal coliform content, based on not less than five samples within a thirty-day period, to be 200 or less per 100 ml and not exceed 400 in more than ten percent of the samples taken, or (b) a geometric mean for *E. coli* content, based on a minimum of five samples within thirty days, shall not exceed 126 per 100 ml and shall not exceed 235 in more than ten percent of the samples taken. These criteria are adopted in the Ohio Water Quality Standards.

Characterization of the Type(s) of Data Utilized

The Ohio Department of Health regularly collects bacteria data at the public beaches in the AOC and has done so for a number of years. Data for 1988 and 1989 from this source were used in the Recreation Impairments Subcommittee report (Appendix D).

Only fecal coliform data were collected during the period referenced. *E. coli* had not yet been adopted as a standard by the Ohio EPA.

The RAP Coordinating Committee has fecal coliform data available for 1990. The gathering of data on bacteria levels is a joint effort by several agencies, including NOACA, NEORSD, CVNRA and Ohio EPA. Figure 4-17 is a summary of fecal coliform data collected in 1990.

Declaration of Impairment

Public swimming beaches exist only in the nearshore area at Euclid Beach and Edgewater, units of the Cleveland Lakefront Start Park. Therefore, only this portion of the Area of Concern will be evaluated.

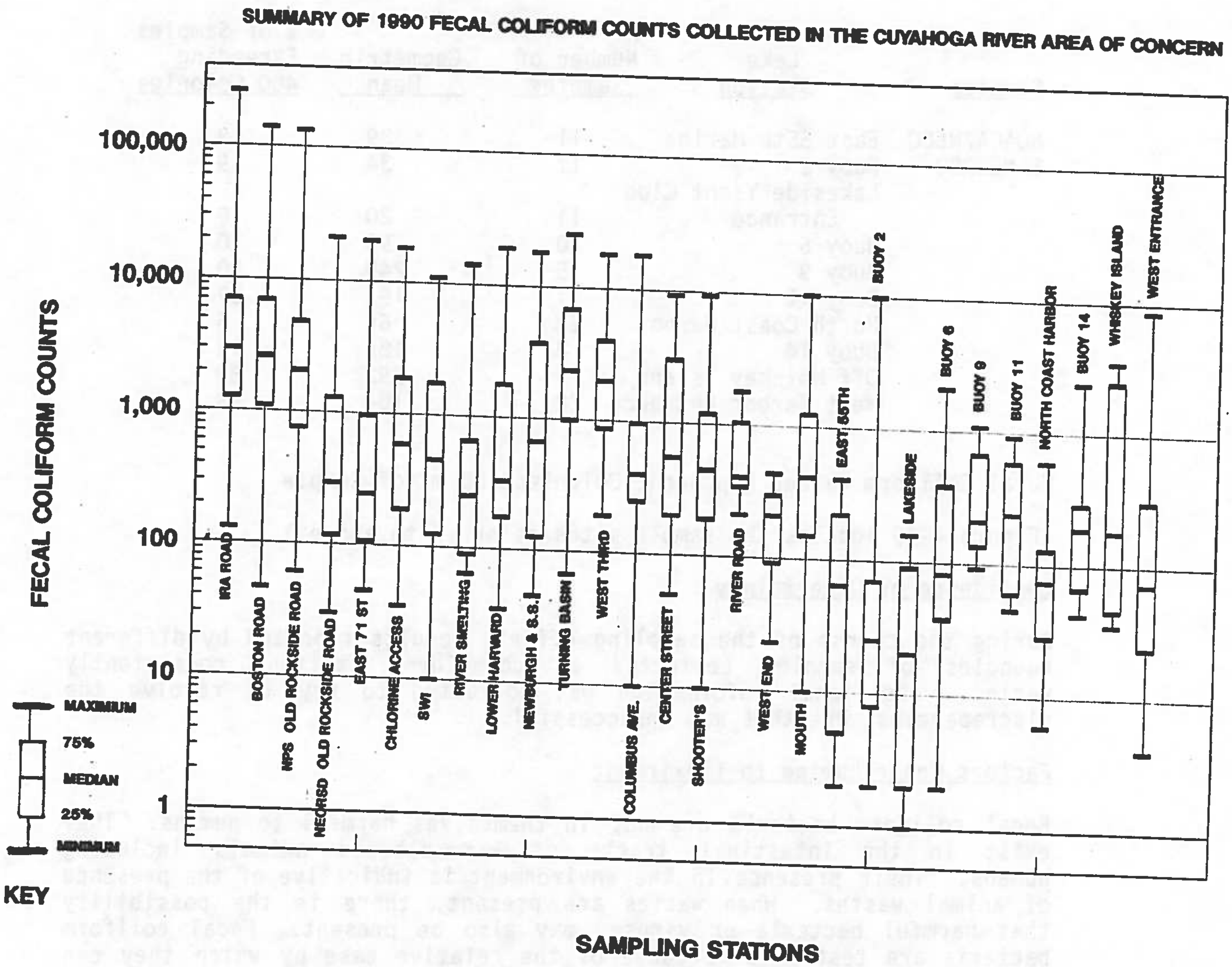
Nearshore Area: Impaired Periodically.

Data collected show that water quality standards for recreational uses are violated periodically in the nearshore area, where public swimming beaches are located. Table 4-2 below summarizes the Status of Compliance with the fecal coliform bacteria water quality standards in the Nearshore Area of Concern in 1990.

A total of 120 samples were analyzed from sites within the harbor. Of these 81 (68%) were below 200 colonies and 16 (13%) were above 400 colonies. Of the 16 samples that had counts which exceeded 400, at least nine of these higher readings were due to mixing influences associated with the discharge from the Cuyahoga River. Combined sewer discharges to the harbor are also believed to be at least partially responsible for the high counts. Other sources include storm sewers and surface runoff.

In general, exceedences of the standard do result from fecal coliform loadings during wet weather periods. Figure 4-18 compares fecal coliform counts in dry weather versus wet weather in the nearshore area.

FIGURE: 4–17



ABOUT THIS GRAPH ***This is known as a "Box & Wiskers" plot. 28 Sampling locations are listed from left to right in the figure. For each sampling location, the ends of the "Whiskers" show the highest & lowest values of fecal coliform bacteria found during the sampling surveys. The "Box" shown for each sampling location surrounds the values most commonly found. Half the samples collected lie on either side of the line which divides the box into two, not necessarily equal, sections.***

Table 4-2

Summary of the 1990 Status of Compliance with the Fecal Coliform Bacteria Water Quality Standards in the Nearshore Area of Concern

Sampler	Lake Station	Number of Samples	Geometric Mean	% of Samples Exceeding 400 Colonies
NOACA/NEDO	East 55th Marina	11	39	9
& NEORSD	Buoy 2	11	34	9
	Lakeside Yacht Club Entrance	11	20	0
	Buoy 6	10	95	10
	Buoy 9	5	249	20
	Buoy 11	11	191	27
	North Coast Harbor	22	66	5
	Buoy 14	8	186	13
	Off Whiskey Island	9	292	33
	West Harbor Entrance	22	104	18

Fecal Coliform Values Represent Colonies/100 ml of Sample

(Figure 4-19 locates the sample sites referred to above.)

Confidence or Uncertainty

During the course of the sampling effort, results reported by different agencies of samples collected at coincident stations consistently varied. Additional information was collected to try to resolve the discrepancies, but this was unsuccessful.

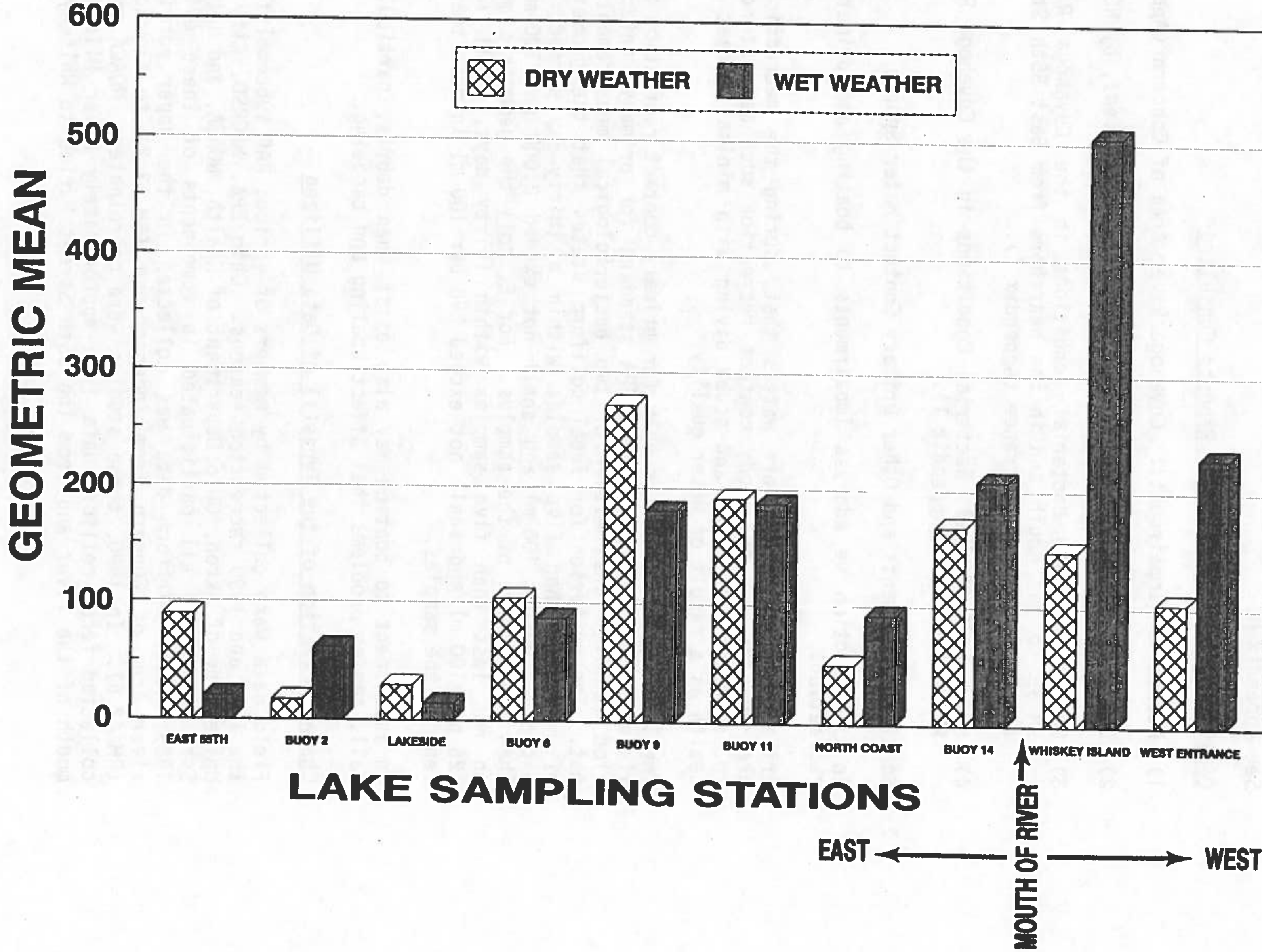
Factors Contributing to Impairment

Fecal coliform bacteria are not in themselves harmful to humans. They exist in the intestinal tracts of warm-blooded animals including humans. Their presence in the environment is indicative of the presence of animal wastes. When wastes are present, there is the possibility that harmful bacteria or viruses may also be present. Fecal coliform bacteria are tested for because of the relative ease by which they can be cultured and grown, because they are comparatively hardy and persist long enough in the natural environment to be collectable, and because animal waste is the only known source of this bacteria.

The State of Ohio standard for bathing waters (public beaches) only considers bacteria. It must be assumed that other pathenogens and viruses are also occasionally present in unacceptably high numbers, which would be indicated by *E. coli* counts.

The most probable sources of this bacteria are wastewater treatment plant bypasses, combined sewer overflows, storm sewers, nonpoint sources (urban runoff) and possibly boat discharges. All of these sources are located quite near the public beaches, but specific sources cannot be identified at this time.

Figure: 4-18 CLEVELAND HARBOR AREA
1990 DRY WEATHER VERSUS WET WEATHER
FECAL COLIFORM COUNT COMPARISON



Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports and Other Reports Consulted

1) Recreation Impairments: Cuyahoga River Area of Concern (Appendix D).

2) Lake Erie Beach Use Task Force Report (1987, updated), by NOACA.

3) Summary of 1990 Bacterial Conditions in the Cuyahoga River from RM 35 to the mouth and in the nearshore from East 55th Street Pier to the West Harbor Entrance (Appendix I).

4) Summary of the 1989 Bacterial Conditions in the Cuyahoga River from RM 42.6 to 13.2 (Appendix I).

2. Boating Impairments and Other Primary Contact Water Sports

In this section we address impairments to boating and primary contact recreation.

Primary contact waters are waters that, during the recreation season, are suitable for full-body contact recreation such as, but not limited to, swimming, canoeing, and scuba diving with minimal threat to public health as a result of water quality.

Impairment criteria exist only for primary contact recreation activities listed by Ohio EPA. The Ohio EPA standard for primary contact recreation requires that either of two bacteriological measurements must be met. The criterion for fecal coliform states that the geometric mean, of not less than five samples within a thirty-day period, shall not exceed 1,000 per 100 ml and shall not exceed 2,000 per 100 ml in more than ten percent of the samples. For *E. coli* the geometric mean, based on not less than five samples within thirty days, shall not exceed 126 per 100 ml and shall not exceed 298 per 100 ml in more than ten percent of the samples.

An impairment to boating may also exist when debris, particularly limb fall, causes problems that affect boating and canoeing.

Characterization of the Types(s) of Data Utilized

Field data were collected by members of various RAP subcommittees during the 1989 and 1990 recreation seasons. Ohio EPA, NEORSD, City of Akron, University of Akron, Ohio Department of Health, NOACA, and National Park Service (CVNRA) all participated in components of these efforts. In 1989, fecal coliform data was collected in the upper portion of the river Area of Concern from Independence (RM 13.2) to Cuyahoga Street (RM 42.6). In 1990, three studies were coordinated: NOACA and Ohio EPA collected fecal coliform data from approximately River Mile 4.5 to the mouth of the river and from the 55th Street Marina to Whiskey Island in the nearshore area. NEORSD collected fecal coliform data from Rockside Road to River Mile 5. See Figure 4-19. The National Park Service gathered both fecal coliform and E. coli data from Ira Road to Rockside Road. See Figure 4-20. Figure 4-17 is a summary of fecal coliform data collected in 1990 in the Cuyahoga River Area of Concern.

Declaration of Impairment

A) Ohio Edison Dam to Head of Navigation Channel: Impaired Periodically.

The 1990 data indicate that standards for fecal coliform levels are generally being met during low-flow (dry weather) periods over the entire section of the river, confirming the 1989 analysis of this stretch. However, during rain events and for several days after rainfall, standards are commonly exceeded. In some instances, extremely high bacteria levels are noted.

CVNRA Segment

The effects of a record setting rainy spell between April and November, 1990 are demonstrated in the fecal coliform levels measured by the NPS in the segment of river flowing through the CVNRA. The geometric means of the three stations sampled by NPS exceed 2000. Only 117 of 488 samples (26%) had counts of less than 1000. 275 samples (56%) had counts exceeding 2000. The magnitude of the higher counts in this segment were an order of magnitude larger than downstream segments. Dry weather counts were low-less than 100 on some occasions. See Figure 4-21 for a comparison of 1990 dry weather and wet weather coliform colony counts. Dry weather periods were less frequent in comparison to 1989.

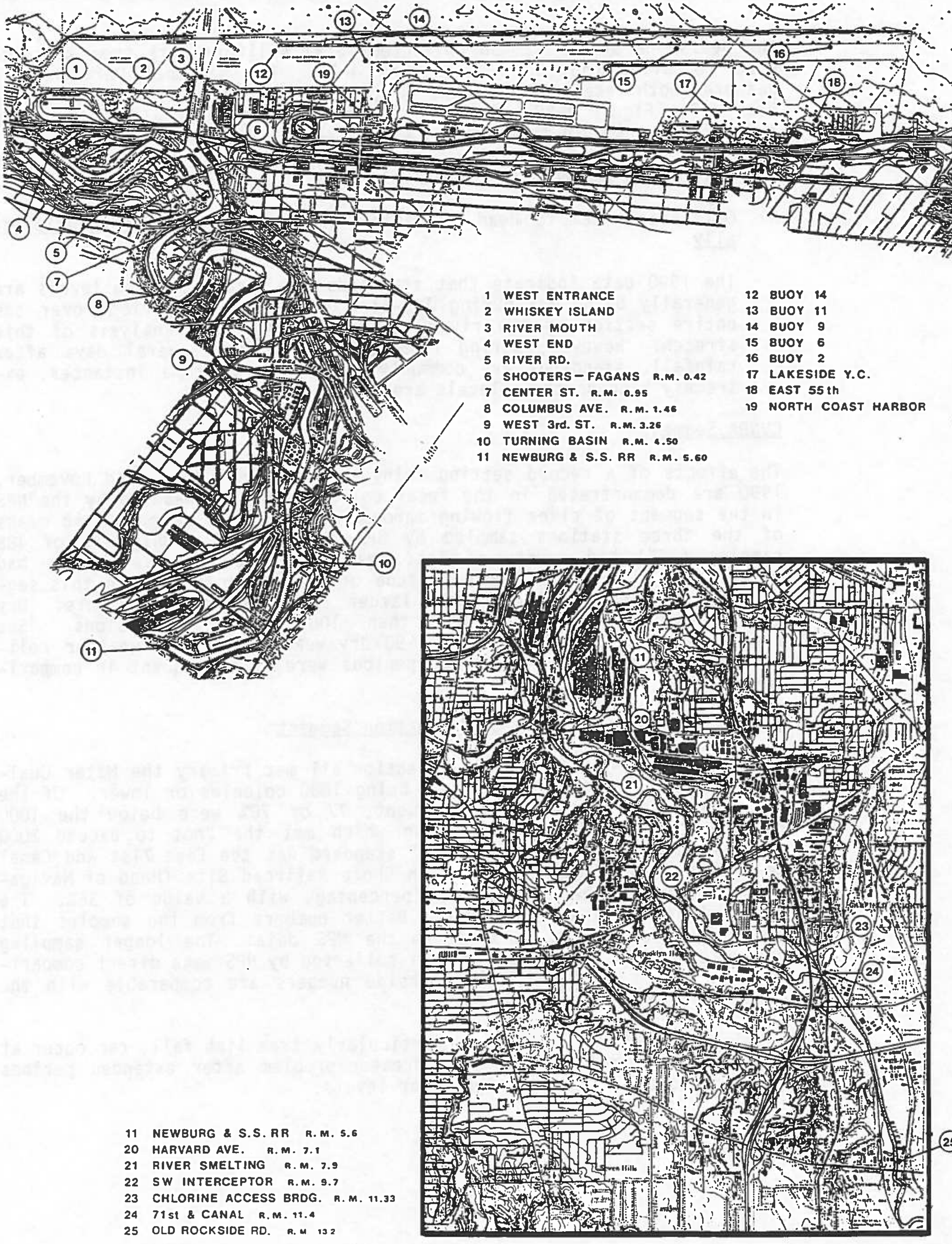
Old Rockside Road to Head of Navigation Segment

The seven river stations in this section all met primary the Water Quality Standard of geometric means, being 1000 colonies or lower. Of the 110 samples collected in the segment, 77 or 70% were below the 1000 colonies level. The only station which met the "not to exceed 2000 colonies more than 10% of the time" standard was the East 71st and Canal Road site. The Newburgh and South Shore Railroad Site (Head of Navigation) had the highest exceedance percentage with a value of 36%. The Old Rockside Road site exhibited better numbers from the samples that NEORSD collected when compared to the NPS data. The longer sampling period and large number of samples collected by NPS make direct comparison invalid. The NEORSD Old Rockside numbers are comparable with the other stations in this segment.

Impairments related to debris, particularly tree limb fall, can occur at any time but are likely to be a greater problem after extended periods of rain and corresponding high river levels.

Figure: 4-19

NOACA/NEDO & NEORSD SAMPLING SITES



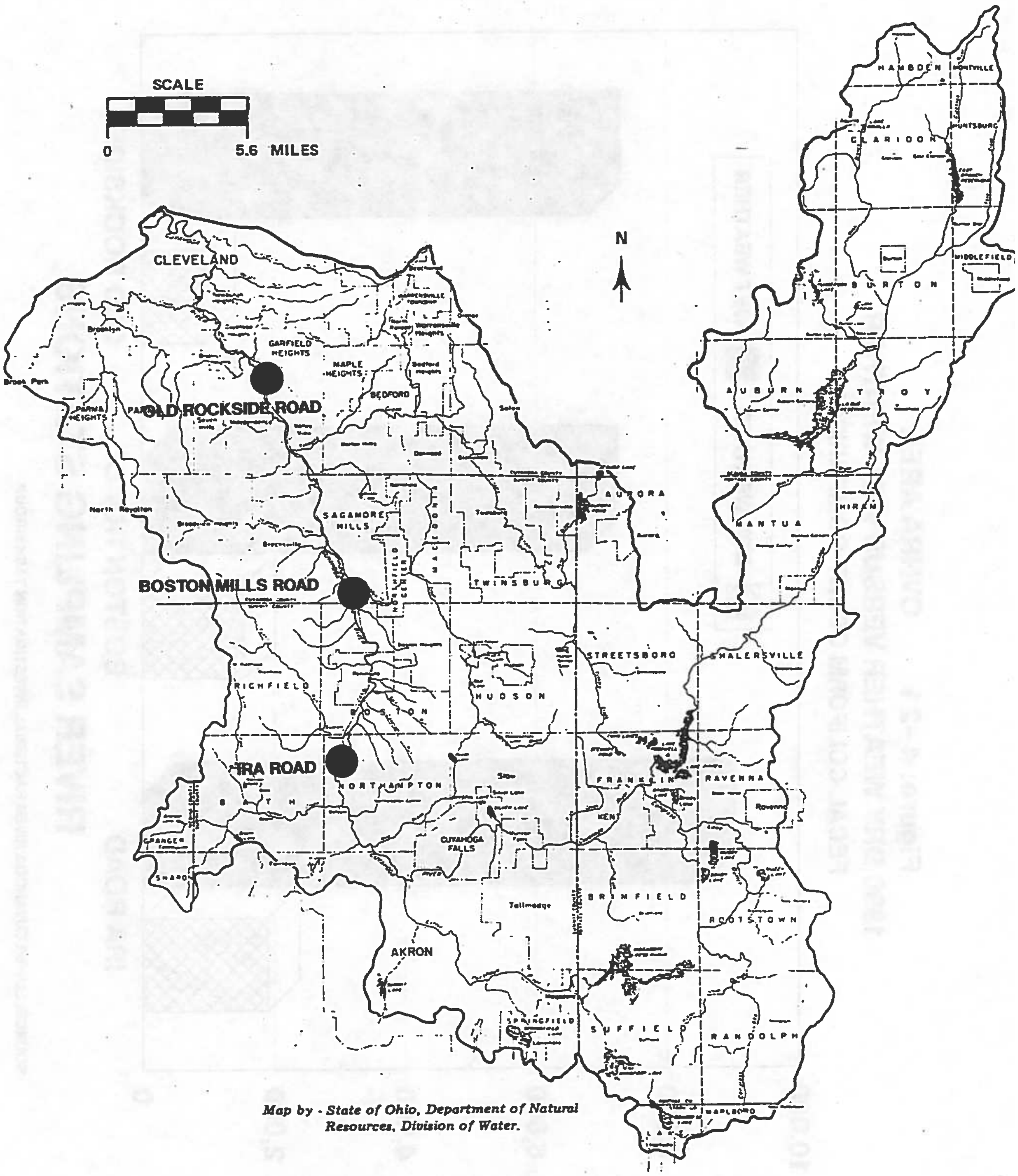
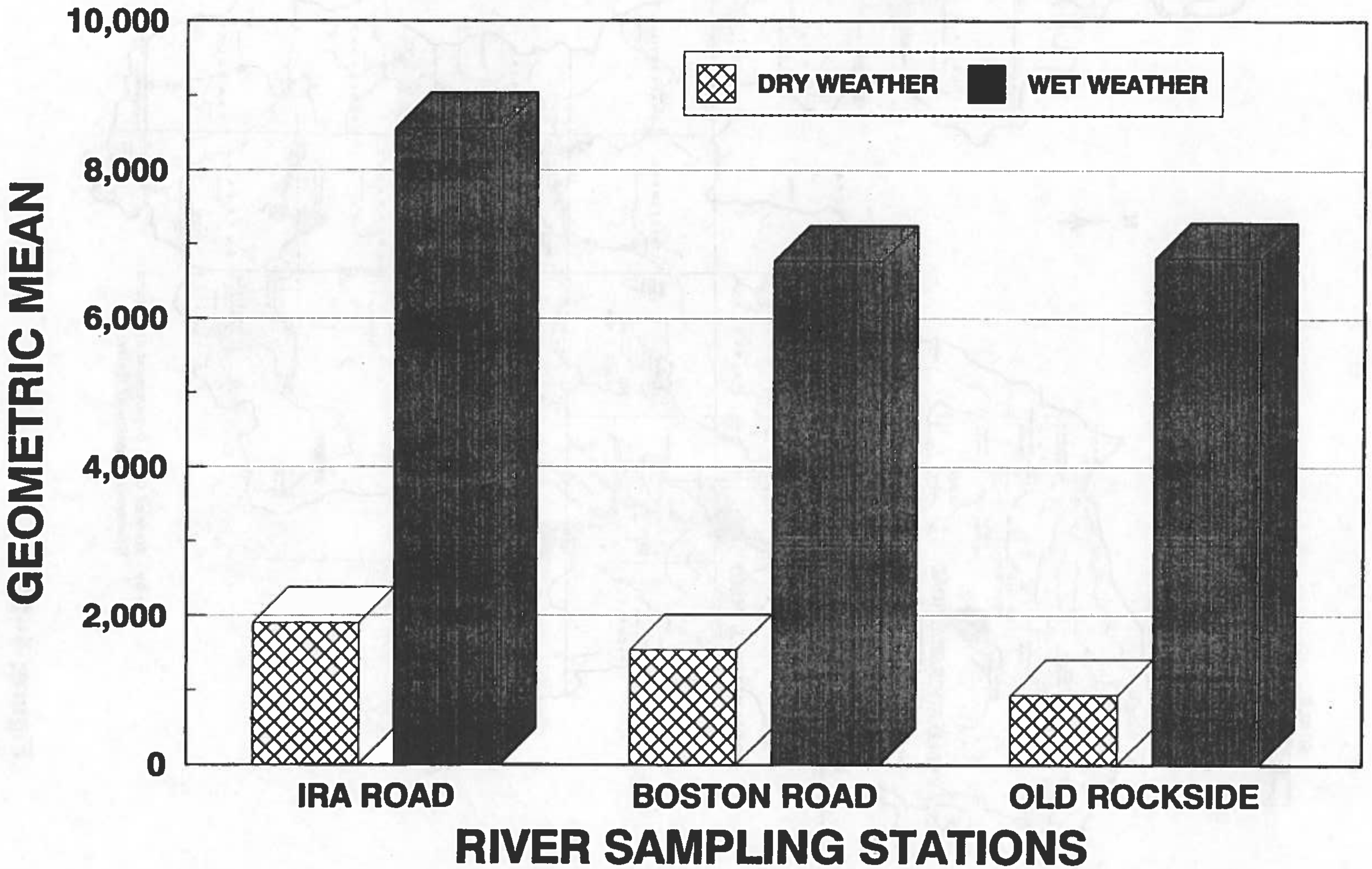


Figure: 4–20
NATIONAL PARK SERVICE SAMPLING SITES

Figure: 4-21 CVNRA AREA
1990 DRY WEATHER VERSUS WET WEATHER
FECAL COLIFORM COUNT COMPARISON



SOURCE: LOWER CUYAHOGA RIVER BACTERIAL INVESTIGATION TASK GROUP

B) Navigation Channel: Impaired Periodically.

Of the 148 samples collected by NOACA/NEDO along the Cuyahoga River, 92 (62%) were below 1000 colonies. The geometric means at 6 of 8 stations were below the 1000 standard. The 2000 colonies standard was exceeded by 33 samples (22%). The only stations which complied with the "not to exceed 10%)" standard were the River Road and West End Station on the Old River Channel. Overall, conditions along most of the river were found to be good during dry weather periods. Conditions at the west end of the Old River Channel are particularly good. During wet weather periods, water quality exceedance values were commonplace all along the river. Conditions were consistently worse in the area upstream of West Third. See Figure 4-22.

C) Nearshore Area: Impaired Periodically.

More stringent standards apply to Lake Erie. Refer to the Declaration of Impairment under Beach Closings, Use Impairment x.I.

Table 4-3 summarizes this analysis of compliance with the fecal coliform bacteria water quality standards in the Area of Concern in 1990.

Confidence or Uncertainty

Existing data are sufficient to clearly indicate that impairments related to bacteria occur throughout the Area of Concern. However, inadequate information is available to specifically classify under what weather conditions impairments are going to occur, the exact duration of impairment or exact locations of the sources, and the distance that the harmful bacteria travel. One can only say that during lower flows the standards are generally met and that rainfall can substantially increase levels and cause exceedances in the Area of Concern. More study locations are needed and data must be collected much more frequently to precisely define where and when problems occur.

During the course of the sampling effort, results reported by different agencies of samples collected at coincident stations varied consistently. Additional information was collected to try to resolve the discrepancies, but this was unsuccessful.

The U.S. Geological Survey is conducting a study on the Cuyahoga River in the Area of Concern to better understand the fate of bacteria when it enters the water (distance travelled and die-off rates under a variety of instream conditions). This study is being conducted in cooperation with the City of Akron, the Northeast Ohio Sewer District, the National Park Service - CVNRA and the Cuyahoga River Community Planning Organization.

Figure: 4–22 LOWER CUYAHOGA RIVER
1990 DRY WEATHER VERSUS WET WEATHER
FECAL COLIFORM COUNT COMPARISON

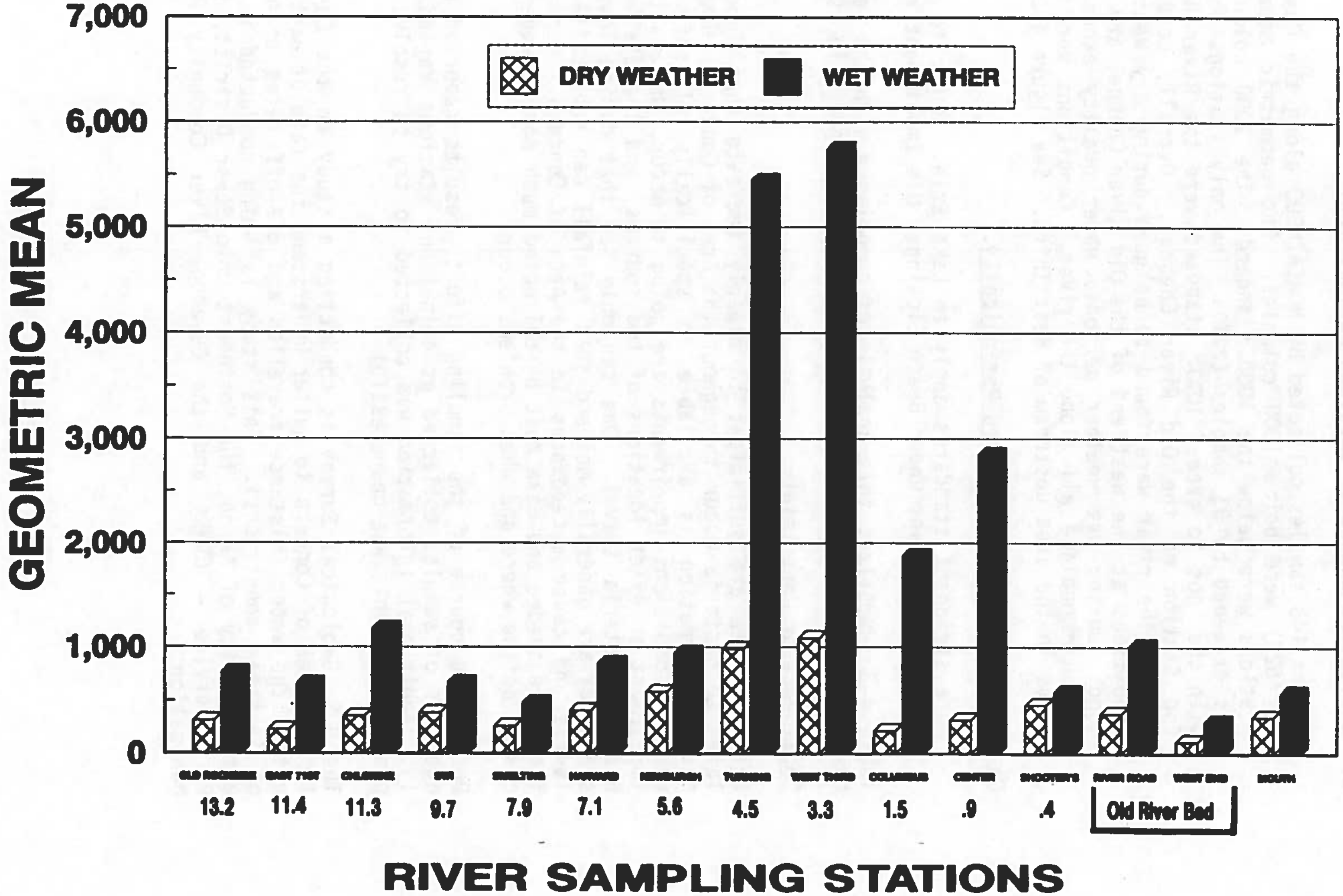


Table 4-3

Summary of the Status of Compliance with the Fecal Coliform Bacterial Water Quality Standards in the Cuyahoga River Area of Concern in 1990

Sampler	River Station*	Number of Samples	Geometric Mean	% Exceeding -2000 Colonies
NPS	Ira Rd (RM 35.5)	163	3491	61
	Boston Rd (RM 26.7)	162	2939	59
	Old Rockside Rd (RM 13.8)	163	2076	50
NEORSD	Old Rockside Rd (RM 13.8)	18	422	17
	E 71 & Canal Rd (RM 11.7)	14	360	7
	Chlorine-Access Br (RM 11.3)	14	593	21
	SW Interceptor (RM 9.8)	17	468	18
	River Smelting (RM 7.9)	15	332	13
	Lower Harvard Ave (RM 7.2)	18	519	22
	Newburgh & SS RR (RM 5.6)	14	715	36
NOACA/ NEDO	Turning Basin (RM 4.5)	14	2317	57
	W 3rd St (RM 3.3)	19	2007	47
	Columbia Ave (RM 1.4)	13	492	15
	Center St (RM 0.9)	23	680	26
	Shooter's/Fagan's (RM 0.5)	23	507	13
	River Rd on Old Channel (RM 0.2)	20	559	0
	West End of Old Channel	11	159	0
	River's Mouth (RM 0.0)	25	441	20

* For Lake Stations, See Table 4-2.

(Figure 4-20 locates the National Park Service sampling sites referred to above; Figure 4-14 locates the lower river sampling sites).

Factors Contributing to Impairment

The state standard for primary contact recreation only considers bacteria. Impairments related to debris, nutrients or silt are not addressed.

Fecal coliform bacteria are not in themselves harmful to humans. They exist in the intestinal tracts of warm-blooded animals including humans. Their presence in the environment is indicative of the presence of animal wastes. When wastes are present there is the possibility that harmful bacteria or viruses may also be present. Fecal coliform bacteria are tested for because of the relative ease by which they can be cultured and grown, because they are comparatively hardy and persist long enough in the natural environment to be collectable, and because animal waste is the only known source of this bacteria.

The most probable sources of bacteria are wastewater treatment plant bypasses, combined sewer overflows, storm sewers, nonpoint sources (urban runoff) and possibly boat discharges. These types of sources are located throughout the Area of Concern. Storm events increase debris, tree limb fall, nutrients and silt.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports and Other Reports Consulted

1) Recreation Impairments: Cuyahoga River Area of Concern (Appendix D).

2) Lake Erie Beach Use Task Force Report (1987, Updated) by NOACA

3) Summary of 1990 Bacterial Conditions in the Cuyahoga River from RM 35 to the mouth and in the nearshore from East 55th Street Pier to the West Harbor Entrance (Appendix I).

4) Summary of the 1989 Bacterial Conditions in the Cuyahoga River from RM 42.6 to 13.2 (Appendix I).

3. Fishing Impairments

Impairment Evaluation Criteria Employed

Restrictions on the consumption of fish is addressed in Use Impairment I. The act of fishing can be impaired by factors such as limited access to the water, degraded fish populations (Use Impairment III B), loss of fish and wildlife habitat (Use Impairment XIV), as well as debris, oil slicks, siltation, and degraded water clarity and quality that may adversely affect the desire to fish (Use Impairment XI). There are, however, neither standards nor a strict definition of impairment for the act of fishing.

Characterization of the Type(s) of Data Utilized

No specific data sources were used to define potential impairments to the act of fishing in the AOC. Problems discussed are based on experiences and knowledge of the report authors (see Appendix E).

Declaration of Impairment

Though several criteria are employed in judging fishing impairments, only the criterion of access to the water is not addressed by another use impairment category. Fishing impairment due to limited public access will be addressed here. It is important to know that there are no standards or strict definitions of impairment for the act of fishing. Fishing may occur anywhere water can be accessed. However, no information has been collected regarding the need or demand for increased access in the Area of Concern.

A) Ohio Edison to Head of Navigation Channel: Not Impaired between RM 45.1 and RM 13.3

Between Ohio Edison dam and CVNRA there are two Metroparks that provide public access to the river. In CVNRA, the National Park Service manages over 22 miles of the Cuyahoga River. Although there are no designated fishing areas in the park, the public has access to the water. North of the park, RM 13.3 to the head of the Navigation Channel, access is much more limited.

B) Navigation Channel: Not Impaired.

Public access to this 5-mile stretch is limited to the two small Heritage Parks in the flats, and parking lots and bridges.

C) Nearshore Area: Not Impaired.

There are a number of fishing facilities in this area, ranging from piers to parks and public utilities facilities with shoreliners or breakwalls (Figure 4-23).

Confidence or Uncertainty

There is no substantive information as to where and why people fish in the area and under what conditions someone would be likely to choose to fish in the Area of Concern. It is, therefore, difficult to assess the adequacy of public access and whether an impairment exists because of a lack of access. However, the Committee's criterion is that if there is public access, there is no impairment of the ability to fish, not withstanding the presence or absence of fish, or the health of the fish.

Factors Contributing to Impairment

Current land use and land ownership precludes public access to the river.

Research Needs and Ideas Identified in the Subcommittee Reports

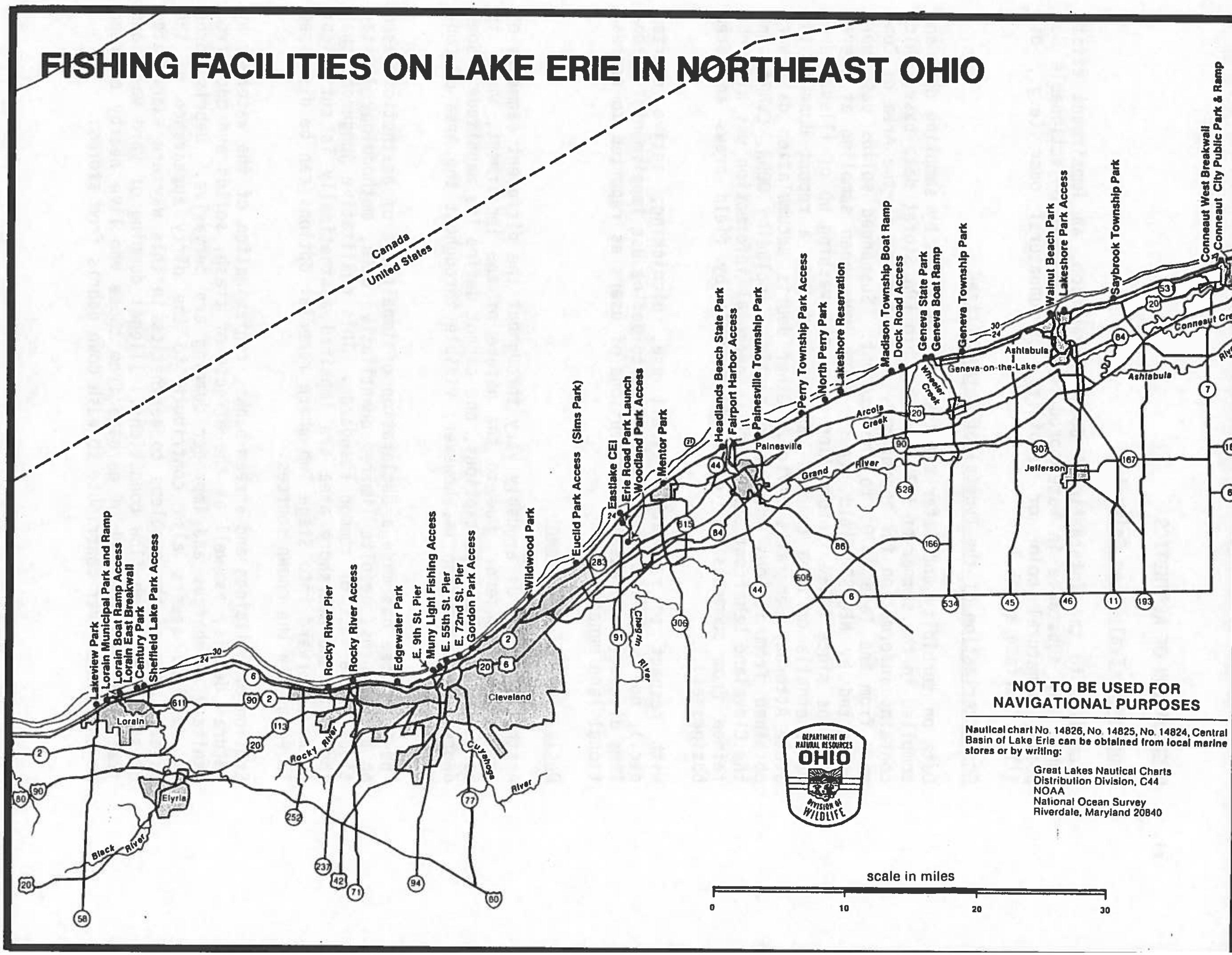
See Appendix M.

Committee Reports and Other Sources Consulted

1) Recreation Impairments: Cuyahoga River Area of Concern (Appendix D).

2) Creel Harvest Data from ODNR.

Figure: 4-23


FISHING FACILITIES ON LAKE ERIE IN NORTHEAST OHIO
Canada
United States
Lakeview Park
Lorain Municipal Park and Ramp
Lorain Boat Ramp Access
Lorain East Breakwall
Century Park
Sheffield Lake Park Access
Rocky River Pier
Rocky River Access
Edgewater Park
E. 9th St. Pier
Muny Light Fishing Access
E. 55th St. Pier
E. 72nd St. Pier
Gordon Park Access
Wildwood Park
Euclid Park Access (Sims Park)
Eastlake CEI
Erie Road Park Launch
Woodland Park Access
Mentor Park
Headlands Beach State Park
Fairport Harbor Access
Painesville Township Park
Perry Township Park Access
North Perry Park
Lakeshore Reservation
Madison Township Boat Ramp
Dock Road Access
Geneva State Park
Geneva Boat Ramp
Geneva Township Park
Walnut Beach Park
Lakeshore Park Access
Saybrook Township Park
Conneaut West Breakwall
Conneaut City Public Park & Ramp
Lorain
Elyria
Black River
Rocky River
Cleveland
Cuyahoga River
Chagrin River
Painesville
Grand River
Arcola Creek
Wheeler Creek
Geneva-on-the-Lake
Ashtabula
Jefferson
Conneaut Creek
NOT TO BE USED FOR NAVIGATIONAL PURPOSES
Nautical chart No. 14826, No. 14825, No. 14824, Central Basin of Lake Erie can be obtained from local marine stores or by writing:
Great Lakes Nautical Charts
Distribution Division, C44
NOAA
National Ocean Survey
Riverdale, Maryland 20840
DEPARTMENT OF NATURAL RESOURCES
OHIO
DIVISION OF WILDLIFE
scale in miles
0
10
20
30

xi. DEGRADATION OF AESTHETICS

Impairment Evaluation Criteria

According to the International Joint Commission, an impairment exists "when any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g., oil slick, surface scum)."

Characterization of the Type(s) of Data Utilized

Data on turbidity and water clarity were obtained by sampling done and compiled in the summer of 1990 for the Ohio EPA Storet data base, which contains information for approximately 35 stations in the Area of Concern from the late 1970s to the present. Suspended solids data were collected by NEORSD field crews, which have been sampling at eleven stations since 1986. Information about the washing up of illegal drug paraphernalia on area beaches was obtained from a report done by the State Attorney General's Office. Other debris accumulation data were obtained from various interested parties, including ODNR, CVNRA, and the Cleveland Lakefront State Park. Anecdotal information was also obtained from comments and observations made by field crews and area businesses.

With respect to recreation (trail use, picnicking, active sports, etc.), no specific data was collected to define use impairments. Problems discussed are based on perceptions of users as reported to recreational land managers.

Declaration of Impairment

Aesthetic standards arguably vary throughout the different segments of the Area of Concern. Due to the nature of the impairment, which is based on individual perceptions, one cannot define its magnitude. Some degree of degradation is, however, visible throughout the Area of Concern.

The Committee has made a declaration of impairment of aesthetics based on a consensus, despite limited quantitative data, methodology limitations and a lack of common standards. This qualitative judgement that the river and nearshore area are impaired aesthetically is sufficient to move forward into Stage Two where remedial options can be discussed to eliminate the known sources.

Erosion of hillsides and stream banks, contamination of the waterway by natural debris, as well as the effects of trash, solids and odor from sanitary discharges and improper dumping are pervasive. Debris borne by combined sewers also contribute to the dirty appearance of the water. Many of the problems to aesthetics in this way are exacerbated by storms and high flow conditions. Illegal dumping of yard waste and trash, and the disposal of garbage from those who live nearby or come to enjoy the river contribute to wash down debris from storms.

Point sources, however, regularly increase turbidity, add detergents, and color the water. Detergents, garbage and wastes make their way from households through improperly functioning on-site systems, package plants and improper connections to storm sewers into the river. Improper disposal of oil, occasional spills, and wash off from urban streets creates the occasional characteristic rainbow sheen on the water's surface.

A) Ohio Edison Dam to Head of Navigation Channel: Impaired

This section is partially impaired, due to the localized nature of the degradation. Impacts by odor, debris, detergents and oil are probably much more obvious near sources (e.g., combined sewer overflows and storm sewer outfalls). These may, however, be noticeable anywhere, anytime in the Area of Concern.

Impairments in this segment are exacerbated by wet weather conditions. Problems due to wet weather conditions are limited in duration.

B) Navigation Channel: Impaired

This section is more uniformly affected and can therefore be termed impaired with problems of turbidity, debris, floatables, and pollution from both non-point sources and point sources which are common throughout the segment.

As above, impairments are exacerbated by wet weather conditions. However, debris accumulates in this area and tends to remain until it can be removed manually.

C) Nearshore Area: Impaired

This area can be described as periodically impaired, with aesthetic degradation evident after high flows and wet weather conditions. In the nearshore area, storms particularly affect the water's appearance by stirring up bottom sediments and flushing urban pollutants and debris into the lake via storm sewers. Sediments and debris carried by the river also affect the clarity and color of water in the nearshore area. During these times, portions of the shoreline are affected by debris, trash, algae, and evidence of sanitary discharges washing up on the beaches.

Confidence of the Statement of Impairment

Specific standards do not exist for uses of the river that are attributable to the aesthetic nature of the river.

A high degree of confidence is thus difficult to achieve in this finding of impairment, partly because of the subjective nature of aesthetic valuation, and also because of the scarcity of attempts to quantify aesthetic degradation over the years. For this reason, impairment can be termed probable, since a consensus of best professional judgement based on anecdotal information and personal experience, as well as laymen's perceptions, is the primary source of confidence in any conclusions made. A better understanding of what the public believes the aesthetic potential of the Area of Concern to be would increase confidence in evaluating the degree of impairment.

Factors Contributing to Impairment

The primary contaminants contributing to aesthetic degradation are natural debris, litter, detergents, suspended solids and odor. Discharges from point sources and storm sewers also contribute to the river's turbidity.

Figure: 4-24 **Debris on the Cuyahoga Mainstem in Valley View (RM 17)**

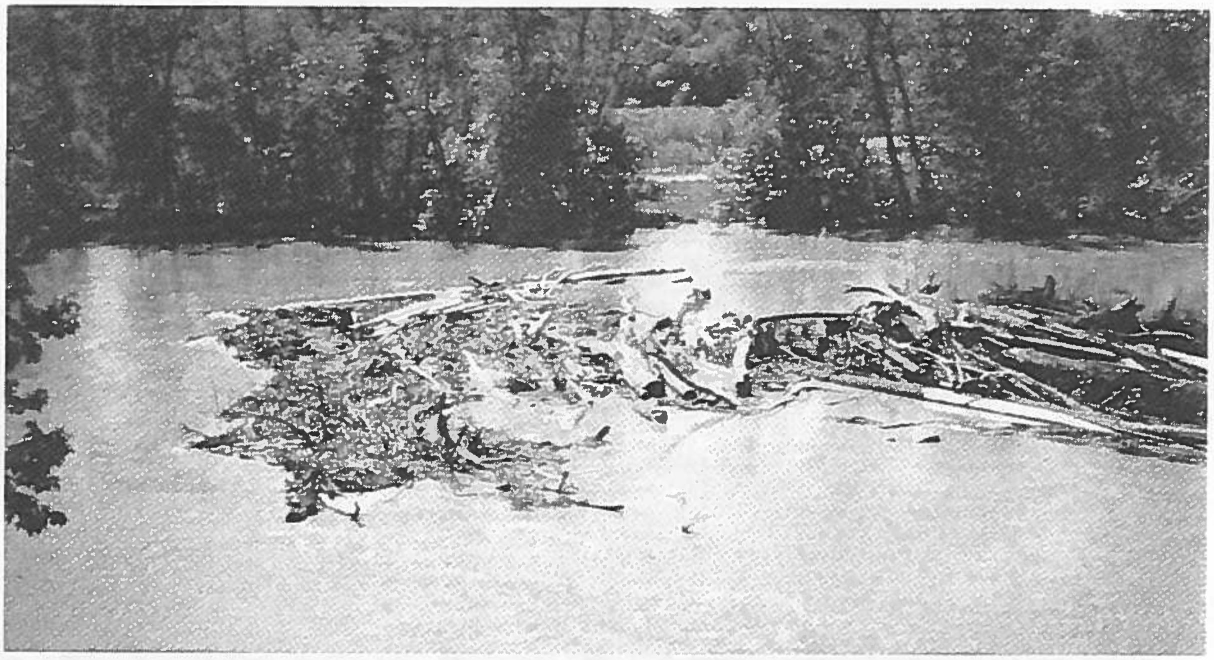


Photo: Ohio EPA June, 1989

The flood waters of the Cuyahoga River carry floating debris downstream, which then can accumulate in large log jams. When these waters recede, a massive pile of natural debris and trapped human litter remain. The jam above (figure 4-24) is just upstream of the Pleasant Valley Road bridge (RM 17). It's only a matter of time until these materials reach the mouth of the river in Cleveland, and ultimately Lake Erie.

Figure: 4-25 **Floating Debris & Litter Collected in the Navigation Channel**

Photo: Ohio EPA June, 1989

Floating debris and litter often finds slack water areas on Cleveland's waterfronts where it can accumulate and greatly detract from the area's aesthetics (see figure 4-25).

Figure: 4-26 Discolored Water at the Confluence of Morgana Run and the Cuyahoga Mainstem in the Navigation Channel

Photo: Ohio EPA
April, 1989

Occasional spills or treatment upsets create offensive plumes of discolored water. An area with a chronic history of such events is Morgan Run, a large storm sewer with several point sources including LTV Steel coking facilities, LTV coal pile runoff, and several publicly owned combined sewer overflows discharging to it (see figure 4-26).

Finally, there are the less frequent but highly visible spills of oil, chemicals, solidified grease, and other industrial discharges, as well as larger items of trash.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports and Other Reports Consulted

1) Eutrophication or Undesirable Algae (Appendix A).

2) Recreation Impairments: Cuyahoga River Area of Concern (Appendix D).

3) Assessment of Physical Habitat in the Lower Cuyahoga and the Dredged Ship Channel. Ohio EPA, DWQPA, Columbus, Ohio. (Appendix A).

4) Aesthetics: Cuyahoga River Area of Concern (Appendix E).

xii. ADDED COST TO AGRICULTURE OR INDUSTRY

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when there are additional costs required to treat the water prior to use for agricultural purposes (i.e., including, but not limited to, livestock watering, irrigation and crop-spraying) or industrial purposes (i.e., intended for commercial or industrial applications and non-contact food processing)."

Characterization of The Types of Data Utilized

The sources of data utilized for this evaluation were water withdrawal registration records maintained by the Ohio Department of Natural Resources Division of Water, and a survey of permitted dischargers undertaken by the Point Source Subcommittee (see Appendix G). Based on these sources, four companies withdraw water from the Cuyahoga River for cooling and limited process operations in amounts greater than 100,000 gallons per day. These withdrawals occur above the navigation channel. No registered withdrawals occur in the navigation channel. In the nearshore area there is one registered withdrawal for thermal use in electrical power generation. There are no registered water withdrawals for agricultural purposes in the Area of Concern.

Declaration of Impairment

A) Ohio Edison Dam to Head of Navigation: Not Impaired.

Three registered withdrawals (greater than 100,000 gallons per day) for industrial purposes occur in this segment as follows:

Goodyear Tire & Rubber Co.	industry
American Steel & Wire Corp.	industry
LTV Steel Company	industry

These withdrawals are primarily for cooling operations. These companies report no additional treatment costs required.

B) Navigation Channel: Not Impaired.

As part of LTV Steel Company's registration, several of its water intakes are located in the navigation channel.

C) Nearshore Area: Not Impaired.

One registered withdrawal graeater than 100,000 gal/day in this area is for thermal application in electricity generation: Cleveland Electric Illuminating Company power generation.

Confidence or Uncertainties

Water withdrawals greater than 100,000 gallons per day are required to be registered, and thus were available for analysis. Smaller water withdrawals may be occurring, but data were not available for these.

Factors Contributing to Impairment

None

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports or Data Consulted

Cuyahoga RAP Permitted Dischargers Survey.

ODNR Division of Water.

xiii.1 DEGRADATION OF PHYTOPLANKTON POPULATIONS

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when phytoplankton community structure significantly diverges from unimpacted control sites of comparable physiochemical characteristics. In addition, this use will be considered impaired when relevant, field validated, phytoplankton bioassays (e.g., algae fractionation bioassays) with appropriate quality assurance/quality controls confirm toxicity in ambient waters."

Characterization of the Type of Data Utilized

Studies of phytoplankton composition, abundance and distribution in Lake Erie were reviewed. Information on the Cleveland offshore area comes largely from Cleveland Municipal Water Treatment Facilities data. For the Area of Concern, few studies were available, and no research has been done on the river since 1978. No phytoplankton bioassays were reported.

Declaration of Impairment

The degraded condition of the phytoplankton population in the vicinity of Area of Concern is characterized by high cell abundance and a predominance of eutrophic indicator species of blue-green algae and diatoms. Such populations can create special problems associated with eutrophy. These species develop a peak and crash growth pattern which results in large quantities of decaying organic material. This uses up dissolved oxygen in the water causing the death of other desirable organisms.

Figure 4-27 shows a steep increase in Lake Erie phytoplankton cells per unit of lake water from 1930 to 1961 followed by a significant decline. This increase corresponds with the period of accelerating eutrophication of Lake Erie. Presently the density of phytoplankton in Lake Erie is less than 500 cells per ml.

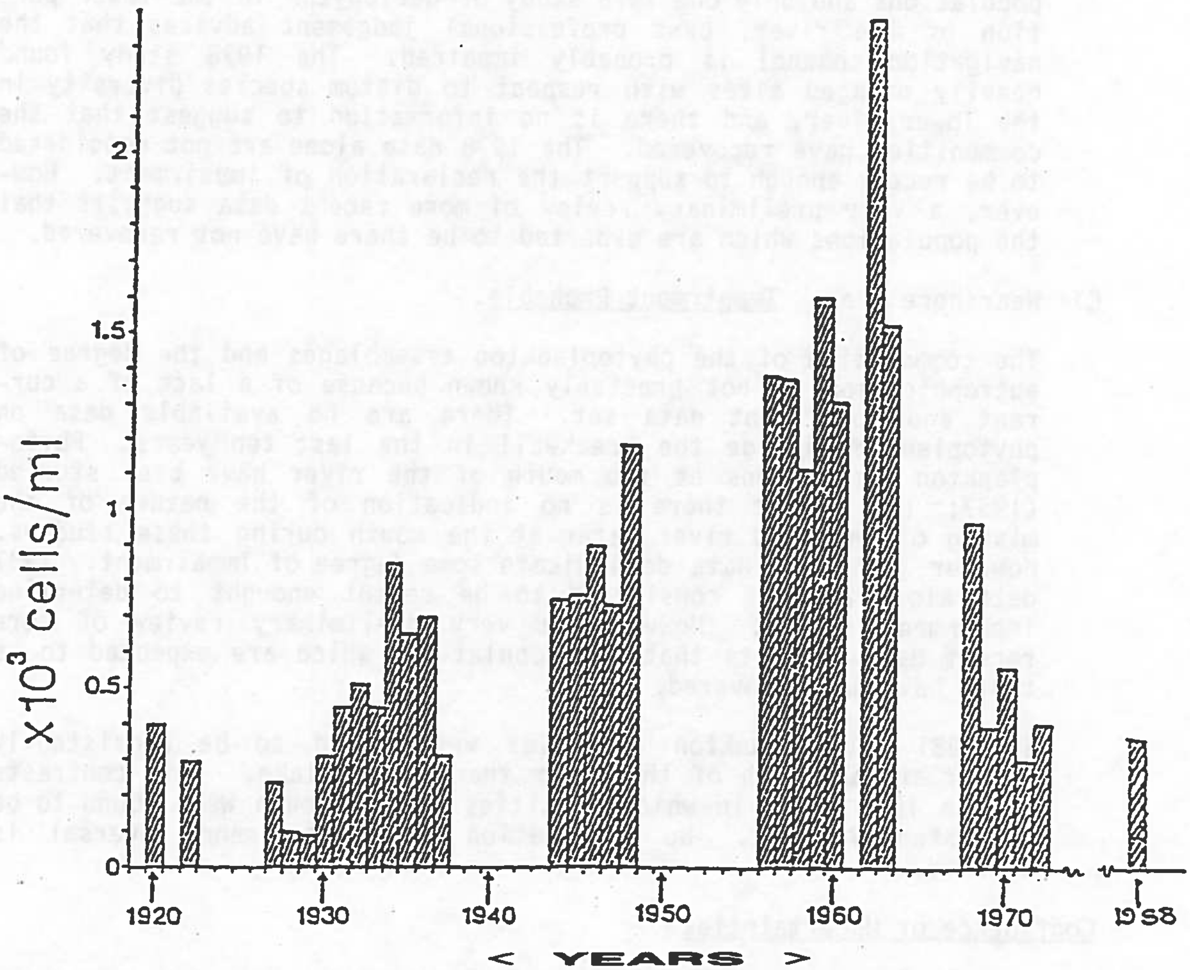
However, no limits defining eutrophication by the number of green or blue-green algal cells per ml exist. Nor do indices of phytoplankton community health or ecosystem health based on the phytoplankton community structure exist.

A) Ohio Edison Dam to Head of Navigation Channel: Impairment Possible.

The 1978 study of periphyton found that the site at Boston Mills (RM 26.7) contained only five percent as many taxa as the site at Hiram Rapids (RM 71) above Akron. The species found in the damaged areas are species especially tolerant of poor water quality conditions. An earlier (1966) study reporting on water quality to the Lake Erie Watershed Conservation Foundation found only one species of algae from the Akron Water Treatment Plan (RM 35) to Furnace Run (RM 30), and only the blue-green alga, *Oscillatoria*, from the Division dam to NEORSD's Southerly plant (RM 11). From Lake

Figure: 4–27

Annual Average Phytoplankton Densities In Lake Erie 1920 – 1972



Proceedings of the Conference on Changes in the Biota of Lakes Erie and Ontario

Figure 4-21. Mean density (cells/ml) of phytoplankton from surface samples collected at very nearshore and far nearshore (here considered to be from about two to ten miles offshore) stations within the Central Basin of Lake Erie, 15 May through 20 October, 1978. Abbreviations: L-V=Lorain Vermilion; C=Cleveland; F=Fairport Harbor; A=Ashtabula (Kline 1981).

Rockwell (RM 58) to the Kent Water Treatment Plant, outside of the Area of Concern, 15 species of algae were found. The 1978 data alone are not considered to be recent enough to support the declaration of impairment. However, a very preliminary review of more recent data suggests that the populations which are expected to be there have not recovered.

B) Navigation Channel: Impairment Possible.

Although there are no studies available describing phytoplankton populations and only one 1978 study of periphyton in the lower portion of the river, best professional judgement advises that the navigation channel is probably impaired. The 1978 study found heavily damaged sites with respect to diatom species diversity in the lower river, and there is no information to suggest that the communities have recovered. The 1978 data alone are not considered to be recent enough to support the declaration of impairment. However, a very preliminary review of more recent data suggests that the populations which are expected to be there have not recovered.

C) Nearshore Area: Impairment Probable.

The composition of the phytoplankton assemblages and the degree of eutrophication is not precisely known because of a lack of a current and consistent data set. There are no available data on phytoplankton inside the breakwall in the last ten years. Phytoplankton populations at the mouth of the river have been studied (1967; 1981), but there is no indication of the nature of the mixing of lake and river water at the mouth during these studies. However, the 1981 data do indicate some degree of impairment. 1981 data alone are not considered to be recent enought to determine impairment status. However, a very preliminary review of more recent data suggests that the populations which are expected to be there have not recovered.

In 1981, phytoplankton densities were found to be consistently higher at the mouth of the river than in the lake. This contrasts with a 1954 study in which densities at the mouth were found to be consistently lower. No explanation for this trend reversal is offered.

Confidence or Uncertainties

The analysis of this area lacks a current data set and clear standards by which to measure phytoplankton community health. No studies have been done on phytoplankton population composition, abundance or distribution within the Area of Concern in more than ten years. There is no way to describe with any confidence the current conditions of these organisms in the river or nearshore area. There is insufficient information on the mixing of river and lake water to know how either might be affecting the populations at the mouth or in the offshore area. Furthermore, without information on the chemical-physical water conditions at the time the older studies were conducted, it is difficult to understand the role of various factors such as phosphates or toxic contaminants on the demise and recovery of certain species.

Factors Contributing to Impairment

The 1978 study noted that differences in chemical-physical water quality were the major factors accounting for the differences in species diversity among the sites between the Area of Concern and upstream. No specific contaminants were identified. Nutrient enrichment as the cause of eutrophic phytoplankton populations, has been documented in Lake Erie in several reports published in the 1980s. Nutrient enrichment in the Cuyahoga Nearshore Area comes in part from the western basin of Lake Erie, and in part from the river. Phosphorus and sewage are principle contaminants of concern. In particular, the abundance found of *Fragilaria*, a genus reported to be associated with sewage, would suggest sewage discharge problems in the Area of Concern. *Fragilaria* were reported in an earlier study of the nearshore/offshore area of the Cuyahoga.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

1) Phytoplankton Degradation (Appendix A).

2) Eutrophication of the Cuyahoga River and the Lake Erie Nearshore (Appendix A).

xiii.2 DEGRADATION OF ZOOPLANKTON POPULATIONS

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when zooplankton community structure significantly diverges from unimpacted control sites of comparable physiochemical characteristics. In addition, this use will be considered impaired when relevant, field-validated, zooplankton bioassays (e.g., Ceriodaphnia bioassays) with appropriate quality assurance/quality controls confirm toxicity in ambient waters."

Seasonal changes in zooplankton species composition and abundances noted in the western basin of Lake Erie have been noted almost simultaneously in the Area of Concern. Long term changes in zooplankton species composition and abundance are also similar between these two regions. These similarities between the western basin and the Area of Concern undoubtedly reflect the rapid movement of water masses from the western basin to the Area of Concern. Determinants of water quality affecting zooplankton in the western basin apparently continue to influence the zooplankton in the Area of Concern.

Characterizations of the Types of Data Utilized

Several major studies of zooplankton community composition and abundance in Lake Erie, including the Cleveland Harbor, have been published (Fish 1929; Davis 1954, 1962, 1969; Rolan et al., 1973; Czaika 1978; Krieger 1981). Those studies extending from the 1920s through 1978 cover the period of accelerating eutrophication of Lake Erie. The studies were conducted seasonally and quantitative data were obtained. The primary objectives of these studies were to assess seasonal changes in zooplankton communities, to determine spatial differences in species composition, and to assess long term trends in species composition as indicators of environmental trends.

One series of zooplankton bioassays is documented for the Area of Concern. In 1985, the U.S. EPA Environmental Research Laboratory-Duluth performed toxicity bioassays with Ceriodaphnia dubia at 13 locations on the Cuyahoga River between Cuyahoga Street in Akron (RM 42.6) and Route 21 (RM 11.33) near Cleveland. The objectives of these bioassays were to measure toxicity contributions from the Akron Wastewater Treatment Plant to the river and to search for other toxicity contributions to the river. Bioassays were conducted over a very short period of time; temporal trends were not determined.

The database is adequate for assessing long term trends in zooplankton communities from the 1920s to the 1980s, but it is not adequate to assess recent trends.

Declaration of Impairment

A) Ohio Edison Dam to Head of Navigation Channel: Impairment Unknown.

Ceriodaphnia bioassays in 1985 indicated "marked toxicity" of ambient river water downstream from the Akron Waste Water Treatment Plant to Cleveland. Data for this section are limited to bioassays performed only in 1985. More recent data are not available.

No studies of natural zooplankton communities have been conducted in the Cuyahoga River between Ohio Edison Dam and Lake Erie.

B) Navigation Channel: Impairment Unknown.

No studies of natural zooplankton communities have been conducted in the Cuyahoga River between Ohio Edison Dam and Lake Erie.

C) Nearshore Area: Impairment Unknown.

The major species of zooplankton encountered in the earliest studies (1920s) were still present as of 1978. Subtle changes occurred in relative abundances of certain species. Indicator species of oligotrophic conditions declined while indicators of eutrophic conditions increased. The density of total zooplankton increased rapidly from the 1920s until the 1960s, then declined moderately in the 1970s, but has recently stabilized at levels well above densities noted in the 1920s. The period of density increase in zooplankton populations corresponds with the period of accelerating eutrophication of Lake Erie.

It is noteworthy that the most recent study (1978) reported that the density of zooplankton usually was low in the vicinity of Cleveland in August-September samples. This was especially unusual because mean densities were very high at stations just current and downcurrent from Cleveland on the Lake. Upcurrent densities were among the highest encountered during the four sampling dates. Densities also were quite low in the Cleveland Harbor during May and October.

Confidence or Uncertainties

The analysis of this impairment lacks a current data set and clear standards by which to measure zooplankton community health.

Most of the studies used to assess zooplankton communities were published in peer-reviewed science journals. The studies were quantitative and conducted seasonally. The data are not adequate, however, for assessing recent trends.

The data are adequate for explaining the effects of eutrophication in Lake Erie but they cannot be used to assess the impact of water quality from the Cuyahoga River on zooplankton communities.

Factors Contributing to Impairment

According to the latest report available (Krieger, 1981), changes in the relative abundance of several species that seem to have occurred since 1928 may relate to changes in the trophic status of Lake Erie. During the past 50 years Lake Erie has become increasingly eutrophic due mostly to the excessive inflows of point source and nonpoint source loadings of phosphorus and municipal sewage systems. The latest study confirmed the trend in recent years toward declining numbers of Limnocalanus and Diaptomus sicilis, which are indicators of oligotrophy. Also noted was the shift in species abundances from the oligotrophic Eubosmina coregoni to the eutrophic Bosmina longirostris (or "mucronate bosminids") that have been present for many years in Lake Erie. Increasing numbers of Diaptomus siciloides have been suggested as an indicator of eutrophic conditions in the Great Lakes. This zooplankton was the second most abundant calanoid in 1978 samples, but was relatively scarce in 1979.

Low densities of zooplankton sometimes observed in the Cleveland Harbor are consistent with expected effects of toxic pollution, but low densities cannot be attributed solely to toxic pollution. Nutrient loadings and toxic pollutants which may affect zooplankton in various ways often occur in the same locations (e.g., harbors), thus rendering it difficult to separate the effects of different pollutants on zooplankton densities in harbor areas. Although toxic pollutants have been suggested as a possible cause, this cannot be adequately demonstrated because river waters normally are zooplankton-poor. The low densities in the harbor may simply result from dilution of the lake water with zooplankton-poor river water.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

Assessment of Zooplankton Communities (Appendix A).

xiv.1 LOSS OF FISH HABITAT

Impairment Evaluation Criteria Employed

According to the International Joint Commission, an impairment exists "when fish management goals have not been met as a result of loss of fish habitat due to a perturbation in the physical, chemical, or biological integrity of the Boundary Waters, including wetlands."

An impairment exists when a loss of fish habitat has occurred due to water quality contamination, and/or fish populations are not self-sustaining and normally productive at a level expected with unimpaired habitat conditions. The Ohio EPA has developed a Qualitative Habitat Evaluation Index (QHEI) to quickly estimate in-stream and riparian habitat features that would reflect the potential or ability of a given stretch of river to support aquatic life*. This index is a systematic approach to objectively evaluate six factors influencing stream habitat. The QHEI is used with the fish Index of Biotic Integrity (IBI) to determine if a stream segment is meeting Clean Water Act goals.

To meet Warmwater Habitat (WWH) life use designation criteria, river segments scores from habitat evaluations (QHEI) should be 60 or higher. Segments with average QHEI scores less than 46 generally perform at less than the WWH aquatic use level. Segments that average between 46 and 60 should receive further evaluation of individual metrics, disturbance type, rate of recovery, and plans for maintenance of modifications to determine biological potential and use attainment.

Characterization of the Type(s) of Data Utilized

The Ohio EPA QHEI was applied to data collected at 25 sites during 1984-1988 on the Cuyahoga River. See Figure 4-28 for a summary of data collected.

Declaration of Impairment

A) Ohio Edison Dam to Head of Navigation: Not Impaired.

This stretch of river had QHEI average scores that indicate habitat would not be a significant factor limiting fish populations.

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* Ohio EPA 1989, Vol III, Biological Criteria for the Protection of Aquatic Life; see Appendix F.

Figure: 4–28

QHEI Warmwater and Modified Warmwater Characteristics for the Cuyahoga River.

Key QHEI Components

CUYAHOGA RIVER, Year: 1987

WWH Attributes

River Mile	QHEI	Gradient (ft/mile)	No Channelization or Recovered	Boulder/Cobble/Gravel Substrates	Silt Free Substrates	Good/Excellent Development	Mod/High Sinuosity	Extensive/Moderate Cover	Fast Current/Eddies	Low/Normal Embeddedness	Max Depth >40 cm	Low/No Riffle Embeddedness	Total WWH Attributes
42.6	71.0	8.62	■	■		■	■	■			■		6
40.4	81.5	5.59	■	■		■	■	■	■	■	■	■	9
38.6	66.0	5.35	■	■		■	■	■	■		■		7
36.5	76.0	4.65	■	■		■	■	■	■		■		7
33.6	71.5	4.76	■	■		■	■	■	■		■		7
26.7	75.5	11.11	■	■		■	■	■	■		■	■	8
24.1	70.0	4.76	■	■		■	■		■		■	■	7
21.3	60.5	3.77	■	■				■	■		■		5
17.3	70.5	2.51		■		■	■	■	■		■	■	7
15.9	51.5	2.51							■		■		2
13.1	54.0	4.00							■		■	■	3
12.2	66.0	4.00		■				■	■		■		4
11.5	67.5	4.00		■		■	■	■	■		■		6
9.8	65.5	2.03		■		■	■	■	■		■		6
7.5	48.0	2.03					■		■		■		3
7.1	55.0	2.03					■		■		■		3
5.5	43.0	0.10		■							■		2
5.0	29.5	0.10							■		■		2
3.4	30.0	0.10							■		■		2
1.4	51.5	0.10		■							■		2
0.8	43.0	0.10							■		■		2

MWH Attributes — High Influence

River Mile	Channelized or No Recovery	Silt/Muck Substrates	Low Sinuosity	Sparse/No Cover	Max Depth >40 cm (WD,HW)	Total (High Influence) MWH Attributes
42.6						0
40.4						0
38.6						0
36.5						0
33.6				●		1
26.7				●		1
24.1				●		1
21.3						0
17.3						0
15.9		●		●		2
13.1	●			●		2
12.2						0
11.5		●				1
9.8						0
7.5	●			●		2
7.1	●			●		2
5.5	●			●		2
5.0	●			●		2
3.4	●			●		2
1.4	●			●		2
0.8	●			●		2

MWH Attributes — Moderate Influence

River Mile	Recovering Channel	Heavy/Mod. Silt Cover	Sand Substrates (BT)	Hardpan Origin	Fair/Poor Development	Low/No Sinuosity	Only 1-2 Cover Types	Intermittent & Poor Pools	No Fast Current	High/Mod. Embeddedness	Ext./Mod. Riffle Embeddedness	No Riffle	Total (Moderate Influence) MWH Attributes	MWH (High)/WWH Attributes	MWH (Mod.)/WWH Attributes
42.6									◀	◀			2	0.14	0.43
40.4													0	0.10	0.10
38.6		◀	◀		◀					◀	◀		5	0.13	0.75
36.5			◀							◀	◀		3	0.13	0.50
33.6		◀	◀		◀					◀	◀		5	0.25	0.88
26.7										◀			1	0.22	0.33
24.1		◀			◀	◀			◀	◀			5	0.25	0.88
21.3		◀			◀	◀			◀	◀		◀	6	0.17	1.17
17.3	◀	◀	◀							◀			4	0.13	0.63
15.9	◀	◀	◀		◀	◀			◀	◀		◀	8	1.00	3.67
13.1		◀	◀		◀	◀			◀	◀	◀		7	0.75	2.50
12.2	◀	◀	◀		◀	◀			◀	◀	◀		8	0.20	1.80
11.5	◀	◀			◀					◀	◀		5	0.29	1.00
9.8	◀	◀	◀		◀					◀	◀		6	0.14	1.00
7.5		◀	◀		◀	◀			◀	◀		◀	7	0.75	2.50
7.1		◀	◀		◀				◀	◀	◀		6	0.75	2.25
5.5		◀			◀	◀	◀		◀	◀		◀	7	1.00	3.33
5.0					◀	◀	◀		◀			◀	5	1.00	2.67
3.4					◀	◀	◀		◀			◀	5	1.00	2.67
1.4		◀			◀	◀			◀	◀		◀	6	1.00	3.00
0.8		◀	◀		◀	◀			◀	◀		◀	7	1.00	3.33

4-79

B) Navigation Channel (RM 5.6 to the mouth RM 0.0): <u>Impaired</u>.

There are no water quality standards for the navigation channel.

The QHEI has not been developed for Lake Erie estuaries. However, if river criteria are applied, the average score is considerably below levels expected to support a Warm Water Habitat fish community.

C) Nearshore Area: <u>Probably Impaired</u>.

This area has not yet been formally addressed, but best professional judgement reveals some degree of impairment to habitat, particularly from the alteration of shoreline (bulkheading, sheet piling and riprap) and maintenance dredging.

<u>Confidence or Uncertainties</u>

A high degree of confidence has been established within Ohio EPA between the relationship of QHEI scores and biological performance levels. This relationship has been developed after evaluating more than 350 stream sites throughout Ohio. However, the ability to predict biological performance based on QHEI scores was challenged in court on a segment of the Cuyahoga River (RM 10.8 to 5.6). Ohio EPA designated this segment as a Warmwater Habitat, indicating that it has sufficient habitat attributes to support a balanced population of warmwater aquatic organisms. The Northeast Ohio Regional Sewer District and LTV Steel contended that the habitat was sufficiently limited (lack of tree canopy and excessive sedimentation) that regardless of the water quality attained, it could not support a balanced community of warmwater organisms. Also, lack of attainability due to chemical conditions contributed by nonpoint sources was an issue in this section. The Ohio EPA designation was upheld upon appeal through the Ohio Court system (58 OHIO ST. 3D 16).

<u>Factors Contributing to Impairment</u>

These include a combination of past channelization, lack of riparian cover, silt cover of substrates, low stream sinuosity, low gradient, concrete and steel sheet piling, annual maintenance dredging, and loss of natural substrates.

<u>Research Needs and Ideas Identified in the Subcommittee Reports</u>

See Appendix M.

<u>Committee Reports and Other Reports Consulted</u>

1) Assessment of Physical Habitat in the Lower Cuyahoga and The Dredged Ship Channel. Ohio EPA, DWQPA, Columbus, Ohio. (Appendix A.)

2) Rankin, E.T. 1989. The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Applications. Ohio EPA, DWQPA, Columbus, Ohio. (Appendix F.)

xiv.2 LOSS OF WILDLIFE HABITAT

<u>Impairment Evaluation Criteria Employed</u>

According to the International Joint Commission, an impairment exists when wildlife management goals have not been met as a result of loss of wildlife habitat due to a perturbation in the physical, chemical or biological integrity of the boundary waters, including wetlands."

An impairment exists when a degradation of wildlife habitat has occurred due to water quality contamination or a loss of suitable vegetation, and/or wildlife populations are not self-sustaining and normally productive at a level expected with unimpaired habitat conditions.

<u>Characterization of the Type(s) of Data Utilized</u>

Impairment is based on the consensus of the Committee and knowledge of the primary land uses near the river and along the nearshore area.

<u>Declaration of Impairment</u>

A) Ohio Edison Dam to Head of Navigation Channel: <u>Impaired in some places</u>.

There are no wildlife management goals for the basin as a whole. There are many parks and several nature preserves and wildlife areas in the watershed. The National Park Service, the Ohio Department of Natural Resources, and several municipalities are the agencies primarily responsible for these areas. None have goals which specifically address enhancing population size. The National Park Service is implementing programs to curb growth of certain populations (e.g., beaver and deer) which can be destructive if allowed to grow unchecked. Otherwise the goals of these agencies are essentially to protect habitat in these areas and thus protect the populations which currently exist there. Little information has been gathered on wildlife populations and habitat conditions in the basin. Use of riparian lands along some stretches has eliminated wildlife habitat.

B) Navigation Channel: <u>Impaired</u>.

Land use along this stretch (primarily urban and industrial) has eliminated most of the wildlife habitat. Open space is limited.

C) Nearshore Area: <u>Impaired in some places</u>.

Use of the litoral zone for development has eliminated a substantial amount of habitat in some places.

Confidence or Uncertainties

The Committee has little quantitative data on which to base a declaration of impairment. Declaration is based on observations and an understanding of the historical picture of the region.

Factors Contributing to Impairment

Urban development and predominant land uses.

Research Needs and Ideas Identified in the Subcommittee Reports

See Appendix M.

Committee Reports Consulted

None available.

4.2 Chemical Quality Issues

4.2.1 Sediment Quality

4.2.1.1 Summary

The most highly contaminated areas for heavy metals and conventional pollutants are in the Munroe Falls and Ohio Edison dam pool sediments near Akron, the navigation channel and Cleveland Harbor.

The most highly contaminated areas for organic compounds are in the Munroe Falls and Ohio Edison dam pool sediments near Akron, river sediments downstream of the Akron WWTP, the navigation channel and Cleveland Harbor. The highest PAH concentrations in the sediments of the Area of Concern are midway between the concentrations of "non-contaminated" references sites and the highly contaminated Black and Mahoning rivers. The highest concentrations of phthalate esters were found downstream from Akron.

Most sediments of the navigation channel (cadmium, chromium, lead, cyanide, zinc, oil and grease) and harbor (Arsenic, cadmium, chromium, copper, iron, zinc, lead, cyanide, oil and grease) continue to exceed the USEPA Heavily Polluted Classification for Great Lakes Harbor sediments according to ACOE data. Other contaminants in the Navigation Channel and Harbor sediments include PCBs and PAHs, although none of the recent sediment samples collected by OEPA and ACOE exceed the USEPA guideline for PCBs. See Figure 4-29 for a summary of 1990 sediment data collected by Ohio EPA.

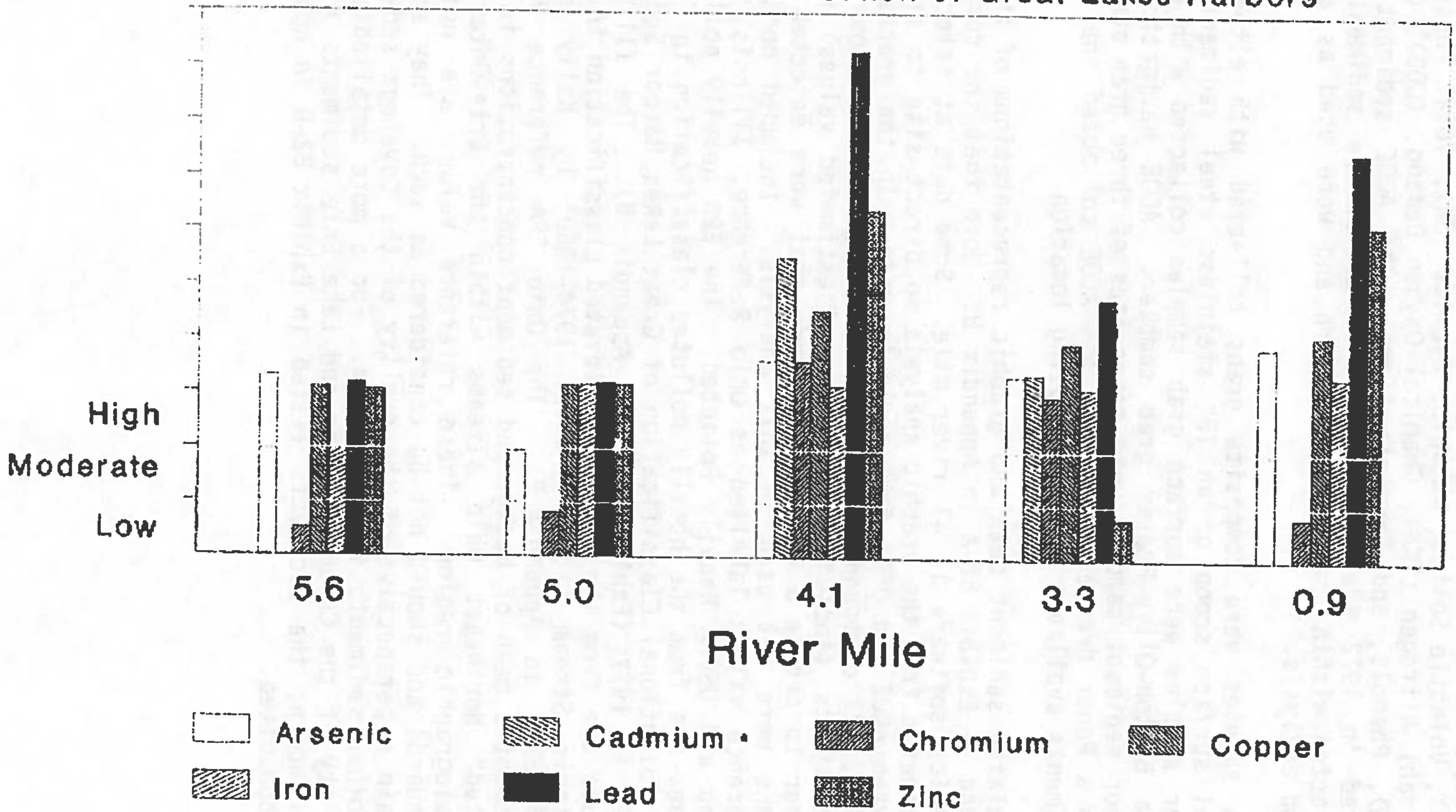
4.2.1.2 General

1985-86 and 1990 Ohio Environmental Protection Agency (OEPA) and 1986, 1989 and 1990 Army Corps of Engineers (ACOE) data were the primary sources of information used to evaluate current sediment quality in the Cuyahoga River Area of Concern (Area of Concern). These data are tabulated in Exhibit B2-A in Appendix B. Other available data were also reviewed and used in the evaluation. As a convenience in interpreting the sediment data, the Cuyahoga River has been divided into three segments. Segment 1 is the free flowing Cuyahoga River from upstream of the Area of Concern to the start of the navigation channel (River Mile (RM) 63.3 to 5.6). Segment 2 includes the Navigation Channel and the Old River Channel (RM 5.6 to 0.0) and Segment 3 includes the Cleveland Harbor and near shore area of Lake Erie. Analysis of OEPA samples included heavy metals (Aluminum (Al), Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Copper (Cu), Iron (Fe), Lead (Pb), Magnesium (Mg), Manganese (Mn), Nickel (Ni), Potassium (k), Sodium (Na), Strontium (Sr), Zinc (Zn)) and organic compounds (Volatile Organic Compounds (VOCs), Base Neutral Acids (BNAs), Pesticides and Polychlorinated Biphenyls (PCBs)). Analysis of ACOE samples included heavy metals (Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Iron (Fe),

Figure: 4–29

CUYAHOGA RIVER 1990 NAVIGATION CHANNEL SEDIMENT DATA

U.S EPA Pollutional Classification of Great Lakes Harbors



DATA COMPILED BY OHIO EPA

Mercury (Hg), Lead (Pb), Manganese (Mn), Nickel (Ni), Zinc (Zn)) and organic compounds (Purgeable Aromatics, Polynuclear Aromatic Hydrocarbons (PAHs), Phthalate Esters, Pesticides and Polychlorinated Biphenyls (PCBs)) and conventional parameters (Total Suspended Solids (TSS), Volatile Solids, Ammonia, Cyanide (CN), Total Phosphorous, Total Kjeldahl Nitrogen (TKN), Chemical Oxygen Demand, (COD), Oil and Grease (O&G), Phenols, and Particle Size). The ACOE sediment samples collected in 1972 are the earliest comprehensive sediment quality data collected within the Area of Concern and were used as a baseline for trend analysis.

OEPA samples were composite grabs collected with either a stainless steel surface scoop or an 18" stainless steel sediment corer. ACOE river samples were surface grab samples collected with either a Ponar or a Barton-Olive-Prater grab sampler. ACOE Navigation Channel and Harbor sediment samples were composites of three grab samples collected with a Ponar dredge. Both OEPA and ACOE collected the finest grained sediments available at each sampling location.

Tabulated sediment data and graphic representations of that data is included in Exhibit B2-A in Appendix B. Note that the resolution of the graphics software is +1 river mile. Some data at selected sites were eliminated from the graphic analysis so direct site to site comparisons between ACOE and OEPA data could be made. In the graphs for Total Organics, all compounds found in a specific fraction above method detection limits (including unknowns and estimated values) were added together to create a value. Compounds that were detected in laboratory blanks were not used in this analysis. Included on the graphs are reference values labelled as Ohio Reference, Illinois Extremely Elevated and USEPA Heavily Polluted. The EPA heavily polluted reference values are from the heavily polluted classification in "Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments" by the USEPA in 1977 (Exhibit B2-B in Appendix B). The Illinois reference values are from the extremely elevated classification in "Evaluation of Illinois Stream Sediment Data: 1974-1980" by Kelly and Hite (Exhibit B2-C in Appendix B). The Ohio EPA reference values are the arithmetic mean of background sediment concentrations in 12 "least impacted" Northeast Ohio streams within the Erie-Ontario Lake Plain physiographic region. These reference values are not criteria or standards and should not be considered as such. They are used here to obtain a perspective of the quality of the Cuyahoga sediments compared to other sediments in the region. For a more detailed analysis of the quality of the Cuyahoga River and Lake Erie sediments within the Area of Concern, the documents listed in Exhibit B2-D in Appendix B should be consulted.

4.2.1.3 Summary of Most Recent Data

CUYAHOGA RIVER TO NAVIGATION CHANNEL

All heavy metal concentrations in the sediment at Shalersville (RM 63.3) were near or below Ohio EPA's reference mean value except for a 1985 chromium value. The Shalersville site is upstream from the Area of Concern, major population centers, and pollution sources in the Cuyahoga basin. The source(s) for these higher concentrations of chromium are not known. No BNAs, VOCs or Pesticide/PCB organic compounds (OEPA data) were detected in the sediments at Shalersville.

The Munroe Falls and Ohio Edison dam pools (RM 50 and 42) contained the highest concentrations of heavy metals and organic compounds outside of the Cleveland area. The Base-Neutral-Acid (BNA) fraction contained the highest concentration of contaminants in the organic fraction analysis of these samples. Included in the BNA fraction are a group of compounds known as Polynuclear Aromatic Hydrocarbons or PAHs. PAHs are common constituents of fossil fuels such as coal and petroleum. Four common PAHs, Fluoranthene, Phenanthrene, Benzo(a)anthracene and Benzo(a)pyrene are suspected as potential fish tumor initiators. The concentration of PAHs were less than those found in the Cuyahoga River ship channel but more than concentrations found at "non-contaminated" reference sites. See Table 4-4 for a comparison of PAH values in the Cuyahoga Area of Concern.

The sediment samples in this portion of the Cuyahoga River also exceed the Ohio EPA reference mean for most of the heavy metals. These dam pools are downstream from the cities of Ravenna and Kent and the Ravenna, Kent and Fishcreek WWTP discharges. This site is upstream from most of the Akron area industrial and municipal discharges.

The stream segment downstream of the Akron WWTP (RM 37.2) to the Navigation Channel (RM 5.6) contained less heavy metal sediment contamination than other segments of the river. Since contaminated sediments and potential contamination sources (i.e., combined or dry weather overflows) in the Akron municipal area are upstream, this segment of the river would be expected to contain more contaminated sediments than the sampling results indicate. The higher stream gradient (faster current and thus fewer fined grained sediment deposition) may account for the lower than expected concentration of contaminants. 1986 ACOE sampling found the highest concentrations of purgeable aromatics, PAHs, Pesticides/PCBs and phthalate esters in this stream segment downstream from the Akron WWTP (RM 37.2) to the head of the navigation channel (RM 5.6). Phthalate esters are a class of compounds included in the BNA fraction. The highest concentrations of the phthalate esters in the sediments of the Area of Concern were found downstream of Akron. These compounds are often associated with plastic and rubber compounding. Phthalate or phthalate-like compounds were suspected agents in causing an impoverished biotic community downstream from Akron. The ACOE PAH concentrations in this river segment, however, appeared to be less than the Munroe Falls and Ohio Edison dam pools. The Munroe Falls and Ohio Edison dam pools were not sampled by the ACOE.

TABLE 4-4: FOUR "COMMON" PAH COMPOUNDS IN SEDIMENTS

MODIFIED FROM ESTENIK 1988

STATION		PHEN [a] mg/kg	FLUO [a] mg/kg	B(a)A [a] mg/kg	B(a)P [a] mg/kg
CUYAHOGA RIVER (UPSTREAM KENT) [b]		BDL	BDL	BDL	BDL
CUYAHOGA RIVER (MUNROE FALLS DAM POOL) [c]		2.6	2.8	<1.3	<1.3
CUYAHOGA RIVER (OHIO EDISON DAM POOL) [c]		3.5	3.9	1.9	1.4
CUYAHOGA RIVER (DOWNSTREAM AKRON WWTP) [b]		BDL	1.33	NA	NA
CUYAHOGA RIVER (CLEVELAND 1986) [d]	MEAN	11.6	12.0	3.2	3.2
	RANGE	2.8-47	4.8-40	0.96-11	0.83-15
CUYAHOGA RIVER (CLEVELAND 1990) [e]	MEAN	54	35	13	7.6
	RANGE	2.2-154	26-95.4	1.2-33.5	0.8-19.8
MAHONING RIVER (WARREN) [f]	MEAN	14.5	16.3	6.5	6.6
	RANGE	1.1-34.0	0.79-53	0.53-16.0	0.77-16.0
MAHONING RIVER (YOUNGSTOWN) [f]	MEAN	356.0	150.3	96.4	86.8
	RANGE	3.1-3200	0.79-1600	3.5-850	2.0-630
MAHONING RIVER (CAMPBELL) [f]	MEAN	14.5	16.3	6.5	6.6
	RANGE	1.1-34	0.79-53	0.53-16	0.77-16
BLACK RIVER (LORAIN) [f]	MEAN	390	220	51	43
9 "TUMOR SITES" [f]	MEAN	49	39	9.0	7.6
5 "REFERENCE SITES" [f,g]	MEAN	0.08	0.15	0.05	0.07

a-PHEN = PHENANTHRENE; FLUO = FLUORANTHENE; B(a)A = BENZO(a)ANTHRACENE; B(a)P = BENZO(a)PYRENE

b - 1986 ACOE c - 1985 OHIO EPA d - 1986 USEPA e - 1990 OHIO EPA f - 1988 ESTENIK g - UNIMPACTED

ACOE data indicate an increase in TKN (from 105 to 757 mg/kg) and COD (from 2350 to 40500 mg/kg) in sediments in the Cuyahoga River downstream of the confluence with Tinker's Creek (RM 16.4). The large amount of municipal WWTP discharges into Tinkers Creek may account for the increases suggested by the ACOE data.

PCBs in the sediments of the river from upstream of the Area of Concern to the head of the Navigation Channel do not appear to be a significant contaminant within this segment. ACOE data from 1986 found only one site (1.8 mg/kg at RM 20.8) from the 23 sites sampled that contained any concentrations of PCBs above the 0.1 mg/kg detection limit. USEPA considers 10 mg/kg total PCBs "polluted" as stated in "Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments".

NAVIGATION CHANNEL

Significant improvements in Total Phosphorous, CN, O&G, COD and heavy metals concentrations have occurred in the navigation channel sediments from 1972 to 1986 although the sediments still generally exceed the USEPA heavily polluted criteria for Great Lakes Harbors. TKN and volatile solids did not appear to improve. The Old River Channel contaminant levels are comparable to the levels in the main Navigation Channel even though there are no NPDES permitted dischargers in the Old River Channel. The ACOE and USEPA have determined (from 1984 and 1990 sampling data) that the sediments at the head of the Navigation Channel (RM 5.6 to 5.4) are suitable for open lake disposal even though some parameters exceeded the USEPA heavily polluted criteria for Great Lakes Harbors.

PAH concentrations in the sediments of the Navigation Channel are less than the mean for nine Great Lakes fish tumor sites and less than the concentrations in the neighboring Black River Navigation Channel. The low concentration of PAHs in the Cuyahoga River Navigation Channel may be due to the annual dredging that is performed there. The highest concentration of PAHs in 1990 OEPA sediment samples were at Third Street. These samples were collected prior to annual maintenance dredging by the ACOE and contained concentrations of PAHs an order of magnitude higher than upstream samples collected where dredging had already occurred. This indicates that there is a continuing source of PAHs to the lower portion of the Cuyahoga River.

Concentrations of PCBs in the Navigation Channel sediments are very low. Only 1 of 8 ACOE sampling sites had concentrations that exceeded the method detection limit of 0.1 mg/kg. That site was RM 3.4 which had a concentration of 6.52 mg/kg. Two of four samples collected from the Old River Channel contained PCBs in concentrations of 0.51 and 1.03 mg/kg.

Only one sample from the Area of Concern is known to have been analyzed for 2,3,7,8 Tetrachlorodibenzo(p)dioxin (TCDD) and 2,3,7,8, Tetrachlorodibenzo(p)furan (TCDF). The sample contained 3 pg/g (TCDD) and 17 pg/g TCDF. Up to 8 pg/g TCDD is considered "background".

One site in particular, downstream of Kingsbury Run (RM 4.1), was found to have extremely elevated levels of cadmium, chromium, lead and zinc. Other parameters at this site were elevated to slightly elevated.

CLEVELAND HARBOR AND LAKE ERIE

Heavy Metals (lead, zinc, cadmium, chromium) and Total Phosphorous and COD concentrations have declined in the Harbor sediments from 1972 to 1986 while O&G, TKN and Volatile Solids sediment concentrations in the Harbor have not declined significantly. The Mid Channel and Eastern Basin of the harbor contain higher concentrations of heavy metals than the Western Basin.

Most sediments of the navigation channel (for cadmium, chromium, lead, cyanide, zinc, oil and grease) and harbor (for arsenic, cadmium, chromium, copper, iron, zinc, lead, cyanide, oil and grease)continue to exceed the USEPA Heavily Polluted Classification for Great Lakes Harbor sediments according to ACOE data. Other contaminants in the Navigation Channel and Harbor sediments include PCBs and PAHs.

The western portion of the near shore area off Edgewater Park Beach is classified as non-polluted using 1986 ACOE data. The Eastern portion of the near shore area near the eastern light is classified as moderately polluted using ACOE data collected in 1983. Other samples collected near Bratenahl were non-polluted except for Cu and Pb which were in the moderately polluted range.

All eight sediment samples collected in the Cleveland Harbor by the ACOE in 1986 contained some concentrations of PCBs. The concentration averaged 0.99 mg/kg with a minimum concentration of 0.5 and a maximum concentration of 0.99 mg/kg. USEPA considers 10 mg/kg total PCBs in sediment to indicate "polluted" harbor sediments as stated in "Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments".

A ACOE 1983 sediment bioassay report classified the navigation channel and harbor as moderately polluted.

4.2.2 Chemical Water Quality

4.2.2.1 1954-1989 Chemical Water Quality Trends

INTRODUCTION

The water quality conditions of the Cuyahoga River during the sixties and seventies received national notoriety as one of the most polluted rivers in the country. More recently, the attention has been focused on the water quality improvements that have occurred during the last twenty years as a result of pollution abatement efforts. This section will provide documentation of improving chemical water quality trends in the lower 40 miles for some of the contaminants that contributed to the lower Cuyahoga River's historical image as the stereotype of a polluted river. It will also discuss some of the circumstances that caused the Cuyahoga River to become so contaminated, and what measures have been responsible for the recent improving trends.

BACKGROUND

The single factor most responsible for the polluting of the Cuyahoga River is the relatively small size of the watershed in relationship to the vast amount and character of development that has occurred. Approximately 15% of the State's population lives and/or works in the watershed (1990 census figures), which only comprises about 2% of the State's land mass. This situation is further amplified with most of the urbanization and industrialization situated in the lower half of the watershed from Akron to Cleveland.

During dry weather conditions the sanitary and industrial wastewater discharge volumes far exceed the natural background flows of the river, making the Cuyahoga River an effluent dominated stream. This point is realized when looking at average summer flow conditions. Two of the larger dischargers (Akron and NEORSD Southerly sewage treatment facilities) have combined effluent volumes that comprise at least 68% of the total stream flow half of the time during the summer months. During lower stream flow conditions this percentage of treated wastewater can be much greater. In addition, there are approximately 200 other NPDES permitted dischargers in the Cuyahoga Watershed. Thus, it is obvious that the water quality of the Cuyahoga River is strongly influenced by the degree to which the many sources of wastewater in the river are treated.

Prior to the mid 1950s, wastewater treatment was usually limited to primary treatment (settling and skimming), if treated at all. Inadequate treatment combined with the volume of wastewater, relative to the size of the Cuyahoga River, created highly degraded water quality conditions.

HISTORICAL WATER QUALITY TRENDS

Many people believe that water pollution is a relatively recent phenomenon with recognition and concern arising in the sixties. Water pollution in the Cuyahoga River was recognized as a problem more than 120 years ago. On May 6, 1868, the Cleveland Daily Plain Dealer reported that; "... from the filthy looking conditions of the river, we imagine that but a short time will be required to remove all evidences of beauty and cleanliness from there. We should think there might be some way discovered by which the filthy refuse of the oil refineries could be disposed of in some other way, than by emptying it into the river."

By 1872, Cleveland was the largest oil refining center in the world. The practice of indiscriminate dumping of waste products like gasoline and naphtha undoubtedly took a terrible toll on the river. By the turn of the century, Cleveland also emerged as one of the world's largest iron and steel making centers along with which came the associated wastewater necessary to support these operations. The industrialization and urbanization of the Akron area, particularly the rubber industry, further added to the pollution impacts upon the relatively small Cuyahoga River.

There are few records of the chemical water quality of the Cuyahoga River until 1954. However, historical references on the appearances of the river usually include vivid descriptions like "rusty orange color" or "oil slicks on the river extending a distance of one mile from shore in the waters of Lake Erie". References to raw domestic sewage in the river are also documented as responsible for the prevalence of typhoid fever which necessitated the 1854 construction of a water intake 400 feet offshore in Lake Erie to avoid the contaminated water. These circumstances suggest that the historical water quality of the Cuyahoga River was even worse than the conditions documented with the first reliable chemical testing of the river in 1954.

In this analysis dissolved oxygen, BOD, and ammonia were selected to evaluate long term trends because of the existence of a sound historical data base, and because they are good indicators of conventional water pollution. Furthermore, the reduction in concentrations of these conventional contaminants in the Cuyahoga River has been so large, which signifies dramatic improvements in the chemical water quality of the river. Improvements in some of the nonconventional pollutants (i.e., heavy metals and other contaminants) have also occurred, but their precise magnitude cannot be documented. This statement is supported by the significant reductions in total phosphorus, cyanide, oil and grease, COD, and heavy metals concentrations that have occurred in the sediments at the mouth of the river when comparing 1972 data against 1986 data (Appendix B). However, very limited long-term water quality information exists for these pollutants. The long term data base for metals is further limited. Much of the historical data for many of the heavy metals are reported at "less than" minimum detection limits, which were two to three times higher than today's analytical capabilities. Lastly, the magnitude of change that has occurred is probably less dramatic and would require more careful consideration of stream flows and conversion to loadings before trends could be meaningfully assessed.

DISSOLVED OXYGEN

During July and August of 1954, a dissolved oxygen survey was conducted by Ohio Department of Health on the Cuyahoga River during low flow conditions. This survey found 20 of the 43 miles from Akron to Cleveland to be completely devoid of any oxygen (a 13-mile stretch downstream from Akron and a 7-mile stretch in Cleveland). Furthermore, the highest concentration of dissolved oxygen found at any site did not achieve the 4.0 mg/l standard needed to sustain healthy populations of aquatic organisms.

A dramatic improvement in the dissolved oxygen regime has occurred as shown in Figure 4-30 which contrasts average levels encountered during five early morning dry weather surveys during the summer of 1984 by Ohio EPA. Low dissolved oxygen levels in the stretch of river between Akron and Cleveland have been virtually eliminated. The NEORSD Cuyahoga Valley Interceptor and upgrades at the Akron WPC facility are largely responsible for this improvement. However, low oxygen conditions continue to persist in the last 6-mile stretch of the navigation channel, which was confirmed by additional tests in 1987, 1989, and 1990 (Ohio EPA data).

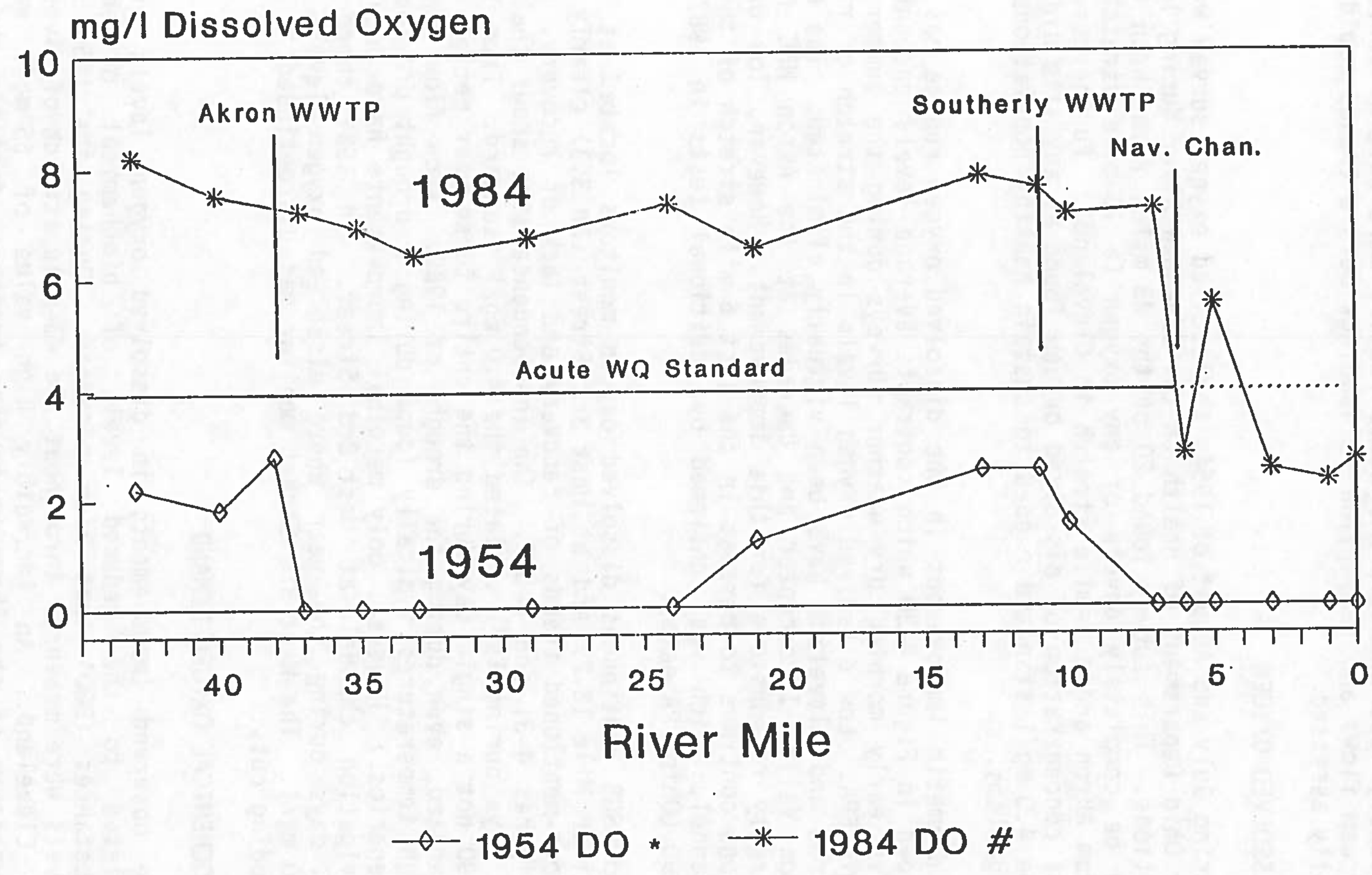
Two USGS continuous dissolved oxygen monitors located at Independence (River Mile 13.2) and at West 3rd Street (RM 3.3) clearly reflect the above-mentioned trends of recovery and lack of recovery, respectively (Figures 4-31 and 4-32). The Independence site shows that as many as 82 days during 1971 violated the 4.0 mg/l standard. From 1988 through 1990 not a single day during the entire three-year period violated the standard, even during the drought of 1988. (Low flow conditions and high temperatures typically found during a drought provide worst case scenarios.) However, only marginal improvements have occurred in the navigation channel at West 3rd Street. In 1987 there were still 167 days during the year where dissolved oxygen levels fell below 4.0 mg/l. The West 3rd Street monitor was discontinued in 1988 due to funding cuts.

BIOCHEMICAL OXYGEN DEMAND

The observed improvements in dissolved oxygen levels are directly related to the reduced levels of biochemical oxygen demanding substances (BOD) that have occurred. During the 1954 survey, BOD levels were measured throughout the 43-mile stretch of river from Akron to Cleveland. An incredibly high value of 65 mg/l was recorded downstream of the Akron wastewater treatment facility and a value of 28 mg/l was found downstream of the Southerly Wastewater Treatment

Figure: 4–30

CUYAHOGA RIVER DISSOLVED OXYGEN TRENDS

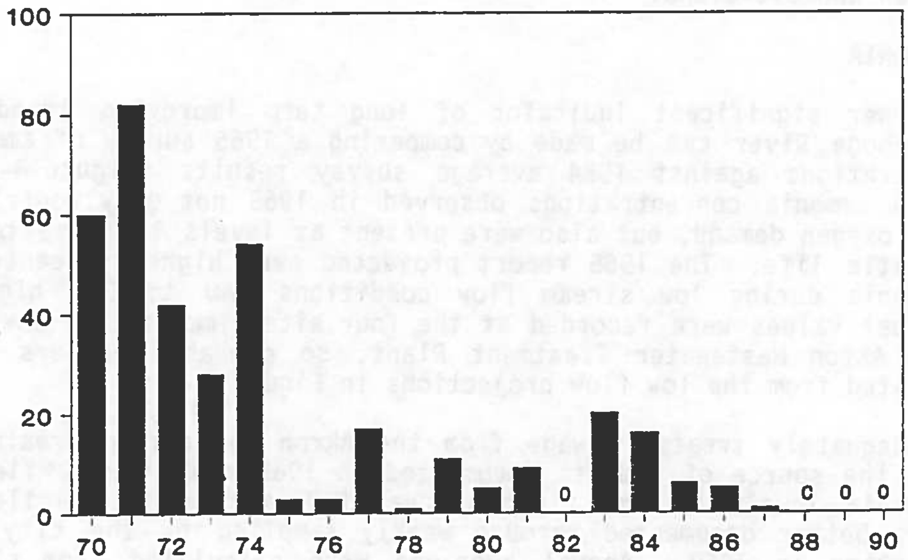


* One day grab samples
# Average of five sampling runs

DATA COMPILED BY OHIO EPA

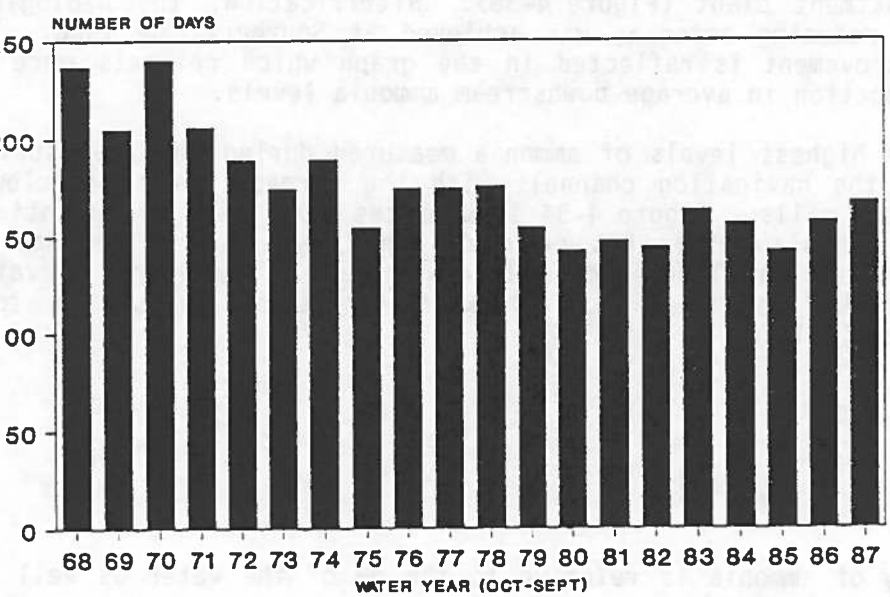
Figure: 4–31 & 32

CUYAHOGA RIVER AT INDEPENDENCE
DO VIOLATIONS PER YEAR



USGS DATA COMPILED BY OHIO EPA

CUYAHOGA RIVER AT WEST THIRD STREET
DO VIOLATIONS PER YEAR



USGS DATA COMPLIED BY OHIO EPA

Plant. Figure 4-33 contrasts the improved changes that have resulted over a thirty year period when compared to average BOD levels found during the 1984 surveys. Improvements at the Akron Water Pollution Control (WPC) facility have reduced the amount of biochemical oxygen demanding substances in its discharge, and the NEORSD Cuyahoga Valley Interceptor eliminated many of the small municipal dischargers between Akron and Cleveland.

AMMONIA

Another significant indicator of long term improving trends on the Cuyahoga River can be made by comparing a 1965 survey of ammonia concentrations against 1984 average survey results (Figure 4-34). The high ammonia concentrations observed in 1965 not only contributed to the oxygen demand, but also were present at levels to cause toxicity to aquatic life. The 1965 report projected even higher concentrations of ammonia during low stream flow conditions (40 to 50% higher). No actual values were recorded at the four sites immediately downstream of the Akron Wastewater Treatment Plant, so probable numbers were calculated from the low flow projections in Figure 4-34.

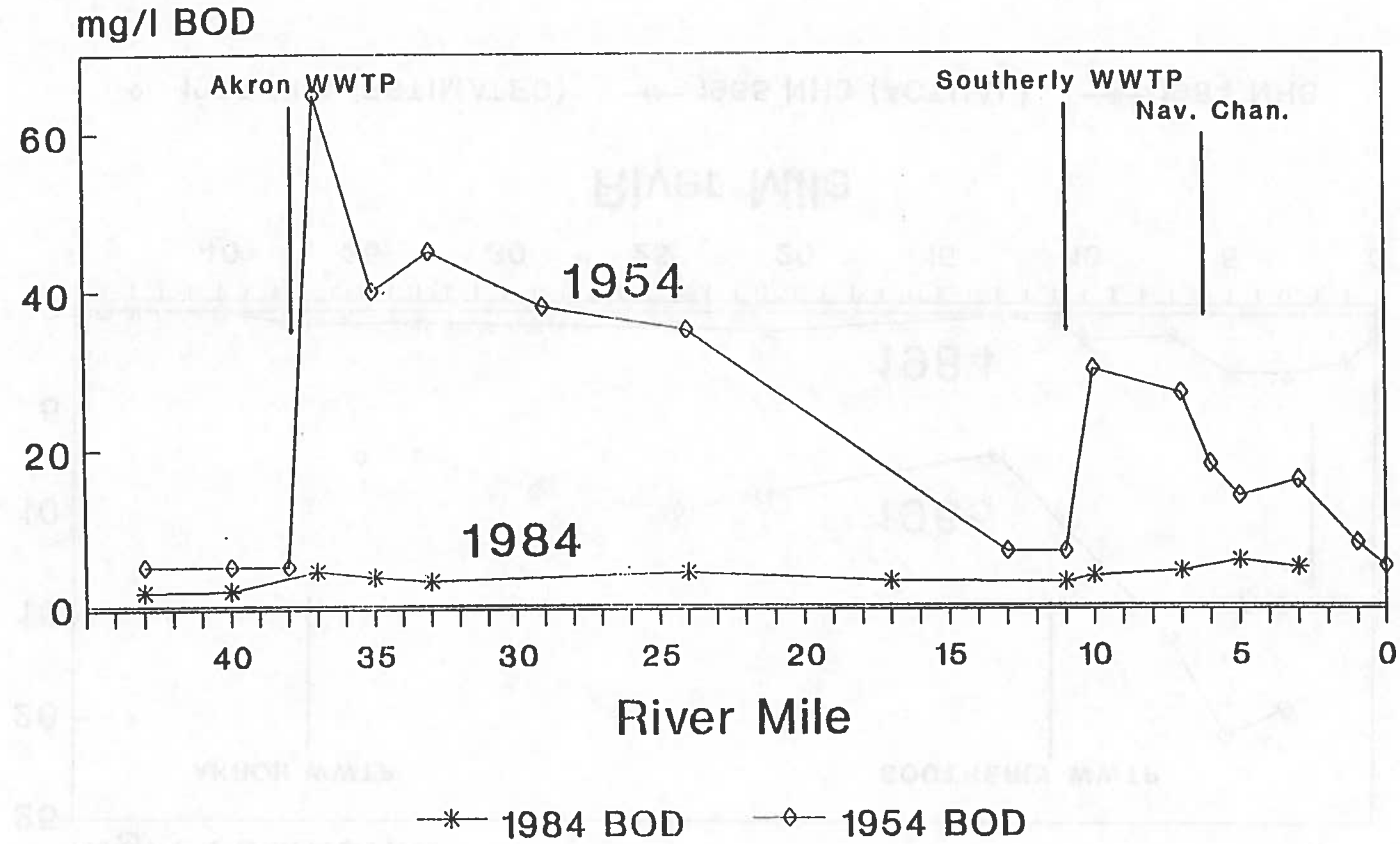
Inadequately treated sewage from the Akron wastewater treatment plant was the source of ammonia documented in 1965 near River Mile 38 where ammonia levels in the river increased dramatically. Similar impacts were better documented through weekly sampling by the city of Akron starting in 1969. Annual averages were calculated from sites immediately upstream and downstream of the Akron discharge for the last 21 years (see Figure 4-35). Improving trends and setbacks correlate closely with plant upgrades and operational problems associated with construction. A similar trend has occurred further downstream near River Mile 11 where the Cuyahoga River receives the treated wastewater from the Northeast Ohio Regional Sewer District Southerly wastewater treatment plant (Figure 4-36). Nitrification, the biological process of reducing ammonia, was achieved at Southerly by 1988. This latest improvement is reflected in the graph which reflects more than a 75% reduction in average downstream ammonia levels.

The highest levels of ammonia measured during the 1965 survey occurred in the navigation channel, with the largest loads contributed by the steel mills. Figure 4-34 illustrates that a very substantial reduction in ammonia levels has occurred since 1965 in the navigation channel. However, the 1984 ammonia levels are still considered elevated and contribute towards dissolved oxygen depletion rates and toxicity* to aquatic life.

* Toxicity of ammonia is relative to the pH of the water as well as the concentration of ammonia.

Figure: 4—33

CUYAHOGA RIVER BIOCHEMICAL OXYGEN DEMAND



DATA COMPLIED BY OHIO EPA

Figure: 4–34

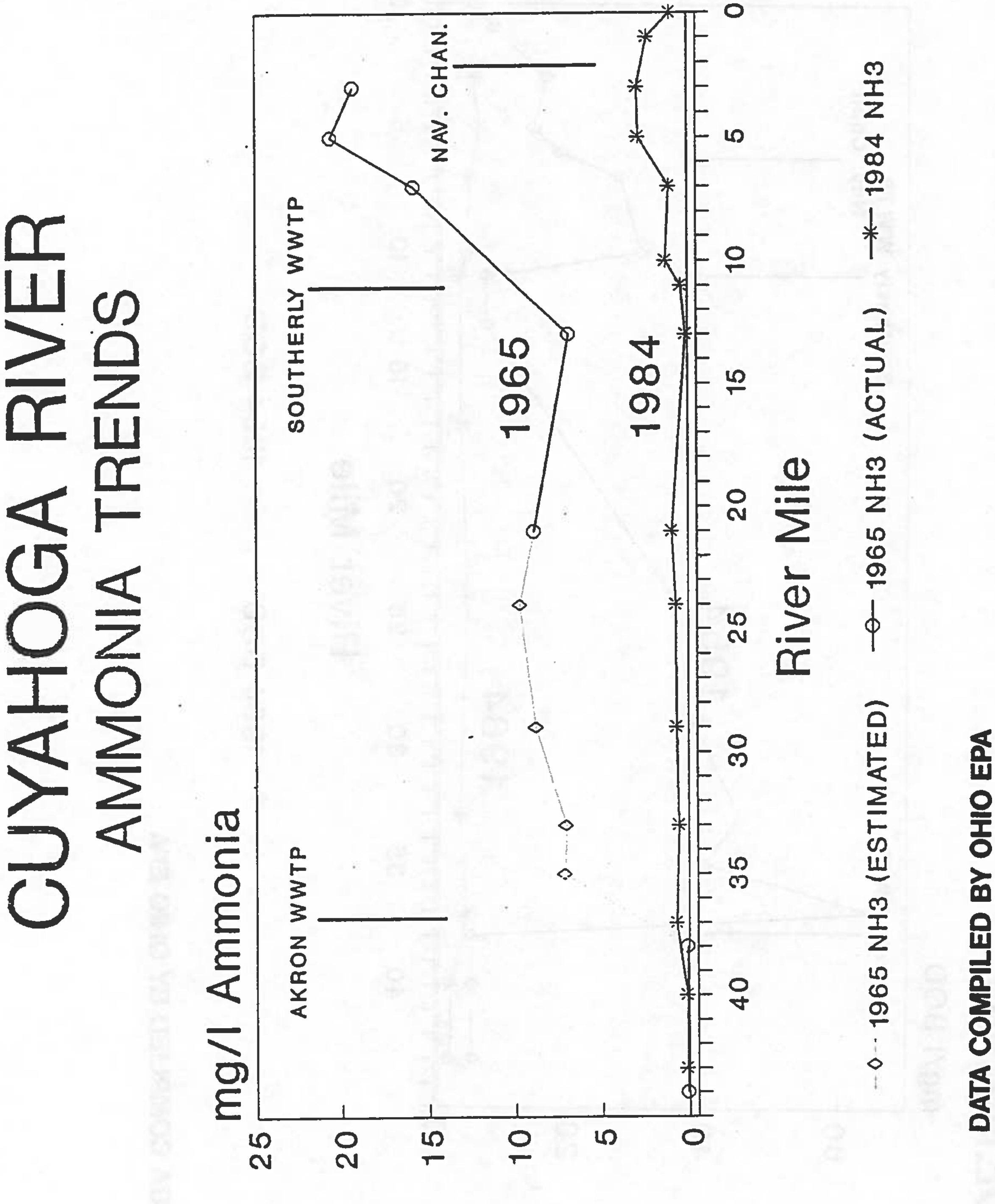
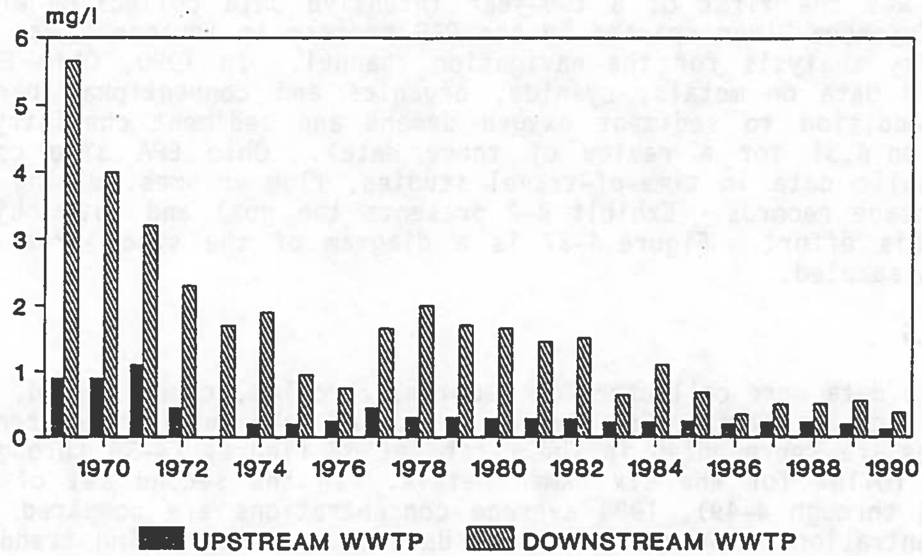

CUYAHOGA RIVER
AMMONIA TRENDS
mg/l Ammonia
AKRON WWTP
SOUTHERLY WWTP
NAV. CHAN.
1965
1984
25
20
15
10
5
0
40
35
30
25
20
15
10
5
0
River Mile
1965 NH3 (ESTIMATED)
1965 NH3 (ACTUAL)
1984 NH3
DATA COMPILED BY OHIO EPA

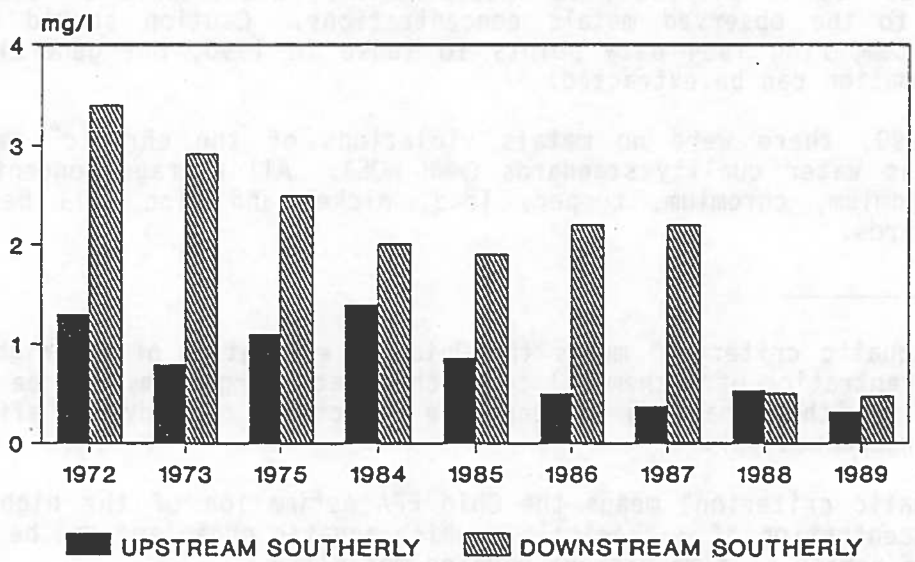
Figure: 4-35 & 36

CUYAHOGA RIVER
AMMONIA CONCENTRATIONS NEAR AKRON WWTP



CITY OF AKRON DATA COMPILED BY OHIO EPA

CUYAHOGA RIVER
AMMONIA CONCENTRATIONS NEAR SOUTHERLY



NEORSD (SOUTHERLY) DATA COMPILED BY OHIO EPA

4.2.2.2 <u>1990 Status of Chemical Water Quality in the Lower Cuyahoga</u>

Significant decreases in the concentrations of conventional contaminants in the Cuyahoga River (RM 13.1 to the Mouth) from 1954 to 1989 are documented above.

1990 was the first of a two-year intensive data collection effort on the Cuyahoga River spawned by the RAP process to advance a use attainability analysis for the navigation channel. In 1990, Ohio EPA collected data on metals, cyanide, organics and conventional parameters (in addition to sediment oxygen demand and sediment chemistry - see Section 4.31 for a review of these data). Ohio EPA also collected hydraulic data in time-of-travel studies, flow volumes, mixing studies and stage records. Exhibit 4-2 presents the goal and 1990 objectives of this effort. Figure 4-37 is a diagram of the study area and the sites sampled.

METALS

Metals data were collected for cadmium, chromium, copper, lead, nickel, zinc and others. 1990 average, maximum and minimum concentration values are represented in the first set of figures (4-38 through 4-43) that follow for the six named metals. In the second set of figures (4-44 through 4-49), 1984 average concentrations are compared to 1990 concentrations. Generally, these data show a continuing trend of decreasing metals concentrations. It must be noted, however, that in 1990 stream flows were relatively high. The median 1990 survey flow was 728 cfs, while in 1984 the median survey flow was 501 cfs. High flows in 1990 may have had a diluting effect on the data. Unfortunately, the relationship between flow volume and metals concentrations is not that straight forward. During high flow events in conjunction with peak turbidity, greatly elevated levels of metals have also been documented. It is difficult to interpret the relationship of these flow data to the observed metals concentrations. Caution should be used when comparing 1984 data points to those in 1990, but general trends information can be extracted.

In 1990, there were no metals violations of the chronic* warmwater habitat water quality standards (WWH WQS). All average concentrations of cadmium, chromium, copper, lead, nickel and zinc fell below the standards.

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* "Chronic aquatic criterion" means the Ohio EPA estimation of the highest instream concentration of a chemical to which aquatic organisms can be exposed indefinitely without causing unacceptable effects (e.g., adverse effects on growth or reproduction).

"Acute aquatic criterion" means the Ohio EPA estimation of the highest instream concentration of a chemical to which aquatic organisms can be exposed for a brief period of time without causing mortality.

Ohio EPA Water Quality Standards Chapter 3745-1 of the Ohio Admin. Code.

EXHIBIT 4-2 Ohio EPA Goals and Objectives for Cuyahoga River Modeling Project

Goal: To develop a water quality model (WASP4) to assess the impact of point and nonpoint source discharges on the water quality in the lower Cuyahoga River.

Objectives:

1. Develop a model for the stretch of river from Southerly WWTP (RM 10.8) to the ship channel (RM 5.6).

   Implementation: Five decay rate surveys will be done to collect data necessary for the model. Emphasis will be on instream reaction rates and hydraulics. In addition, ten routine sampling surveys will be done to develop a more extensive database for possible use in Monte Carlo simulations to model long term "average" conditions. Three of the routine survey sites will be reference stations that will be sampled for additional parameters. It is anticipated that surveys will be done under a variety of instream conditions.

2. Determine background conditions in the ship channel (RM 5.6 to 0.0)

   Implementation: Ten routine sampling surveys supplemented with continuous datasonde information will define existing conditions in the shipping channel.

3. Begin special studies on reaeration, SOD, mixing, algal impacts, sediments, and lake intrusion.

   Implementation: As resources permit, special studies will be done. Work in 1990 can be reviewed in the off season and modifications to procedures used in the special studies can be developed as necessary for the 1991 field season.

Figure: 4–37

Cuyahoga River Study Area Reference Points

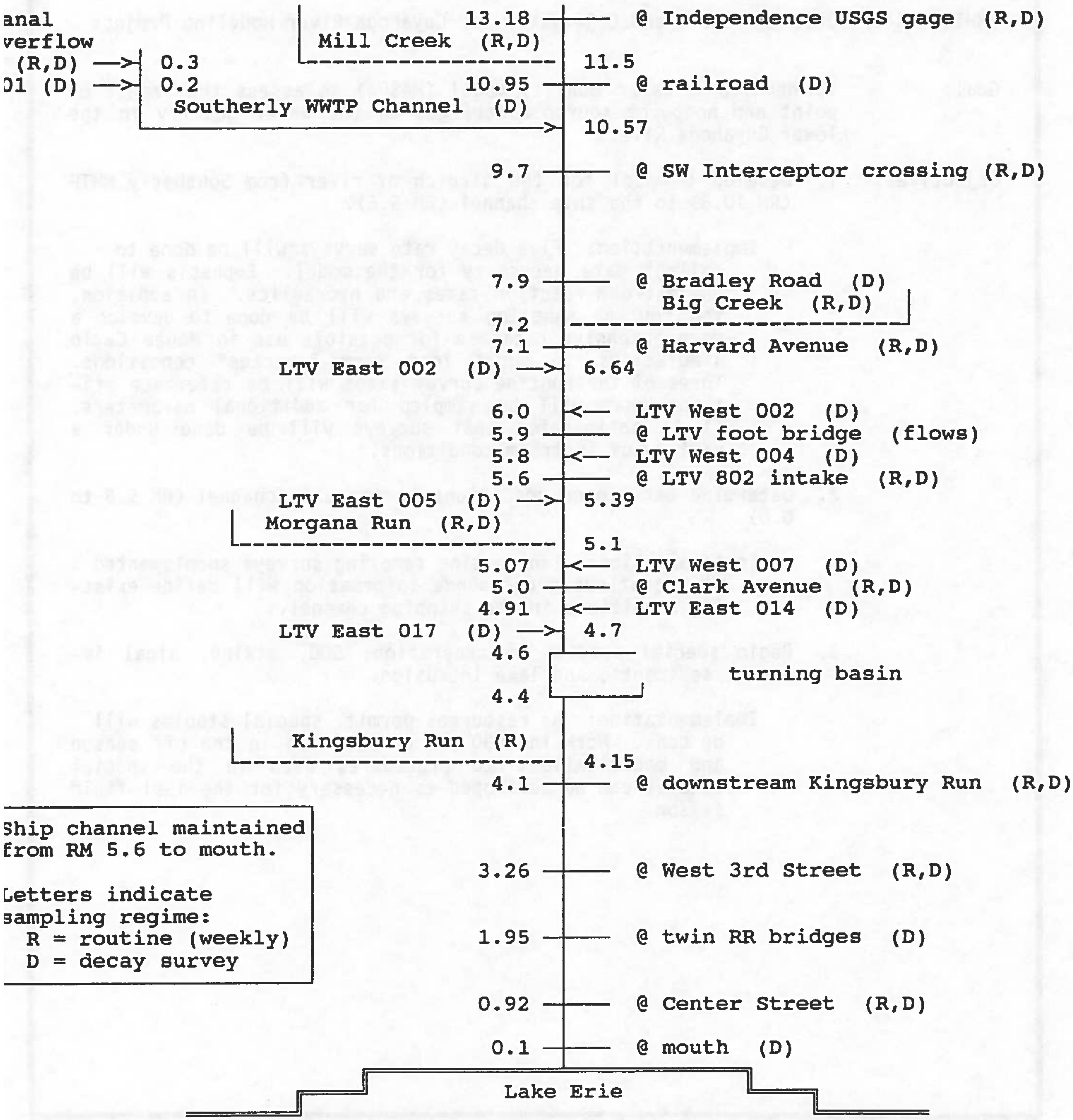
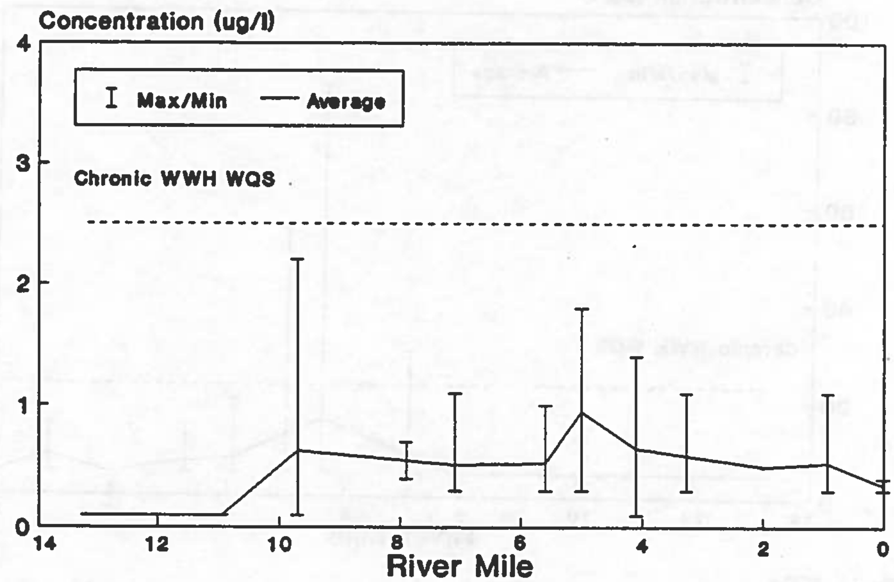


Figure: 4–38

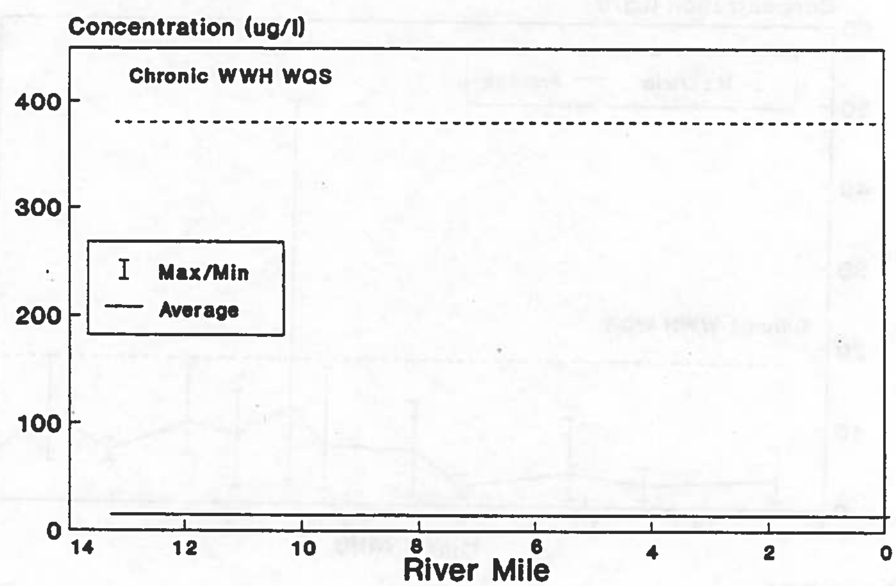
Cuyahoga River 1990 Cadmium Data



Ohio EPA

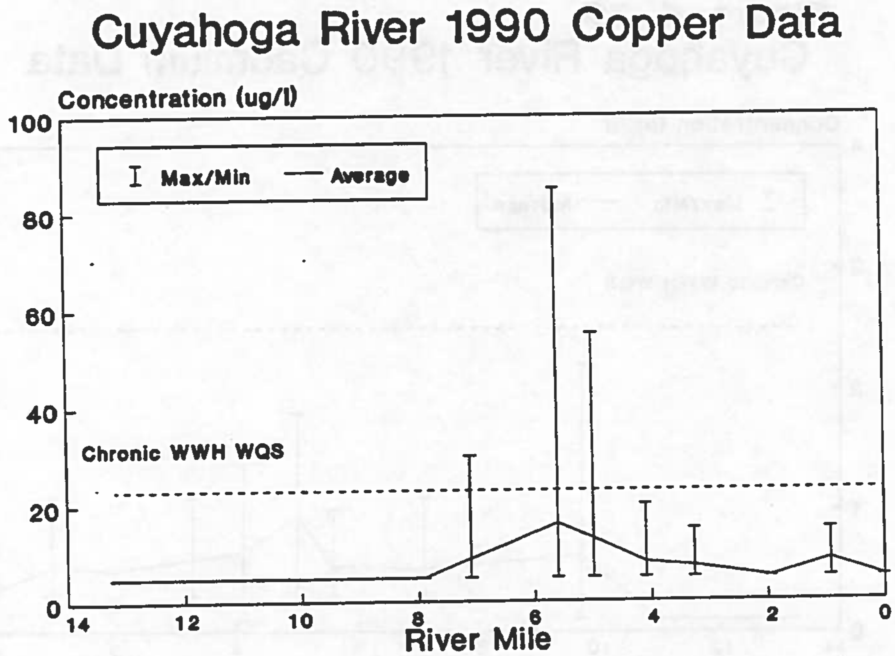
Figure: 4–39

Cuyahoga River 1990 Chromium Data



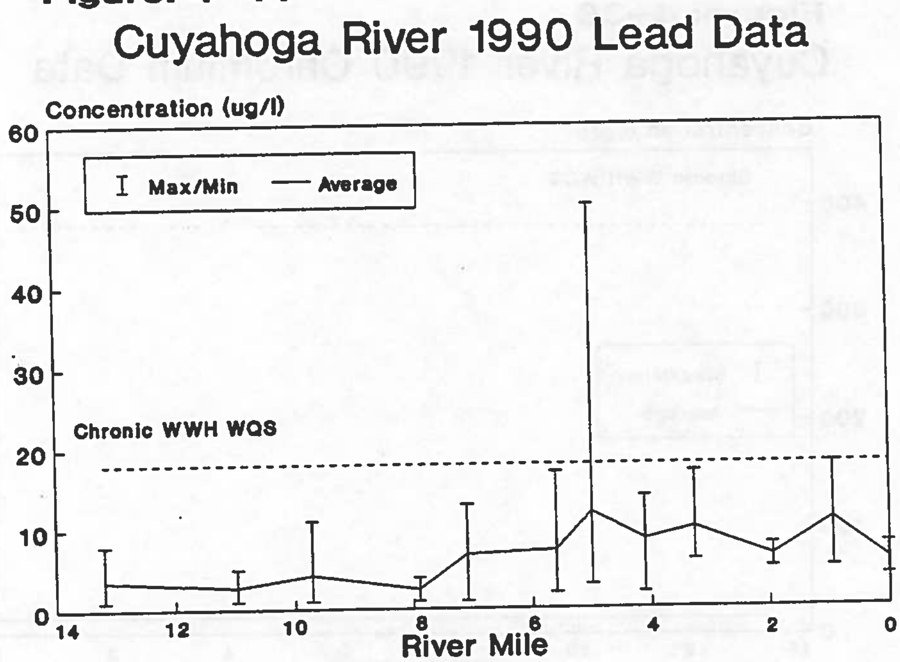
Ohio EPA

Figure: 4-40



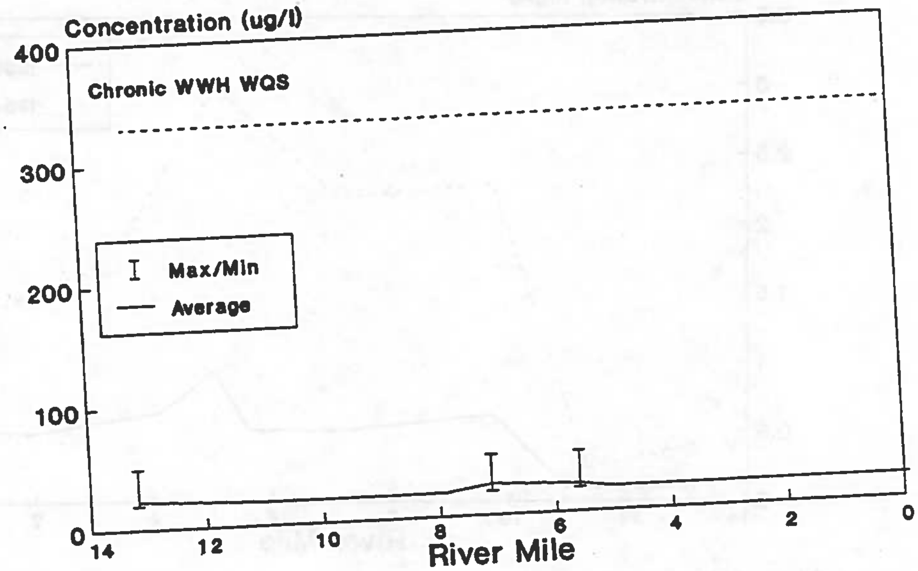
Ohio EPA

Figure: 4-41



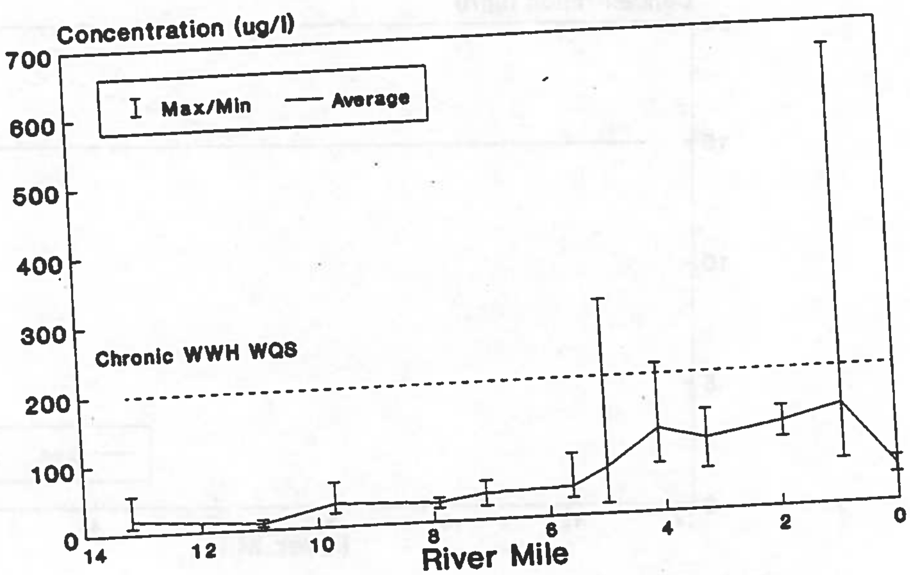
Ohio EPA

Figure: 4-42
Cuyahoga River 1990 Nickel Data



Ohio EPA

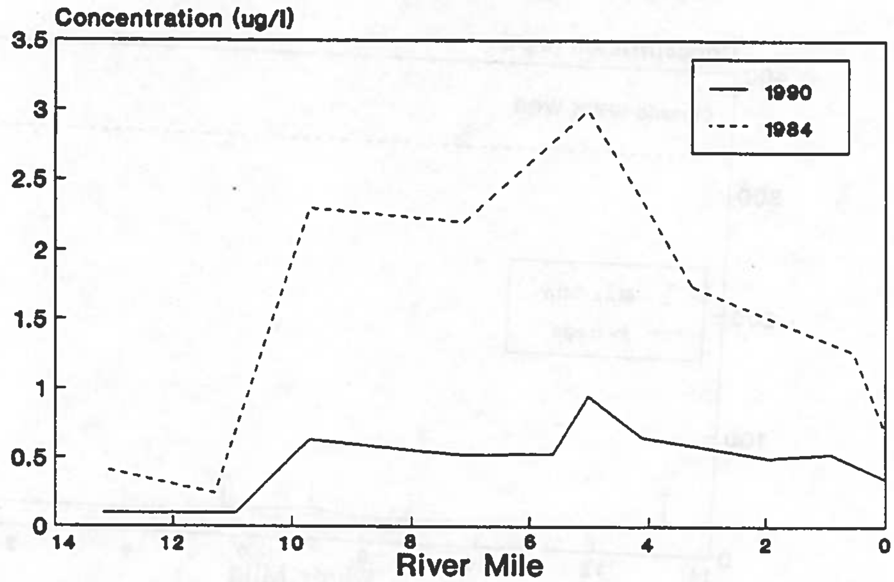
Figure: 4-43
Cuyahoga River 1990 Zinc Data



Ohio EPA

Figure: 4–44

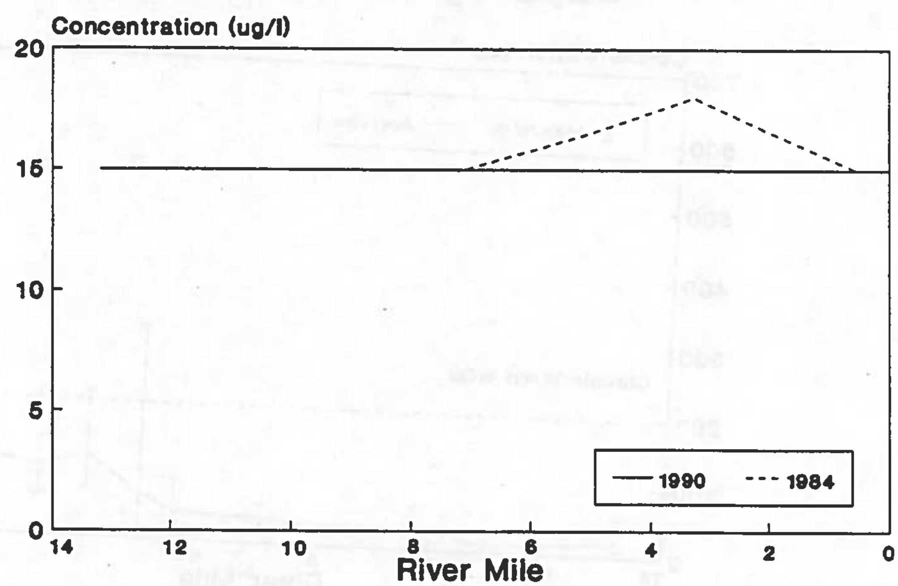
Cuyahoga River Cadmium: 1984 vs. 1990



Ohio EPA

Figure: 4–45

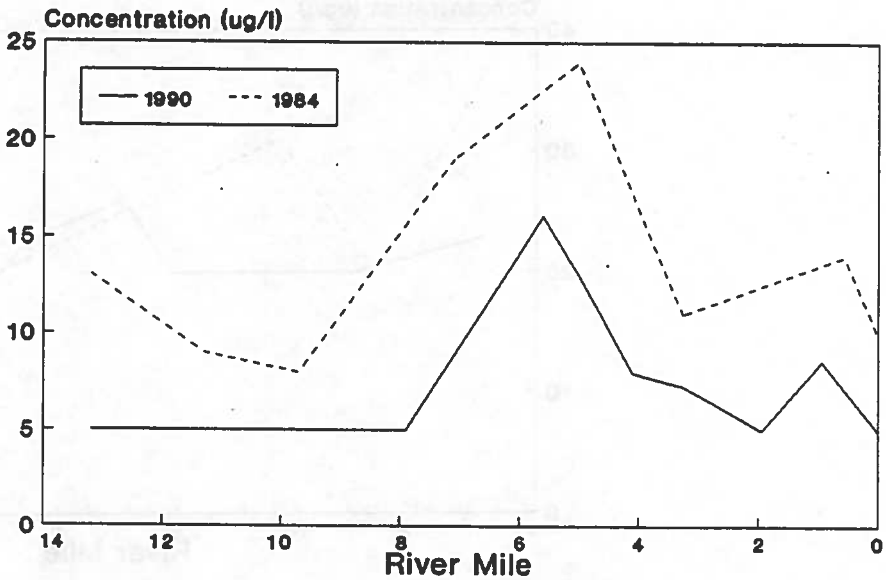
Cuyahoga River Chromium: 1984 vs. 1990



Ohio EPA

Figure: 4-46

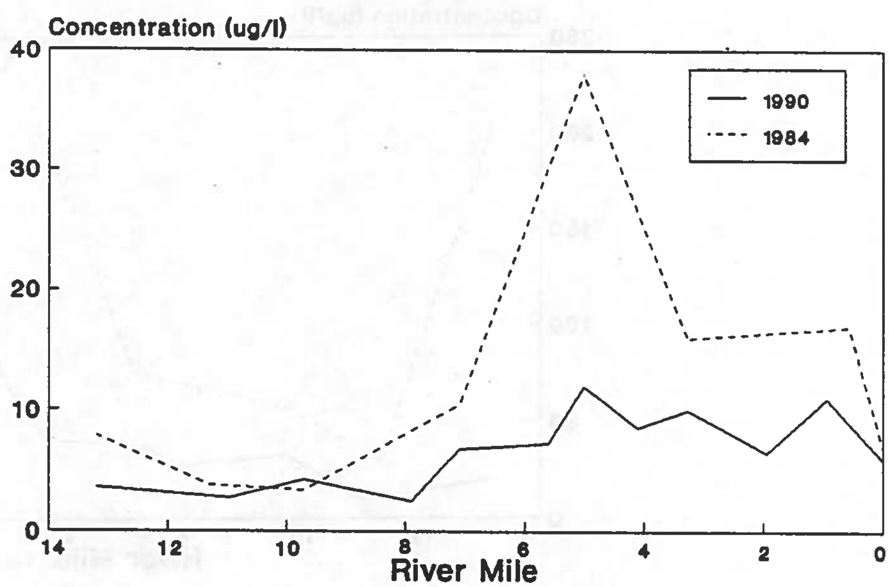
Cuyahoga River Copper: 1984 vs. 1990



Ohio EPA

Figure: 4-47

Cuyahoga River Lead: 1984 vs. 1990



Ohio EPA

Figure: 4-48

Cuyahoga River Nickel: 1984 vs. 1990

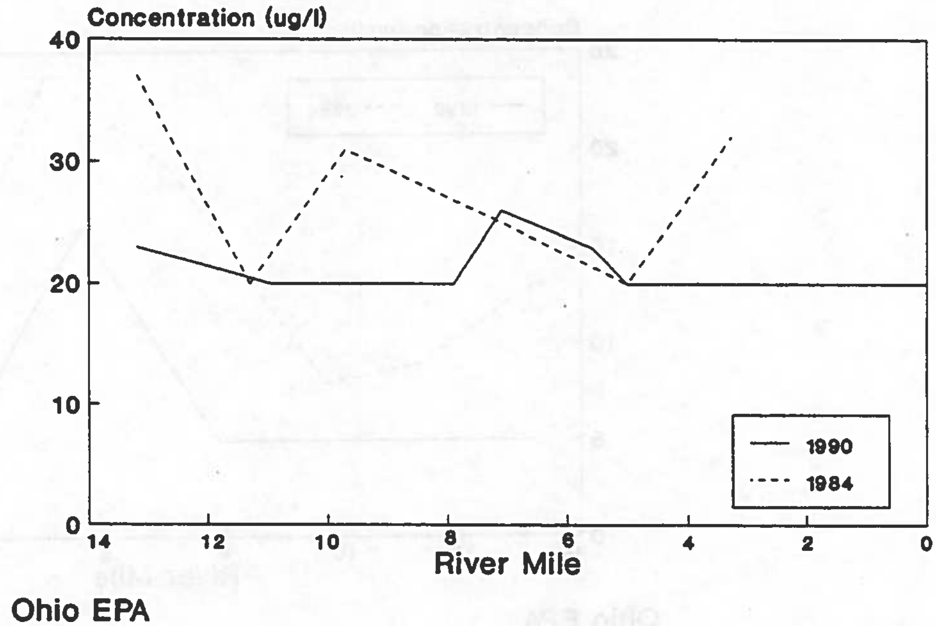
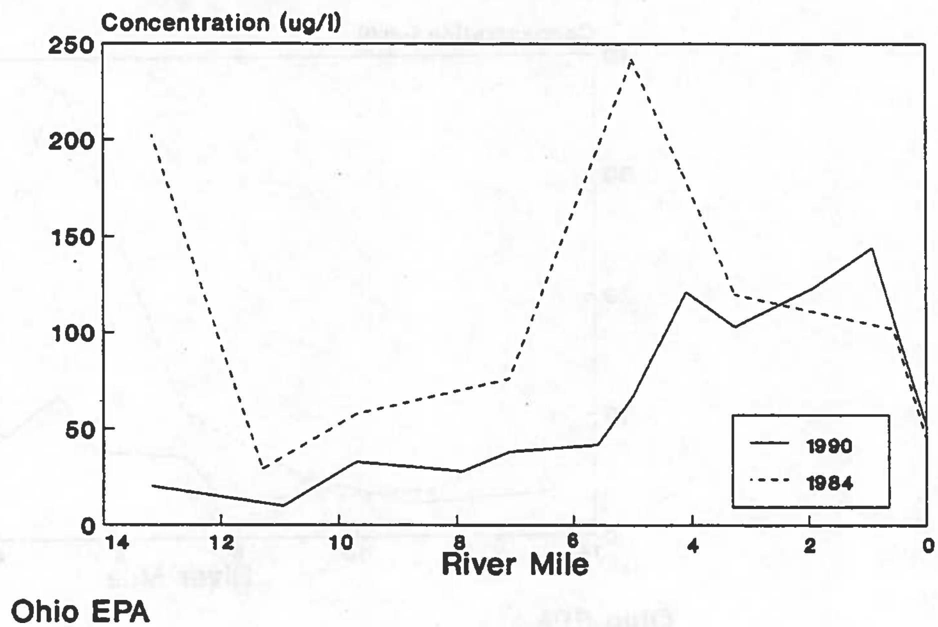


Figure: 4-49

Cuyahoga River Zinc: 1984 vs. 1990



Possible violations of the acute WWH WQS may be occurring in the Navigation Channel. Acute criteria for copper, lead and zinc are 37 ug/l, 340 ug/l, and 220 ug/l, respectively, based on an average hardness of the river over the 1990 survey period. In order to determine whether a particular grab sample, which is represented in the figure, actually exceeded the acute criterion, one would have to refer back to the hardness condition in the river at the time the sample was taken. With the actual hardness known, the specific value of the acute standard could be taken from the appropriate table in Ohio Water Quality Standards, and a comparison could be made. For planning purposes it is sufficient to say that acute violations of metals including copper, lead and zinc may still be occurring.

CYANIDE

Each site was sampled once during a cyanide survey in 1990. Total cyanide was quantified and is represented in the graph (Figure 4-50). There is no standard for total cyanide but the acute criterion for free cyanide is 46 ug/l. Ohio EPA is currently working on a methodology by which to measure free cyanide.

ORGANICS

Each site was sampled once during an organics survey in August 1990. All sites were analyzed for volatile organic compounds (VOG), base-neutral acids (BNAs), polychlorinated biphenyls (PCBs) and/or pesticides. In general, organics were not detectable, with few exceptions. Chloroform was generally detectable at low levels.

At Morgan Run, measurable concentrations of organics were found, but at levels lower than Ohio water quality criteria.

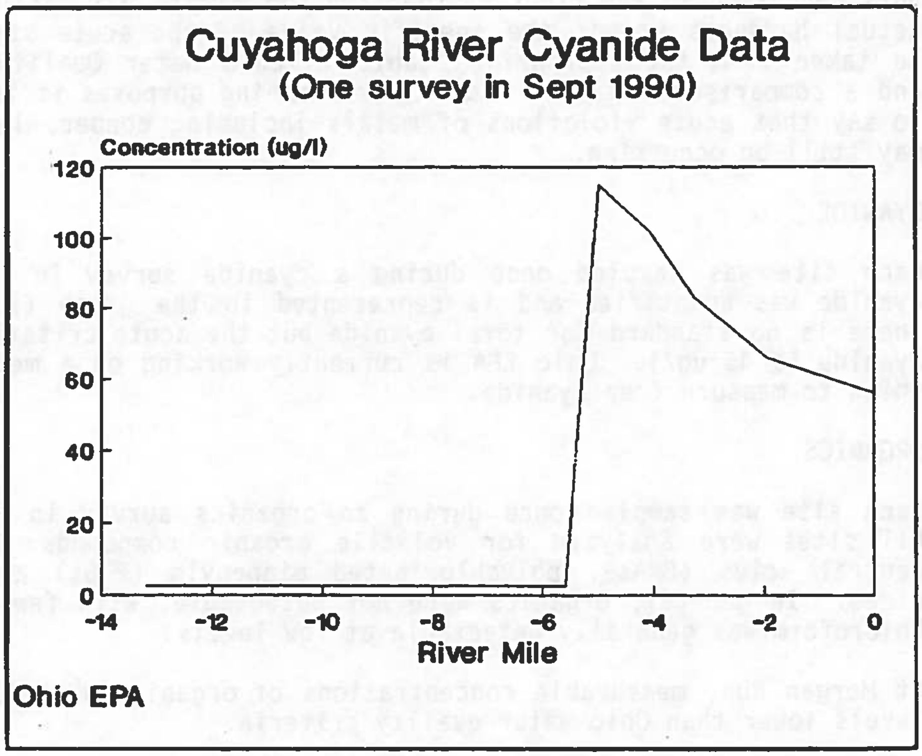
At LTV outfalls 005, 007 and 014, measurable concentrations of organics were found. All concentrations were at levels lower than Ohio water quality criteria except naphthalene at outfall 005.

At NEORSD Southerly WWTP outfall, only chloroform, bromodichloromethane and dibromochloromethane were detected, but at very low levels, well below chronic or acute criteria. Presence of these compounds may be due to chlorination..

CONVENTIONAL CONTAMINANTS

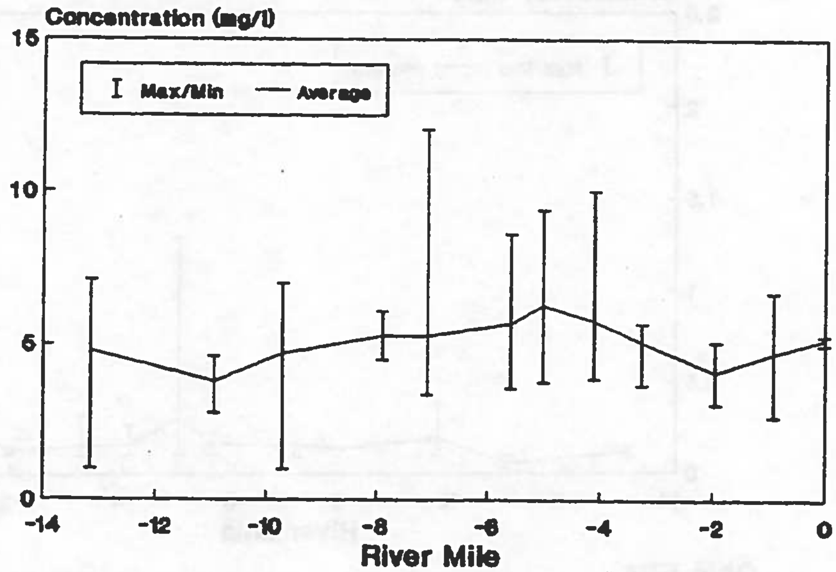
Ammonia-N, phosphorus, dissolved oxygen (DO) and carbonaceous biochemical oxygen demand ($CBOD_{20}$) were also sampled in 1990. For modelling purposes, $CBOD_{20}$ measurements have replaced $CBOD_5$ measurements. See Figures 4-51 through 4-58 for representation of 1990 data and a comparison of 1990 and 1984 data.

Figure: 4–50



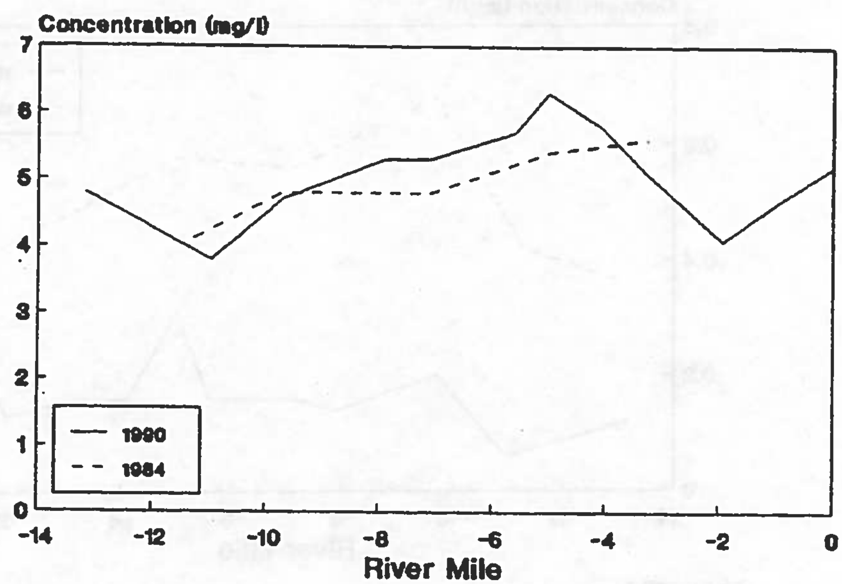
Cuyahoga River Cyanide Data
(One survey in Sept 1990)
Concentration (ug/l)
120
100
80
60
40
20
0
-14
-12
-10
-8
-6
-4
-2
0
River Mile
Ohio EPA

Figure: 4-51
Cuyahoga River 1990 $CBOD_{20}$ Data



Ohio EPA

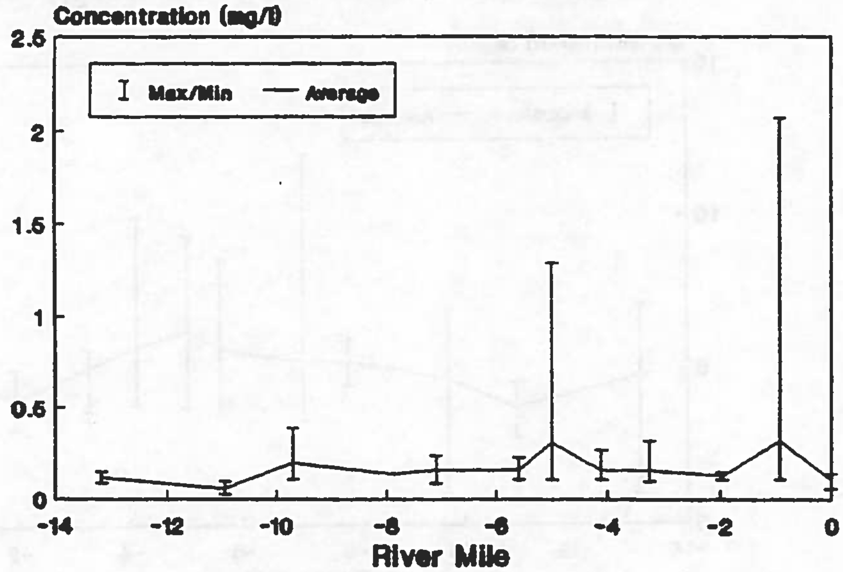
Figure: 4-52
Cuyahoga River $CBOD_{20}$: 1984 vs. 1990



Ohio EPA

Figure: 4-53

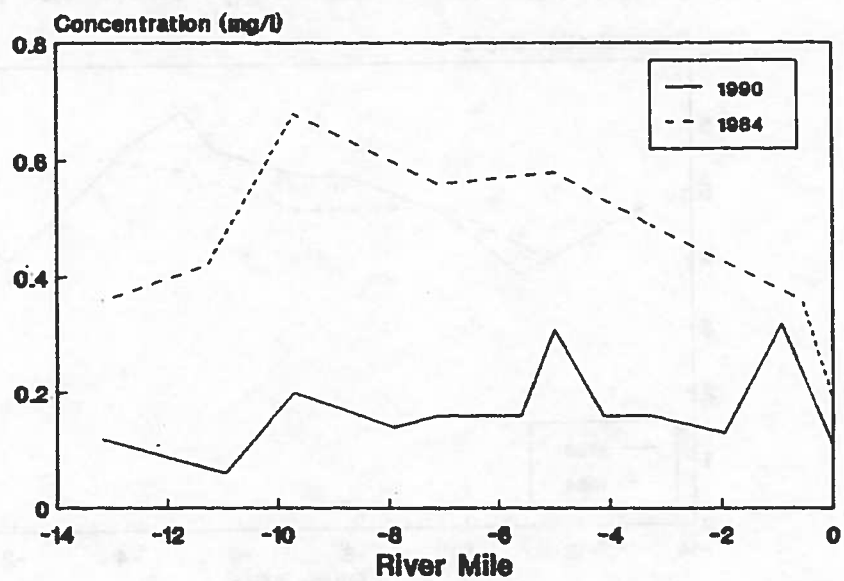
Cuyahoga River 1990 Phosphorus Data



Ohio EPA

Figure: 4-54

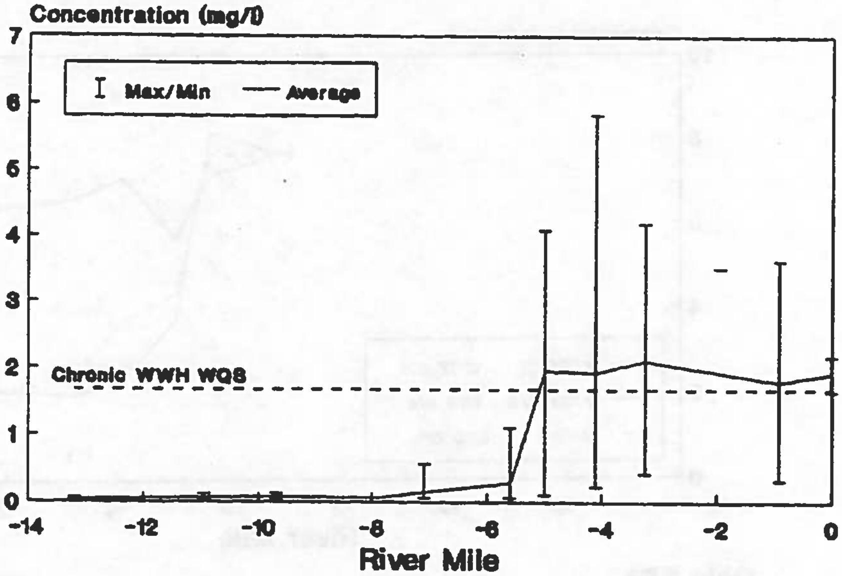
Cuyahoga River Phosphorus: 1984 vs. 1990



Ohio EPA

Figure: 4–55

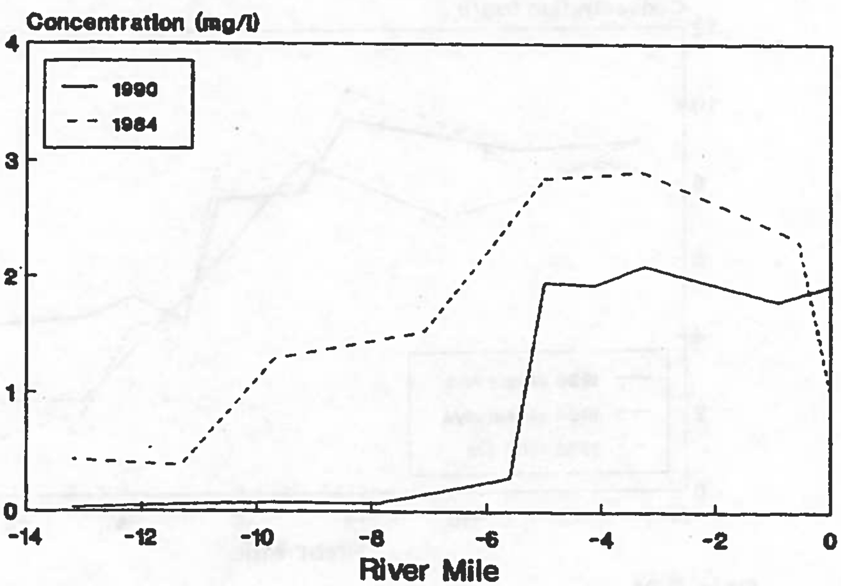
Cuyahoga River 1990 Ammonia-N Data



Ohio EPA

Figure: 4–56

Cuyahoga River Ammonia-N: 1984 vs. 1990

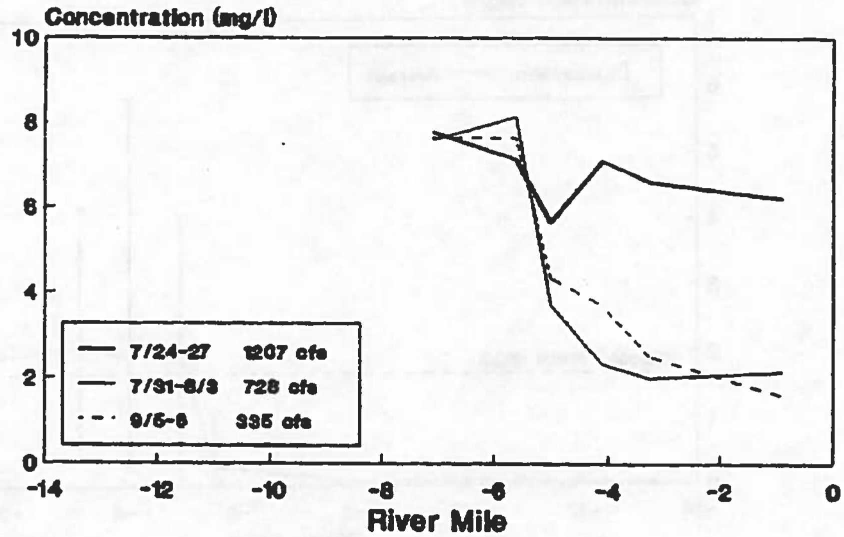


Ohio EPA

Figure: 4–57

Cuyahoga River 1990 D.O. Data

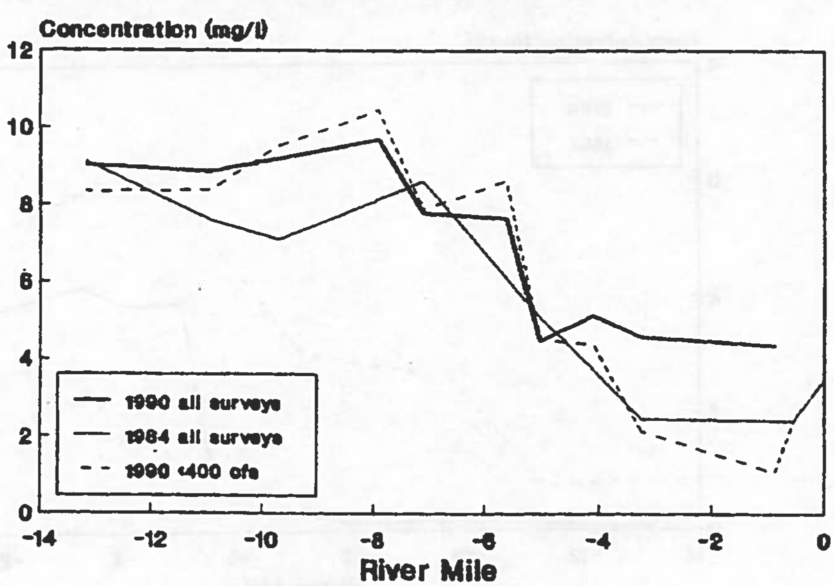
Comparison of 3 Surveys



Ohio EPA

Figure: 4–58

Cuyahoga River D.O.



Ohio EPA

With respect to ammonia, the WWH WQS is shown in Figure 4-51 (slightly less than 2 mg/l). The modified warmwater habitat standard (at the specific temperature and pH of the water) is 2.5 mg/l, and the acute standard at that point is 13 mg/l. The navigation channel does not have a designated aquatic life habitat use. Generally, though, the WWH criterion for ammonia-N is not being met below RM 6. With the closure of an LTV coke battery in December 1990, the 1991 summer's sampling may find greatly reduced ammonia concentrations below RM 6.

The Warmwater Habitat Water Quality Standard for DO is a minimum of 4.0 mg/l at any time. The minimum criterion was met above RM 5, while under low flow conditions later in the summer, the DO criterion was not met below RM 5. (See Figure 4-57).

During the second season of sampling in this two-year effort, Ohio EPA will be placing less emphasis on metals sampling in the water column. This reflects the finding that metals, in general, are contributing less to the degraded water quality of the Cuyahoga than other classes of contaminants. There will be a greater emphasis on sediment sampling, sediment oxygen demand, stream mixing including ship impacts, and defining the river/lake interface.

In the nearshore, data on lake water quality has been gathered by NEORSD, but was not available at the time this report was published.

4.2.2.3 1991 Ship Mixing Study of the Cuyahoga River Modeling Project

The Cuyahoga River shipping channel is subject to a wide variety of impacts not usually observed in Ohio's streams and rivers. It has been observed on many occasions that the large lake freighters and/or the tugboats that assist them stir up a considerable amount of sediment as they make their way up the ship channel. The focus of this study is to determine the impact of shipping traffic on water quality in the ship channel. This information will be used by the Water Quality Modeling Section of the Division of Water Quality Planning and Assessment (Ohio EPA) to construct a water quality model of this area.

The stretch of river to be studied was one where the incoming ship would have to use the bow and/or stern thrusters to maneuver around a bend in the river. The site selected was a river mile 1.77 at the Conrail bridge crossing. After the incoming ship had passed this point sampling would be conducted at specific time intervals to detect any changes in water quality. A dye tracer, rhodamine WT, would be used to ensure that the same "slug" of water would be sampled each time.

This study was conducted on August 28, 1991. Boat and staff support were provided to the Water Quality Modeling Section by the Eastern District Office of U.S.EPA - Region V. The shipping schedule was obtained from the Great Lakes Towing Dispatcher. The Paul Thayer was scheduled to move upstream late that morning. When the Paul Thayer was spotted, the sampling crew proceeded to the sampling site to collect a background sample.

Samples were analyzed for the following parameters:

arsenic	chloride
cadmium	fecal step
calcium	fecal coliform
chromium	volatile organic compounds
copper	base neutral/acid extractibles
iron	nitrate-nitrite
lead	nitrite
magnesium	ammonia nitrogen
nickel	total kjeldahl nitrogen
zinc	phosphorus
hardness	total residue
$CBOD_5$	filterable residue
$CBOD_{20}$	Nonfilterable residue
TOC	sulfate
COD	

Most of the samples were depth integrated grab samples with aliquots collected at the surface, 15 feet, and 25 feet. The bacterial, VOC and BNA samples were all surface grabs only. Temperature, dissolved oxygen, and conductivity were measured at the three depths mentioned above

(This information is summarized in Table B3-1). Two gallons of rhodamine WT were dumped into the river at the Conrail railroad bridge immediately prior to passage of the ship. As the ship passed the stern, thrusters were turned on at 11:27. The first samples were collected five minutes after the ship passed. Subsequent samples were collected 38, 108, 203, and 303 minutes after the passage of the ship. A fluorometer was used to locate the peak of the dye cloud to identify the sampling site. During the course of the five hour study, the dye peak moved approximately 1,000 feet downstream. Each sample was collected by immersing a submersible pump to the appropriate depth and collecting a sample aliquot. The samples for the organics analysis and the bacteriological determination were collected as surface grabs. The bacteriological samples were filtered on site and incubated in portable incubators.

The results of the chemical analyses were graphed as parameter concentration versus time (Figures B3-1 through B3-27). The results plotted at the most downstream site (303 minutes after ship passage) are an average of the results for the duplicate samples. The sample blank and field duplicate results were satisfactory for all of the parameters with the exception of the surface grab organics samples.

The results for total suspended solids, arsenic, cadmium, calcium, copper, iron, lead, magnesium, zinc, hardness, total residue, phosphorus, fecal coliforms, and fecal strep all show marked increases in the sample collected five minutes after the passage of the ship. All of these parameters should have a large particulate phase. The subsequent samples declined at various rates, to near background levels, depending on the parameter.

Chromium and nickel did not show any increases in concentration with all but one sample being reported at the detection limit. This appears consistent with the results of the sediment analyses conducted this year which show relatively low levels of these two parameters.

$CBOD_5$ and $CBOD_{20}$ both showed minor increases from the sample collected five minutes after the ship passed. This was lower than expected since relatively high sediment oxygen demand (SOD) rates have been measured in other sections of the river. However, since this site was selected as a section of the river which required the use of the ship steering thrusters, the continual disturbance of the sediments may have prevented the buildup of oxygen demanding sediments at this site as they are continually oxidized.

COD, TOC, and the other parameters which exist primarily in the dissolved form (total dissolved solids, chloride, sulfate, ammonia, nitrite, nitrite - nitrate, and TKN) did not show any significant impacts resulting from the ship passage. The organic chemical analyses are not presented. Poor results from the duplicate samples casts doubt on the validity of the organics data.

In summary, the suspension of sediments into the water column by shipping traffic results in a brief increase in the metals and suspended solids results. The metals are a particulate, nondissolved fraction which quickly resettle. The relatively quick return to background metals concentration show that there is no persistent impact on the water quality. The increase in the suspended metals should not have a significant impact on the biota since it is the dissolved form of the metal which is toxic.

CHAPTER 5
SOURCES AND CAUSES OF IMPAIRMENTS

5.0 Introduction

This chapter addresses the following four questions.

1) What are the point sources that affect the Cuyahoga Area of Concern?

2) What are the nonpoint sources that affect the Area of Concern?

3) What information exists on the causes of impairment of beneficial uses and the sources of the causes?

4) What information exists on the contaminants and their loadings which affect beneficial uses and water quality in the Area of Concern?

Questions 1 and 2 are discussed in Sections 5.1 and 5.2, respectively. However, Question 3, discussed in Section 5.3, is the heart of Chapter 5. This section summarizes the information available on the causes of each impairment in a series of tables which list the contaminants or conditions. The tables also identify generally which sources do or may contribute those contaminants or create the conditions which result in impairment. Question 4 is discussed in Section 5.4.

The pollutant sources which are identified in Section 5.3 are discussed in detail in Sections 5.1 and 5.2. Section 5.1: Point Source Inventory describes each category of point sources, namely permitted industrial dischargers, permitted municipal dischargers, combined sewer overflows, sanitary sewer overflows and wastewater treatment plant bypasses. Every known point source discharger in the Cuyahoga River watershed has been included in this discussion. Locational information and a description of the contaminants discharged by individual point sources is provided. This section also reports on the survey of permitted dischargers undertaken by the RAP to verify the loadings data used by Ohio EPA and the RAP.

Section 5.2: Nonpoint Source Inventory is a systematic look at all of the categories of nonpoint sources and an evaluation of the extent to which each category occurs anywhere in the Cuyahoga River watershed. There are 19 categories evaluated, ranging from atmospheric deposition to oil and gas wells to urban runoff. In Section 5.2 there is a description of each category, qualitative locational information on each category, and a discussion of how each category impacts the Cuyahoga Area of Concern. For some categories the information is based on national databases which are interpreted for local applicability. In other cases, local or regional data exist to support the discussion of impact.

Sections 5.1 and 5.2 help to identify important gaps in the available information which would identify sources as specifically contributing to impairments. On the other hand, these two sections also help to evaluate the magnitude of the nonpoint source problem in the watershed and the impact each individual person's behavior and habits has on the pollution problem in the Area of Concern. Where Section 5.1 and 5.2 identify needs for future research which would lend support to the identification of any source as specifically contributing to impairments, these suggestions have been placed in Appendix M. Those needs which are of highest priority have been included in the RAP Research Agenda. The Nonpoint Source Research Agenda is on page 7-11 and the Point Source Research Agenda is on page 7-12.

Section 5.4 begins where 5.3 left off - by listing those contaminants which the Cuyahoga RAP should be investigating because they do or may impair beneficial uses. There are roughly 50 contaminants on this list, including metals, conventional pollutants, pesticides, Dibenzodioxins and Dibenzofurans, PCBs, PAHs, volatile organic compounds, Base-Neutral/Acid extractables, and micro-organisms. The list compiles four kinds of information relevant to the contaminants of concern issue:

1) contaminants identified in Section 5.3: Linkages of Sources and Impairments in the Cuyahoga Area of Concern,

2) exceedances of Ohio EPA Warmwater Habitat Acute Water Quality Standards,

3) contaminants listed in t he Great Lakes Water Quality Agreement Annex 1 "Persistent Toxic Substances," and

4) contaminants listed on the Great Lakes Water Quality Board's "Critical 11" list.

Several impairments are caused by "conditions," rather than contaminants. These are usually physical alterations, like bulkheading and riprap, or the result of pollution, such debris and foam, or residual impacts of past toxicity (contaminated sediments). There is a complete list of these at the end of Section 5.4.1.

Section 5.4.2 looks at the available loadings data and in-stream concentration data, whether measured directly, estimated or modeled, for any of the contaminants identified in the first part of the section. This information is presented in a series of tables, one table per contaminant. Actual loads are reported by discharger in each table. In this section, where nonpoint source loading estimates are available, comparisons can be made between the relative sizes of point and nonpoint source loadings.

Section 5.4.3 concludes with a summary description of each contaminant or contaminant category.

5.1 Point Source Inventory

5.1.1 Overview of Present-Day Point Source Dischargers

For purposes of identifying sources of pollution causing impairments in the Cuyahoga River Area of Concern for the Cuyahoga River Remedial Action Plan, permitted dischargers to the Cuyahoga River or its tributaries have been inventoried here. Generally the dischargers inventoried fall into two categories, industrial dischargers and publicly owned sanitary waste water treatment works (POTW) processing over 25,000 gallons per day (Refer to 5.1.2). Also reported in the Point Source Inventory are combined sewer overflows, separate sanitary overflows and treatment plant bypasses (Refer to 5.1.3). Combined sewer overflows are reported here because they are being incorporated into the NPDES Program.

The Federal Water Pollution Control Act Amendments of 1972 require that all point sources, including publicly owned treatment works, obtain a National Pollution Discharge Elimination System (NPDES) permit for the discharge of wastewaters to the navigable waters of the United States. Ohio EPA issues the permits for dischargers throughout the state and maintains permit information in its Liquid Effluent Analysis Program (LEAPs) data base. The primary source of information in this inventory comes from the LEAPs data base. Additional information has been developed by a RAP survey of the permitted dischargers in the basin and from the data bases generated by the Northeast Ohio Regional Sewer District and Akron Public Utilities Bureau.

The geographic scope of the point source inventory was the Cuyahoga River basin and the land east to the Euclid Creek basin draining directly to Lake Erie. 1990 NPDES permit holders are shown on the following map of the Cuyahoga River basin (Figure 5-1).

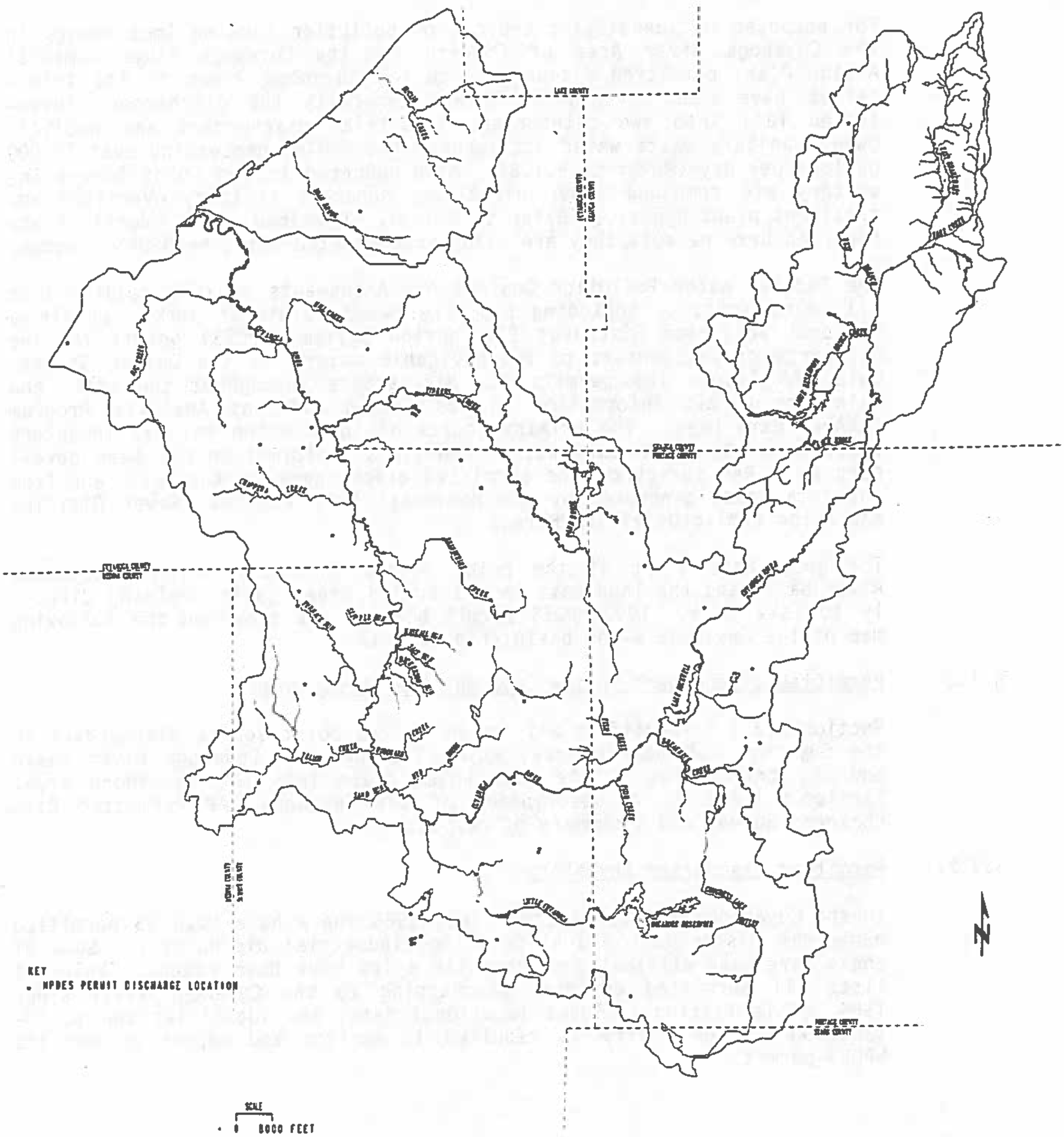
5.1.2 Permitted Dischargers in the Cuyahoga RAP Source Area

Section 5.2.1.1 identifies all the permitted point source dischargers in the Cuyahoga RAP Source Area, which includes the Cuyahoga River basin and the tributaries to the east which drain into the Nearshore Area. Section 5.1.2.2 is a description of the Cuyahoga RAP Permitted Dischargers Survey and a summary of responses.

5.1.2.1 Permitted Discharger Inventory

In the Cuyahoga RAP source area since 1985 there have been 83 permitted municipal dischargers and 91 permitted industrial dischargers. Some of these have been eliminated since while a few have been added. Table 5-1 lists all permitted entities discharging to the Cuyahoga River since 1985. This listing includes locational data, and identifies the pollutants which the entity is required to monitor and report as per its NPDES permit.

CUYAHOGA RIVER BASIN AND LAKE ERIE TRIBUTARIES



1990 NPDES PERMITTED DISCHARGERS

Figure: 5-1

NEARSHORE AREA

There are seven known point source dischargers to the Nearshore Area tributaries. All discharge to Euclid Creek. Already listed in Table 5-1 are two municipal permitted dischargers, Scottish Highlands and Richmond Park. Pleasant Hills WWTP in Lake County is not listed. There are four industries, none of which are listed in Table 5-1. Of those four, G&E Oils, Petromart and General Motors Corporation have permits. Glastic has applied for a permit, but as of yet, none has been issued. Cleveland Metal Cleaning and the City of Cleveland Nottingham Drinking Water Treatment Plant are also discharging without a permit. Enforcement actions and negotiations are pending to resolve these issues.

The NPDES permit requires each discharger to submit a Monthly Operating Report (MOR). The MORs are submitted to Ohio EPA where they are scanned for completeness, accuracy, and compliance with permit conditions. The information is keyed into a data base (LEAPS). Reported effluent quality is compared against violation limits in a computerized process known as the "130 program". These printouts are then sent to the Ohio EPA District Enforcement Section where they are evaluated further and appropriate action is taken. Field verification of the discharger's operations is conducted periodically by Ohio EPA in the form of Compliance Inspections, Compliance Sampling Inspections, and downstream biosurveys.

The LEAPs data base was used to produce the contaminant loadings tables presented in Section 5.4.2.

5.1.2.2 RAP Survey of Permitted Dischargers

To augment information contained in the LEAPs data base, the Point Source Subcommittee of the Cuyahoga River Remedial Action Plan's Plan Drafting Committee developed and administered a mailed questionnaire survey of permitted dischargers in the Cuyahoga River Watershed. Both publicly owned treatment works (POTWs) and industrial sources were contacted. Permitted semi-public* sources were also surveyed. This survey, which was undertaken as part of the subcommittee's point source inventory work for the Cuyahoga River RAP, had the following objective:

to obtain brief descriptions of current treatment facilities, improvements recently completed and planned, and estimates of capital expenditures and operating costs;

to obtain (from industrial sources) brief descriptions of production manufacturing and services;

to determine raw water usage; and

to afford wastewater treatment plant (WWTP) owner/operators the opportunity to comment on Ohio EPA compiled discharge characteristics data which the RAP proposed to use in the RAP effort.

Appendix G.1 contains the survey format.

The survey effort was initiated in December 1990 and completed in May 1991. Follow-up efforts to contact non-respondents, or to clarify information received, took place in late winter 1991. Of the 149 surveys mailed, the following responses were received:

Permitted Source	Mailed Survey	Returned Survey	Response Rate
POTWs	50	44	88%
Semi-POTWs	9	3	33%
Industries	90	38	42%
Total	149	85	57%

Profiles of individual respondents are reported in the following tables: Table 5-2 lists POTWs alphabetically by county, and includes information on treatment facilities/improvements planned, and comments pertinent to the source inventory Table 5-3 lists responding industries alphabetically and includes, in addition to information listed in Table 5-2, information concerning the entity's production and manufacturing process. Non-responding industries are listed alphabetically in Table 5-4.

The survey confirms that the POTW permit program has been very dynamic in recent years. The vast majority of those responding report improvements to facilities during the past five years, and a large number anticipate additional improvements in the near future.

Of the 38 industries responding, some interesting facts emerge from a cursory analysis:

- five discharge only non-contact water to receiving stream;
- eleven discharge stormwater only;
- two operations have been suspended, two have eliminated their discharge, one has tied in to city sewer service and three anticipate doing so shortly;
- Two others are community water supplies.

This leaves something like 25 percent of the industries responding as having what would be considered conventional wastewater treatment programs. It should also be noted that 11 of the 38 industrial respondents reported recent improvements to WWTP facilities. Six indicated significant withdrawals of surface water for production purposes and two indicated significant groundwater withdrawals.

The survey also indicated, with a few exceptions, general confidence that the 1989 annual summary data in the LEAPs data base provides a reasonable characterization of point source inputs to the Cuyahoga River.

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* The term "semi-public" source refers to any facility that is open to the public.

TABLE 5-1: 1989 Permitted Discharger
Inventory – Cuyahoga Basin

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
AKRON, CITY OF	OH0023833	3PF00000*ED	582	37.46	1989
			1		1989
			801	37.46	1989
			3	37.46	1989
			2	37.46	1989
			901	37.46	1989
			583	37.46	1987
			581	37.46	1989
			601	37.46	1989
AKRON WATER PLANT	OH000612	3IV00000		57.62	1989
AKZO (DIAMOND CRYSTAL SALT)	OH0004812	3IE00003	801	3.87	1989
			802	3.87	1989
			1	3.87	1989
ALUMINUM SMELT. AND REFIN. CO.	OH0052353	3IN00097*CD	1	0.9	1986
AMERICAN STEEL AND WIRE	OH0002160	3ID00026	801		1989
			1	8.4	1989
AMETEK CORP	OH0051217	3IN00078*CD	1		1989
AURORA, CITY OF	OH0021911	3PB00003*BD	581		1988
			601		1988
			582	1.67	1985
			901		1988
			1		1988
			801		1988
	OH0021938	3PB00002*CD	582	3.8	1985
			801	3.8	1988
			601	3.8	1988
			1	3.8	1988
			581	3.8	1988
			901	3.8	1988
	OH0027090	3PG00091*CD	581		1988
			601		1988
			1		1988
	OH0098043	3PD00046*AD	601		1989
			582		1989
			1		1989
			901		1989
			581		1989
			601		1989
A.C. WILLIAMS CO	OH0011797	3ID00023*BD	3		1986
			2		1986
			1		1986
AURORA POND DISCHARGE	OH0063380		1	3.38	1989
BEDFORD, CITY OF	OH0024040	3PD00005*CD	2	1.51	1989
			901	1.51	1989
			801	1.51	1989
			1	1.5	1989
			601	1.51	1989
			581	1.51	1989
BEDFORD HEIGHTS, CITY OF	OH0024058	3PD00008*GD	582	7.78	1989
			901		1989

TABLE 5–1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
			601		1989
			1	7.78	1989
			601		1989
			581	7.78	1989
BEMIS COMPANY INC.	OH0051683	3IF00033*CD	2	39.78	1989
			1	39.78	1989
BOSTONIAN MOTEL	OH0087891	3PR00085*BD	1		1989
BP OIL COMPANY PIPE LINE-CLEVE.	OH0000710	3IG00014*BD	1	4.2	1989
	OH000221	3IE00046	1	8.93	1989
MOGADORE	OH0051535	3IG00003*CD	1	42.27	1989
			2		1989
BUCKEYE FORGE	OH0096386		1		1989
BUCKEYE PIPE LINE CO.	OH0063410	3IG00034*BD	2	70.23	1987
			1	70.19	1989
BURTON, VILLAGE OF	OH0021580	3PA00001*BD	901		1989
			601		1989
			1		1989
			582		1988
			2		1989
			601		1989
			581		1989
	OH0045217	3IY00003*BD		66.55	1989
BURTON RUBBER PROCESSING INC	OH0063363	3IR00036*BD	602		1989
			601		1989
			1	67.46	1989
B.F. GOODRICH	OH0004774	3IF00026*FD	900		1989
			801		1989
			800		1989
			602		1989
			1	42.27	1989
	OH0005509	3IR00024*DD	1	1.8	1988
			2	1.5	1989
			800	2.7	1988
	OH0006508	3IS00016*CD	1	4.01	1987
			801	4.01	1987
CAJON (CRAWFORD FITTING)	OH0051667	3IG00021*DD	1	2	1986
CHRYSLER CORPORATION	OH0051721	3IS00030*CD	1	12.75	1989
CITY OF CLEVELAND	OH0000680	3IV00070*BD	63		1986
			61	0.06	1989
			62		1986
CITY OF CUYAHOGA FALLS	OH0001091	3IZ00010*BD		0.23	1989
COLONIAL RUBBER CO	OH0064092	3IR00032*BD	2	2.54	1989
			1	2.54	1989
			601	2.54	1989
CONNELL LIMITED PARTNERSHIP	OH0000078	3ID00042	3	7.97	1989
			4	8.05	1989
CONSOLIDATED FREIGHTWAYS	OH0002224	3IN00009*CD	1	3.06	1989
CORMAX METAL TREATING CO. INC.	OH0001953	3IC00007	1	60.29	1989
CSX TRANSPORTATION INC	OH0051225	3IT00005*CD	1	4.05	1987

TABLE 5–1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
CUYAHOGA CO. COMM.\BRENT.	OH0024864	3PH00020*BD	601		1989
			1		1989
SHAR-BON	OH0038873	3PG00050*BD		2.6	1985
				2.6	1985
HUB PARK	OH0038903	3PG00044*CD	601	1.4	1985
			1	1.4	1985
BRAMBLEWOOD	OH0043923	3PG00080*CD	1	1.71	1987
			601	1.71	1987
SOUTHERN ESTATES	OH0043940	3PG00049*BD	1	*	1989
				1.67	1989
SCOTTISH HIGHLANDS	OH0043982	3PH00021*BD	581		1989
			1		1989
			601		1989
ECHO HILLS	OH0044211	3PG00090*BD	1		1989
			601		1989
RICHMOND PARK	OH0044229	3PH00031*CD	1		1989
			581		1989
			601		1989
DOYELSTOWN, VILLAGE OF	OH0042056	3IY00020*BD			1989
EATON CORP	OH0084085	3IQ00032*AD	1	69.28	1988
ELCO LUBRICANT CORPORATION	OH0000973	3IF00004	2	6.46	1989
			1	6.45	1985
				6.46	1985
FERRO CORPORATION	OH0002291	3IE00020		1.7	1989
	OH0029054	3IE00022*BD	1	4.68	1989
			2	4.68	1989
FILMCO INDUS INC	OH0098256	3IQ00042	1		1989
FIRESTONE TIRE AND RUBBER CO.	OH0008265	3IR00026*ED	3	4.03	1989
			2	3.86	1989
FLAMBEAU-VLCHEK CORP	OH0001686	3IQ00009*CD	1		1989
FODOR'S COUNTRY INN	OH0087904	3PR00086*BD	601		1989
			581		1989
			1		1989
FORD MOTOR COMPANY	OH0001228	3IS00027*BD	1	3	1989
FOREST CITY CONSTRUCTION	OH0091448	3IN00122*AD	1		1989
			2		1989
			601		1989
FRASER MANAGEMENT CO	OH0044865	3PS00002*BD	601		1989
			581		1989
			1		1989
GEAUGA COMPANY	OH0052370	3IR00037*BD	2	3.69	1985
			1	3.69	1985
			3	3.69	1985
			801	3.69	1985
GEAUGA COUNTY COMMISSIONERS\	OH0028924	3PG00002*BD	1	0.02	1989
			581	0.02	1989
BROADWOOD	OH0028932	3PG00011*BD	581		1988
			1		1989
			601		1989
[illegible]	[illegible]	[illegible]	601		[illegible]

TABLE 5–1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
			1		1989
SAFETY CENTER	OH0043532	3PG00077*BD		1.02	1986
AQUILLA	OH0088382	3PG00100*BD	1	0.19	1989
			601	0.19	1989
	OH0089605	3PG00102*BD	1		1989
			601		1989
			561		1987
INFIRMARY CREEK	OH0089788	3PG00103*AD	1		1989
			601		1989
			561		1989
GEAUGA HOSPITAL ASSOC INC	OH0035769	3PT00006*BD			1986
GEN CORP RESEARCH	OH0084149	3IN00039*BD	1		1989
GENCORP, INCORPORATED	OH0051411	3IF00029*CD	3		1988
			2		1989
			1		1986
GENERAL DIE CASTERS INC	OH0092126	3IN00136*AD	2		1989
			1		1989
GENERAL MOTORS CORP.	OH0002275	3IS00043*BD	1	6.67	1989
GENERAL TIRE AND RUBBER CO	OH0051233	3IR00013*BD		7.07	1989
			7	6.66	1989
			8	6.82	1989
			4	7.01	1989
			3	7.03	1989
			5	6.89	1989
GOLDSMITH AND EGGLETON INC.	OH0007692	3IR00020*BD	1		1989
			801		1989
			2		1989
GOODYEAR TIRE AND RUBBER CO	OH0000337	3IR00026*CD	1	7.13	1989
			801	7.13	1989
WINGFOOT LAKE HANGAR	OH0000892	3IC00022*ED	1	4.3	1989
			1	4.3	1987
GOUGLER INDUSTRIES	OH0063258	3IS00090*BD	601		1989
			1	55.7	1989
GRANGER LAKE CONDOMINIUM	OH0045691	3PW00014*BD	1		1989
GULF OIL CORP	OH0001171	3IG00022*BD	1	3.99	1989
HANS ROTHENBUHLER & SON, INC	OH0061276	3IH00025*BD	1		1989
HARSHAW CHEMICAL COMPANY	OH0000655	3IE00006	603		1989
			602	7.36	1987
			5	7.34	1989
			601	7.36	1987
			2	7.31	1988
			6	7.35	1989
			7	7.36	1989
			1	7.3	1989
HILLTOP AGGREGATE	OH0051438	3IJ00004*BD	1		1989
HUDSON, VILLAGE OF	OH0020818	3PC00006*BD	2		1989
			801		1989
			1		1989
			601		1989

TABLE 5-1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
			901		1989
			581		1989
HUKILL CHEMICAL CORPORATION	OH0063444	3IF00036*CD	1	16.36	1989
H-W INDUSTRIES PCP DIV	OH0063607	3IR00045*AD	1		1989
IMO INDUSTRIES INC	OH0022136	3IS00041*BD	1	10	1989
JACQUES MOBILE HOMES INC	OH0044491	3PV00007*BD	581		1989
			1		1989
JOE NOSSE PACKING, INC	OH0063347	3IH00002*BD	1		1988
			2		1988
JOHNSON PLASTIC CORPORATION	OH0001449	3IF00010	1	83.29	1989
			3		1989
JOHNSON RUBBER COMPANY	OH0051365	3IR00001*CD		2.53	1989
				2.46	1989
				2.5	1989
				2.57	1989
KENT, CITY OF	OH0025917	3PD00031*GD	6	53.86	1985
			801		1989
			901		1989
			7	53.86	1987
			601		1989
			581		1989
			1	53.85	1989
LORAIN COUNTY COMMISSIONERS	OH0044458	3PG00052*BD	1	6.82	1989
			601	6.82	1989
			581	6.82	1988
LTV STEEL CO	OH0000949	3IM00006*BD	3		1989
			1	1.2	1988
			4		1989
			2		1989
			601	1.2	1986
	OH0000957	3ID00003	601		1989
			17	4.68	1989
			4	6.5	1989
			602		1989
			802	4.65	1985
			5	6	1989
			604	4.65	1989
			610	4.65	1989
			10	5.3	1989
			9	5.74	1989
			11	4.73	1989
			609	4.65	1989
			604	4.65	1989
			14	5.13	1989
			605	4.65	1989
			19	4.65	1989
			16	4.64	1989
	OH000850	3ID00017*GD	2		1989
			600		1988
			601	5.07	1989

TABLE 5-1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
			7	5.07	1989
			601	5.07	1987
			602		1989
			4	5.4	1989
MAHONING COUNTY COMMISSIONE	OH0026301	3PG00040*BD	1		1985
			601		1985
	OH0037249	3PK00002*GD	1		1989
			582		1988
			901		1989
			601		1989
			801		1989
			581		1989
	OH0037257	3PG00041*CD	1	5.72	1988
			601	5.72	1988
MANTUA, VILLAGE OF	OH0022063	3PB00031*CD	801		1989
			581		1988
			1	69.2	1989
			901		1989
			601		1989
			582		1988
MARATHON OIL CO.	OH0064254	3IG00036*BD	1		1989
MIDDLEFIELD, VILLAGE OF	OH0021181	3PB00034*CD	1	1.8	1989
			801	1.8	1989
			581	1.8	1988
			601	1.8	1989
			901	1.8	1989
MOBILE MANORS, INC.	OH0098299	3PY00003*AD	1		1989
			581		1989
MORTON SALT COMPANY	OH0004448	3IE00008*CD	1		1989
			601		1989
			901		1988
			602		1989
			2		1988
MOTOR WHEEL CORP	OH0098281	3IS00107*AD	4		1989
			1		1989
NATALINA FOOD CO. INC	OH0089699	3IH00068*AD	1		1989
			601		1989
NEORSD	OH0024651	3PF00002*FD	2		1989
			1	_	1989
			901		1989
			582		1989
			801		1989
			601		1989
			3		1987
			581		1989
NORANDEX	OH0051870	3IC00037	1	6.2	1987
				8.95	1987
			601		1989
			2		1989

TABLE 5-1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
N.R.M. CORPORATION	OH0011975	3IS00057*DD	1		1989
OBERLIN, CITY OF	OH0020427	3PD00025*CD	582		1989
			601		1989
			581		1989
			601		1989
			1		1989
			901		1989
			2		1989
			3		1989
ODNR - PUNDERSON S.P.	OH0037702	3PP00009*AD	581		1988
			1		1989
ODNR - PUNDERSON S.P.	OH0037711	3PP00006*AD	581		1989
			1		1989
ODNR - PUNDERSON S.P.	OH0037729	3PP00007*AD	1		1989
ODNR - PUNDERSON S.P.	OH0037737	3PP00008*AD	1		1989
			581		1989
OHIO DEPT OF TRANSPORTATION	OH0088196	3PP00022*BD	581		1989
			1		1989
OHIO DEPT OF TRANSPORTATION	OH0088200	3PP00023*AD	581		1989
			1		1989
OHIO EDISON COMPANY	OH0000213	3IB00006*DD	4		1989
			2		1989
			801		1989
			601		1989
			608		1989
			5		1989
			901		1989
			608		1988
			7		1989
			1	45	1989
			603		1989
OHIO WATER SERVICE COMPANY	OH0045446	3IW00082*BD	2		1989
			1		1989
O'BRIEN CUT STONE CO	OH0044067	3IJ00030*BD	1	7.6	1989
PORTAGE CO SANITARY ENGR\STRE	OH0090131	3PK00014*AD	801		1989
			901		1989
			581		1989
			1		1989
			601		1989
	OH00902045		1		1989
			581		1989
			601		1989
MURRAY LAKE	OH0092037	3PG00126*AD	581		1989
			1		1989
PORTAGE CO. COMM./ROLLING HILL	OH0023485	3PH00012*CD	581		1985
			601		1985
			1		1985
GILLIE	OH0027111	3PH00013*CD	901		1985
			601		1985
			1		1985

TABLE 5–1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
			601		1985
			581		1985
ARROWHEAD	OH0028495	3PG00033*CD	601		1985
			1		1985
SANDY LAKE	OH0036663	3PG00098*CD	601		1989
			1		1989
			581		1989
TWIN LAKES	OH0038580	3PH00038*DD	1		1989
			581		1989
			601		1989
			901		1989
			601		1989
VILLAGE ESTATES	OH0038598	3PG00099*CD	1		1989
			581		1989
			601		1989
RED FOX	OH0036601	3PH00037*CD	1		1989
			581		1989
			601		1989
FAIR LANE	OH0036709	3PG00096*CD	601		1989
			581		1989
			1		1989
FRANKLIN HILLS	OH0036717	3PK00016*AD	601		1989
			801		1989
			581		1989
			1		1989
			901		1989
BOLINGBROOK	OH0036768	3PH00035*CD	601		1989
			1		1989
			581		1989
BARONWOOD	OH0036814	3PG00092*AD	601		1989
			1		1989
			581		1989
RAVENNA, CITY OF	OH0023221	3PD00018*GD	601	4.8	1989
			801	4.8	1989
			1	4.8	1989
			901		1989
			582	4.8	1989
			581	4.8	1989
REPUBLIC CHEMICAL CORP.	OH0063401	3IE00062*BD	1	6.65	1989
REVERE BOARD OF EDUCATION	OH0044636	3PT00022*BD	601		1989
			1		1989
RICHFIELD NURSING CTR, INC	OH0064026	3PR00076*BD	601	0.08	1989
			1		1989
			581		1989
RIVERPLACE PROPERTIES, INC	OH0033987	3PH00003*CD	901		1989
			1		1989

TABLE 5-1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
			601		1989
			601		1989
R.C.A. RUBBER CO	OH0002003	3IR000030*CD	3		1989
			5		1989
			2	7.46	1989
			1	7.45	1989
			4		1989
SEVILLE, VILLAGE OF	OH0027375	3PB00044*BD	1		1989
			601		1989
			801		1989
			2	15.87	1985
			581		1989
			901		1989
SHELL OIL COMPANY	OH0052051	-	1	0.32	1989
SKYVIEW ACRES WWTP	OOH0044971		1	1.06	1985
SOLON, CITY OF	OH0027430	3PD00019*FD	901	10.62	1989
			1	10.62	1989
			6	10.62	1989
			601	10.62	1989
			581	10.62	1989
			801	10.62	1989
SPS TECHNOLOGIES	OH0031437	3IS00026*BD	1		1989
					1986
STANDARD OIL CO.	OH0000141	3IN00004*ED	1	16.95	1989
			2	16.96	1985
STANDARD SLAG	OH0002127	3IJ00017*DD	1		1989
			2		1989
STARK COUNTY COMMISSIONERS	OH0064360	3PG00019*BP	1		1989
			601		1989
STOUFFER FOODS CORP	OH0063631	3IH00061*AD	1		1989
SUMMIT CO. / ROSELAND	OH0027626	3PH00009*DD	581		1989
			1		1989
			582		1989
			601		1989
#43 MIDWEST COLISEUM	OH0031101	3PH00025*CD	1		1989
			601		1989
			581		1989
			582		1989
#42 ROBINWOOD HILLS	OH0044202	3PG00069*DD	601		1989
			1		1989
			601		1989
			901		1989
			582		1988
			581		1989
SUMMIT CO. COMM./#9 MACED.	OH0027634	3PG00020*DD	1		1988
			582		1988
			581		1987
			601		1986
CONNECTICUT COLONY	OH0027651	3PH00050**DD	901		1986
			801		1986

TABLE 5–1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA
			601		1986
			581		1986
			1		1986
#5 HUDSON/TINKERS CREEK	OH0033740	3PH00010*CD	801		1988
			901		1988
			582		1988
			1		1988
			601		1988
			581		1988
#7 NAGY PARK	OH0033766	3PG00016*DD	601	3.61	1985
			1	3.61	1985
#23 SAGAMORE HILLS	OH0033821	3PH0005*BD	601	0.52	1985
			1	0.52	1985
#26COLONY HILLS	OH0033847	3PG00027*ED	581		1989
			601	·	1989
			1		1989
#29 AURORA SHORES	OH0033871	3PG00030*DP	601	3.7	1989
			582	3.7	1989
			901	3.7	1989
			581	3.7	1989
			1		1989
			801	3.7	1989
	OH0046705	3PH00040*BD	901		1989
			581		1989
			801		1989
			1		1989
			2		1986
			601		1989
#25 FISHCREEK	OH0064009	3PK00012*CD	901		1989
			1		1989
			582		1989
			581		1987
			801		1989
			601		1989
SUN REFINING & MARK./CLEVE.	OH0002402	3IG00013*BD	1	5.38	1989
			2	5.39	1986
AKRON	OH0001678	3IG00010*BD	1	42.27	1989
	OH0012025	3IG00015*BD	1		1989
S.K. WELLMAN CORP	OH0000043	3IC00027	2	16.36	1986
			1	16.36	1987
			4	16.36	1986
			3	16.36	1989
TAVERN OF RICHFIELD	OH0090085	3PR00113*AD	1		1989
			581		1989
TECHNICAL SERVICES	OH0000871	3IR00017*DD	1	56.62	1989
			602		1989
TELEDYNE MONARCH RUBBER CO	OH0029050	3IS00019*BD	1		1989
TROY OAKS CLUB	OH0043508	3PV00051*BD	1		1989
			601		1989
TRUCK WORLD INC	OH0059991	3II00000*AD	1		1989

TABLE 5-1 (continued)

DISCHARGER NAME	NPDES #	OEPA #	OUTFALL	RM	DATA	pH	TEMPERATURE	DISSOLVED OXYGEN	TOT SUSP SOLIDS	DISSOL SOLIDS	CBOD	BOD(5)	OIL & GREASE	AMMONIA-N	NITRATE	NITRITE	[illegible]	TOT PHOSPHORUS	TOT CHLORIDE	TOT CADMIUM	TOT CHROMIUM	TOT COPPER	TOT LEAD	TOT NICKEL	TOT ZINC	CHROMIUM (6)	TOT MERCURY	PHENOL (4AAP)	TOT CYANIDE	RESID CHLORINE	FECAL COL (1/100ML)	RESIDUE (TOT NFLT)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	BYPASS	[illegible]	[illegible]
			601		1989																																			X																										
			901		1989								X																																																
			1		1989	X							X																																																
TWINSBURG, CITY OF	OH0027863	3PD00039*CD	3	15.66	1985							X																				X																														X		
			581	15.66	1989	X								X			X			X	X	X	X	X	X		X										X	X																									
			801	15.66	1989	X	X	X				X		X				X			X					X			X			X																															
			601	15.66	1989	X	X					X		X				X		X	X	X	X	X	X		X		X																																	
			901	15.66	1989	X	X	X				X		X				X													X	X																															
			2	15.66	1989							X																				X																														X		
			1	15.65	1989	X	X	X			X	X	X	X			X	X		X	X	X	X	X	X	X	X	X	X	X	X	X																																
UNITED STATES STEEL	OH0061630	3IS00047*DD	1		1989	X	X																																																									
UNOCAL CHEMICALS DIVISION	OH0083828	3IG00039*BD	1		1989	X							X					X																																													
	OH0086129		1		1988	X							X																																																	
UNO-VERN CO. (UNOCAL 76)	OH0045543	3IG00026*ED	1		1985	X							X																																																	
YOUNGSTOWN HARDCHROME, INC	OH0064238	3IC00074*BD	3		1989	X							X																			X																																
WHITE RUBBER COMPANY	OH0012670	3IR00009*BD	1		1989	X	X											X																																												
ZACLON, INC	OH0000990	3IE00006	4	4.38	1989	X	X						X	X				X		X	X	X	X		X																X	X																							
			2	4.08	1989	X	X																																																									
ZIRCOA PRODUCTS	OH0000591	3IE00014*DD	601		1989																											X																																
			2		1989	X												X																																												
			1		1989	X												X																										X																		
			3		1989	X												X																																												

TABLE 5-2

CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS –

CUYAHOGA COUNTY WASTEWATER TREATMENT FACILITIES

ENTITY NAME	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF FACILITY	FACILITY IMPROVED SINCE 85?	FACILITY IMPROVMENTS PLANNED?	CAP/OPER* COSTS PROV'D?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENTS?
BRAMBLEWOOD	3PG00080*CD	POTW	PLANT WAS ABANDONED						
BRENTWOOD	3PH00020	POTW	EXTENDED AERATION	YES	NR	NO	YES	YES	
EASTERLY	3PF00001	POTW	155 AVG MGD/330 PEAK MGD; PRELIM/1ARY/2ND; HYPOCHLORITE DISINFCT	YES	DECHLORINATION BEGIN IN 1992; FINE BUBBLE DIF-FUSERS IN AERATION TNKS	YES	YES	YES	
ECHO HILLS	3PG00090	POTW	EXTENDED AERATION W/ 3IARY RAPID FILTER	YES	COMPLETION OF SAND FILTER REPAIRS	NO	YES	NO	PLANT WAS BETTER IN 1990 AND EXPECT TO IMPROVE
HUB PARK	3PG00044*CD	POTW	PLANT WAS ABANDONED						
RICHMOND PARK	3PH00031	POTW	EXTENDED AERATION	YES	NEW PUMP STATION TO BE INSTALLED; PLANT MAY BE ABANDONED	NO	YES	NO	1990 RESULTS MARKEDLY IMPROVED OVER 1989
SCOTTISH HIGHLANDS	3PH00021	POTW	EXTENDED AERATION	YES	PLANT WILL PROBABLY BE ABANDONED ONCE HILLTOP IS COMPLETED	NO	YES	NO	1990 RESULTS MARKEDLY IMPROVED OVER 1989
SHAR-BON	3PG00050*BD	POTW	PLANT WAS ABANDONED						
SOLON	3PD00019	POTW	3.6 MGD; 3IARY TRTMT ADVANCED DESIGN;	YES	CONDUCTING FACIL. PLAN W/ EMPH ON SLUDGE DISP	YES	YES	YES	
SOUTHERLY	3PF00002	POTW	ADVANCED TREAT; PRE-LIM/1ARY/TWO-STAGE AERATION/FILTERS/ CHLORID; SLUDGE TREAT	YES	NEW BOILER; IMPROVED SOLIDS HANDLING	YES	YES	YES	
SOUTHERN ESTATES	3PG00049	POTW	EXTENDED AERATION	YES	ELIMINATE I&I	NO	YES	NO	PLANT WAS BETTER IN 1990 AND EXPECT TO IMPROVE
WESTERLY	3PE00001	POTW	1ARY TREAT/PRESSURE FILTRATION/DISINFCT	YES	TRICKLING FILTER/SOLIDS CONTRACTOR BY 1994	YES	YES	YES	

LEGEND

* "Capital or Operating"
**Most recent data (1989 or be
N/A = Not Applicable
NR = No Response

TABLE 5-2 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS –

GEAUGA COUNTY WASTEWATER TREATMENT FACILITIES

ENTITY NAME	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF FACILITY	FACILITY IMPROVED SINCE '85?	FACILITY IMPROVMENTS PLANNED?	CAP/OPER* COSTS PROV'D?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENTS?
AQUILLA	3PG00100	POTW	40,000 GPD; 2 STORAGE LAGOONS (WINTER), AND OVERLAND FLOW (SPR/SUM)	NONE	NONE	YES	YES	NO	ONLY DISCHARGE IN SPRING TO FALL
BROADWOOD	3PG00011	POTW	27,500 GPD; 1ARY SETTLE AND AERATION/CHLORINE	YES	NONE	YES	YES	NO	IN 1989 NEW CHLOR. TANK WAS INSTALLED
BURTON	3PB00066	POTW	60,000 GPD; COMMUNATOR AERATION/FILTERS/CHLOR	YES	NONE	YES	YES	YES	
GEAUGA HOSPITAL	3PT0006*BD	POTW	PLANT ELIMINATED JULY 1, 1986						
INFIRMARY CREEK	3PG00103	POTW	90,000 GPD; 1ARY SETTLE/ AERATION/FILTERS/CHLOR	NO	NEXT 3-5 YEARS, SLOW SAND FILTERS TO BE REPLACED W/ RAPID FILT	YES	YES	YES	
MIDDLEFIELD	3PB00034	POTW	TREATMENT W/ LAGOONS	YES	REVISED COMPLIANCE SCHEDULE ATTACHED TO RESPONSE	YES	YES	YES	OEPA SHOULD RESPOND TO MONTHLY REPORTS
PLYMOUTH ACRES	3PG00002	POTW	10,000 GPD; 1ARY SETTLE/ AERATION/FILTERS/CHLOR	YES	NONE	YES	YES	NO	LATE 1990 SLOW SAND FILTERS OPERATIONAL
ODNR (PUNDERSON)	3PP00006 3PP00009 3PP00008 3PP00007	POTW POTW POTW POTW	FOUR TREATMENT PLANTS; 3 ARE EXTENDED AERATION AND 1 IS A TRICKLING FILTER.	YES	WOULD LIKE TO UPGRADE TRICKING FILTER TO AERATION	YES	YES	YES	
SAFETY CENTER CLAIRDON TWP.	3PG00077*BD	POTW	PLANT ELIMINATED IN 1986						
TROY OAKS	3PG00079	POTW	90,000 GPD; 1ARY SETTLE/ AERATION/CHLORINATION	YES	NONE	YES	YES	YES	

LEGEND

* "Capital or Operating"
**Most recent data (1989 or before)
N/A = Not Applicable
NR = No Response

TABLE 5-2 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS –

PORTAGE COUNTY WASTEWATER TREATMENT FACILITIES

ENTITY NAME	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF FACILITY	FACILITY IMPROVED SINCE 85?	FACILITY IMPROVMENTS PLANNED?	CAP/OPER* COSTS PROV'D?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENTS?
ARROWHEAD	3PG00033*BD	POTW	PHASED OUT AND FLOW PUMP'D TO STR'TSBORO						
BARONWOOD	3PG00092*AD	POTW	.080 MGD FACILITY	YES	REMAINING DISCHARGE ELIMINATED IN 1991	NO	NR	NR	PROBLEMS W/ SS RECENT IMPROV'T HAS HELPED
BOLINGBROOK	3PH00035*CD	POTW	.120 MGD FACLITY	YES	AS NECESSARY TO MEET NI 1991 NPDES PERMIT	NO	NR	YES	
CITY OF KENT	3PD00031	POTW	ADV'D 2NDARY ACTIVE SLUDGE; P REMOVAL	YES	IMPROVED SIDESTREAM CONTROL BY 1993, pH CONTROL BY 1994, FLOW EQUALIZATION BY 1995	YES	NR	NO	NH3 DISCHARGE HAS IMPROVED TO MEET PERMIT REQS
FAIRLANE	3PG00096*CD	POTW	.052 MGD FACILITY	YES	3IARY SAND FILTER INSTALLED IN 1991	NO	NR	NR	RECENT IMPROV'TS HAVE KEPT PLANT MOSTLY IN COMPL; ADDED IMPROV'TS TO ASSURE PROPER TREATMENT
FRANKLN HILLS	3PK00015*AD	POTW	.990 MGD FACILITY	YES	1991 GENERATOR, 3IARY UN UNIT AND ULTRAVIOLET UNIT ADDED	NO	NR	NR	NH3 AND PERIODIC SS VIOLATIONS; AERATION CONVERT IN 1990 SOLVED NH3 PROBLEM; 1991-3IARY WILL SOLVE SS PROBLEM
GILLIE	3PH00013*CD	POTW	PHASED OUT AND FLOW PUMP'D TO STR'TSBORO						
MANTUA VILLAGE	3PB00031	POTW	2 150,000 GAL/DAY CONTACT STABILIZATION PHOS REMOVAL	YES	ADDITIONAL AIR DIFFUS WORK IN 1991	YES	NO	NO	50060 TOT RESID Cl2 CONCENTATION IN ERROR
MURRAY LAKE	3PG00126	POTW	PHASED OUT IN 1990						

LEGEND

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N/A = Not Applicable
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TABLE 5-2 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS –

PORTAGE COUNTY WASTEWATER TREATMENT FACILITIES, CONTINUED

ENTITY NAME	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF FACILITY	FACILITY IMPROVED SINCE 85?	FACILITY IMPROVMENTS PLANNED?	CAP/OPER* COSTS PROV'D?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENTS?
PORTAGE CO HOME	3PG00097*DD	POTW	.020 MGD FACILITY	YES	PHASED OUT IN 1992 AND PUMPED TO RAVENNA	NO	YES	NR	
RAVENNA	3PD00018	POTW	ACTIVATED SLUDGE	YES	IMPROVEMENTS AND TIME TABLE PROVIDED	YES	NO	YES	1988 CHANGES LOWERED NH3 AND INCREASED D.O. IN EFFLUENT
RED FOX	3PHOOO37*CD	POTW	.080 MGD FACILITY	YES	AS NECESSARY TO MEET 1991 NPDES PERMIT	NO	NR	YES	
RIVERMOOR	3PG00127*AD	POTW	.0425 MGD FACILITY	NO	NONE ANTICIPATED	NO	NR	YES	
ROLLING HILLS	3PH00012*CD	POTW	PHASED OUT AND FLOW PUMP'D TO STR'TSBORO						
SANDY LAKE	3PG00098*CD	POTW	.136 MGD FACILITY	YES	USE OF BARONWOOD TO PRETREAT TO REDUCE ORGANIC LOAD TO SANDY LAKE – 1991; STUDY UNDERWAY	NO	NR	NR	PROBLEMS W/ SS. RECENT IMPROV'T HAS HELPED
STREETSBORO	3PK00014*AD	POTW	2.5 MGD FACLITY BUILT IN 1985 TO REPLACE 4 WWTPS; NOMINATED FOR OEPA O&M AWARD	NO	PLANT EXPANSION UNDER STUDY; ADDED CAPACITY AND/OR FLOW EQUALIZA-TION	NO	NR	YES	
TWIN LAKES	3PH00038*DD	POTW	.60 MGD FACILITY	YES	AS NECESSARY TO MEET 1991 NPDES PERMIT	NO	NR	NR	NH3 VIOLATIONS IN 89-90; RECENT IMPROV'T HAVE CORRECTED THIS
VILLAGE ESTATES	3PG00099*CD	POTW	PHASED OUT 10/22/90						

LEGEND

* "Capital or Operating"
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N/A = Not Applicable
NR = No Response

TABLE 5-2 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS –

SUMMIT COUNTY WASTEWATER TREATMENT FACILITIES

ENTITY NAME	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF FACILITY	FACILITY IMPROVED SINCE 85?	FACILITY IMPROVMENTS PLANNED?	CAP/OPER* COSTS PROV'D?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENTS?
AKRON WPC STATION	3PF00000	POTW	2NDARY TREAT W/ ACTIVE SLUDGE PROC. 4 INCINERATORS CAPAC = 207 MGD AVG FLOW 80-90 MGD	YES	PLANT-WIDE DISTRIBUTED CONTROL SYSTEM AND DISINFECTION IMPROV'TS	YES	NR	NO	IN APRIL 1990 BEGAN COMBINING 2NDARY BYPASS FLOWS W/ TREAT'D FLOWS AND REPORTING; PRIOR, REPORTED SEP'TELY
AURORA SHORES SUMMIT CO #29	3PG00030	POTW	EXTENDED AIR; EFFLU TO SAND FILTERS	NO	NO CHANGES IN FACILITY ANTICIPATED	YES	YES	YES	
BOSTONIAN MOTEL	3PR00085	SEMI	3000 GAL/DAY AERATION SYSTEM	YES	NONE	YES	YES	YES	OWNERS IMPROVING OPERATING SKILLS
COLONY HILLS SUMMIT CO #28	3PG00027	POTW	7,000 GPD EXTENDED AERATION PLANT	YES	NONE	YES	YES	YES	
CONNECTICUT COLONY SUMMIT CO #17	3PH00050	POTW	ACTIVATED SLUDGE – 3IARY TREAT (LAGOON)	YES	REPLACEMENT OF EXISTING 3IARY LAGOON W/ RAPID SAND FILTER – 1993	YES	NO	YES	RECEIVING STREAM IS BRANDYWINE CREEK, NOT MUD BROOK
FISHCREEK SUMMIT CO #25	3PK00012	POTW	4 MGD ADVANCED RBC PHOS REMOVAL 3IARY TREAMNT	YES	IMPROVEMENTS TO SOLIDS HANDLING IN 1992	YES	NR	YES	
HUDSON/TEREX SUMMIT CO #6	3PK00000*BD	POTW	ABANDONED SEPTEMBER 1987.						
HUDSON/TINKERS CRK SUMMIT CO #5	3PH00010*CD	POTW	ABANDONED SEPTEMBER 1988.						

LEGEND

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**Most recent data (1989 or before)
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NR = No Response

TABLE 5–2 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS –

SUMMIT COUNTY WASTEWATER TREATMENT FACILITIES, CONTINUED

ENTITY NAME	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF FACILITY	FACILITY IMPROVED SINCE 85?	FACILITY IMPROVMENTS PLANNED?	CAP/OPER* COSTS PROV'D?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENTS?
MACEDONIA ESTATES SUMMIT CO #9	3PG00020*DD	POTW	ABANDONED AUGUST 1986.						
MACEDONIA SUMMIT CO #15	3PK00001*GD	POTW	ABANDONED OCTOBER 1988.						
MIDWEST COLISEUM SUMMIT CO #43	3PH00025	POTW	FLOW EQUALIZATION STORE INTERMIT FLOW 3AIRY TREATMNT RAPID SAND FILTERS	NO	CURRENTLY DESIGNING FOR IMPROVED [BOD] AND [SS] CONSTRUCTION 1991	YES	YES	YES	
NAGY PARK SUMMIT CO #7	3PG00018	POTW	ABANDONED 1985.						
REVERE SCHOOL DIST.	3PT00022	POTW	SCHOOL DIST WWTP	YES	NONE	YES	YES	YES	
ROBINWOOD HILLS SUMMIT CO #42	3PG00089	POTW	SETTLING BASINS TO RAPID SAND FILTERS	YES	TO UPGRADE TREATMENT & ADD 50,000 GPD. PRIVATE FUNDS TO BE USED	YES	YES	YES	
ROSELAND ESTATES SUMMIT CO #1	3PH00009	POTW	TO BE ABANDONED JANUARY 1991						
SAGAMORE HILLS SUMMIT CO #23	3PH00005*BD	POTW	ABANDONED AUGUST 1985						
TWINSBURG WWTP	3PD00039	POTW	3.4 MGD ACTIVE SLUDG 3IARY SCREENING AMMONIA/PHOS REDUCT FLOW EQUAL; CONDIT'N	YES	EXPANSION TO APPROX 5 MGD BY 1994	YES	YES	NO	1990 METALS HAVE BEEN REDUCED FOR Cu, Zi AND Pb
VILLAGE OF HUDSON	3PD00044	POTW	.80 MGD FACILITY 3IARY TREATMNT	YES	CONSTRUCTION OF 2.5 MGD PLANT BY 1994 PER PERMIT REQUIREMENTS	NO	YES	YES	

LEGEND

* "Capital or Operating"
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NR = No Response

TABLE 5-3

CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS–

INDUSTRY RESPONDENTS

ENTITY	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF WWT PROCESS	FACILITY IMPROVED SINCE 85?	FACILITY IMPRVMTS PLANNED?	CAP/OPER* COSTS PROV'D?	PROCESS RAW WATER?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENT?
AKRON WATER PLANT	3IV00000	DRINKING WATER PLANT (45 MGD)-CITY OF AKRON	35 ACRES OF SED-IMENT DRYING AND FREEZING BASINS.	YES	SEDIMENT/ SLUDGE HANDLING PLAN	YES	YES, FOR DRINKING	NR	YES	
AKZO SALT (DIAMOND CRYSTAL SALT COMPANY)	3IE00003	PRODUCE GRANU-LATED SALT	NONE	NO	NONE	NO	YES, BUT NO TREAT	YES	NO	DISCHARGE IMPROVED IN 1990
ALSIDE DIVISION ASSOC. MAT'LS INC.	3IS00047	COIL COATING PROCESS-MANUF HAS BEEN TEMP-ORARILY SUSPEND				YES		YES	NO	MANUF WAS SUPENDED
ALUMINUM SMELTING & REFINING CO., INC.	2IN00097*CD	2NDARY ALUMINUM ALLOY SMELTER	RECYCLING COOLING WATERS. NO LONGER DISCHARGING			YES		YES	NO	WENT TO ZERO DSCH
AMERICAN STEEL AND WIRE CO., INC.	3ID00026	MAKES ROD AND WIRE. ROD MILL IS 1ARY SOURCE OF PROCESS WATER DSCHGED	PROCESS WATERS ARE TREATED & RECYCLED; DSCHG ONLY OCCASSIONALY	YES	YES	YES	YES, AND TREAT IT	YES	NO	JAN 1991 MOVE TO ZERO DSCH
BP OIL COMPANY/ CLEVELAND TERMINAL	3IG00014	REFINED PETRO PRODUCT STORAGE AND DISTRIB. CENTER	TREATS STORMWATER THAT MAY BE CONTACTING PETROL	YES	PROPOSED TO ELIM CONTAM. STMWATER	YES		NO	NO	INCORRECT ADDRESS, pH, O&G, P & PHENL ZINC & BENZENE
BP OIL CO. PIPELINE/ MOGADORE TERMINAL	3IG00003	TERMINAL IS A PUMP STATION OF REFINED PETRO	DRAIN STORMWATER TO OIL/WATER SEP; THEN TO PONDS	MINOR	PROPOSE IMRVMENTS TO DRAIN SYSTEM	NO		NR	YES	
BUCKEYE PIPELINE CO.	3IG00034	COMMON CARRIER PIPELINE STA.	STORMWATER RUNOFF TO OIL/WATER SEP; THEN TO PONDS	YES	NONE	NO		YES	YES	
BURTON RUBBER PROCESSING, INC.	3IR00038	RUBBER COMPOUND -MIX RAW MATTER TO CUSTOM. SPEC	SAND FILTER TO CHLORINE STA. TO POLISH POND	YES	NONE	NO		YES	NO	1989 RAW SEWAGE PROBS NOW STABIL

LEGEND

* "Capital or Operating"
**Most recent data (1989 or 1
N/A = Not Applicable
NR = No Response

TABLE 5–3 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS–

INDUSTRY RESPONDENTS

ENTITY	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF WWT PROCESS	FACILITY IMPROVED SINCE 85?	FACILITY IMPRVMTS PLANNED?	CAP/OPER* COSTS PROV'D?	PROCESS RAW WATER?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENT?
CAJON COMANY (CRAWFORD FITTING)	3IG00021	FINAL ASSEMBLY, PACKAGING AND WAREHOUSING FOR SMALL INDUST. FITTINGS	AERATION TANKS TO CLARIFIER; EFFL. TO SAND FILT TO CHLORINE TANKS	YES	NONE	YES		NO	YES	
CSX TRANSPORTATION	3IT00005*CD	NPDES PERMIT WAS CANCELLED MAY 19, 1991								
DOYLESTON VILLAGE WATER PLANT	3IY00020	COMMUNITY WELL WATER SUPPLY	FILTER AND CHLOR-INATE WELL WATER; FILTER BACKWASH TO SAND FILTER	YES	ADDITION OF 2ND BACKWASH FILTER	YES	YES, FROM GRNDWATER	NR	YES	
FERRO CHEMICAL DIV.	3IE00020	BATCH PRODUCT OF POLYMER ADDS HEAT & UV STABL /ANTIOXIDANTS AND CATALYSTS, EPOXY PLASTICI-ZERS AND ANTIMI-CROBIAL AGENTS	NONCONTACT PRO-CESS AND STORM WATER DISCHARGED	YES	BIOLOGIC WWT CAPAC TO BEGIN	YES		N/A	YES	
FILMCO INDUSTRIES	3IQ00042	MANUFACTURES FILM FOR THE FOOD INDUSTRY	ALL NPDES REQMNTS ARE MET BEFORE DISCHARGE	YES	NONE	YES		YES	NO	1990 DATA REFLECTS 1989 IMPR
FOREST CITY CONSTR.	3IN00122	MANUF OF PRE-CAST CONCRETE FOR COMMERCIAL USE	CONVENTIONAL AERATION WITH SAND FILTERS; INDUST WASTE FLOW TO SED BASIN TO pH REDUCT TO DISCHARGE	YES	NONE	YES	YES, FROM GRNDWATER	YES	YES	
GENCORP RESEARCH	3IN00039	RESEARCH CENTER	NONE–SOURCES OF DISCHARGE HAVE BEEN ELIM.	YES						
GOLDSMITH AND EGGLETON, INC.	3IR00020*BD	REPROCESSING & MIXING SCRAP VIRGIN SYNTHET RUBBER & OTHER ELASTOMERS	DISCHARGE NON-CONTACT, NON-TREATED WATER ONLY	N/A	N/A	NO	YES, AND FILTER IT	YES	YES	

LEGEND

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TABLE 5-3 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS–

INDUSTRY RESPONDENTS

ENTITY	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF WWT PROCESS	FACILITY IMPROVED SINCE 85?	FACILITY IMPRVMTS PLANNED?	CAP/OPER* COSTS PROV'D?	PROCESS RAW WATER?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRESENTATION?	LEAPS DATA COMMENT?
GOODYEAR TIRE AND RUBBER COMPANY	3IR00026	MANUFACTURE OF RACING TIRES; BUTADINE CO-POLYMER RESINS AND BULK LATEX	TREATMENT FACIL TREATS TOTAL FLOW OF LITTLE CUY.- SETTLING, SKIM, AND AERATION.	YES	YES	YES	YES, AND SCREEN IT	NO	NO	1989 O&G AND RESID NFLT IN-CORRECT
GOODYEAR TIRE AND RUBBER CO./ WINGFOOT LAKE HANGER	3IC00022	AIRSHIP REPAIR FACILITY	LITTLE TO NO GENERATION OF WW-LARGE PUMPS NOT IN USE	NO	NONE	NO		YES	YES	
HILLTOP AGGREGATE	3IJ00004	MINE AND WASH SAND AND GRAVEL	WASH SAND AND GRAVEL; MUDDY H2O TO POND THEN RET-URNED TO LAKE	YES	YES	NO		NR	NR	
HUKILL CHEMICAL CORPORATION	3IF00036	DISTRIBUTOR OF ACIDS, ALKALIS, AND SOLVENTS; ALSO SOLVENT RECLAIMING & HW FUELS BLEND	PROCESS WATER FROM SOLVENT REC-LAIM & FUEL BLEND IS SHIPPED TO A TSDF FOR TREAT	NO	REDIRECT STMWATER TO SANIT. SEWERS	YES		YES	YES	ACTUAL LOADS ARE LESS
IMO INDUSTRIES INC. MORSE CONTROLS	3IS00041	MANUFACTURE OF MARINE AND INDUSTRIAL CONTROLS	NO TREATMENT FACIL AT THIS OPERATION	YES	NONE	YES		YES	NO	1991 WILL BE LESS
MORGAN ADHESIVES COMPANY (BEMIS)	3IF00033	MANUFACTURES ADHESIVE COATED PAPER LAMINATES	STORMWATER DSCHG ONLY; NO TREAT	NR	NR	NO		NR	NR	
NATALINA FOOD	3IH00066	PREMADE PIZZA	TIE INTO CITY SEWER IN 1991	YES	N/A	YES	YES, FROM GRNDWATER	YES	YES	
NORANDEX, INC.	3IC00037*DD	MAUFACTURER OF ALUMINUM AND VINYL WINDOWS	3 STAGE ACID-IFICATION, REDUCT NEUTRAL SYSTEM TO TREAT WW GENERATD FROM CLEANING ALUM. EXTRUSIONS	YES	NONE	YES	YES, BUT NO TREAT	YES	YES	
N.R.M. STEELASTIC	31S00057	RAW CASTINGS, STEEL FABRICAT; MACHINING SAME	AIR COMPRESSOR WATER IS DISCHGED	YES	NONE	YES		YES	YES	

LEGEND

* "Capital or Operating"
**Most recent data (1989 or 1
N/A = Not Applicable
NR = No Response

TABLE 5-3 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS– INDUSTRY RESPONDENTS

NTITY	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF WWT PROCESS	FACILITY IMPROVED SINCE 85?	FACILITY IMPRVMTS PLANNED?	CAP/OPER* COSTS PROV'D?	PROCESS RAW WATER?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENT?
'BRIEN CUT STONE	3IJ00030	CUT LIMESTONE W/ DIAMOND BLADES	2 OF 4 SAWS RECYCLE COOLING WATER. OTHER 2 REQUIRE SETTLING	YES	2 SAWS TO RECYCL	YES	YES, BUT NO TREAT	YES	YES	
DOT	3PP00022	N/A	10,000 GAL; AERATOR/CLARIFIER DOSING/CHLORIN; SLUDGE HOLDING	YES	NONE	YES		YES	NO	UPGRADED IN 1990; OPERATOR EDUCATION
DOT	3PP00023	N/A	10,000 GAL; AERATOR/CLARIFIER DOSING/CHLORIN; SLUDGE HOLDING	YES	NONE	YES		YES	NO	UPGRADED IN 1990; OPERATOR EDUCATION
IIO EDISON COMPANY IRGE PLANT	3IB00006	SHUT-DOWN; WAS COAL-FIRED ELECTRIC POWER GENERATING FACL	2 FLY ASH PONDS AND 1 BOTTOM ASH POND; BOTTOM ASH DSCHG DIRECT TO RIVER	YES	NONE	YES	YES, AND TREAT IT	NO	YES	pH CANNOT BE ARITH-METICALLY AVERAGED
.A. RUBBER CO.	3IR00030	MIXING, MILLING CALENDARING & CURING OF RUBBER FLOORING	NON-CONTACT COOLING WATERS DIRECT TO RIVER	NO	NONE	YES	YES, AND TREAT IT	YES	YES	
PUBLIC CHEMICAL RPORATION	3IE00062	CHEMICAL AND COLOR DISPERS COMPOUND	ONLY MONITORING STORMWATER DSCHG; TEMP SLIGHT INCR.	N/A	N/A	NO	YES, BUT NO TREAT	N/A	N/A	
. WELLMAN CORP.	3IC00027	PLANT HAS BEEN CLOSED SINCE AUG. 1990	OUTFALLS CARRY ONLY RAIN FROM ROOFS AND PKG LOT							
I REFINING AND RKETING/ AKRON	3IG00010	PETROLUEM MARKETING TERM.	STORMWATER RUNOFF TREAT BY OIL/ WATER SEPARATOR	YES	NONE	NO		YES	YES	
I REFINING AND RKETING/ CLEVE	3IG00013	PETROLUEM MARKETING TERM.	STORMWATER RUNOFF TREAT BY OIL/ WATER SEPARATOR	YES	NONE	NO		NO	NO	1989 DATA ONE GRAB; NOT REPRE-SENTATIVE
ERNE OF RICHFIELD	3PR00113	RESTAURANT	EXTENDED AERATION TO SAND FILT TO CHLORINATION	YES	PLAN TO TIE INTO SANITARY	YES		YES	NO	BOD AND SS ARE LOWER

LEGEND

* "Capital or Operating"
**Most recent data (1989 or before)
N/A = Not Applicable
NR = No Response

TABLE 5-3 (cont.) CUYAHOGA RAP PERMITTED DISCHARGERS SURVEY RESPONDENTS–

INDUSTRY RESPONDENTS

ENTITY	OHIO EPA PERMIT #	MANUF PROCESS	DESCRIPTION OF WWT PROCESS	FACILITY IMPROVED SINCE 85?	FACILITY IMPRVMTS PLANNED?	CAP/OPER* COSTS PROV'D?	PROCESS RAW WATER?	LEAPS DATA** ACCURATE?	1989 DATA FAIR REPRE-SENTATION?	LEAPS DATA COMMENT?
UNOCAL CHEMICALS DIV TWINSBURG	3IG00039	DISTRIBUTION CENTER- NO MANUFACTURING	STORMWATER RUNOFF TO RETENTION POND	YES	ENCLOSE TRANSFER STATION	YES		YES	YES	
UNO-VERN CO./ TALLMADGE TERMINAL	3IG00026	N/A	STORMWATER RUNOFF TO OIL/WATER SEP TO HOLDING POND	NO	NONE	YES		YES	YES	
WHITE RUBBER CO.	3IR00009	MANUFACTURE OF ELECTRICIAN'S GLOVES AND SLEEVES	N/A	NO	TIE INTO SANITARY	YES		YES	NO	ACTUAL IS 5% GREATR THAN RE-PORTED
ZACLON, INC.	3IE00005	MAIN PRODUCTION IS MAKING ZINC CHLORIDE FOR USE IN GALVAN.; POTASSIUM SILIC GLASS/SOLN/CHEM FOR USE IN PAPER AND LATEX RUBBER INDUSTRIES	PRIMARY TREATMENT TO NEUT. ACIDS AND REMOVE METALS AND SOLIDS SETTLE FOR DISPOSAL.	YES	SOURCE REDUCTION AND RECY-CLE GOALS	YES		YES	NO	DATA ANAYLIS PROVIDED

LEGEND

* "Capital or Operating"
**Most recent data (1989 or before)
N/A = Not Applicable
NR = No Response

Table 5-4: Cuyahoga Basin Industrial Dischargers Not Responding to the RAP Survey

ENTITY	NPDES PERMIT NUMBER
Ametek Corporation	3IN00078
Aurora Terminal and Transportation, Inc.	3IG00033
B.F. Goodrich Co., Plants 1, 2 & 5	3IR00024
B.F. Goodrich Co., Plant 3	3IF00029
B.F. Goodrich Company Engineered Systems	3IS00016
B.P. Oil Company Pipeline - Bradley Rd. Location	3IE00046
Buckeye Forge, Inc.*	3IS00108
Chrysler Corporation	3IS00030
Cleveland Builders Supply*	3IJ00041
Cleveland Division Filtration Plant*	3IV00070
Colonial Rubber Co.	3IR00032
Consolidated Freightways	3IN00009
Cormak Metal Treating Co., Inc.	3IC00007
Cuyahoga Falls Water Plant	3IZ00010
Elco Lubricant Corporation	3IF00004
Ferro Corporation Electro Division discharge eliminated	3IE00022
Firestone Tire and Rubber Co.	3IR00025
The France Stone Co.***	3IJ00054
Flambeau-Vlchex Corp.	3IQ00009
Ford Motor Company Cleveland Plant 1	3IS00027
Gencorp, Inc.	3IF00029
General Die Casters, Inc.	3IN00136
General Electric Co.*	3IF00022
General Motors Corporation	3IS00043
General Tire and Rubber Co.	3IR00013
Gougler Industries	3IS00090
Gulf Oil Corporation	3IG00022
Hamilton Kent Mfg. Co.	3IR00017
Harshaw Chemical Company	3IE00006
H-W Industries PCP Division*	3IR00045
Johnson Plastic Corporation	3IF00010
Johnson Rubber Company	3IR00001
Marathon Oil Co.**	3IG00038
Motor Wheel Corp.**	3IS00107
LTV Steel Company, Inc./Cleveland West	3ID00017
LTV Steel Company, Inc./Flat Rolled Division, Cleveland Works	3ID00003
LTV Steel Company Research Center	3IM00006
North American Mfg. Co.	3IM00011
Norton Company/Performance Plastics	3IQ00014
Hans Rothenbuhler and Son, Inc.	3IH00025
Shell Oil Company	3IG00023
Snow Metal Products Co.***	3IC00082

* Discharge stopped (no flow), tied into POTW, or plant closed.
** Discharging stormwater only.
*** Entity has not submitted monthly operating reports to Ohio EPA.

Table 5-4: Cuyahoga Basin Industrial Dischargers
(cont.) Not Responding to the RAP Survey

ENTITY	NPDES PERMIT NUMBER
SPS Technologies	3IS00026
Standard Oil Co. Pleasant Valley Lab	3IN00004
Standard Slag Co.*	3IJ00017
Stouffer Foods Corp.***	3IH00006
Sun Refining & Marketing Co., Sunmark Industries/Youngstown Terminal	3IG00015
Truck World, Inc.**	3IZ00000
The A.C. Williams Co. Magnesium Division	3ID00023
Unocal 76 Tallmadge Tank Farm	3IG00026
Zircoa Products***	3IE00014

* Discharge stopped (no flow), tied into POTW, or plant closed.
** Discharging stormwater only.
*** Entity has not submitted monthly operating reports to Ohio EPA.

5.1.3 Combined Sewer Overflows (CSOs), Sanitary Sewer Overflows (SSOs), and Plant Overflows and Bypasses in the Cuyahoga River Basin and Nearshore Area

Section 5.1.3 reports the numbers and locations of CSO/SSO/bypass discharges, the approximate volumes of discharges and typical discharge contaminant composition of the discharges for the two large metropolitan service areas in the RAP Study area, Cleveland and Akron. Other smaller municipalities may experience such discharges, but these have not yet been inventoried by the RAP.

Section 5.1.3.1 documents CSO/SSO/plant overflows and bypasses in the Northeast Ohio Regional Sewer District's (NEORSD) service area in Cleveland. Information from Akron is summarized in 5.1.3.2.

5.1.3.1 Northeast Ohio Regional Sewer District (NEORSD) Service Area

COMBINED SEWER OVERFLOWS

Typical contaminants of concern in combined sewer overflow (CSO) discharges include bacteria, floatable material, BOD and suspended solids. However, as combined sewers capture both sanitary sewage and stormwater runoff from a variety of residential, commercial and industrial establishments, many other pollutants can be found in the CSO discharge. The NEORSD CSO Facilities Plan Phase I study is currently sampling CSO discharges to determine pollutant loadings from CSOs. This sampling effort is scheduled to be complete in December, 1991.

Each CSO discharge is site-specific. Each reacts differently to a given rainfall event. To obtain information on the number, duration and volume of annual CSO occurrences in the NEORSD service area, long-term monitoring (i.e., eight months) at nearly 40 CSO discharge points is occurring in the Phase I study. Flow monitoring is scheduled for completion in December, 1991.

Another effort ongoing in the Phase I study is the inspection of all CSO outfall points in the NEORSD service area. Pertinent outfall information is being recorded, including location and size of each outfall. A complete listing of updated CSO outfall information will be available in 1992.

Table 5-5 lists the locations of CSOs in the NEORSD service area. Also indicated is the receiving stream to which the various CSOs discharge. There are 121 CSO locations. Approximately 60% of these flow to the Cuyahoga River. The remaining 40% flow to Lake Erie, either directly or via smaller tributaries.

Table 5-6 provides a summary of annual combined sewer overflow volumes in the NEORSD service area. These estimates were obtained through review of previous combined sewer system study reports. Estimates for the Northwest, Mill Creek, Southerly and Big Creek Interceptor areas may be conservative, due to the fact that CSO controls (i.e. automated regulator devices) were installed after these estimates were provided. The NEORSD's current Combined Sewer Overflow Facilities Plan Phase I Study will provide updated CSO annual volume estimates for entire NEORSD service area. These estimates will be available in 1992.

Table 5-7 provides a summary of pollutant concentrations discharged from CSOs in the NEORSD service area. Data reported in this table were obtained during the NEORSD Combined Sewer Overflow Facilities Plan Phase I Study from the period of May 6, 1991 - June 15, 1991. Updated CSO sampling data will be available throughout the study; with summary data available in early 1992. It is important to note that many pollutant parameters have been found to be below detection limits.

Table 5-7 also provides a summary of all contaminants (in CSO samples) which were analyzed for but were below detection levels. Sampling for these parameters will continue during 1991.

Table 5-8 provides a summary of the range of average pollutant concentrations found in CSOs in the NEORSD service area.

Confidence and Reliability of the Data

The CSO volume estimates which were discussed above are based on data from the late 1970s. Some improvements to the sewer system have been made, so there is limited confidence that these historical data reflect current conditions. CSO loading estimates are based on a partial data set of concentration data which is presented below. The concentration data is based on sampling done by NEORSD in 1991. The confidence in these data will increase significantly as the NEORSD CSO study is completed. Even so, CSOs are difficult to characterize because they are associated with transcient events.

CSO LOADING ESTIMATES

Using values presented in Table 5-8 and the CSO volume estimates provided in Table 5-6, annual CSO loadings estimates were calculated and are provided in Table 5-9. Loadings were not calculated for sulfide, total phenolics, volatile organic compounds, EPA 625 pesticides/PCBs, EPA 625 GC/MS acids, and EPA 625 base/neutral compounds, due to an insufficient number of samples.

SEPARATE SANITARY SEWER OVERFLOWS

Separate sanitary sewer overflows (SSOs) act much the same as combined sewer overflows. Contaminants of concern are similar to CSO discharges and each overflow reacts differently to rainfall events.

No set pattern exists which can be used to describe the number and duration of separate sanitary sewer overflow occurrences. Some overflows discharge during minimal rainfall events while others require very intense rainfall events to trigger the overflow. Similarly, the duration of an overflow event can range from only several minutes to many hours. Duration and volume of overflow is rainfall dependent.

The locations of separate sanitary sewer overflows in the Cuyahoga River Area of Concern (NEORSD service area) are listed in Table 5-10. Also indicated is information on size of overflow and the receiving water to which the various overflows discharge. There are 140 SSO locations. Roughly 75% of these drain to Lake Erie. The remaining 25% drain to the Cuyahoga River.

Analytical data regarding pollutant concentrations in SSOs were not available. However, a reasonable assumption can be made that pollutant types found in SSOs are comparable to those found in CSOs. Concentrations in SSOs are higher than those in CSOs. Annual volume estimates for SSOs in the NEORSD service area are not available. However, interceptor construction and community relief sewer/rehabilitation efforts are underway to control SSOs.

TABLE 5-5

Combined Sewer Overflows in Area of Concern (NEORSD Service Area)

Permit No.	Location	Receiving Water (refer to Figure 3-3 on page 3-7)
3PA00002001	Storm overflow @ Easterly	Lake Erie
3PA00002002	Storm overflow @ Westerly	Lake Erie
3PA00002007	7611 Bancraft	Mill Creek
3PA00002008	Rosewood Ave	Mill Creek
3PA00002009	7605 Vineyard	Mill Creek
3PA00002010	7608 Jefferies	Mill Creek
3PA00002011	7602 York	Mill Creek
3PA00002012	Connecticut Ave	Mill Creek
3PA00002013	7625 Maryland	Mill Creek
3PA00002014	Lawmar Ave	Mill Creek
3PA00002015	Force Ave	Mill Creek
3PA00002016	Goodman Ave	Mill Creek
3PA00002017	Dorver Ave	Mill Creek
3PA00002018	Miles Park @ Broadway	Mill Creek
3PA00002019	Warner @ Turney	Mill Creek
3PA00002020	Warner @ exit ramp from Broadway	Mill Creek
3PA00002021	Broadway @ East 49th St	Mill Creek
3PA00002022	East Blvd bridge @ Thornhurst	Mill Creek
3PA00002023	East Blvd bridge	Mill Creek
3PA00002024	East 131 north outfall @ Cranwood Park	Mill Creek
3PA00002025	East 131 south outfall @ Cranwood Park	Mill Creek
3PA00002026	East 131 southwest outfall @ Cranwood Park	Mill Creek
3PA00002027	East 154 @ Alonzo	Mill Creek
3PA00002028	East 173 @ Elmer in Kerruish Park	Mill Creek
3PA00002029	Lee @ Westview	Mill Creek
3PA00002030	East 88 @ South Highland	Mill Creek
3PA00002031	West Vista & Birchwood	Mill Creek
3PA00002032	Edgepark @ East 110	Mill Creek from Wolf Creek
3PA00002033	Harvard/Denison @ Ohio Canal	Cuyahoga River
3PA00002034	East 55 & Brow to Burke Brook	Cuyahoga River
3PA00002035	Burke Brook	Cuyahoga River
3PA00002036	Morgana Run	Cuyahoga River
3PA00002037	North of Morgana	Cuyahoga River
3PA00002038	East 26 & Independence	Cuyahoga River
3PA00002039	Dille & Independence	Cuyahoga River
3PA00002040	Kingsbury Run	Cuyahoga River
3PA00002043	Tarlton & West 15	Big Creek from Treadway Creek
3PA00002044	Irving & West 15	Big Creek from Treadway Creek
3PA00002045	Jennings & Valley	Big Creek
3PA00002049	Snyder & West 23	Big Creek
3PA00002050	West 25 Street bridge	Big Creek
3PA00002051	Mouth of triple culvert in zoo	Big Creek
3PA00002052	Middle of triple culvert in zoo	Big Creek
3PA00002053	West 57 & Ridgeview	Big Creek
3PA00002054	Ridge Road bridge	Big Creek

TABLE 5-5

Combined Sewer Overflows in Area of Concern (NEORSD Service Area)

Permit No.	Location	Receiving Water (refer to Figure 3-3 on page 3-7)
3PA00002055	Bellaire Road bridge	Big Creek
3PA00002056	Bellaire Road bridge	Big Creek
3PA00002057	I-71 east of Memphis	Big Creek Culvert
3PA00002058	West 114 & Pheony	West Branch of Big Creek
3PA00002059	Spring Road & Jennings	Spring Creek (trib to Cuyahoga between Big Creek and Mill Cr.)
3PA00002060	Big Creek emergency bypass off Van Epps	Cuyahoga River
3PA00002061	Cuyahoga River east of Denison	Cuyahoga River
3PA00002063	West 12 & Broadlawn	West Creek
3PA00002069	Edgewater Park West of Beach	Lake Erie
3PA00002070	Edgewater (N)east of Harborview	Lake Erie
3PA00002071	West 117 & Edgewater	Lake Erie
3PA00002072	West of East 77 & Finney	Mill Creek
3PA00002073	Giddings Brook culvert	Doan Brook (See Figure 3-4 on page 3-9)
3PA00002074	West of 45 St north of Denison Ave	Old Riverbed, Cuyahoga River
3PA00002075	River Rd & Elm St	Old Riverbed. Cuyahoga River
3PA00002076	Center St @ Cuyahoga River	Cuyahoga River
3PA00002077	Downstream of Columbus Rd (36" outfall)	Cuyahoga River
3PA00002078	Columbus Rd @ Cuyahoga River	Cuyahoga River
3PA00002079	24" Storm-Carter Rd @ Republic Nut Works	Cuyahoga River
3PA00002080	University & Scranton	Cuyahoga River
3PA00002081	Downstream of West 3rd	Cuyahoga River
3PA00002082	West 3rd @ Cuyahoga River	Cuyahoga River (south side)
3PA00002083	West 25th @ Big Creek	Big Creek (north side)
3PA00002084	South of intersection/West 66 & Barberton St	Big Creek from Barberton Creek.
3PA00002085	West 56th south of Denison	Big Creek from Barberton Creek.
3PA00002086	Mary St east of West 3rd St	Cuyahoga River
3PA00002087	Houston Ave @ Quigley	Cuyahoga River
3PA00002088	Jennings north of W & LE RR	Cuyahoga River (west side)
3PA00002089	East of West 3rd pump station	Cuyahoga River
3PA00002090	Superior St @ West 11th	Cuyahoga River
3PA00002091	West 11th & Main	Cuyahoga River
3PA00002092	Front & West 11th	Cuyahoga River
3PA00002093	North of Lakefront Stadium	Lake Erie
3PA00002094	North of East 12th & Lakeside	Lake Erie

TABLE 5-5

Combined Sewer Overflows in Area of Concern (NEORSD Service Area)

Permit No.	Location	Receiving Water (See Figure 3-4 on page 3-9)
3PA00002095	North of East 20th & Lakeside	Lake Erie
3PA00002096	North of East 26th & Lakeside	Lake Erie
3PA00002097	North of I-71 @ I-90	Lake Erie
3PA00002098	North of East 33rd & Lakeside	Lake Erie
3PA00002099	North of East 38th & King	Lake Erie
3PA00002100	North of East 40th & King	Lake Erie
3PA00002101	Forest City Yacht Club	Lake Erie
3PA00002102	East 55 & Lake Erie	Lake Erie
3PA00002103	East of East 55th	Lake Erie
3PA00002104	NW of East 72nd & Memorial Shoreway	Lake Erie
3PA00002105	North of East 88th & Carr	Lake Erie
3PA00002106	East 156 St, north of Lakeshore Blvd	Lake Erie
3PA00002107	NW of East 156 & Lakeshore Blvd	Lake Erie
3PA00002108	East of Neff Rd & East Park Drive	Lake Erie
3PA00002109	Lakeshore Blvd @ Euclid Creek	Euclid Creek, west side of stream
3PA00002110	St Clair @ Nottingham Rd	Euclid Creek
3PA00002111	East of Coit Rd & Kirby Rd	Nine Mile Creek
3PA00002112	Quilliams @ Bridgeview Rd	Nine Mile Creek east side of stream
3PA00002113	Opposite Lancaster & Belvoir	Nine Mile Creek
3PA00002114	Saranac Rd, along railroad tracks	Green Creek
3PA00002115	East of Wheelock & St Clair Ave	Doan Brook
3PA00002116	West of Parkgate & East Blvd	Doan Brook
3PA00002117	West of East Blvd & East 98th St	Doan Brook
3PA00002118	West of East Blvd & Superior	Doan Brook
3PA00002119	West of Superior St & East Blvd	Doan Brook
3PA00002120	West of Ashbury Rd & East Blvd	Doan Brook
3PA00002121	East 105th & Hough Ave	Doan Brook
3PA00002122	East 105th @ Doan Brook	Doan Brook
3PA00002123	North of East 107th & Parklane	Doan Brook
3PA00002124	North of East 107th & Parklane	Doan Brook
3PA00002125	East of Kemper Rd & Fairhill Rd	Doan Brook
3PA00002126	North of Fairhill & Coventry Rd	Doan Brook
3PA00002127	North of Woodland, between West & South Park	Doan Brook
3PA00002128	Lee Rd @ Doan Brook	Doan Brook
3PA00002129	Coventry Rd @ Doan Brook	Doan Brook
3PA00002130	Lakeshore Blvd @ Dugway Brook	Dugway Brook, West Branch
3PA00002131	Lakeshore Blvd @ Dugway Brook	Dugway Brook, East Branch
3PA00002132	East of Eddy Rd & Memorial Shoreway	Shaw Brook
3PA00002133	West 150th St @ Big Creek	Big Creek
3PA00002134	East 105th @ Doan Brook	Doan Brook
3PA00002135	West 3rd near Stones Levee	Cuyahoga River (east side)
3PA00002136	NE of Hough Ave & Ansel Rd	Doan Brook

TABLE 5-6 - COMBINED SEWER OVERFLOW ANNUAL VOLUME ESTIMATES
NEORSD SERVICE AREA

Location	Annual CSO Volumes (Million gallons)	Receiving Water
Easterly District*	3100	Lake Erie
Westerly District		Lake Erie
Walworth Run Area*	950	
Northwest Interceptor Area**	414	
	1364	
Southerly District		Cuyahoga River
Mill Creek Interceptor Area***	517	
Southerly Interceptor Area**	437	
Big Creek Interceptor Area**	493	
	1447	
TOTAL	5911	

* Estimates were obtained from 1978 Metcalf and Eddy reports on combined sewer overflows.

** Estimates were obtained from 1973/74 Watermation reports on combined sewer overflows.

*** Estimates were obtained from 1980 Dalton-Dalton-Newport Mill Creek Interceptor Facility Plan-Main Report.

TABLE 5-7

COMBINED SEWER OVERFLOW SAMPLING*
NEORSD SERVICE AREA

POLLUTANT	NUMBER OF SAMPLES	NUMBER OF-SAMPLES BELOW DETECTION LEVELS	NUMBER OF SAMPLES ABOVE DETECTION LEVELS	MAXIMUM VALUE	MINIMUM VALUE OR DETECTION LIMIT	MEAN OF SAMPLES ABOVE DETECTION LEVELS
Fecal Coli	159	5	154	9,000,000/100ml	<1000 /100ml	476,755 /100ml
Esch Coli	160	6	154	1,240,000/100ml	<1000 /100ml	251,626 /100ml
Sus. Solids	139	1	138	6060 mg/l	1 mg/l	528.200 mg/l
BOD-5 day	135	2	133	886 mg/l	9 mg/l	97.300 mg/l
NH3	139	8	134	14.1 mg/l	0.02 mg/l	3.370 mg/l
Tot P	137	8	129	14.4 mg/l	0.1 mg/l	2.840 mg/l
Cadmium	141	133	8	0.3 mg/l	0.01 mg/l	0.276 mg/l
Copper	140	12	128	2.09 mg/l	0.015 mg/l	0.148 mg/l
Zinc	141	1	140	2.524 mg/l	0.02 mg/l	0.405 mg/l
Iron	140	0	140	105.6 mg/l	0.42** mg/l	11.305 mg/l
Nickel	141	102	39	0.74 mg/l	0.03 mg/l	0.074 mg/l
Lead	140	10	130	1.653 mg/l	0.03 mg/l	0.199 mg/l
Chromium	141	74	67	0.78 mg/l	0.015 mg/l	0.081 mg/l
pH	138	0	138	8.86 S.U.	6.53**	7.140
Sulfide	2	1	1	0.12 mg/l	0.02 mg/l	0.120 mg/l
Tot Phenolics***	52	15	37	0.266 mg/l	0.013 mg/l	0.061

* Sampling data was obtained from NEORSD CSO Study May 6 - June 15, 1991.

** The values for iron and pH are the minimum value reported during analysis. All other minimum values represent detection limits.

*** Sampling data was obtained from NEORSD CSO Study May 6 - October 12, 1991.

S.U. = Standard Units

TABLE 5-7

COMBINED SEWER OVERFLOW SAMPLING
NEORSD SERVICE AREA

The following contaminants were analyzed for and were below detection levels:

VOLATILE ORGANIC COMPONENTS

Benzene
Carbon Tetrachloride
Chlorobenzene
Chlorethane
2-Chloroethyvinyl
Dichlorobromomethane
1,1-Dichlorethane
1,2-Dichlorethane
1,1-Dichlorethylene
1,2-Dichloropropane
1,3-Dichloropropylene
Methyl Bromide
Methyl Chloride
Methylene Chloride
1,1,2,2,-Tetrachlolroethane
Tetrachloroethylene
1,2-trans-Dichloroethylene
1,1,2-Trichlorethane
Trichloroethylene
Vinyl Choride
Trichlorofluoremethane
Acrolein
Acrylonitrile
Chlorodibromomethane
Bis(chloromethyl)ether

EPA 625 PESTICIDES/PCBS

Aldrin
Alpha-BHC
Beta-BHC
Gamma-BHC
Delta-BHC
Chlordane
4,4'-DDT
4,4'-DDE
4,4'-DDD
Dieldrin
Alpha-endosulfan
Beta-endosulfan
Endosulfan sulfate
Endrin
Endrin Aldehyde
Heptachlor
Heptachlor epoxide
PCB-1221
PCB-1232
PCB-1248
PCB-1260
PCB-1016
Toxaphene
Methoxychlor
Cyanide

EPA 625 GC/MS ACIDS

2-Chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
4,6-Dinitro-o-cresol
2,4-dinitrophinol
2-nitrophenol
4-nitrophenol
p-chloro-m-cresol
pentachlorophenol
phenol
2,4,6-Trichlorophenol

EPA 625 BASE/NEUTRAL COMPOUNDS

Acenaphthene
Acenaphthylene
Anthracene
benzidine
benzo(a)anthracene
Benzo(a)pyrene
3,4-benzofluoranthene
benzo(ghi)perylene
benzo(k)fluornathene
bis(2-Chloroethoxy)methane
bis(2-Chloroethyl)ether
bis(2-ethylhexyl)phthalate
4-Bromophenyl phenyl ether
butylbenzyl phthalate
2-chloronaphthalene
4-Chlorophenyl phenyl ether
Chrysene
Dibenzo(a,h,)anthracene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3-dichlorobenzidine
Diethyl phthalate
dimethly phthalate
di-n-butyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
di-n-octyl phthalate
1,2 Diphenylhydrazine
Fluoranthene
Flourene
hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
indeno (1,2,3-cd)pyrene
isophorone
naphthalene
Nithrbenzene
n-nitrosodimethylamine
n-nitrosodi-n-propylamine
n-nitrosodi-n-propylamine
phenanthrene
pyrene
1,2,4-trichlorobenzene

Based on recent sampling (May 6-October 12, 1991) the following pollutants were found only once or twice above detection levels:

Ethylbenze (1 out of 52 samples was above detection levels)
Toluene (1 out of 52 samples was above detection levels)
Bromoform (2 out of 52 samples were above detection levels)
Chloroform (2 out of 52 samples were above detection levels)
Total Cyanide (1 out of 52 samples was above detection levels)
1,1,1-Trichloroethane (1 out of 52 samples was above detection levels)

Table 5-8 CSO Concentration Data
NEORSD Service Area

POLLUTANT	AVERAGE POLLUTANT CONCENTRATIONS (mg/l)* Minimum	Mean	Maximum
Susp. Solids	524.40	524.40	524.41
BOD-5 day	95.86	95.93	95.99
NH3	3.25	3.25	3.25
Tot P	2.67	2.68	2.68
Cadmium	0.02	0.02	0.03
Copper	0.14	0.14	0.14
Zinc	0.40	0.40	0.40
Iron	11.31	11.31	11.31
Nickel	0.02	0.03	0.04
Lead	0.18	0.19	0.19
Chromium	0.04	0.04	0.05

* Sampling results indicate that various pollutant parameters have been found to be in concentrations less than the detection limit. All values, including those below detection, were utilized when pollutant concentrations were calculated. The "minimum","mean", and "maximum" average pollutant concentrations were obtained by assigning a value of zero, half the detection limit and the detection limit, respectively, to any results below detection.

* Summer 1991 Preliminary Results

Table 5-9

Annual Loading Calculation- NEORSD Service Area

ANNUAL CSO LOADINGS (kg)**

POLLUTANT	Southerly District Min	Mean	Max
Sus. Solids	2872083.74	2872103.44	2872123.14
BOD-5 day	525007.04	525372.17	525737.29
NH3	17793.21	17795.18	17797.15
Tot P	14646.10	14662.09	14678.08
Cadmium	85.77	111.60	137.43
Copper	741.10	744.62	748.14
Zinc	2202.41	2202.80	2203.19
Iron	61916.30	61916.30	61916.30
Nickel	112.10	171.53	230.96
Lead	1012.05	1017.92	1023.79
Chromium	210.80	232.36	253.92

	Easterly District Min	Mean	Max
Sus. Solids	6153047.40	6153089.61	6153131.81
BOD-5 day	1124755.93	1125538.16	1126320.39
NH3	38119.52	38123.75	38127.97
Tot P	31377.26	31411.52	31445.78
Cadmium	183.74	239.08	294.42
Copper	1587.71	1595.25	1602.80
Zinc	4718.36	4719.20	4720.03
Iron	132647.22	132647.22	132647.22
Nickel	240.16	367.48	494.80
Lead	2168.18	2180.75	2193.33
Chromium	451.61	497.80	543.99

	Westerly District Min	Mean	Max
Sus. Solids	2707340.86	2707359.43	2707378.00
BOD-5 day	494892.61	495236.79	495580.97
NH3	16772.59	16774.45	16776.31
Tot P	13806.00	13821.07	13836.14
Cadmium	80.85	105.20	129.54
Copper	698.59	701.91	705.23
Zinc	2076.08	2076.45	2076.81
Iron	58364.78	58364.78	58364.78
Nickel	105.67	161.69	217.71
Lead	954.00	959.53	965.06
Chromium	198.71	219.03	239.35

** Loadings were calculated using annual CSO volume estimates from 1973/74, 1978 and 1980. provided in Table 5.6. Loading were not calculated for sulfide, pH, total phenolics, volatile organic compounds, EPA 625 pesticides/pcbs, EPA 625 GC/MS acids or EPA 625 base/neutral compounds. Concentration data were obtained in 1991 and reported in Table 5-8.

Table 5-9 con't Annual CSO Loading Calculation
NEORSD Service Area

POLLUTANT	TOTAL CSO LOADING (KG) Min	Mean	Max
Sus. Solids	11732471.99	11732552.47	11732632.95
BOD-5 day	2144655.58	2146147.12	2147638.66
NH3	72685.33	72693.37	72701.42
Tot P	59829.36	59894.68	59960.00
Cadmium	350.35	455.87	561.39
Copper	3027.40	3041.79	3056.17
Zinc	8996.86	8998.44	9000.03
Iron	252928.29	252928.29	252928.29
Nickel	457.94	700.71	943.48
Lead	4134.24	4158.21	4182.18
Chromium	861.13	949.19	1037.26

TABLE 5-10

NEORSD SEPARATE SANITARY SEWER OVERFLOW INVENTORY
SEPARATE SEWERS TRIBUTARY TO THE EASTERLY WWTP

OVERFLOW TYPE
LEGEND

1 WEIR-SIDE OR PERPEND
2 HIGH LEVEL RELIEF
3 BOOTLEG BYPASS
4 PUMP STATION

COMMUNITY	NAME-NUMBER	INTERSECTION OR STREET ADDRESS	OVERFLOW TYPE	OVERFLOW OUTLET SIZE	RECEIVING WATER (see Figure 3-4 on page 3-9)
CLEVELAND	OF2	QUILLIANS AND BRIDGEVIEW: 350 FT N.	2	10 INCHES	9 MILE CR
CLEVELAND	OF3	2352 BELVOIR	2	24 INCHES	9 MILE C
CLEVELAND	OF4	NOBLE/E152	2	12 INCHES	DOAN BRK
CLEVELAND HEIGHTS	C2X1	FAIRMOUNT/COVENTRY	1		DOAN BRK
CLEVELAND HEIGHTS	C2X2	FAIRMOUNT/COVENTRY	1		DOAN BRK
CLEVELAND HEIGHTS	C2AX	N.PARK/COVENTRY	1	8 INCHES	DOAN BRK
CLEVELAND HEIGHTS	B2X	FAIRMOUNT/FAIRFAX	1		DOAN BRK
CLEVELAND HEIGHTS	5	FAIRFAX/N.PARK	1		DOAN BRK
CLEVELAND HEIGHTS	C2X3	FAIRMOUNT/MARLBORO	1		DOAN BRK
CLEVELAND HEIGHTS	C2X4	FAIRMOUNT/ARLINGTON	2	15 INCHES	DOAN BRK
CLEVELAND HEIGHTS	C2X5	N.SIDE FAIRMOUNT/N.WOODLAND	1		DOAN BRK
CLEVELAND HEIGHTS	C3X	S.SIDE FAIRMOUNT/N.WOODLAND	1		DOAN BRK
CLEVELAND HEIGHTS	10	3012 N.WOODLAND	2		DOAN BRK
CLEVELAND HEIGHTS	D4X	FAIRMOUNT/WELLINGTON	1		DOAN BRK
CLEVELAND HEIGHTS	F6X	FAIRMOUNT/DARTMOOR	1		DOAN BRK
CLEVELAND HEIGHTS	P12X	FAIRMOUNT/S.FAIRMOUNT	2		DOAN BRK
CLEVELAND HEIGHTS	S14X	FAIRMOUNT/S.FAIRMOUNT	2		DOAN BRK
CLEVELAND HEIGHTS	R13X	FAIRMOUNT/S.FAIRMOUNT	1		DOAN BRK
CLEVELAND HEIGHTS	E5X	FAIRMOUNT/LEE	2	12 INCHES	DOAN BRK
CLEVELAND HEIGHTS	C17	MONMOUTH E. OF DARTMOOR	1		DOAN BRK
CLEVELAND HEIGHTS	G17X	BRADFORD/LEE	1		DOAN BRK
CLEVELAND HEIGHTS	M1X	HAMPSHIRE/MAYFIELD	1		DUGWY BRK
CLEVELAND HEIGHTS	M1X	HAMPSHIRE/MAYFIELD	1		DUGWY BRK
CLEVELAND HEIGHTS	M2LX	LEE/SUPERIOR	1		DUGWY BRK
CLEVELAND HEIGHTS	CH1X	CEDAR/BELLEFIELD	2	15 INCHES	DUGWY BRK
CLEVELAND HEIGHTS	H8X	HAMPSHIRE/EUCLID HEIGHTS	2	18 INCHES	DUGWY BRK
CLEVELAND HEIGHTS	24	CEDAR BTW. FAIRMOUNT AND DEMINGTON	2		DUGWY BRK
CLEVELAND HEIGHTS	CH2X	CEDAR/GRANDVIEW	2		DUGWY BRK
CLEVELAND HEIGHTS	CH9X	DERBYSHIRE/EUCLID HEIGHTS	1		DUGWY BRK
CLEVELAND HEIGHTS	L10X	COVENTRY/CEDAR	1		DUGWY BRK
CLEVELAND HEIGHTS	28	ST JAMES/DEMINGTON	2		DOAN BRK
CLEVELAND HEIGHTS	29	1685 CUMBERLAND	2		DUGWY BRK
CLEVELAND HEIGHTS	30	S.COMPTON/BLANCHE	2		DUGWY BRK
CLEVELAND HEIGHTS	31	CUMMINGS/GROSVENOR	2		DUGWY BRK
CLEVELAND HEIGHTS	E1FX	OAKHILL/NORTHVALE	2	12 INCHES	9 MILE CRK
CLEVELAND HEIGHTS	OF1	2225 NOBLE ROAD		18 INCHES	9 MILE CRK
CLEVELAND HEIGHTS	CH3X	CEDAR BTW. FAIRMOUNT AND DEMINGTON			DOAN BROOK
CLEVELAND HEIGHTS	C2A	FAIRMOUNT S. OF SCARBOROUGH			DOAN BROOK
CLEVELAND HEIGHTS	63	COVENTRY S. OF FAIRMOUNT			DOAN BROOK

TABLE 5-10

NEORSD SEPARATE SANITARY SEWER OVERFLOW INVENTORY
SEPARATE SEWERS TRIBUTARY TO THE EASTERLY WWTP

OVERFLOW TYPE
LEGEND

1 WEIR-SIDE OR PERPEND
2 HIGH LEVEL RELIEF
3 BOOTLEG BYPASS
4 PUMP STATION

COMMUNITY	NAME-NUMBER	INTERSECTION OR STREET ADDRESS	OVERFLOW TYPE	OVERFLOW OUTLET SIZE	RECEIVING WATER (refer to Figure 3-4 on page 39)
CLEVELAND HEIGHTS	DV13	EAST OVERLOOK AT EDGEHILL	1	60 INCHES	DOAN BROOK
CLEVELAND HEIGHTS	DV15	2330 EUCLID HTS. BLVD.	1	20 INCHES	DOAN BROOK
CLEVELAND HEIGHTS	DV16	CEDAR AT SOUTH OVERLOOK	1	24 INCHES	DOAN BROOK
CLEVELAND HEIGHTS	DV28	12537 CEDAR RD.	1	24 INCHES	DOAN BROOK
CLEVELAND HEIGHTS	DV32	SIDEWALK, FAIRMOUNT AT FAIRFAX	1	42 INCHES	DOAN BROOK
CLEVELAND HEIGHTS	DV36	FAIRMOUNT BTW. STRATFORD AND WELLING	1	54 INCHES	DOAN BROOK
EAST CLEVELAND	OF6	RAVINE S. OF DEANWOOD	2	8 INCHES	9 MILE CRK
EAST CLEVELAND	OF8	CALEDONIA/DEANWOOD	2	15 INCHES	9 MILE CRK
EAST CLEVELAND	I5	NOBLE AT TERRACE	1		9 MILE CRK
EAST CLEVELAND	I6	NELACREST AT NOBLE	2	15 INCHES	9 MILE CRK
EAST CLEVELAND	I5X	NELAVIEW AT NELA CT.	1	8 INCHES	9 MILE CRK
EAST CLEVELAND	I6X	NELMSDALE AT NELA CT.	2	8 INCHES	9 MILE CRK
HIGHLAND HEIGHTS	PS1	WILLIAMSBURG P.S.	4		EUCLID CR
HIGHLAND HEIGHTS	PS2	FRANKLIN P.S.	4		EUCLID CR
LYNDHURST	OF1	RICHMOND N. OF RIDGEBURY	2	24 INCHES	EUCLID CR
LYNDHURST	OF2	5136 MAYFIELD	2	12 INCHES	EUCLID CR
LYNDHURST	OF3	1547 EDGEFIELD	2	7 INCHES	EUCLID CR
MAYFIELD VILLAGE	PS2	MT. VERNON P.S.	4		BEECHERS B (Chagrin River basin)
MAYFIELD HEIGHTS	1	RIDGEBURY/CRANBROOK	2		EUCLID CR
MAYFIELD HEIGHTS	2	RIDGEBURY/CRANBROOK	2		EUCLID CR
RICHMOND HEIGHTS	PS1	RICHMOND MALL P.S.	4		EUCLID CR
RICHMOND HEIGHTS	PS2	RICHMOND WHITE P.S.	4		EUCLID CR
SHAKER HEIGHTS	S1X1	SHAKER/LEE	2	24 INCHES	DOAN BRK
SHAKER HEIGHTS	S1X2	SHAKER/LEE	2	12 INCHES	DOAN BRK
SHAKER HEIGHTS	S1HX	S.PARK/LEE	2	12 INCHES	DOAN BRK
SHAKER HEIGHTS	V1BX	SOUTHINGTON/HUNTINGTIN	2	8 INCHES	DOAN BROOK
SHAKER HEIGHTS	6	ASHBY/VAN AKEN	1	12 INCHES	KINGSBURY
SHAKER HEIGHTS	VA9	INGLESIDE/FERNWAY	2	12 INCHES	DOAN BRK
SHAKER HEIGHTS	11	LOMOND/LYNNFIELD	2	15 INCHES	KINGSBURY
SHAKER HEIGHTS	DV45	S. WOODLAND AT WEST PARK	1	36 INCHES	DOAN BROOK
SOUTH EUCLID	OF4	S. BELVOIR/LANCASTER	1	42 INCHES	9 MILE C
SOUTH EUCLID	OF5	LIBERTY/EUCLID CREEK	2	12 INCHES	EUCLID CR
SOUTH EUCLID	OF6	BROOKLINE/RUGBY	2	8 INCHES	9 MILE CRK
SOUTH EUCLID	OF7	4715 COTTAGE	2	12 INCHES	EUCLID CR
SOUTH EUCLID	BP1	QUILLIANS/PRINCETON	3	8"X6"	9 MILE CRK
SOUTH EUCLID	BP2	QUILLIANS/MERRYMOUND	3	3 INCHES	9 MILE CRK
SOUTH EUCLID	BP3	3783 MERRYMOUND	3		9 MILE CRK
SOUTH EUCLID	BP4	LANCASTER/GREENVALE	3		9 MILE CRK

TABLE 5-10

NEORSD SEPARATE SANITARY SEWER OVERFLOW INVENTORY
SEPARATE SEWERS TRIBUTARY TO THE EASTERLY WWTP

OVERFLOW TYPE
LEGEND

1 WEIR-SIDE OR PERPEND
2 HIGH LEVEL RELIEF
3 BOOTLEG BYPASS
4 PUMP STATION

COMMUNITY	NAME-NUMBER	INTERSECTION OR STREET ADDRESS	OVERFLOW TYPE	OVERFLOW OUTLET SIZE	RECEIVING WATER (see Figure 3-4 on page 3-9)
SOUTH EUCLID	BP5	4780 ANDERSON	3	12"X6"	EUCLID CR
SOUTH EUCLID	BP6	14435 CEDAR	3	6 INCHES	9 MILE CRK
SOUTH EUCLID	BP7	NEAR ANDERSON/E.GREEN	3	12 INCHES	EUCLID CR
SOUTH EUCLID	BP8	1050 ARGONNE	3		9 MILE CRK
SOUTH EUCLID	BP9	1062 AVONDALE	3		9 MILE CRK
SOUTH EUCLID	BP10	1039 WINSTON	3	3 INCHES	9 MILE CRK
SOUTH EUCLID	BP11	1062 WINSTON	3	4"X2"	9 MILE CRK
SOUTH EUCLID	BP12	1106 PLAINFIELD	3	10"X8"	9 MILE CRK
SOUTH EUCLID	BP13	S. BELVOIR/ELMWOOD	3	8 INCHES	9 MILE CRK
SOUTH EUCLID	BP14	1228 S. BELVOIR	3	8 INCHES	9 MILE CRK
SOUTH EUCLID	BP15	S.BELVOIR/ARDMORE	3	8 INCHES	9 MILE CRK
SOUTH EUCLID	BP16	S. BELVOIR/PRASSE	3	10 INCHES	9 MILE CRK
SOUTH EUCLID	BP17	1372 S. BELVOIR	3	8 INCHES	9 MILE CRK
SOUTH EUCLID	BP18	S. BELVOIR/BELVOIR MEWS	3	8 INCHES	9 MILE CRK
SOUTH EUCLID	BP19	FRANCIS CT FIRST MH S. OF PRASSE	3	4 INCHES	9 MILE CRK
SOUTH EUCLID	BP20	SHERBROOK FIRST MH S. OF MAYFIELD	3	12 INCHES	9 MILE CRK
SOUTH EUCLID	BP21	MIRAMAR/HINSDALE	3	10 INCHES	9 MILE CRK
SOUTH EUCLID	BP22	MIRAMAR/BAYARD	3	10 INCHES	9 MILE CRK
SOUTH EUCLID	BP23	MIRAMAR/STONEHAVEN	3	10 INCHES	9 MILE CRK
SOUTH EUCLID	BP24	MIRAMAR FIRST MH N. OF WILMINGTON	3	10 INCHES	9 MILE CRK
SOUTH EUCLID	BP25	1956 S. BELVOIR	3	8 INCHES	9 MILE CRK
SOUTH EUCLID	BP26	S. BELVOIR/ACACIA	3	15"X12"	9 MILE CRK
SOUTH EUCLID	BP27	S. GREEN/TEMBLETT	3	6 INCHES	9 MILE CRK
SOUTH EUCLID	BP28	1396 PLAINFIELD	3	6 INCHES	9 MILE CRK
SOUTH EUCLID	BP29	4330 ELMWOOD	3		EUCLID CR
UNIVERSITY HTS.	32	MEADOWBROOK/CANTERBURY	2	12"X12"	DUGWY BRK
UNIVERSITY HTS.	2	3694 WASHINGTON	2	12 INCHES	DUGWY BRK

TABLE 5-10

NEORSD SEPARATE SANITARY SEWER OVERFLOW INVENTORY
SEPARATE SEWERS TRIBUTARY TO THE SOUTHERLY WWTP

OVERFLOW TYPE
LEGEND

1 WEIR-SIDE OR PERPEND
2 HIGH LEVEL RELIEF
3 BOOTLEG BYPASS
4 PUMP STATION

COMMUNITY	NAME/NUMBER	INTERSECTION OR STREET ADDRESS	OVERFLOW TYPE	STORMWATER OUTLET SIZE	RECEIVING WATER (see Figure 3-3 on page 3-7)
BROOK PRK	BP1	DONALD/MIDDLEBROOK	2	15 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP2	HAVENDALE/MIDDLEBROOK	N/A		TRIB OF BIG CREEK
BROOK PRK	BP3	MIDDLEBROOK 150 FT S. OF BROOKHAVEN	2	15 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP4	PICKWAY/FAYETTE	2	15 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP5	SMITH 150 FT S. OF HOCKING	2	18 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP6	SMITH 110 FT N. OF HARRISON	2	21 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP7	SMITH 400 FT N. OF ELM	2	36 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP8	ALVIN/CYNTHIA	2		TRIB OF BIG CREEK
BROOK PRK	BP9	ROBERT 50 FT S. OF CYNTHIA	2	12 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP10	ROBERT 50 FT S. OF SHELBY	2	18 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP11	SHELBY 50 FT SW. OF ROBERT	2	12 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP12	BOWFIN/FRY	2		TRIB OF BIG CREEK
BROOK PRK	BP13	REMORA/FRY	2	24 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP14	NW CORNER WEDGEWOOD/SHELDON	4	10 INCHES	TRIB OF BIG CREEK
BROOK PRK	BP16	FRY-HUMMEL P.S.	4	24 INCHES	TRIB OF BIG CREEK
BROOKLYN	PS1	TIEDEMAN RD P.S.	4	8 INCHES	TRIB OF BIG CREEK
BROOKLYN	Y113	RIDGE/W.66		8 INCHES	TRIB OF BIG CREEK
BROOKLYN	5	TAUNTON/S.PARKSIDE		8 INCHES	TRIB OF BIG CREEK
BROOKLYN	4	250 FT E. OF EAST END MANOA DRIVE	4		BIG CREEK
MAPLE HTS	MC46	MAPLE HTS BL/BROADWAY	1		MILL CREEK
NORTHFIELD	1	BIRCH AVENUE		8 INCHES	TRIB OF CUYAHOGA
NORTHFIELD	2	SUNSET AVENUE		8 INCHES	TRIB OF CUYAHOGA
NORTHFIELD	PS1	LINCOLN NEAR SAGAMORE	4	10 INCHES	TRIB OF CUYAHOGA
NORTHFIELD	PS2	LOWRIE NEAR VORDERMAN	4	8 INCHES	TRIB OF CUYAHOGA
NORTHFIELD	PS3	ELM NEAR SUMMIT	4	8 INCHES	TRIB OF CUYAHOGA
PARMA	X117	BROADVIEW 600 FT N. OF BROADROCK	2		TRIB OF BIG CREEK
PARMA	X119	BROADVIEW 600 FT N. OF BROAD ROCK	2		TRIB OF BIG CREEK
PARMA	Y111	W 54/LUELDA	2	10 INCHES	TRIB OF BIG CREEK
PARMA	Z91	EDGEHILL/PARKLAND	2		TRIB OF BIG CREEK
PARMA	8	RUSSEL 1300 FT W. OF STATE	2	10 INCHES	TRIB OF BIG CREEK
PARMA	10	BELMERE/MANCHESTER	2	10 INCHES	TRIB OF BIG CREEK
PARMA	14	BIG CREEK PKWY/PINEGROVE	2	8 INCHES	TRIB OF BIG CREEK
PARMA	34	BROOKPARK/STATE	2	12 INCHES	TRIB OF BIG CREEK
PARMA	XYZ1	BISCAYNE 550 FT S. OF HOPHAVEN	2	10 INCHES	TRIB OF BIG CREEK
PARMA	XYZ2	STATE/BROOKPARK	2		TRIB OF BIG CREEK
PARMA	XYZ3	BIG CREEK PKWY 450 FT S. OF OAKDALE	1		TRIB OF BIG CREEK

WASTEWATER TREATMENT PLANT OVERFLOWS AND BYPASSES

The NEORSD operates three major wastewater treatment plants within the Cuyahoga River Area of Concern. These plants are the Easterly and Westerly which directly discharge to Lake Erie near the Southerly Wastewater Treatment Plant which discharges to the Cuyahoga River. Overflows and bypasses can occur at wastewater treatment plants. Overflows occur whenever the treatment plants' hydraulic capacity is exceeded. A bypass refers to the intentional diversion of waste streams from any portion of the treatment plant. A brief summary of each plant's reported overflows and bypasses are provided in the following discussion:

<u>Easterly Wastewater Treatment Plant</u>: Flows in excess of plant wet-weather capacity are diverted to Lake Erie without treatment. This overflow is included on the District's Ohio EPA CSO NPDES Permit. Monitoring and sampling of this overflow is performed by the NEORSD, with results reported to Ohio EPA. Plant bypasses can occur if major equipment malfunctions occur. During 1989, no plant bypasses were reported. Table 5-11a is a summary of 1989 reported data:

<u>Table 5-11a Easterly 1989 Overflow Information</u>

* Total Number of overflows -	45
Duration of overflows	- 1.0 - 15.08 hrs.
Overflow flows	- 1.03 - 55.95 mgd
Dissolved oxygen	- 2.9 - 12.8 mg/l
Suspended solids	- 67 - 1228 mg/l
BOD	- 12 - 390 mg/l

* <u>NOTE</u>: More than one overflow can occur on a given date.

In 1990 and 1991 Easterly had had 83 overflows.

<u>Southerly Wastewater Treatment Plant</u>: In extremely high flow situations flows can be bypassed after primary treatment. Bypass flows are discharged to the Cuyahoga River. Monitoring and sampling of this bypass is performed by the NEORSD, with results reported to Ohio EPA. Table 5-11b is a summary of 1989 reported data:

<u>Table 5-11b Southerly 1989 Bypass Information</u>

Total number of bypasses	- 1
Duration of bypasses	- 1.30 hrs.
Bypass flows	- 4.6 mgd
Suspended solids	- 98 mg/l
BOD	- 22 mg/l

In 1990 Southerly had 7 bypasses, receiving primary treatment only. In 1991 to date, Southerly has had only 1 bypass.

Westerly Wastewater Treatment Plant: Flows in excess of plant wet-weather capacity are first diverted to a Combined Sewer Overflow Treatment Facility (CSOTF) for storage and subsequent treatment. Six million gallons of storage volume is available in the CSOTF tanks and an additional six million gallons of in-line storage capacity is available in the NEORSD's Northwest Interceptor which flows to CSOTF. After available storage capacity is consumed, excess flows are diverted to Lake Erie without treatment. During 1989, the CSOTF facility was inoperable due to mechanical problems. The CSOTF facility was placed back into service in early 1991. This plant overflow is included on the District's Ohio EPA CSO NPDES Permit. Monitoring and sampling of this overflow is performed by the NEORSD, with results reported to Ohio EPA. Additionally, a bypass of the plant's carbon adsorption units and pressure filters is possible. Due to mechanical problems, the carbon adsorption process was discontinued in March 1989. Redesign of the Westerly Wastewater Treatment Plant to a trickling filter/solid contact process is ongoing. A summary of 1989 reported overflow data is provided in Table 5-11c.

Table 5-11c Westerly 1989 Overflow Information

* Total number of overflows	-	97		
Duration of overflows	-	0.5	-	24 hrs.
Overflow flows	-	0.02	-	192 mgd
Dissolved oxygen	-	0.5	-	7.8 mg/l
Suspended solids	-	12	-	5332 mg/l
BOD	-	12	-	445 mg/l

* NOTE: More than one overflow can occur on a given date.

In 1990 and 1991 Westerly has had 3 overflows or bypasses.

5.1.3.2 Akron Public Utilities Bureau Service Area

CSOs

There are 36 CSOs in the Akron Service Area. Table 5-12a reports the location and receiving stream of these CSOs. Table 5-12b describes each of these CSOs. Table 5-12c reports the number of overflow occurrences, and duration and volume of overflows. Table 5-12d reports the industries upstream of CSOs and the metals that each is permitted to discharge to the Akron WWTP.

SSOs

There are 8 SSOs in the Akron Service Area within the watershed which remain open. These are listed in Table 5-12e. Table 5-12f reports the number of overflow incidents and the duration of each SSO.

PUBLIC UTILITIES BUREAU STREAM MONITORING DATA

Table 5-12g reports stream monitoring data from recent overflows. Data reported are from grab samples taken at the time of overflows. The parameters sampled are listed across the top of the table. Three sites have been routinely sampled after rainfall events. These are in the first column. Ohio Canal at Cedar Street is upstream from all overflows in the Akron area. sampled. Ohio Canal at Lock 15 is downstream of many major CSOs. The Little Cuyahoga at Otto Street site is downstream of the confluence of Ohio Canal and several more CSOs. The Akron WWTP effluent does not affect any of these sites.

PLANT BYPASSES

Figure 5-2 shows the decline in volume of raw sewage bypasses at the Akron WWTP. There have been no bypasses to date in 1991.

Table 5-12a

Combined Sewer Overflows (CSO)
Area of Concern
(Akron Service Area)

OEPA Permit Number	Location	Combined Sewer *Rack No.	Receiving Stream
3PF00000 046	South Arlington Street District	3	Little Cuyahoga River
3PF00000 047	Mill Street	4	Ohio Canal
3PF00000 048	River Street	5	Little Cuyahoga River
3PF00000 049	Factory Street	6	Little Cuyahoga River
3PF00000 050	Case Avenue	7	Little Cuyahoga River
3PF00000 051	North Case Avenue and Dublin Street	8	Little Cuyahoga River
3PF00000 052	Kent Street and Williams Street	9	Little Cuyahoga River
3PF00000 053	Case Avenue and Newton Street District	10	Little Cuyahoga River
3PF00000 054	Hazel Street Trunk District 4	11	Little Cuyahoga River
3PF00000 055	Home Avenue District	12	Little Cuyahoga River
3PF00000 056	Maderia Street	13	Little Cuyahoga River
3PF00000 057	North Forge Street	14	Little Cuyahoga River
3PF00000 058	Forest Hill District	15	Little Cuyahoga River
3PF00000 059	Wolf Ledges Trunk	16	Ohio Canal
3PF00000 060	West Exchange Street	17	Ohio Canal
3PF00000 061	Willow Run Trunk	18	Ohio Canal
3PF00000 062	West Market Street	19	Ohio Canal
3PF00000 063	West North Street	20	Ohio Canal
3PF00000 064	North Howard Street	21	Little Cuyahoga River
3PF00000 065	North Hill Trunk	22	Little Cuyahoga River
3PF00000 066	North Maple Street	23	Little Cuyahoga River
3PF00000 067	West Market Street Outlet	24	Little Cuyahoga River
3PF00000 068	Otto Street	25	Little Cuyahoga River
3PF00000 069	Aqueduct Street Outlet	26	Little Cuyahoga River
3PF00000 070	Uhler Avenue	27	Little Cuyahoga River
3PF00000 071	Tallmadge Avenue (Memorial Parkway)	28	Little Cuyahoga River
3PF00000 072	Uhler Avenue Carpenter Street Outlet	29	Little Cuyahoga River
3PF00000 073	Cuyahoga Street and Peck Road	30	Little Cuyahoga River
3PF00000 074	Portage Sunnyside District	31	Little Cuyahoga River
3PF00000 075	Carpenter Heights District	32	Cuyahoga River
3PF00000 076	Northside Interceptor	33	Cuyahoga River
3PF00000 077	Riverside Boulevard District	34	Cuyahoga River
3PF00000 078	Gorge Boulevard District	35	Cuyahoga River
3PF00000 079	Merriman Road Outlet	36	Cuyahoga River
3PF00000 080	Bowery Street	37	Ohio Canal
3PF00000 082	Mill Street (currently shown as 047)		

*** RACK –** ***an in line cleaning device such as a bar screen; the rack number, in this instance, serves to locate the point of overflow.***

City of Akron, PUB, USD
Industrial Pretreatment Program / January 1992
tbl513a

Table 5-12b

Combined Sewer Overflows (CSO)
Description
(Akron Service Area)

OEPA Permit No.	Rack No.	Sanitary Pipe Size (inch) CS		SAN	Interceptor Pipe Size (inch)	Overflow Pipe Size (inch)	Overflow Pipe Initial Slope (%)	Overflow Type	Estimated Drainage Area (acres)
046	3	78	to	24	60	78	0.8	rack-vertical drop	337
047	4	60	to	15	15	60	8.1	rack-vertical drop	99
048	5	48	to	12	57	57	3.6	rack-vertical drop	32
049	6	36	to	12	57	36	1.5	rack-vertical drop	112
050	7	48	to	12	57	48	2.8	rack-vertical drop	95
051	8	36	to	15	60	36	2.6	rack-vertical drop	46
052	9	20	to	8	60	20	5.9	rack-vertical drop	20
053	10	63	to	15	57	63	0.8	rack-vertical drop	215
054	11	102	to	18	63	102	0.8	rack-vertical drop	412
055	12	120	to	24	30	120	0.9	rack-vertical drop	969
056	13	30	to	12	54	30	3.0	rack-vertical drop	72
057	14	48	to	12	12	48	3.6	rack-vertical drop	240
058	15	54	to	12	54	54	1.8	rack-vertical drop	232
059	16	96	to	30	30	96	0.4	rack-vertical drop	64
060	17	72	to	15	36	144	0.2	rack-vertical drop	176
061	18	126	to	48	48	126	0.7	rack-vertical drop/overflow weir	1669
062	19	90	to	48	48	90	0.7	rack-vertical drop/overflow weir	144
063	20	30	to	8	39	30	7.0	rack-vertical drop	45
064	21	60	to	12	24	60	2.2	rack-vertical drop	104
065	22	57	to	20	24	57	16.0	side weir	463
066	23	36	to	12	87	36	3.6	rack-vertical drop	50
067	24	63	to	15	87	63	1.6	rack-vertical drop	369
068	25	51	to	12	87	48	2.0	rack-vertical drop	83
069	26	48	to	10	87	48	1.8	rack-vertical drop	160
070	27	39	to	8	90	39	6.3	rack-vertical drop	97
071	28	54	to	12	87	54	0.9	rack-vertical drop	304
072	29	54	to	12	15	48	9.6	rack-vertical drop	138
073	30	33	to	12	15	36	2.0	rack-vertical drop	69
074	31	48	to	12	90	36	3.4	rack-vertical drop	309
075	32	42	to	15	48	72	1.8	rack-vertical drop	280
076	33	24	to	12	36	36	47.0	rack-vertical drop	48
077	34	30	to	8	24	30	16.0	rack-vertical drop	83
078	35	72	to	24	24	72	6.0	rack-vertical drop	691
079	36	39	to	12	117	39	5.6	rack-vertical drop	189
080	37	48	to	12	36	48	46.0	rack-vertical drop	38

Notes:
a. Pipe sizes shown are circular equivalents.
b. The sanitary pipe size shown as CS is the combined sewer upstream of the sewer rack and overflow.
c. SAN is the sanitary connection from the rack to the sanitary sewer interceptor.
d. The overflow pipe is the conveyance pipe for wet weather flows in excess of the interceptor capacity (CSO).

Table 5-12c

Combined Sewer Overflows (CSO)
Characteristics
(Akron Service Area)

OEPA Permit No.	Rack No.	Number of Overflows (#) 86	87	88	89	90	91	Yearly Average	Duration of Overflows (Hours) 86	87	88	89	90	91	Yearly Average	Recorded Flow (M Gallons) 86	87	88	89	90	91	Yearly Average
046	3	1	0	5	26	31	23	14.3	12	0	19	65	171	38	50.8							
047	4	0	1	2	30	32	35	16.7	0	3	9	110	164	85	61.8							
048	5	12	28	20	44	40	35	29.8	55	76	78	132	146	76	93.8							
049	6	17	15	10	23	27	29	20.2	73	48	52	68	135	55	71.8							
050	7	12	18	12	26	31	35	22.3	67	46	58	69	142	51	72.2							
051	8	1	0	14	42	41	36	22.3	12	0	64	123	209	65	78.8							
052	9	9	13	11	22	33	30	19.7	58	76	52	63	111	43	67.2							
053	10	35	22	17	39	40	37	31.7	183	73	68	91	161	48	104.0							
054	11	1	0	5	15	23	30	12.3	2	0	22	40	84	67	35.8							
055	12	57	46	45	72	100	57	62.8	46	33	87	98	168	128	93.3	52	38	78	36	125	31	60.0
056	13	23	20	13	28	31	28	23.8	94	47	48	85	136	48	76.3							
057	14	23	3	1	35	47	35	24.0	76	12	6	120	224	69	84.5							
058	15	2	2	18	45	48	53	28.0	7	3	68	136	194	113	86.8							
059	16	99	77	85	102	113	66	90.3	355	133	240	481	254	89	258.7	288	138	228	239	309	95	216.2
060	17	21	24	10	35	40	45	29.2	86	76	44	113	208	88	102.5							
061	18	67	37	45	46	120	39	59.0	58	37	81	46	207	33	77.0	257	6	25	7	32	4	55.2
062	19	27	23	25	35	65	17	32.0	15	11	14	20	66	8	22.3	17	8	8	9	1	4	7.8
063	20	20	18	14	30	22	15	19.8	68	50	70	86	97	22	65.5							
064	21	18	22	5	23	32	11	18.5	84	68	20	71	154	15	68.7							
065	22	0	2	4	48	0	0	9.0	0	2	24	180	0	0	34.3							
066	23	8	9	9	18	18	23	14.2	41	44	39	62	87	30	50.5							
067	24	28	21	24	43	11	45	28.7	123	66	90	149	75	90	98.8							
068	25	1	1	8	21	19	20	11.7	4	2	26	236	97	26	65.2							
069	26	20	17	12	42	43	37	28.5	80	63	40	160	237	84	110.7							
070	27	29	25	25	43	37	50	34.8	126	84	102	498	199	136	190.8							
071	28	0	1	2	38	41	40	20.3	0	1	7	477	205	85	129.2							
072	29	17	18	23	30	33	42	27.2	81	65	79	104	179	72	96.7							
073	30	13	24	22	28	28	2	19.5	54	78	90	103	144	2	78.5							
074	31	23	22	24	32	29	40	28.3	104	105	97	111	166	64	107.8							
075	32	107	76	81	107	130	60	93.5	112	79	77	117	252	69	117.7	17	9	11	15	23	4	13.2
076	33	2	0	1	24	10	10	7.8	2	0	3	78	62	11	26.0							
077	34	3	1	13	13	47	47	20.7	12	3	48	44	239	95	73.5							
078	35	0	3	1	34	41	42	20.2	0	4	1	121	181	59	61.0							
079	36	22	14	6	26	44	37	24.8	78	41	28	134	61	89	71.8							
080	37	3	0	2	17	14	16	8.7	7	0	10	71	70	50	34.7							

Table 5-12d

Combined Sewer Overflows (CSO)
Upstream Industrial Users
(Akron Service Area)

OEPA Permit No.	Rack No.	Industrial User (IU)	IU Discharge Parameters: Cd	Cr	Cu	Cy	Pb	Ug	Ni	Zn	TP	Average Day Flow (gpd)
49	6	Valley Association Corp.,MA-004 1210 Massillon Rd. Akron, Ohio 44315	X	X	X	X				X		360,000
55	12	Akron Anodizing, SI-001 1066 Home Ave. Akron, Ohio 44310		X	X	X	X		X	X		5,100
		Uniwear, Inc.,SI-018 825 E. Tallmadge Ave. Akron, Ohio 44310	X	X	X	X	X		X	X		178,000
		Falholt Division/Russel, MI-014 1066 Home Ave. Akron, Ohio 44310										1,500
		Hauser Products,MI-032 854 Evans Ave. Akron, Ohio 44305										21,500
		Quickey Manufacturing,MI-056 1500 Industrial Parkway Akron, Ohio 44310										21,290
		Rohrich Corp.,MI-061 903 E. Tallmadge Ave. Akron, Ohio 44310										9,765
		Schrader Bellows,MI-067 1000 Home Ave. Akron, Onio 44310			X		X		X	X		12,500
		Thermo-Rite Mfg.,MI-075 1355 Evans Ave. Akron, Ohio 44305		X	X		X		X	X		200
		Signs and Blanks, Inc.,MI-086 861 E. Tallmadge Ave. Akron, Ohio 44310		X								1,500
57	14	Akron City Hospital,SI-002 525 E. Market Street Akron, Ohio 44309						X				251,166
		Russel Products Comp.,SI-019 275 N. Forge St. Akron, Ohio 44304										36,450
59	16	(Note: During high flows, some of this flow bypasses 16 and is directed to Rack 17(NPDES No. 60))										
		Universal Plating, Inc.,MA-007 478 Morgan Ave. Akron, Ohio 44311	X	X	X	X	X		X	X		1,400
		Summit Heat Treating Co.,MI-010 336 Morgan Ave. Akron, Ohio 44311		X	X		X		X	X		495
		Heirloom Refinishing,MI-034 1025 Sweitzer Ave. Akron, Ohio 44311			X	X	X		X	X		465
		McNeil Akron, Inc.,MI-045 96 E. Crosier St. Akron, Ohio 44311	X		X		X			X		4,000
		Ruscoe, W.J.,MI-084 219 E. Miller Ave. Akron, Ohio 44301										3,000

Table 5-12d

Combined Sewer Overflows (CSO)
Upstream Industrial Users
(Akron Service Area)

OEPA Permit No.	Rack No.	Industrial User (IU)	IU Discharge Parameters: Cd	Cr	Cu	Cy	Pb	Hg	Ni	Zn	TP	Average Day Flow (gpd)
60	17	Beacon Journal Publishing,MI-008 44 E. Exchange St. Akron, Ohio 44328										80,000
61	18	Akron Plating Comp., Inc.,MA-001 1774 Hackberry St. Akron, Ohio 44301	X	X	X	X			X	X		5,500
		The B.F. Goodrich Company Chemical Group,MA-003 240 W. Emerling Ave. Akron, Ohio 44301									X	950,000, 28,800
		Akron General,SI-003 400 Wabash Ave. Akron, Ohio 44307						X				131,000
		Akron Paint & Varnish,SI-004 1390 Firestone Parkway Akron, Ohio 44301										2,200
		Children's Hospital,SI-005 281 Locust St. Akron, Ohio 44308						X				106,000
		AKZO Salt, Inc.,SI-006 2065 Manchester Rd. Akron, Ohio 44314										6,000
		B.F. Goodrich Adhesives,SI-009 123 W. Bartges St. Akron, Ohio 44311										3,300
		Ohio Pure Foods, Inc.,SI-014 681 W. Waterloo Road Akron, Ohio 44314										28,000
		Recycle Energy Plant,SI-017 226 Opportunity Parkway Akron, Ohio 44309	X		X		X		X	X		423,174
		Akro-Mils, MI-002 880 W. Waterloo Road Akron, Ohio 44314										3,100
		Akron Electrotype,MI-004 414 Water Street Akron, Ohio 44307										2,680
		Akron Metal Etching,MI-006 463 Locust St. Akron, Ohio 44307	X	X	X	X	X		X	X		800
		Bridgestone/Firestone,MI-018 Centeral Res. Labs S. Main & Wilbeth Akron, Ohio 44317										43,000
		Bridgestone/Firestone,MI-020 Syn. R&L 381 W. Wilbeth Akron, Ohio 44301										11,000
		Bridgestone/Firestone,MI-023 1200 Firestone Parkway Akron, Ohio 44317										100,000
		James C. Heintz Co.,MI-033 894 W. Waterloo Rd. Akron, Ohio 44314										1,110

Page No. 2 of 3

Table 5-12d

Combined Sewer Overflows (CSO)

Upstream Industrial Users

(Akron Service Area)

OEPA Permit No.	Rack No.	Industrial User (IU)	Cd	Cr	Cu	Cy	Pb	Ug	Ni	Zn	TP	Average Day Flow (gpd)
		Preferred Rubber,MI-054 1020 Lambert St. Barberton, Ohio 44203										4,100
		Tradco,MI-076 1081 Rosemary Blvd. Akron, Ohio 44306										1,000
		Malco Products, Inc.,MI-084 393 W. Wilbeth Rd. Akron, Ohio 44301										2,100
		Ohio Camshaft,MI-087 1566 Firestone Parkway Akron, Ohio 44301										
63	20	Children's Hospital,SI-005 281 Locust St. Akron, Ohio 44308						X				106,000
65	22	St. Thomas Hospital,SI-015 444 N. Main St. Akron, Ohio 44310						X				138,000
76	33	Beringer Plating, Inc.,MA-002 1211 DeValera Ave. Akron, Ohio 44310	X	X	X	X			X	X		7,500
		Plate-All Metal Comp.,MA-006 1210 Devalera Ave. Akron, Ohio 44310	X	X	X	X	X		X	X		500
		The Hygenic Corp.,SI-012 1245 Home Ave. Akron, Ohio 44310								X		20,000
78	35	Beringer Plating, Inc.,MA-002 1211 DeValera Ave. Akron, Ohio 44310	X	X	X	X			X	X		7,500
		Plate-All Metal Comp.,MA-006 1210 Devalera Ave. Akron, Ohio 44310	X	X	X	X	X		X	X		500
		The Hygenic Corp.,SI-012 1245 Home Ave. Akron, Ohio 44310								X		20,000

(Columns Cd through TP: IU Discharge Parameters)

Page No. 3 of 3

Table 5-12e

Sanitary Sewer Overflows (SSO)
Area of Concern
(Akron Service Area)

OEPA Permit Number	Location	Type	Receiving Stream	Date Bulkhead Installed	Pinch Valve Installed
3PF00000 004	Clearfield Avenue	Lift Station	Ohio Canal	06/06/90	-
3PF00000 005	Mud Run	Lift Station	Mud Run	-	-
3PF00000 006	Bellevue Avenue	Lift Station	Pigeon Creek	02/05/90	-
3PF00000 007	St. Michaels Avenue	Lift Station	Pigeon Creek	05/16/91	-
3PF00000 008	Shullo Drive	Lift Station	Sand Run Creek	-	-
3PF00000 009	Brookshire Road	Lift Station	Sand Run Creek	12/09/86	-
3PF00000 010	Cromwell Drive	Lift Station	Sand Run Creek	08/12/87	-
3PF00000 011	Fairhill Drive	Lift Station	Sand Run Creek	11/06/89	-
3PF00000 012	Brookfield Drive	Lift Station	Sand Run Creek	06/06/90	-
3PF00000 013	Merriman Road	Lift Station	Cuyahoga River	05/16/91	-
3PF00000 014	Brittain Road (I) Elton	Lift Station	Little Cuyahoga River	06/06/90	-
3PF00000 015	Fairlawn Knolls Drive	Lift Station	Sand Run Creek	05/17/88	-
3PF00000 016	Brittain Road (II) Chapel Hill	Lift Station	Little Cuyahoga River	05/16/91	-
3PF00000 017	Quaker Ridge	Lift Station	Schocalog	06/22/82	-
3PF00000 018	Schocalog Road	Lift Station	Schocalog	05/16/91	-
3PF00000 019	Shoreline Drive	Lift Station	Nesmith Lake	06/05/90	
3PF00000 020	Weathervane Lane	Lift Station	Cuyahoga River	09/12/89	-
3PF00000 021	White Pond And Mull Avenue	Lift Station	Pigeon Creek	-	-
3PF00000 022	316 South Firestone Boulevard	Sanitary	Ohio Canal	11/13/91	06/29/87
3PF00000 023	194 South Firestone Boulevard	Sanitary	Ohio Canal	11/13/91	06/29/87
3PF00000 024	Grant Street and North Firestone Boulevard	Sanitary	Ohio Canal	12/11/91	06/30/87
3PF00000 025	Bellows Street and North Firestone Boulevard	Sanitary	Ohio Canal	08/07/91	06/29/87
3PF00000 026	Beardsley Avenue North Firestone Boulevard	Sanitary	Ohio Canal	12/11/91	06/30/87
3PF00000 027	318 North Firestone Boulevard	Sanitary	Ohio Canal	12/11/91	06/30/87
3PF00000 028	Archwood Avenue and Grant Street	Sanitary	Ohio Canal	09/04/91	06/30/87
3PF00000 029	Huguelet Street and Sumatra Avenue	Sanitary	Alder Pond	02/05/90	-
3PF00000 030	Little Street and South Hawkins	Sanitary	Pigeon Creek	-	02/20/87
3PF00000 031	1187 Copley Road	Sanitary	Pigeon Creek	-	-
3PF00000 032	Hardesty Road and Packard Avenue	Sanitary	Pigeon Creek	-	-
3PF00000 033	Cadillac Boulevard and Packaerd Avenue	Sanitary	Pigeon Creek	-	03/11/87
3PF00000 034	Kenilworth Drive and Garman Road	Sanitary	Little Cuyahoga River	05/14/91	03/11/87
3PF00000 035	Castle Boulevard and Garman Road	Sanitary	Little Cuyahoga River	05/14/91	-
3PF00000 036	Melbourne Avenue and Garman Road	Sanitary	Little Cuyahoga River	08/05/88	-
3PF00000 037	1372 Dewitt Drive	Sanitary	Little Cuyahoga River	05/14/91	-
3PF00000 038	Schocalog Road and Hampshire Road	Sanitary	Sand Run Creek	06/01/88	-
3PF00000 039	111 Schocalog Road	Sanitary	Sand Run Creek	02/05/90	-
3PF00000 040	Wiltshire Road and Winston Road	Sanitary	Sand Run Creek	04/25/88	-
3PF00000 041	184 Winston Road	Sanitary	Sand Run Creek	04/25/88	-
3PF00000 042	Sand Run and Winston Road	Sanitary	Sand Run Creek	10/07/76	-
3PF00000 043	Copley Road and Bacon Avenue	Sanitary	Pigeon Creek	-	-
3PF00000 081	Bye Street and Dart	Sanitary	Pigeon Creek	-	-

SSOs currently outside of Cuyahoga Watershed.

City of Akron, PUB, USD
Industrial Pretreatment Program / January 1992
tbl513d

Table 5-12f

Sanitary Sewer Overflows (SSO) Characteristics

(Akron Service Area)

OEPA Permit No.	Number of Overflows (#) 86	87	88	89	90	91	Yearly Average	Duration of Overflows (Hours) 86	87	88	89	90	91	Yearly Average
004	0	0	0	0	–	–	–	0	0	0	0	–	–	–
005	168	211	115	50	134	92	128.3	161	103	55	92	178	63	108.7
006	4	1	11	18	–	4	–	12	4	32	58	–	38	–
007	0	1	0	0	0	4	–	0	1	0	0	0	31	–
008	6	1	3	9	17	5	6.8	37	2	4	29	45	16	22.2
009	2	–	–	–	–	–	–	6	–	–	–	–	–	–
010	1	4	–	–	–	–	–	20	90	–	–	–	–	–
011	1	2	4	–	–	–	–	5	22	4	–	–	–	–
012	1	0	1	0	1	2	–	12	0	2	0	2	1	–
013	2	2	0	4	3	2	–	5	3	0	3	17	23	–
014	0	0	0	2	–	–	–	0	0	0	2	–	–	–
015	3	5	1	–	–	–	–	15	12	6	–	–	–	–
016	1	0	1	1	0	–	–	3	0	16	13	0	–	–
017	Replaced Miller Station w/ new, no overflow													
018	1	2	0	1	1	–	–	11	3	0	4	4	–	–
019	Replaced Station w/ new, no overflow													
020	3	0	2	0	0	3	–	18	0	1	0	0	6	–
021	1	2	1	5	0	0	1.5	12	15	2	23	0	0	8.7
022	1	1	4	4	9	–	–	1	7	23	24	60	–	–
023	0	0	2	4	7	2	–	0	0	8	27	37	11	–
024	0	1	1	3	3	–	–	0	6	6	9	23	–	–
025	0	2	2	4	7	–	–	0	2	7	32	34	–	–
026	0	0	0	2	1	–	–	0	0	0	18	15	–	–
027	0	1	0	0	0	–	–	0	6	0	0	0	–	–
028	0	1	2	0	1	–	–	0	7	8	0	1	–	–
029	0	0	1	0	–	–	–	0	0	6	0	–	–	–
030	0	1	2	0	5	0	1.3	0	6	8	0	37	0	8.5
031	0	0	2	0	2	1	0.8	0	0	8	0	10	3	3.5
032	0	0	0	0	1	0	0.2	0	0	0	0	1	0	0.2
033	0	2	3	0	4	0	1.5	0	13	8	0	6	0	4.5
034	0	0	0	0	0	–	–	0	0	0	0	0	–	–
035	0	0	0	0	0	–	–	0	0	0	0	0	–	–
036	0	0	1	–	–	–	–	0	0	2	–	–	–	–
037	0	0	1	0	0	–	–	0	0	6	0	0	–	–
038	0	2	2	–	–	–	–	0	14	8	–	–	–	–
039	0	0	1	0	–	–	–	0	0	6	0	–	–	–
040	0	0	2	–	–	–	–	0	0	8	–	–	–	–
041	0	0	1	1	–	–	–	0	0	6	7	–	–	–
042	–	–	–	–	–	–	–	–	–	–	–	–	–	–
043	0	1	0	2	0	0	0.5	0	7	0	17	0	0	4.0
081	0	0	0	4	3	2	1.5	0	0	0	17	5	4	4.3

SSOs currently outside Cuyahoga Watershed

City of Akron, PUB, USD
Industrial Pretreatment Program/January 1992 tbl513e

Table 5-12g

Stream Monitoring Stations

Ohio Canal and Little Cuyahoga River

(Akron Service Area)

Rainfall Event	Station	Time of Sample	Flow (mgd)	pH (au)	Hardness (mg/l)	DO (mg/l)	BOD mg/l)	SS mg/l)	TDS mg/l)	Fecal Coliform (ct/100ml)	Ammonia (mg/l)	Temp. (C)	Total Phos. (mg/l)	Cd (ug/l)	Cr (ug/l)	Cu (ug/l)	Pb (ug/l)	Hg (ug/l)	Zn (ug/l)	MBAS (mg/l)	COD (mg/l)	TKN (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	Phenol (ug/l)
03/30/89	Ohio Canal@	0835	AD	8.0	268	9.90	3	14	742	660	0.30	11.0	0.08	AA	8.0	5.0	7.0	0.21	34	0.022	39	1.18	0.46	0.03	3.
	Cedar Street	—	AD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Memorial	Ohio Canal@	0850	117.80	9.1	316	9.20	74	890	312	360,000	2.02	9.0	2.39	4.0	65.0	181.0	317.0	0.85	908	0.090	456	10.81	0.10	0.05	51.
0.78"	Lock 15	0920	48.00	8.6	226	10.00	43	534	325	230,000	2.49	9.0	1.55	4.0	67.0	97.0	316.0	1.10	670	0.056	289	8.03	1.69	0.08	51.
	L. Cuy. @	0900	213.20	8.3	200	9.00	46	641	290	550,000	1.30	9.5	1.46	2.0	43.0	222.0	233.0	1.22	606	0.062	275	7.15	0.70	0.04	70.
	Otto St.	0930	178.70	8.0	180	9.60	38	596	282	280,000	0.94	9.5	1.35	4.0	49.0	242.0	243.0	1.02	617	0.064	262	5.84	0.18	0.04	51.
05/23/89	Ohio Canal@	0855	—	7.8	248	10.10	4	16	938	1,100	0.08	17.0	0.07	0.2	1.0	5.0	6.0	0.10	40	0.027	40	1.08	0.36	0.01	22.
	Cedar Street	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Morley	Ohio Canal@	0908	41.17	8.4	110	9.25	39	332	653	260,000	0.61	16.5	1.16	1.0	28.0	76.0	126.0	0.40	442	0.123	187	4.71	0.64	0.04	42.
0.98"	Lock 15	0938	31.35	7.8	76	9.15	23	141	597	220,000	0.55	16.5	0.60	1.0	13.0	40.0	74.0	0.24	260	0.110	112	2.39	0.32	0.03	23.
Memorial		1008	28.42	7.8	80	9.20	20	83	724	200,000	0.61	16.0	0.42	0.5	10.0	28.0	43.0	0.14	172	0.082	68	3.34	0.50	0.03	23.
0.85"	L. Cuy. @	0924	124.20	7.7	146	8.35	31	275	574	390,000	0.61	16.0	1.22	2.0	32.0	60.0	118.0	0.33	382	0.040	211	6.07	0.38	0.04	42.
	Otto St.	0954	109.50	7.5	200	8.20	38	301	564	220,000	0.83	15.5	1.03	2.0	29.0	70.0	116.0	0.50	390	0.074	157	4.77	0.14	0.07	58.
		1024	121.70	7.4	170	8.45	24	187	508	240,000	0.61	16.0	0.76	1.0	20.0	44.0	78.0	0.20	243	0.086	117	3.74	0.46	0.04	30.
09/14/89	Ohio Canal@	1432	AD	8.2	273	8.80	6	19	666	520	0.13	20.5	0.06	AA	1.0	6.0	1.0	AA	5	0.052	26	1.38	0.00	0.00	30.
	Cedar Street	—	AD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Morley	Ohio Canal@	1438	111.70	7.3	86	5.95	66	233	340	1,400,000	1.94	21.5	1.58	2.0	39.0	76.0	94.0	0.47	382	0.184	237	5.77	0.96	0.04	150.
1.08"	Lock 15	1508	99.00	7.9	95	7.40	43	221	222	500,000	0.85	20.0	1.20	2.0	31.0	58.0	80.0	0.53	266	0.213	211	4.51	0.74	0.04	122.
Memorial	L. Cuy. @	1445	166.70	7.5	121	6.45	36	152	357	630,000	0.56	20.5	0.83	1.0	24.0	51.0	60.0	0.44	230	0.176	128	3.17	0.72	0.04	84.
0.87"	Otto St.	1515	129.50	7.5	106	6.35	44	148	265	660,000	1.27	20.5	0.96	2.0	20.0	42.0	83.0	0.62	246	0.238	151	4.93	0.74	0.05	150.
02/01/90	Ohio Canal@	0830	AD	7.6	271	10.80	3	34	614	300	0.53	4.50	0.10	0.1	4.7	7.2	11.3	—	46	0.020	26	1.36	0.46	0.01	A
	Cedar Street	—	AD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Morley	Ohio Canal@	0933	99.00	7.5	90	11.00	25	106	288	110,000	0.71	6.5	0.54	0.8	25.4	30.2	51.0	—	146	0.065	79	2.73	0.60	0.02	4.
0.27"	Lock 15	1003	70.57	7.4	100	11.00	14	62	288	160,000	0.60	5.5	0.45	0.4	18.1	21.8	37.2	—	112	0.048	58	2.23	0.46	0.02	2.
Memorial	L. Cuy. @	0944	353.70	7.3	85	11.00	20	456	504	88,000	0.71	6.0	0.89	0.9	53.3	71.7	180.0	—	392	0.040	163	3.70	0.36	0.01	0.
0.35"	Otto St.	1014	331.50	7.2	141	10.80	16	466	516	100,000	0.74	6.0	1.34	2.5	82.1	158.0	290.0	—	904	0.032	205	4.35	0.55	0.01	1.
05/15/90	Ohio Canal@	0830	AD	8.0	115	9.70	6	26	480	1,700	0.15	18.0	0.10	0.2	0.5	6.7	6.5	AA	23	0.093	15	0.97	0.14	0.01	A
	Cedar Street	—	AD	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Morley	Ohio Canal@	0920	54.90	6.8	80	9.70	16	212	188	160,000	0.27	17.5	0.46	1.0	12.8	37.5	105.0	0.17	210	0.133	84	2.00	0.56	0.02	A
0.48"	Lock 15	0950	32.35	6.5	75	9.50	12	186	202	100,000	0.75	17.5	0.52	1.0	12.5	37.8	102.0	0.16	186	0.164	63	2.46	0.63	0.02	1.
Memorial	L. Cuy. @	0910	363.50	6.8	95	9.00	29	488	182	190,000	0.47	17.5	0.76	1.7	65.6	76.1	175.0	0.24	344	0.123	123	2.99	0.72	0.03	0.
0.25"	Otto St.	0940	341.20	6.2	90	8.80	20	340	218	110,000	0.30	17.3	0.54	1.8	64.2	61.0	141.0	0.22	308	0.113	104	2.68	0.86	0.02	A
08/13/90	Ohio Canal@	1105	15.00	8.1	221	7.90	4	8	500	1,200	AA	24.0	0.06	AA	2.0	5.0	3.0	0.42	29	0.056	32	0.71	0.07	AA	A
	Cedar Street	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Firestone	Ohio Canal@	1205	123.50	8.1	40	8.10	19	144	125	300,000	0.66	20.7	0.62	2.0	14.0	24.0	70.0	1.40	178	0.193	81	1.77	0.35	0.02	16.
0.83"	Lock 15	1235	83.50	7.8	55	8.80	12	63	192	330,000	0.47	21.1	0.51	2.0	15.0	25.0	48.0	0.25	178	0.236	72	1.24	0.38	0.02	13.
Memorial	L. Cuy. @	1130	240.50	8.1	100	8.40	32	395	283	870,000	0.55	21.0	0.88	2.0	23.0	57.0	153.0	0.67	348	0.195	137	3.22	0.54	0.04	13.
0.62"	Otto St.	1230	321.50	7.8	70	8.10	22	251	151	400,000	0.44	20.9	0.77	2.0	20.0	49.0	104.0	0.30	290	0.152	104	2.32	0.46	0.03	4.

Table 5-12g

Stream Monitoring Stations
Ohio Canal and Little Cuyahoga River
(Akron Service Area)

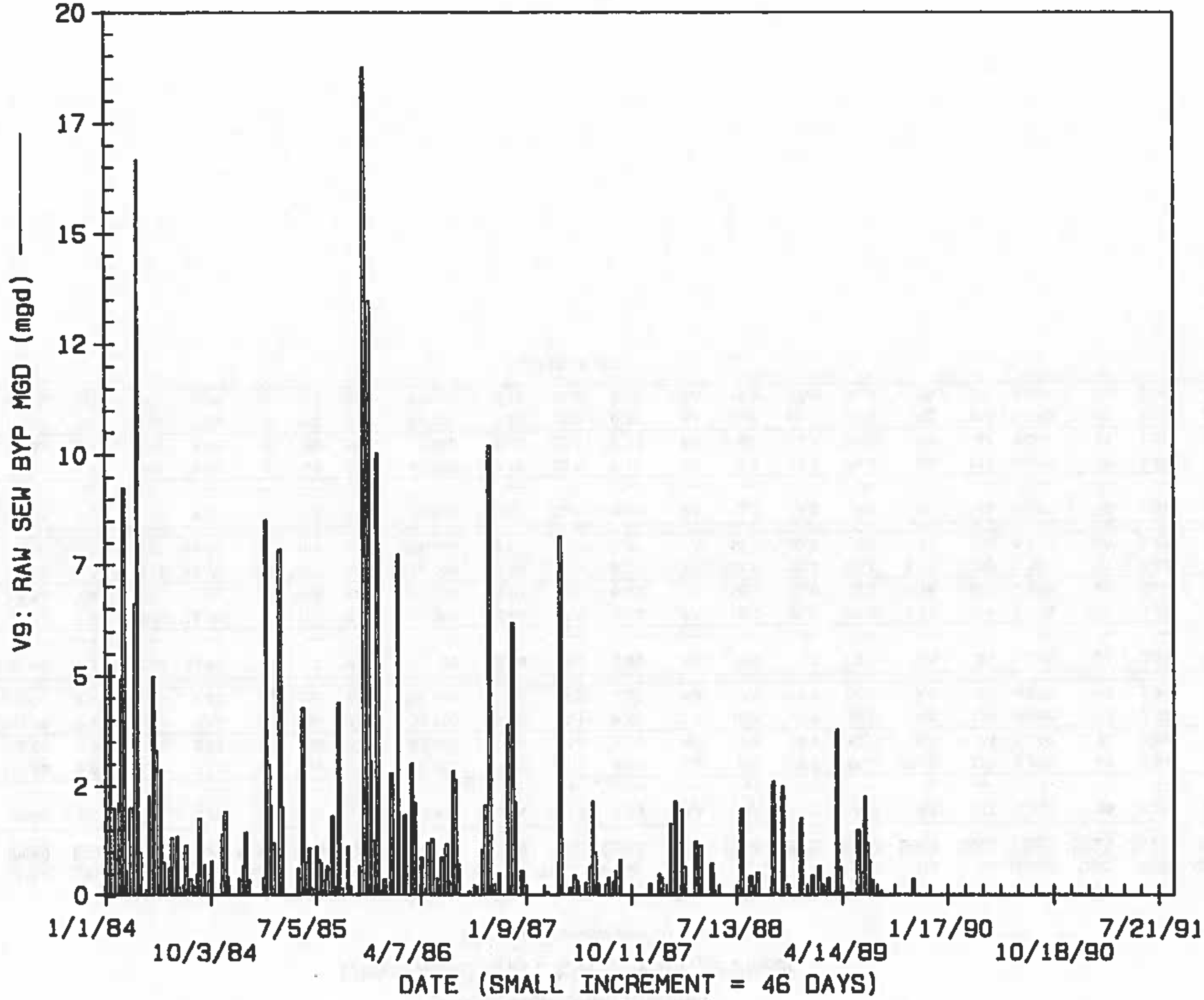
Rainfall Event	Station	Time of Sample	Flow (mgd)	pH (su)	Hardness (mg/l)	DO (mg/l)	BOD mg/l)	SS mg/l)	TDS mg/l)	Fecal Coliform (ct/100ml)	Ammonia (mg/l)	Temp. (C)	Total Phos. (mg/l)	Cd (ug/l)	Cr (ug/l)	Cu (ug/l)	Pb (ug/l)	Hg (ug/l)	Zn (ug/l)	MBAS (mg/l)	COD (mg/l)	TKN (mg/l)	Nitrate (mg/l)	Nitrite (mg/l)	Phenols (ug/l)
10/04/90	Ohio Canal@	1008	15.00	8.0	201	8.80	5	12	444	2,100	0.04	17.5	0.08	AA	AA	5.0	5.0	AA	37	0.037	19	0.76	0.39	0.03	AA
	Cedar Street	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Firestone	Ohio Canal@	1031	120.50	7.8	131	9.40	30	163	234	180,000	1.08	17.1	0.55	1.0	8.0	29.0	66.0	0.12	178	0.032	86	2.81	0.47	0.03	11.0
0.91"	Lock 15	1121	53.90	7.9	161	9.20	10	40	347	83,000	0.25	17.0	0.24	AA	2.0	6.0	15.0	AA	64	0.096	32	1.26	0.44	0.03	0.5
Memorial	L. Cuy. @	1048	284.70	7.7	111	9.10	20	169	172	73,000	0.30	17.1	0.56	1.0	10.0	14.0	46.0	AA	136	0.116	73	1.73	0.64	0.03	3.9
1.04"	Otto St.	1138	206.00	7.8	121	9.00	13	155	200	28,000	0.09	17.2	0.37	AA	7.0	10.0	30.0	AA	96	0.074	48	1.29	0.64	0.03	AA
03/06/91	Ohio Canal@	1015	20.00	7.8	256	11.60	3	7	602	80	0.19	6.5	0.09	AA	1.0	5.0	6.0	AA	31	0.016	21	0.81	0.76	0.01	0.1
	Cedar Street	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Firestone	Ohio Canal@	1030	31.35	7.9	225	12.10	17	133	610	240,000	0.82	7.0	0.62	AA	18.0	38.0	46.0	0.17	214	0.273	114	3.55	0.78	0.04	7.0
0.63"	Lock 15	1100	31.35	7.9	231	12.00	14	109	589	120,000	0.82	7.0	0.43	AA	15.0	35.0	37.0	0.16	202	0.265	82	3.37	0.82	0.03	8.1
Memorial	L. Cuy. @	1045	99.75	7.8	211	11.70	20	175	451	110,000	0.54	7.0	0.51	AA	14.0	36.0	46.0	0.22	200	0.122	91	2.83	0.58	0.02	3.4
0.80"	Otto St.	1115	109.50	7.9	191	11.80	11	103	418	91,000	0.50	7.0	0.37	AA	14.0	26.0	30.0	0.15	152	0.122	69	2.11	0.54	0.02	2.4
09/04/91	Ohio Canal@	835	30.00	7.5	214	6.20	4	16	553	72,000	0.04	23.0	0.09	AA	3.0	7.0	9.0	AB	55	0.037	18	1.01	0.08	0.02	0.5
	Cedar Street	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Firestone	Ohio Canal@	910	61.80	8.1	236	8.40	6	48	583	40,000	0.12	22.5	0.18	AA	4.0	12.0	29.0	AB	114	0.050	36	1.46	0.15	0.03	1.0
1.02"	Lock 15	940	59.80	8.0	229	8.30	8	53	552	17,000	0.09	22.5	0.17	AA	4.0	13.0	24.0	AB	84	0.044	31	1.35	0.10	0.01	0.9
Memorial	L. Cuy. @	920	151.50	7.8	163	7.90	6	125	343	36,000	0.14	21.0	0.32	AA	12.0	20.0	39.0	AB	134	0.046	30	1.57	0.39	0.14	1.0
1.23"	Otto St.	950	141.70	7.9	161	8.10	5	110	330	26,000	0.12	21.5	0.22	AA	10.0	17.0	31.0	AB	151	0.038	35	1.38	0.40	0.09	0.9

Figure: 5-2

AKRON WPCS RAW SEWAGE BYPASS

Time Series Plot

1/1/84 to 9/1/91



DATASTREAM STAT PAC

5.2. Nonpoint Source Inventory

5.2.1 Introduction

For the purposes of identifying nonpoint sources of pollution in the Cuyahoga River basin and providing information on causes of impairments for the Cuyahoga River Remedial Action Plan (RAP), the following nonpoint source categories have been inventoried:

1. Background Contribution
2. Atmospheric Deposition
3. Hazardous Waste Sites
4. Landfills
5. Quarries and Mines
6. Industrial Stock Piles
7. Tank Storage Areas
8. Underground Storage Tanks
9. Oil and Gas Wells
10. Waste Injection Wells
11. Pipelines
12. Home Sewage Systems
13. Chemical Spills
14. Cropland
15. Rural Non-cropland
16. Metropolitan
17. Suburban
18. Streets/Highways
19. Urban Construction

A discussion of in-place sediments and persistent, widely distributed toxic substances can be found in Section IV of Chapter 5.

For each category listed above, the following information is provided in the nonpoint source inventory section of Chapter 5: 1) a description of the category; 2) locational information such as density and distribution of the source throughout the Cuyahoga River basin; 3) a statement of the significance of the source category, detailing when possible the likely contaminants and loads coming from the source; 4) recommendations for future work, inventory or research on the category; and 5) references used in researching/inventorying the category.

The geographic scope of the nonpoint source inventory includes the entire Cuyahoga River basin and all the land contained within its boundary and atmospheric contributions, the sources of which may be outside the basin. Much of the information provided in this inventory is supported by NOACA's 1977 Land Use Inventory data. Since 1977, while certain sub-basins have undergone change, large changes in land use distribution have not occurred in the basin. A summary of development permits issued over the past 10 years, which supports this point, can be found in Section 5.2.3.19. The NOACA 1977 Land Use Inventory database is considered adequate for the following analysis of nonpoint source contributions.

The NOACA 1977 Land Use Inventory data was used in the nonpoint source analysis primarily because it is the most complete and comprehensive land use data base, oriented specifically to basin-wide analysis. The land use data have been allocated on the basis of watershed boundaries. NOACA divided the Cuyahoga River basin into 91 sub-basins ranging in size from 702 to 30,973 acres and averaging 5,629 acres. These basins are numbered from 1 to 91. Figure 5-3 shows the Cuyahoga River basin with numbered sub-basins. Figure 5-4 provides a schematic demonstrating the relationship of the Cuyahoga sub-basins and identifying major tributaries. Table 5-13 provides the NOACA sub-basin alignment with Ohio EPA stream segment designations. Figure 5-5 shows the sub-basins of the nearshore portion of the study area and the major tributaries.

The NOACA 1977 Land Use Inventory contained 26 categories. These were compressed into the following nine categories for the purpose of analyzing nonpoint sources of pollution. The correspondence between the classifications is as follows:

1. "Rural non-croplands" in the nonpoint source inventory include lands previously classified as grassland, livestock, forest, rural residential (less than one dwelling unit per acre), parks, cemeteries, outdoor recreation, rail and utility rights-of-way, water bodies, and wetlands.

2. "Cropland" consists of agricultural lands, nurseries, and horticulture lands.

3. "Suburban residential areas" consist of lands that have dwelling unit densities between 1 and 4 per acre.

4. "Metropolitan areas" have housing densities in excess of four units per acre.

5. "Industrial areas" include lands used for industry, wholesale, or storage.

6. "Commercial lands" include indoor recreation, retail and offices, regional shopping centers, central business districts, utilities and communications, and transportation facilities.

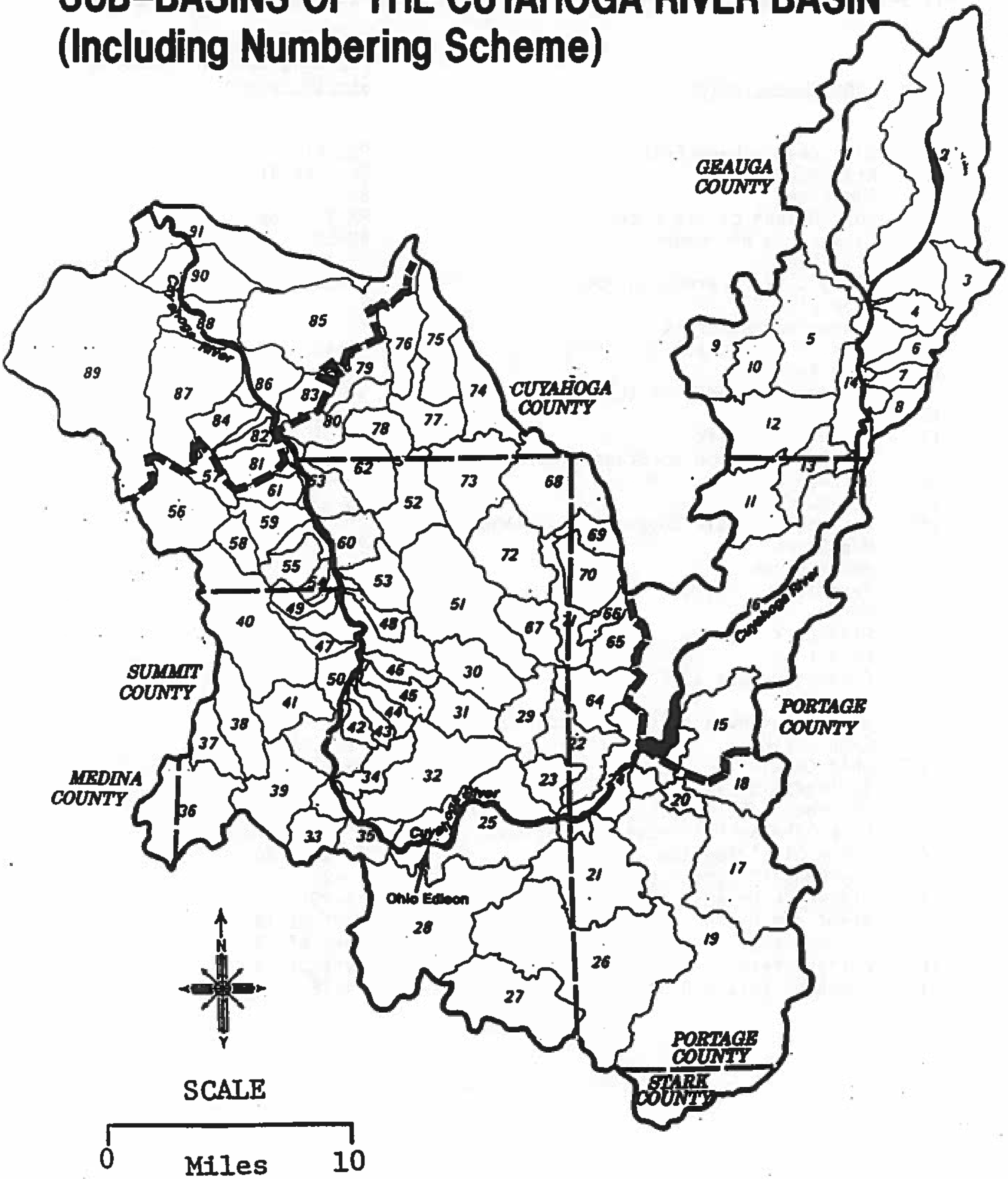
7. "Highway areas" consist of major highways and their dedicated rights-of-way.

8. "Quarries" include mines and quarries which generally involve the extraction of sand, gravel, shale, or clay materials.

9. The "landfill" category includes active landfills and abandoned mines and quarries. No estimate of differentiation within this category is available.

Figure: 5-3

SUB-BASINS OF THE CUYAHOGA RIVER BASIN (Including Numbering Scheme)



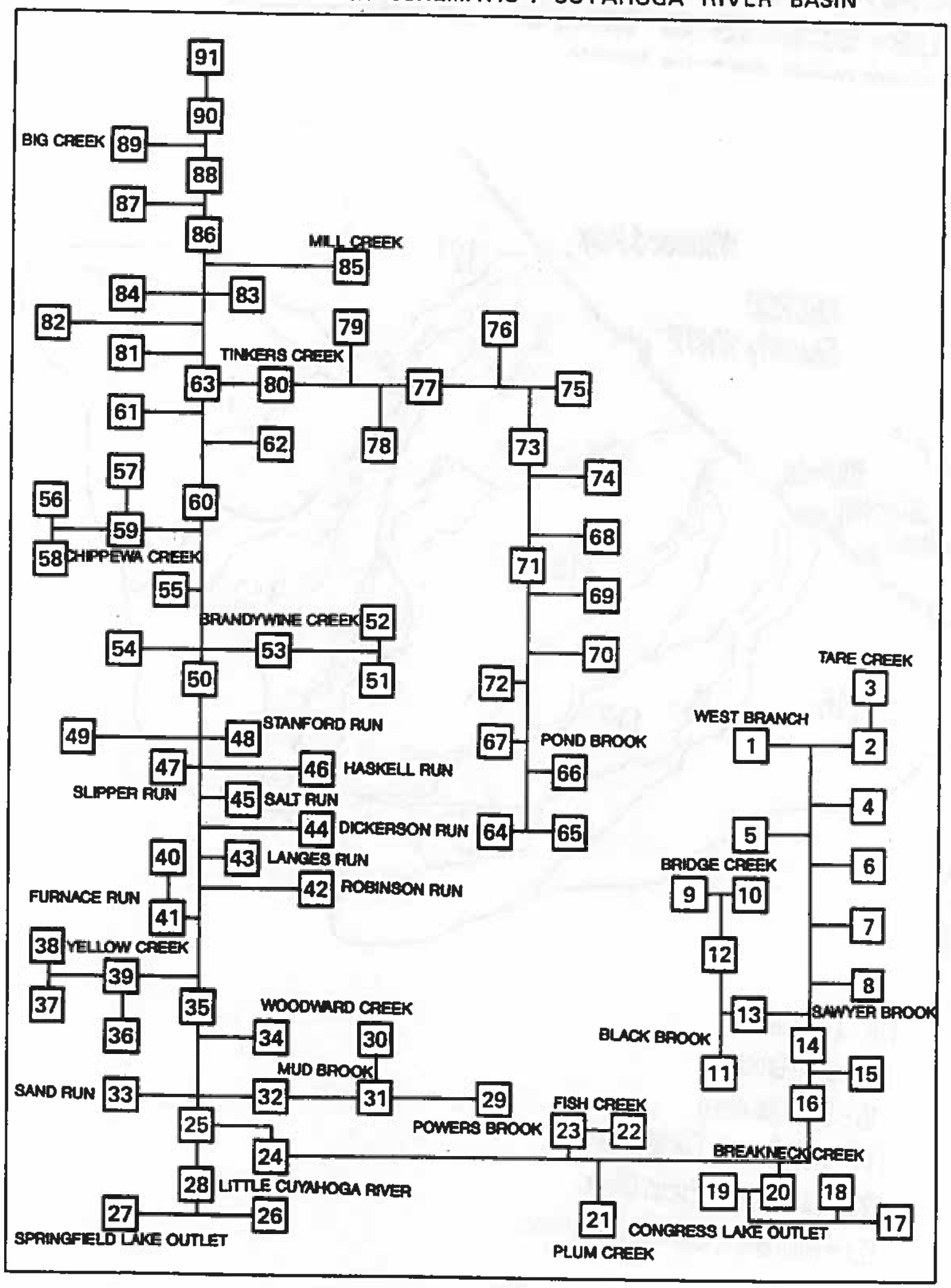
SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

Table 5-13: NOACA Sub-basin Alignment with Ohio EPA Stream Segment Designations

OH Code		Short Description	NOACA Sub-Basin(s) Draining to and including Stream Segment
89	1	Big Creek - Lake Erie	90, 91
	2	Kingsbury Run	Part of 91
	5	Big Creek	89
	5.1	Ford Branch of Big Creek	Part of 89
	6	Tinkers to Big Creek	82-88
	7	Mill Creek	85
	8	Tinkers (Pond Brook to mouth)	67-80
	8.2	Deer Lick Run	?
	8.3	Beaver Meadow Creek	?
	9	Tinkers (Headwater to Pond Brook)	64-65
	10	Pond Brook	66
	11	Cuyahoga (Brandywine to Tinkers)	54-63
	12	Chippewa Creek	56-59
	13	Brandywine Creek	51-53
	14	Cuyahoga (Yellow to Brandywine)	40-50
	24	Furnace Run	40-41
	25	Yellow Creek	36-39
	27	Cuyahoga (Little Cuyahoga to Yellow)	29-35
	29	Mud Brook	29-32
	30	Power Brook	29
	8.1	Brimfield	
	9	Wahoo	
	8	Breakneck	
	10	Potter	
	11	Cuyahoga Black to Congress	
88	1	Little Cuyahoga below Wingfoot Outlet	28
	1.1	Camp Creek	Part of 28
	1.2	Ohio Canal	Part of 28
	2	Springfield Lake Outlet	27
	3	Wingfoot Lake Outlet	Part of 26
	4	L. Cuyahoga (headwater to Wingfoot)	26
	4.1	Union Oil Tributary	Part of 26
	5	Cuyahoga (Congress Lake to L. Cuyahoga)	21-25
	8	Breakneck Creek	17-20
	8.1	Brimfield Ditch	Part of 19
	9	Wahoo Ditch	Part of 19
	10	Potter Creek	Part of 19
	11	Cuyahoga (Black Brook to Congress Lake)	14-16

Figure: 5–4

SUB–BASIN SCHEMATIC DEMONSTRATING THE RELATIONSHIP OF THE SUB–BASINS TO MAJOR TRIBUTARIES & THE CUYAHOGA MAINSTEM

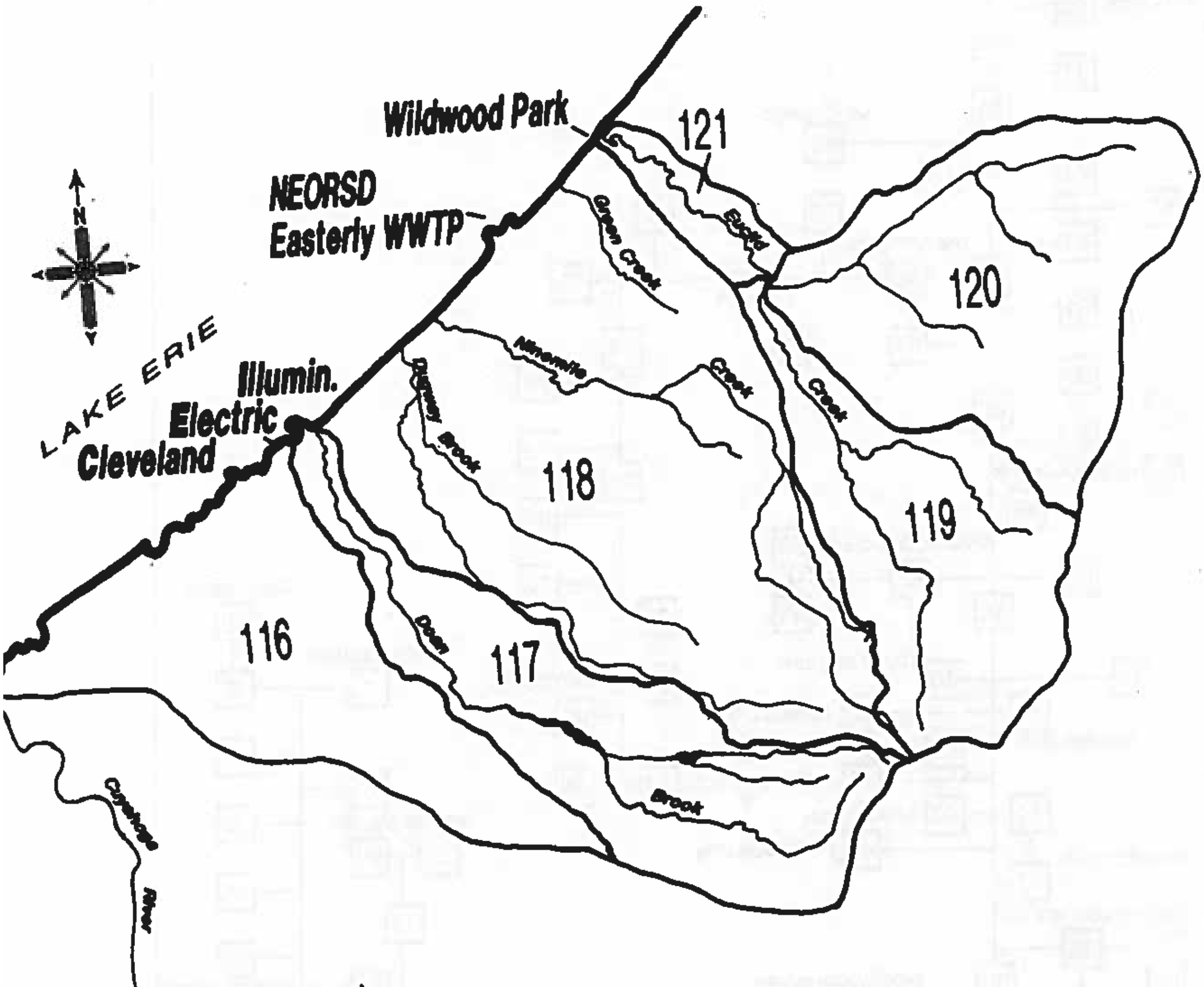


SOURCE: Northeast Ohio Areawide Coordinating Agency

Figure: 5-5

NEARSHORE STUDY AREA SUB-BASINS & MAJOR TRIBUTARIES

(Including NOACA Numbering Scheme)



116 - Cleveland
117 - Doan Brook
118 - East Cleveland
119 - West Branch, Euclid Creek
120 - East Branch, Euclid Creek
121 - Main Stem, Euclid Creek

5.2.2 Summary of Nonpoint Source Contributions

In order to address the contributions of nonpoint sources to the Area of Concern, the following list of nonpoint source categories emerged:

1. Background Contribution
2. Atmospheric Deposition
3. Hazardous Waste Sites
4. Landfills
5. Quarries and Mines
6. Industrial Stock Piles
7. Tank Storage Areas
8. Underground Storage Tanks
9. Oil and Gas Wells
10. Waste Injection Wells
11. Pipelines
12. Home Sewage Systems
13. Chemical Spills
14. Cropland
15. Rural Non-cropland
16. Metropolitan
17. Suburban
18. Streets/Highways
19. Urban-Construction

The analysis of nonpoint sources is based on these categories. At the outset a preliminary list of contaminants of concern was developed by the Nonpoint Source Subcommittee. The nonpoint source categories that were likely to have a more significant impact on a contaminant by contaminant basis were then identified. Table 5-14 summarizes this analysis.

Table 5-14 summarizes the relative pollutant contributions of each nonpoint sources category. It generally characterizes the relationship of a nonpoint source category to water quality problems recognized in the Cuyahoga River Area of Concern. The purpose of this table is to reveal the scope of potential sources that may or do contribute any one contaminant. Emphasis should be placed on the information obtained by reading down a column and not across a row. This table can therefore focus the relationship between a pollutant type in the Area of Concern and its origin from specific nonpoint sources in the basin.

The table highlights those relationships that are critical to resolving problems in the river and can assist in determining where to focus resources for implementation or for additional research.

To characterize the importance of a source's contribution of a given pollutant, five evaluation categories are employed: seriousness of risk, location of impairments, extent of impairments, potential magnitude of impacts, and relative contribution of the specific source. In making a judgement as to whether a source's contribution is "major", "intermediate", or "minor", all five evaluation categories are considered.

TABLE 5-14: NONPOINT SOURCE CONTRIBUTORS TO THE CUYAHOGA RIVER AREA OF CONCERN

POLLUTANT CATEGORIES / SOURCE CATEGORIES	CONVENTIONAL POLLUTANTS					TOXIC POLLUTANTS			NUTRIENTS	
	PATHOGENS viruses bacteria	BIOCHEMICAL OXYGEN DEMAND	CHLORIDES brine road salt	OIL & GREASE	SEDIMENT VOLUME	PESTICIDES herbicides insecticides fungicides	ORGANIC TOXICS PCBs PAHs others	METALS cadmium chromium iron lead mercury others	PHOSPHORUS soluble phosporus phosphates	NITROGEN COMPOUNDS nitrites nitrates ammonia TKN
BACKGROUND CONTRIBUTION	MINOR	MINOR	NO	NO	MAJOR	NO	NO	INTERMEDIATE	MINOR	MINOR
ATMOSPHERIC DEPOSITION	NO	NO	NO	NO	MINOR	INTERMEDIATE	MAJOR	MAJOR	NO	MINOR
HAZARDOUS WASTE SITES	NO	POSSIBLE	POSSIBLE	POSSIBLE	NO	POSSIBLE	POSSIBLE	POSSIBLE	NO	NO
LANDFILLS	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE
QUARRIES AND MINES	NO	NO	NO	NO	MINOR	NO	NO	NO	MINOR	NO
INDUSTRIAL STOCK PILES	NO	MINOR	MINOR	MINOR	MINOR	NO	MAJOR	MINOR	MINOR	NO
TANK STORAGE AREAS	NO	POSSIBLE	NO	POSSIBLE	NO	POSSIBLE	POSSIBLE	POSSIBLE	NO	NO
UNDERGROUND TANKS	NO	NO	NO	POSSIBLE	NO	POSSIBLE	NO	POSSIBLE	NO	NO
OIL AND GAS WELLS	NO	NO	MINOR	POSSIBLE	POSSIBLE	NO	POSSIBLE	POSSIBLE	NO	NO
WASTE INJECTION WELLS	NO	NO	POSSIBLE	POSSIBLE	NO	NO	POSSIBLE	POSSIBLE	NO	NO
PIPELINES	NO	POSSIBLE	NO	POSSIBLE	NO	NO	POSSIBLE	POSSIBLE	NO	NO
HOME SEWAGE SYSTEMS	MAJOR	INTERMEDIATE	MINOR	MINOR	NO	NO	MINOR	MINOR	INTERMEDIATE	INTERMEDIATE
CHEMICAL SPILLS	NO	POSSIBLE	NO	POSSIBLE	NO	POSSIBLE	POSSIBLE	POSSIBLE	NO	NO
CROP LAND	NO	NO	NO	NO	MINOR	MAJOR	NO	NO	INTERMEDIATE	INTERMEDIATE
RURAL NON-CROP LAND	MINOR	MINOR	NO	NO	MAJOR	MINOR	NO	NO	INTERMEDIATE	MINOR
METROPOLITAN	MAJOR	MAJOR	MINOR	MAJOR	MINOR	MINOR	INTERMEDIATE	MAJOR	MINOR	INTERMEDIATE
SUBURBAN	MAJOR	INTERMEDIATE	MINOR	INTERMEDIATE	MINOR	INTERMEDIATE	MINOR	MINOR	MINOR	MINOR
STREETS/HIGHWAYS	NO	MINOR	MAJOR	MAJOR	MINOR	MINOR	MINOR	MAJOR	MINOR	NO
URBAN-CONSTRUCTION	NO	NO	NO	NO	MAJOR	NO	MINOR	NO	INTERMEDIATE	NO

NOTES

Background Contribution = level of a given contaminant that would naturally occur, in the absence of human influence.
NO = the given pollutant category is not considered to be contributed by the corresponding source.
POSSIBLE = the given pollutant occurs from the source but does not migrate off-site as a result of existing regulations and adequate control technologies.
Additional Pollutant Contribution Levels = MINOR, INTERMEDIATE, or MAJOR

The first factor is Seriousness of Hazards. The presence of hazards to human health arising from the nature of the pollutant of concern is considered to be the most serious; hazards to the aquatic environment are also considered to be serious. Hazards related to economic and social losses are considered, but are not given as great a weight.

The second factor is Location of Impairments Throughout the Basin. Loadings which affect local tributaries as well as the main stem are given greatest weight. The second level of importance involves impacts which affect only the Area of Concern. Loadings which affect tributary streams but are not sufficient to affect the Area of Concern itself are given the least weight.

The third factor is Extent of Impairments. Problems which affect large extents of the Area of Concern or are pervasive in the watershed are given more significance than those which affect isolated or very limited areas in the basin.

The fourth factor is Potential Magnitude of Contribution. Elevated concentrations that can be attributed to a particular nonpoint source, are known to have an impact, and can be directly tied to a use impairment are given the most weight. Slightly elevated concentrations of a pollutant found in limited stretches of the river have less weight.

The last factor considered is Relative Source Contribution. Given all other sources of a particular pollutant, how does the source category under discussion compare in terms of relative loading rates, frequencies, and extents and in its ability to contribute to water quality problems in the Cuyahoga River watershed.

Two other levels of contribution can apply: "POSSIBLE" and "NO".

A POSSIBLE category is one where pollutants occur in concentration at a site but are not normally expected to migrate off-site due to the existing regulatory environment and the availability of adequate control technology. However, operational or maintenance short-comings may lead to an occasional illicit releases of pollutants. Potential source areas need to be identified in order to assist in problem resolution.

A NO is indicated whenever a given pollutant category is not normally associated with the specified source type in a potentially problematic amount or volume.

What follows in Section 5.2.3 is a discussion of each of the 19 nonpoint source categories in terms of locational data and significance.

5.2.3 Report on Nonpoint Source Contributions Categories

5.2.3.1 Background Contribution

DESCRIPTION OF THE SOURCE CATEGORY

The background contributions category refers to nonpoint source pollutant loadings associated with natural occurrences. The category addresses pollutants that naturally occur in the soil or in the biomass which it supports. These pollutants can be carried to the water attached to eroded soil particles or be leached from the soil directly to the stream. Naturally occurring erosion and sedimentation processes are also accounted for by this category.

LOCATIONAL INFORMATION

Input from background contributions occurs throughout the watershed. These may consist of phosphorus, bacteria, nitrogen, BOD, heavy metals or soil loadings. Background phosphorus loading emanates from its natural occurrence in the soil. The phosphorus content in local soils varies from one soil type to another and reflects accumulation due to past management. However, no significant difference in the average phosphorus content has been demonstrated to exist among the various soil associations which occur in the basin. Therefore, potential phosphorus loading rates are considered to be fairly uniform across the watershed. Actual phosphorus loading rates from background sources are probably related to local erosion rates. Areas of high erosion can result in increased loadings of phosphorus. (The high silt/clay fraction of the sediment load is most directly related to the actual phosphorus load. However, there has been no documentation of variations in the relative occurrence of mineral grain size classes across the basin.)

Nitrogen compounds are derived from native soil materials through the erosion process or by the decay of organic materials. Significant variation of the nitrogen content of the soil association in the basin is not expected. Ammonia loadings are largely related to wildlife wastes and will be largest in areas where wildlife are plentiful. This generally is more common in rural areas and can include urban settings where waterfowl may concentrate around ponds.

Bacteria are also introduced by wildlife, and high nonpoint source loadings are directly tied to the location of large populations of wildlife.

Biochemical oxygen demand comes from the decay of vegetative matter. Significant variations in loads are not expected across most of the basin. Heavy urbanized areas may have lower loadings due to a lack of vegetated areas.

Numerous heavy metals occur at least in trace amounts in the native soil material in the watershed. Only iron is present in sufficient quantity to be of concern. High background levels of iron can lead to water quality standards violations. The occurrence of high iron levels is pervasive throughout the watershed in particular and Northeast Ohio in general (Ohio EPA 305 b reports). Arsenic has also been found at reference sites and at certain levels would be considered "background." This is true even in areas unaffected by large scale development or the effects of point source discharges.

Soil erosion is far from uniform across the watershed. Table 5-15 provides a composite view of highly eroding lands grouped by land use type. Over 24,000 acres are eroding at "excessive" levels. Of these basins that are highly eroding, 65% of the soil comes from grassland, forestland, and parkland, the areas least disturbed by human activities. Figure 5-6 indicates the sub-basins which have the highest estimated erosion rates (NOACA, 1981). Since 1981, National Park Service conservation measures may have modified this figure.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Background loading rates of bacteria from wildlife, biochemical oxygen demand from decaying organic matter, and phosphorus and nitrogen from soil materials are all considered to be minor contributors to the Area of Concern. Comparatively low unit area loading rates are the reason for this determination.

Loadings of iron from soil and rock materials are considered to be intermediate in impact. Whereas loadings from background sources may be severe in some locales, overall loadings are considered to be intermediate.

Naturally occurring erosion and sedimentation rates are high in much of the middle Cuyahoga Valley. Steep slopes and deep soil depth combine to create erosive conditions. A high stream density contributes to increased sediment delivery to waterways. Mass-wasting, which includes soil creep, soil slumps, and landslides, is a major contributor to sediment rates in the valley that are higher than average for the region. Background erosion rates are considered to be one of the largest sources of sediment in the Area of Concern.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

Nonpoint Source Loading Rage Estimates: Lower Cuyahoga River, Appendix H.1.

NOACA (1981). Technical analysis of existing and potential soil loss: Application of the Universal Soil Loss Equation. Technical Appendix A02.

TABLE 5-15: DISTRIBUTION OF HIGHLY ERODING LANDS AS A FUNCTION OF GENERAL LAND USE IN AREAS OF HIGH ESTIMATED SOIL LOSS

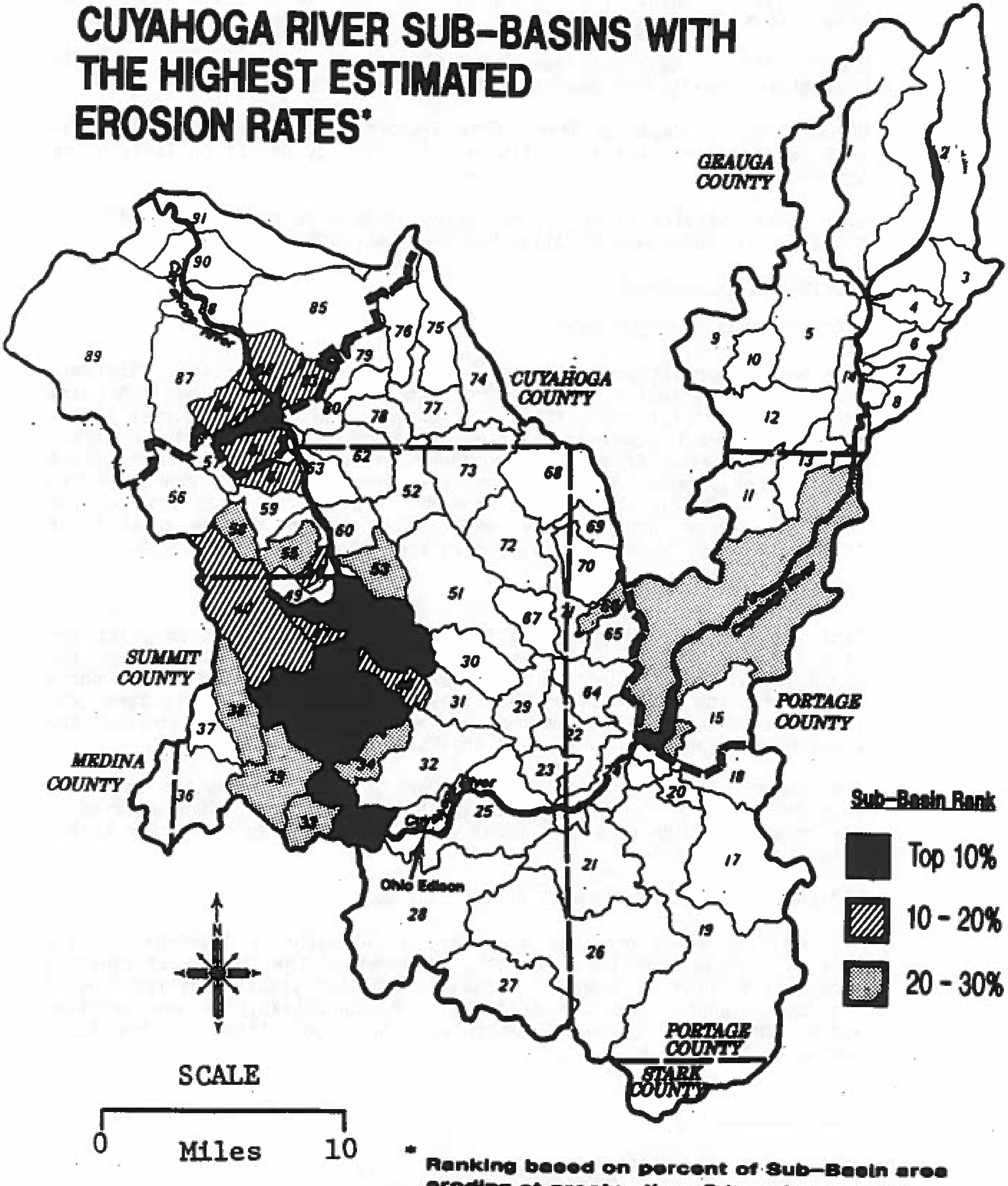
		HIGHLY ERODING LANDS		
SUB-BASIN NUMBER	TOTAL ACRES	TOTAL ACRES HIGHLY ERODING	ACRES IN GRASSLAND FORESTLAND PARKLAND	ACRES IN DEVELOPED LAND USES (including Cropland)
16	30,973	6,211	2,053	4,158
33	2,293	517	413	104
34	2,229	454	323	131
35	3,668	1,051	812	239
38	4,018	820	527	293
39	5,238	1,155	807	348
40	10,077	2,423	1,632	791
41	2,953	933	869	64
42	973	513	506	7
43	1,023	349	346	3
44	1,356	487	473	14
45	1,767	457	455	2
46	1,399	540	540	0
48	1,280	467	403	64
49	1,409	251	204	47
50	10,269	3,291	2,829	462
53	2,869	586	486	100
54	690	198	178	20
55	2,089	413	302	111
58	1,681	326	172	154
61	1,609	407	309	98
66	1,248	263	114	149
81	2,115	566	362	204
82	987	343	161	182
83	1,824	513	374	139
84	2,101	483	200	283
86	3,858	872	387	485
TOTAL	101,996	24,889	16,237	8,652
% OF TOTAL ERODING		100%	65%	35%

*Of the sub-basins that are highly eroding, 65% of the acres are in grassland, forestland, and parkland, ie, "background."

SOURCE: NOACA 1977 LAND USE DATABASE

Figure: 5-6

CUYAHOGA RIVER SUB-BASINS WITH THE HIGHEST ESTIMATED EROSION RATES*



* Ranking based on percent of Sub-Basin area eroding at greater than 5 tons/acre/year

SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978
Based on 1977 Land Use Information

NOACA (1981a). Ranking of Sub-basins for the Rural Clean Water Program. Technical Appendix A42.

USACOE (1979). Cuyahoga River, Ohio Restoration Study: Third Interim Preliminary Feasibility Report on Erosion and Sedimentation.

USACOE (1982). Cuyahoga River, Ohio Restoration Study: Supplement Report to the Third Interim Preliminary Feasibility Report on Erosion and Sedimentation.

U.S. Forest Service (1985). Evaluation of Reports on Erosion and Sedimentation in the Cuyahoga Valley National Recreation Area (CVNRA).

5.2.3.2 Atmospheric Deposition

DESCRIPTION OF THE CATEGORY

Atmospheric deposition is the path by which surface water is contaminated by air pollution. Pollutants emitted into the air by stationary sources (industrial smokestacks, for example) and mobile sources (automobile tailpipes) eventually wash out in rainfall or fall out. Contaminants originating from the atmosphere either fall into the surface waters or onto land. In the latter case, the contaminants can be washed to the streams in storm water runoff. Table 5-16 lists some of the toxic substances found in Lake Erie and the percent of the total input to the lake that is most likely coming from atmospheric deposition.

LOCATIONAL INFORMATION

Data and analysis on the impacts of atmospheric deposition exist for Lake Erie as a whole.* An analysis has not yet been done for the Cuyahoga Area of Concern which breaks out the percent of water-borne versus airborne pollution to the river itself. However, this Lake Erie study provides useful information on the relative size and nature of the atmospheric deposition problem in the Lake Erie basin.

The search for sources of air pollution which is eventually deposited into the water is further complicated by wind patterns. Many sources of air emissions which result in local water pollution can be as far as 500 miles from Lake Erie.*

STATEMENT OF THE SIGNIFICANCE OF THE CATEGORY

The Battelle Study provides a summary of atmospheric loadings to Lake Erie as a whole, and indicates that for most of the substances studied, atmospheric input is a minor (less than 50%) but significant fraction of the total input. The two exceptions are benzo(a)pyrene and cadmium, where atmospheric pathways constitute the major input to the lake. (Refer to Table 5-16).

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* Source: Kelley, et al. (Battelle), August 1989

Table 5-16: Percent Contribution of Atmospheric Deposition to Contamination in Lake Erie

Substance	Total Input to Lake Erie by All Pathways (kg/year)	Percentage of Total from Atmospheric Pathways
PCBs	1,014	27%
PAHs	50,800	19
Benzo-a-pyrene	1,234	66
Hexachlorobenzene	121	9
2,3,7,8-TCDD	0.16	11
2,3,7,8-TCDD	0.32	37
Lead	673,000	37
Mercury	3,310	22
Cadmium	21,000	59
Chromium	142,000	17
Arsenic	128,000	8
Dieldrin	115	34
DDT	123	25

Source: Kelley, et al. (Battelle), August 1989

The Northeast Ohio Regional Sewer District has done some preliminary analysis of rainfall samples as part of its Combined Sewer Overflow Study. Table 5-17 presents the results from data collected during summer 1991.

Table 5-18 reports for 1988 the air emissions in tons per year of carbon monoxide (CO), nitrogen oxides (NOx) and volatile organic compounds (VOCs) originating in the four county area of the Cuyahoga River basin. Three categories of sources are used: point sources (e.g., factory smoke stacks), area sources (e.g., dry cleaners) and mobile sources (e.g., car tailpipes). Mobile sources are the largest contributor of the three classes of contaminants shown. Factories are likely to be the largest contributor of metals, although inventories more recent than 1986 are not available.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

Kelley, et al., 1989. The Final Report on Input of Toxic Substances from the Atmosphere to Lake Erie, (The Battelle Study)

Preliminary Findings on Atmospheric Deposition (Appendix H-3)

Pat Walling, Director of the Department of Air Pollution Control, Ohio EPA, Columbus

5.2.3.3 <u>Hazardous Waste Sites</u>

DESCRIPTION OF THE SOURCE CATEGORY

Active hazardous waste generators, transporters, and treatment, storage and disposal facilities (TSDs) are regulated by the federal Resource Conservation and Recovery Act (RCRA). Ohio EPA is the regulatory agency in Ohio given the authority under RCRA to regulate generators and TSDs in Ohio. These active generators and TSDs are regulated in order to minimize their impact on human health and environmental quality. If regulated appropriately, these facilities in the Cuyahoga River basin should not contribute nonpoint source pollution to the Cuyahoga River Area of Concern. These facilities which number into the thousands in the basin have not been inventoried for this analysis.

In the four-county area of the Cuyahoga River basin there are several hundred sites where active, inactive or abandoned generators and TSDs exist that were in operation prior to RCRA regulation. Action may be taken on these sites under CERCLA. (See below.)

Stormwater runoff and ground water from historically unregulated facilities could be carrying contaminants that are of concern to water quality in the Area of Concern. These sites have been inventoried for the Stage One Report.

Table 5-17: Metals Found** in Cleveland Area Rainfall

	All Samples		Samples Above Detection Limit		
	#	mean (ug/l)*	#	range	mean (ug/l)
Copper	22	20	7	20-118	17
Zinc	22	119	18	40-320	143
Lead	22	31	8	40-126	58
Iron	22	525	22	75-1895	525

* Using a value of 1/2 the dection limit for samples below detection limit.

** Cadmium, Chromium, Mercury and Nickel were also analyzed for but not found above detection limits.

TABLE: 5-18

1988 BASE YEAR EMISSIONS (tons/day) INVENTORY CLEVELAND-AKRON CONSOLIDATED METROPOLITAN STATISTICAL AREA

VOC (Tons/Day)								
COUNTY	POINT	%	MOBILE	%	AREA	%	TOTAL	%
CUYAHOGA	22.6		211.4		58.6		292.6	
GEAUGA	1.8		11.1		3.8		16.7	
PORTAGE	0.8		3.2		5.5		9.5	
SUMMIT	25.2		106.8		21.5		153.5	
TOTAL	50.4	11	332.5	70	89.4	19	472.3	100

NOx (Tons/Day)								
	POINT	%	MOBILE	%	AREA	%	TOTAL	%
CUYAHOGA	33.1		142.7		29		204.8	
GEAUGA	-		7.5		1.5		9	
PORTAGE	0.3		2.3		0.1		2.7	
SUMMIT	7.2		64.6		1		72.8	
TOTAL	40.6	14	217.1	75	31.6	11	289.3	100

CO (Tons/Day)								
	POINT	%	MOBILE	%	AREA	%	TOTAL	%
CUYAHOGA	34.7		716.3		11.8		762.8	
GEAUGA	-		38		0.9		38.9	
PORTAGE	-		-		0.2		0.2	
SUMMIT	0.4		343.7		2.7		346.8	
TOTAL	35.1	3	1098	96	15.6	1	1148.7	100

SOURCE: OHIO ENVIRONMENTAL PROTECTION AGENCY

"POINT" = factory smokestacks, etc.

"AREA" = drycleaners, etc.

"MOBILE"= autos, trucks, buses, etc.

The federal Comprehensive Environmental Response Compensation and Liability Act (CERCLA, or Superfund) establishes a process by which those historically inactive or abandoned generators and TSDs can be identified, ranked in terms of hazardousness, and funded for clean up.

The Ohio EPA's Division of Emergency and Remedial Response (DERR) is responsible for investigating and ranking potential CERCLA sites in Ohio. In addition to the criteria imposed by USEPA's Hazard Ranking System, DERR conducts its own Preliminary Assessment to assign a priority to the site for additional investigations.

When Ohio EPA investigates a site, typically the first step is to prepare a Preliminary Assessment (PA) based on available information and to use that information to assign a priority to the site for additional investigations. The PA is a file review only, where available files (NPDES wastewater, RCRA hazardous waste, etc.) are examined to develop a list of potential contaminants of concern. The PA may also include a drive-by to verify the address and to confirm if the site is active or closed. No sampling or on-site analyses are conducted as part of the PA. A <u>high</u> priority indicates that hazardous substances are known to be present which could be released to the environment. A <u>medium</u> priority indicates suspected or potential presence of hazardous substances which could potentially affect human health or the environment. <u>Low</u> priority indicates little or no evidence of a hazardous condition. <u>Zero</u> priority sites have been found not to be a hazardous substance problem. In several cases a PA has not been completed, and therefore, a blank space is left on the Unregulated Sites Master List. According to each site's ranking, further investigations will be conducted by Ohio EPA as resources permit. Most of the sites listed in the 1990 Unregulated Sites Master List (see Appendix H-6) were assessed in the early 1980's. Updates were added only if new information was presented to the Ohio EPA, i.e., from a consultant, or from the facility. The Ohio EPA feels that the information in a PA provides a reasonable understanding of what exists at a site and is an adequate initial screening tool. However, they point out that the Unregulated Sites Master List is generated in response to sites brought to the attention of the Agency. Due to resource limitations, there is no active Agency program looking for additional potential sites.

LOCATIONAL INFORMATION

Ohio EPA has established an Unregulated Sites Master List which contains the addresses of all the sites listed on USEPA's Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) list as well as any others identified by Ohio EPA. This Master List also contains the federal hazard rank and the Ohio preliminary assessment rank of each site listed.

Using Ohio EPA DERR's Unregulated Sites Master List, those sites located in the basin which ranked Medium or High in Ohio EPA's priority ranking system have been identified. Ohio EPA's criteria reflect a complex of environmental concerns, while the CERCLA (Hazard Ranking System) criteria are heavily weighted toward the concern of contaminated drinking water. Because drinking water for the Cleveland metropolitan area is drawn from Lake Erie, and upstream of the industrial areas in the basin for the Akron Metropolitan area, federal priority in this basin will continue to be low. No sites in the basin rank high enough to qualify for the National Priorities List for federal funding as of July 1991.*

The numbers of sites listed for each county is summarized below.

	Total Sites on the Master List	Medium or Highs by OEPA Priority Ranking
Cuyahoga County	138	29
Summit County	46	17
Portage County	12	3
Geauga County	4	1

The medium and high priority sites have been located on Figure 5-7 and an index of these sites is included in Exhibit 5-1 which follows the figure. The one page summary of the Preliminary Assessment can be found in Appendix H-9.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

The Nonpoint Source Subcommittee of the Cuyahoga RAP in consultation with Ohio EPA has determined that those sites within half a mile from the river and ranked Medium or High in priority are potentially the greatest hazard to water quality and wildlife. Potential hazard is based on a number of factors, several of which are: toxicity of the material, quantity of the material present at the site, permeability of the soil at the site, and proximity of the site to any water course. A medium or high priority indicates that hazardous substances are known or suspected at the site.

A review of the Preliminary Assessments for the high priority sites revealed the following contaminants found at each site:

Index	Name	Date Reviewed	Contaminants Found
H1/H3	B&O Rail Northway	1984	PCBs (suspected)
H2	Mobile Tank Car Services	1984	"high levels of" napthanlene, fluorine, amthracene, phenanthrene, chrysene, bis-2-ethylhexyl-phthalate, benzo-a-anthracene, carbazole, (2) pyrene, arsenic and lead
H4/H5	Anaconda	1984	Toluene, phenol, ketones, metals, PCBs, other flammable organics, and several pesticides

* HRSI was the federal ranking system applied. USEPA has recently adopted a new ranking system, HRSII, which deemphasizes drinking water supplies from ground-water sources, and emphasizes surface water contamination potential. Ohio EPA will revisit all sites based on the new ranking system.

At this time it has not been determined what contaminants currently exist at these sites, or what they are potentially contributing in the form of nonpoint source pollution. Any site could possibly be contributing conventional pollutants such as biochemical oxygen demand, chlorides and oil and grease, and toxic pollutants such as pesticides, organics and metals.

Ohio EPA presumes that those sites ranking low in priority are addressed by existing regulation. Typically a low ranking is given if there is some operation still active at the site which falls under another regulation. If regulated properly, problems from past action will be identified.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

Dan Markowitz, Emergency and Remedial Response, Ohio EPA NEDO, June 1991

Nonpoint Source Pollution: Groundwater (Appendix H-2)

1990 MEDIUM & HIGH PRIORETY POTENTIAL HAZARDOUS WASTE SITES IN THE CUYAHOGA RAP AREA

(Refer to index on following pages)

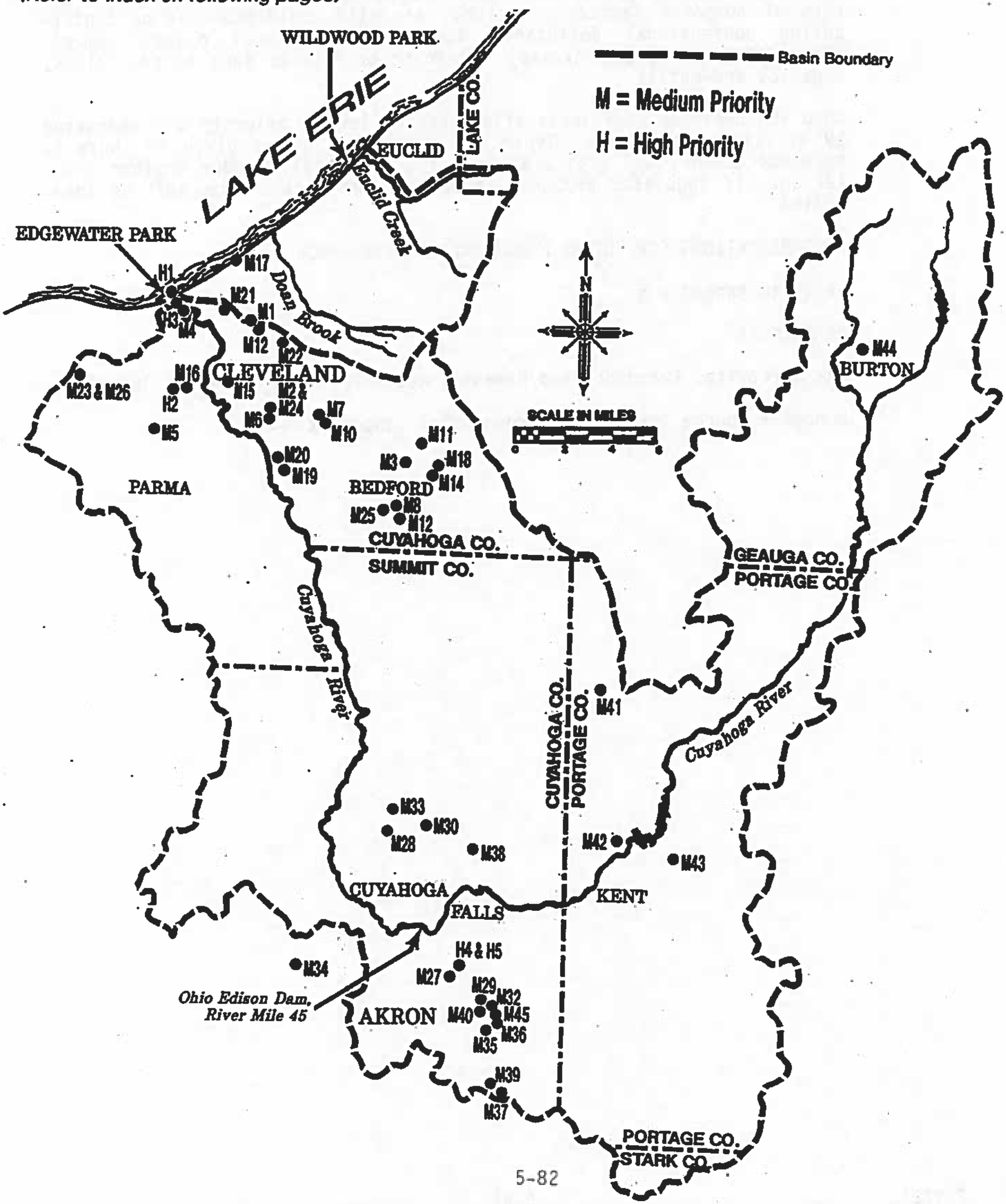

EXHIBIT 5-1

CUYAHOGA RAP STUDY AREA: HAZARDOUS WASTE SITES INDEX
(Map on Preceding Page)

CUYAHOGA COUNTY

M1	ADVANCED BARREL & DRUM	6830 BEAVER AVE	CLEVELAND OH 44104
M2	ALLIED CORP NAT WKS	5000 WARNER RD	GARFIELD HTS OH 44125
H1	BALTIMORE & OHIO RAILROAD	W 4TH ST	CLEVELAND OH 44112
M3	BEN VENUE LABS INC	270 NORTHFIELD RD	BEDFORD OH 44146
M4	CHEMICAL & MINERALS RECLAMATION INC	401 STONE'S LEVEE	CLEVELAND OH 44072
M5	CLEVELAND BUILDERS SUPPLY	RIDGE & BROOKPARK RD	CLEVELAND OH 44109
M6	CONTI LDFL	WARNER RD	GARFIELD HTS OH 44125
M7	DUMP INTO LAKE AT BROADWAY & HENRY	1/2 MI NE OF BROADWAY & HENRY	GARFIELD HTS OH 44125
M8	ERIEWAY POLLUTION CONTRL INC	33 INDUSTRY DR	BEDFORD OH 44146
M9	FERRO CORP CHEM DIV	7050 KRICK RD	BEDFORD OH 44146
M10	GARFIELD ALLOYS (DUMP INTO LAKE AT)	4878 CHAINCRAFT RD	GARFIELD HTS OH 44125
M11	HALEX CO	23901 AURORA RD	BEDFORD HTS OH 44146
M12	HORIZONS INC	2909 E 79TH ST	CLEVELAND OH 44104
M13	HUKILL CHEMICAL CORP	7013 KRICK RD	BEDFORD OH 44146
M14	MAYER CHINA (DUMPING INTO TINKERS CREEK)	24400 SOLON RD	BEDFORD HTS OH 44146
M15	MC GEAN CHEM CO	2910 HARVARD AVE	CLEVELAND OH 44101
H2	MOBILE TANK CAR SERV	3610 BROOKSIDE PARK DR	CLEVELAND OH 44109
H3	NORTHWAY	2400 W 4TH ST	CLEVELAND OH 44113

M = Medium Priority as listed on Ohio EPA's 1990 Unregulated Sites Master List

H = High Priority as listed on Ohio EPA's 1990 Unregulated Sites Master List

EXHIBIT 5-1 (Continued)

CUYAHOGA RAP STUDY AREA: HAZARDOUS WASTE SITES INDEX
(Map on Preceding Page)

CUYAHOGA COUNTY (Continued)

M16	OHIO DRUM RECONDITIONING	3967 PEARL RD	CLEVELAND OH 44109
M17	OHIO MEDICAL PRODUCTS	1177 MARQUETTE ST NE	CLEVELAND OH 44114
M18	PIONEER ASPHALT & AGG AKA BDFD HTS MTLS	5444 PERKINS RD	BEDFORD HTS OH 44146
M19	ROCKSIDE HIDEAWAY LDFL (MATOUSEK LDFL)	OFF CANAL RD BETWEEN ROCKSIDE RD	GARFIELD HTS OH 44125
M20	ROCKSIDE LDFL	5661 CANAL RD	CLEVELAND OH 44125
M21	SOHIO #1 REF	2735 BROADWAY AVE	CLEVELAND OH 44115
M22	STANDARD PAIL & DRUM CO INC	8105 PREBLE AVE	CLEVELAND OH 44104
M23	STEEL DRUM EXCHANGE INC	3363 W 140TH ST	CLEVELAND OH 44111
M24	WARNER HILL LDFL	4720 WARNER RD	GARFIELD HTS OH 44125
M25	WELLMAN SK CORP	200 EGBERT RD	BEDFORD OH 44146
M26	WITCO CHEM	3363 W 140TH ST	CLEVELAND OH 44111

SUMMIT COUNTY

M27	ABC DEMOLITION CO INC	259 HARRIS ST	AKRON OH 44304
M28	AKRON CITY LDFL	1505 HARDY RD	AKRON OH 44313
M29	AKRON LDFL & WASTE	HAZEL ST	AKRON OH 44305
M30	ALSIDE INC SUB US STEEL CORP	3773 AKRON-CLEVELAND RD	NORTHHAMPTON TWP OH 44223
H5	ANACONDA AVE GEORGEOFF SITE	18 ANACONDA	AKRON OH 44310

M = Medium Priority as listed on Ohio EPA's 1990 Unregulated Sites Master List

H = High Priority as listed on Ohio EPA's 1990 Unregulated Sites Master List

EXHIBIT 5-1 (Continued)

CUYAHOGA RAP STUDY AREA: HAZARDOUS WASTE SITES INDEX
(Map on Preceding Page)

SUMMIT COUNTY (Continued)

M45	ASHLAND CHEM CO	2699 MOGADORE RD	AKRON OH 44305
M32	ASHLAND CHEMICAL CO OLD PLT	200 DARROW	AKRON OH 44305
M33	BLOSSOM MUSIC CENTER	1145 W STEELS CORNER RD	CUYAHOGA FALLS OH 44223
M34	EATON CORP	1242 MINA AVE	AKRON OH 44321
M35	GOODYEAR AEROSPACE CORP	1210 MASSILLON RD	AKRON OH 44315
M36	GOODYEAR SEIBERLING LDFL	SEIBERLING ST & TWAIN AVE	AKRON OH 44316
M37	KITTINGER TRUCKING & SUPPLY CO	2064 KILLIAN RD	AKRON OH 44312
M38	SILVERLAKE VILLAGE	2961 KENT RD	SILVERLAKE OH 44224
M39	SUMMIT EQUIP & SUPPLIES INC	875 IVOR AVE	AKRON OH 44309
H4	SUMMIT NATIONAL REFUSE SERV	18 ANACONDA AVE	AKRON OH 44309
M40	TRI-STATE PLATING	183 N CASE AVE	AKRON OH 44305

PORTAGE COUNTY

M41	DILLY SAND PIT	ST RTE 43 N OF FROST RD	STREETSBORO OH 44240
M42	KENT CITY DUMP OLD	BRADY LAKE RD	FRANKLIN TWP OH 44240
M43	US ARMY RAVENNA ARMY AMMUNITION PLT	ST RTE 5	RAVENNA OH 44266

GEAUGA COUNTY

M44	MANFREDI MOTOR TRANSIT CO	11250 KINSMAN RD	NEWBURY OH 44065

M = Medium Priority as listed on Ohio EPA's 1990 Unregulated Sites Master List

H = High Priority as listed on Ohio EPA's 1990 Unregulated Sites Master List

5.2.3.4 Landfills

DESCRIPTION OF THE SOURCE CATEGORY

Landfills are solid waste disposal facilities that may also contain hazardous waste, regulated by the Ohio Solid Waste Disposal Act (OAC 3745.27), enacted June 24, 1988. Facilities regulated by OAC 3745.27 are those landfills which are currently active or those that have closed since the bill's passage. Those storage and disposal facilities that closed prior to June 24, 1988 are sited on Ohio EPA's Unregulated Sites Master List (see discussion above on: Hazardous Waste Sites). Regulations for landfills of demolition debris and construction materials are regulated by OAC 3745.27, but state rules have not yet been adopted.

Based on 1977 data, there are 112 acres of known landfill space in the nearshore study area. It is located entirely within the Cleveland City limits.

LOCATIONAL INFORMATION

The eight open and twenty closed landfills in the Cuyahoga River basin which have been identified are listed in Table 5-19. This information was provided by Ohio EPA NEDO's Division of Solid and Hazardous Waste Management (DSHWM) and Cuyahoga County District Board of Health. There are probably many others in the basin which have not been identified.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Improperly constructed or maintained landfills are a potential source of conventional pollutants, toxic pollutants, nutrients, and debris. Programs are in place to regulate pollutant migration from landfills, but accidents are still possible. OAC 3745.27 specifically addresses problems such as leachate and erosion. Enforcement is planned to address that erosion and leachate measures are in place on both open landfills and those that have been closed since June 24, 1988. A closed landfill in Akron opposite the Akron Correction Facility was definitely a source of debris to the river before some bank stabilization was done. Others may be contributing debris as well, particularly the construction demolition debris landfills located on the river banks and not yet regulated to prevent erosion or wash outs.

The closer a landfill is located to a water course, especially the Cuyahoga River mainstem in the Area of Concern, the greater the potential of water quality impacts to the Area of Concern.

Cuyahoga Board of Health has initiated a stream monitoring program for all streams which have landfills next to them. The Northeast Ohio Regional Sewer District has done some limited analysis of the water upstream and downstream of several landfills in Cuyahoga County for the Board of Health. Those landfills for which there are preliminary data are noted in Table 5-19. The data are in Appendix H.7.

Table 5-19: Located Sanitary Landfills in the Cuyahoga River Basin, Operating and Closed

Facilities	County	Status	Comments	Preliminary Water Quality Sampling Available**	Preliminary Groundwater Monitoring System in Pla
ALCOA	Cuy	Open PTI Submitted*	Inner plant wastes, demolition wastes and fly fly ash. Significant erosion control measures initiated. Seeding of site completed. No known impact on river.		X
LTV	Cuy	Open	Industrial wastes, specifically wastewater treatment sludges and BOF dusts.		X
Garfield Heights Landfill	Cuy	Closed	I-480 and East 98th interchange. Sits up on ridge one-quarter to one-half mile from river; probably does not have significant migration.	X	
Matousek Landfill	Cuy	Closed	Significant leachate produced which cannot be shown to adversely impact the river.		
R & B Development Landfill	Cuy	Closed	I-480 and East 98th interchange. Sits up on ridge one-quarter to one-half mile from river; probably does not have significant migration.		
Harvard Refuse	Cuy	Closed	Construction and demolition site. East 72nd and Harvard.		X
BFI Waste Management	Cuy	Closed	Adjacent to Harvard refuse and Warner Road.		
Inland Reclamation Landfill	Cuy	Open	200-300 feet from Tinkers Creek and runs for several thousand feet along Tinkers. No known impact on Tinkers Creek.	X	X
City of Solon	Cuy	Open	Tied together with Inland.		
Parma Landfill	Cuy	Closed	Off Ridgewood Drive in Parma; runs several thousand feet directly adjacent to tributary of stream to Big Creek. Site is capped and seeded. No known impact on stream.	X	X

SOURCE: Ohio EPA NEDO, Division of Solid and Hazardous Waste Materials. 1991.
* PTI = "Permit to Install"
** Appendix H-7

Table 5-19: Located Sanitary Landfills in the Cuyahoga River Basin, Operating and Closed

Facilities	County	Status	Comments	Preliminary Water Quality Sampling Available**	Preliminary Groundwater Monitoring System in Pl
Cleveland Land Development Landfill	Cuy	Open	Adjacent to West Creek. Erosion control measures intact, straw baler, silt fences and seeding.	X	
North Royalton Rd	Cuy	Open PTI* Phase III submitted and approved	Phase I and II closed. Seeding taking place. Leachate collection system. Sedimentation pond installed. No known impact on Chippewa Creek.		X
Chippewa Creek	Cuy	Closed	1,000 feet from creek.		
City of Brooklyn	Cuy	Open PTI* approved for vertical expansion	Cut-off wall under construction. Sedimentation pond installed. No known impact on Big Creek.		X
Nicky Boulevard Landfill	Cuy	Closed	Grant Avenue in Cuyahoga Heights.		X
Bedford Landfill	Cuy	Closed	Walton Hills - Crick Road		
Shaker Heights Landfill	Cuy	Closed	Bartlet and Columbus Road in Shaker Heights		X
Rockside Road Reclamation	Cuy	Closed	Rockside in Independence Rockside Woods		
Independence Landfill	Cuy	Closed	South of Hemlock Road in Independence; west of the Cuyahoga River		
GE - Nela	Cuy	Closed	Cleveland Heights		
BFI Glenwillow	Sum	Open PTI* approved for vertical expansion	Upstream on Tinkers; Cochran and Pettybone Road, close to stream (100 feet); runs for several hundred feet along stream; tied into old Twinsburg. Erosion control measures intact. Silt fencing, straw bales and seeding.	X	X

SOURCE: Ohio EPA NEDO, Division of Solid and Hazardous Waste Materials. 1991.
* PTI = "Permit to Install"
** Appendix H-7

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Table 5-19: Located Sanitary Landfills in the Cuyahoga River Basin, Operating and Closed

Facilities	County	Status	Comments	Preliminary Water Quality Sampling Available**	Preliminary Groundwater Monitoring System in Pla
Old Twinsburg Landfill	Sum	Closed	See BFI Glenwillow.		
Hardy Road	Sum	Open	Akron Peninsula Road across from Wastewater Treatment Plant; due to submit closure plan by 1993 and an upgrade permit by 1995.		X
Cacade Valley park	Sum	Closed	Located on east and west sides of Cuyahoga Street near Akron Correctional Facility.		
Goodyear Tire & Rubber Landfill	Sum	Closed	Siberling Street east of downtown Akron.		
Harris Street Landfill	Sum	Closed	415 East Market Street		
Akron Landfill and Waste, Inc. (aka A.B.C.Demolition Site)	Sum	Closed	Located near Evans & Home Avenue near Little Cuyahoga River.		
A & B Refuse	Por	Open	2767 Summit Rd 1/2 mile east of Kent State Stadium. On Breakneck Creek.		X
Ravenna Arsenal	Por	Closed			
Portage Landfill	Por	Closed	2898 Tallmadge Road, Rootstown.		X
Teledyne-Monarch Landfill	Por	Closed	Captive waste		X

SOURCE: Ohio EPA NEDO, Division of Solid and Hazardous Waste Materials. 1991.
* PTI = "Permit to Install"
** Appendix H-7

Local impacts of many facilities have been documented, but overall the magnitude of loadings from landfills to the Area of Concern is not expected to be large. The County Board of Health believes that with the new regulations and the stream monitoring program landfills will not impact the streams.*

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

John Watkins. Ohio EPA NEDO, Division of Solid and Hazardous Waste Materials

5.2.3.5 Quarries and Mines

DESCRIPTION OF THE SOURCE CATEGORY

This category covers resource extraction sites composed of sand and gravel pits, shale chip operations and one salt mine.

LOCATIONAL INFORMATION

There are approximately 50 quarries and mines in the basin, which were located using the 1977 NOACA Land Use Inventory data. Twenty-five sub-basins have at least one to two percent of their land area devoted to quarries or mines. Of these, four have between four and six percent of their land in quarries. Eleven sub-basins are in the two to three percent range. The remainder are one percent or less. Figure 5-8 shows the locations of those sub-basins with three percent or more land area occupied by quarries and mines.

There are no quarries or mines east of the Cuyahoga River in the nearshore portion of the study area.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Quarries where sand, gravel or shale chips are extracted pose a sediment threat and, thus, can contribute to the phosphorus load. Properly constructed and operated quarries incorporate erosion and sediment controls and thus alleviate potential problems, although leakage from transport trucks and dust migration do result even from the best of operations. These sources are considered to be minor contributors to the sediment and phosphorus loads in the Area of Concern.

The salt mine located on Whiskey Island does not result in contamination of surface waters in and of itself. It is a deep mine which has no potential connection to surface waters. The loading docks and surface storage areas can result in chloride loadings but these are treated in the industrial stockpile category.

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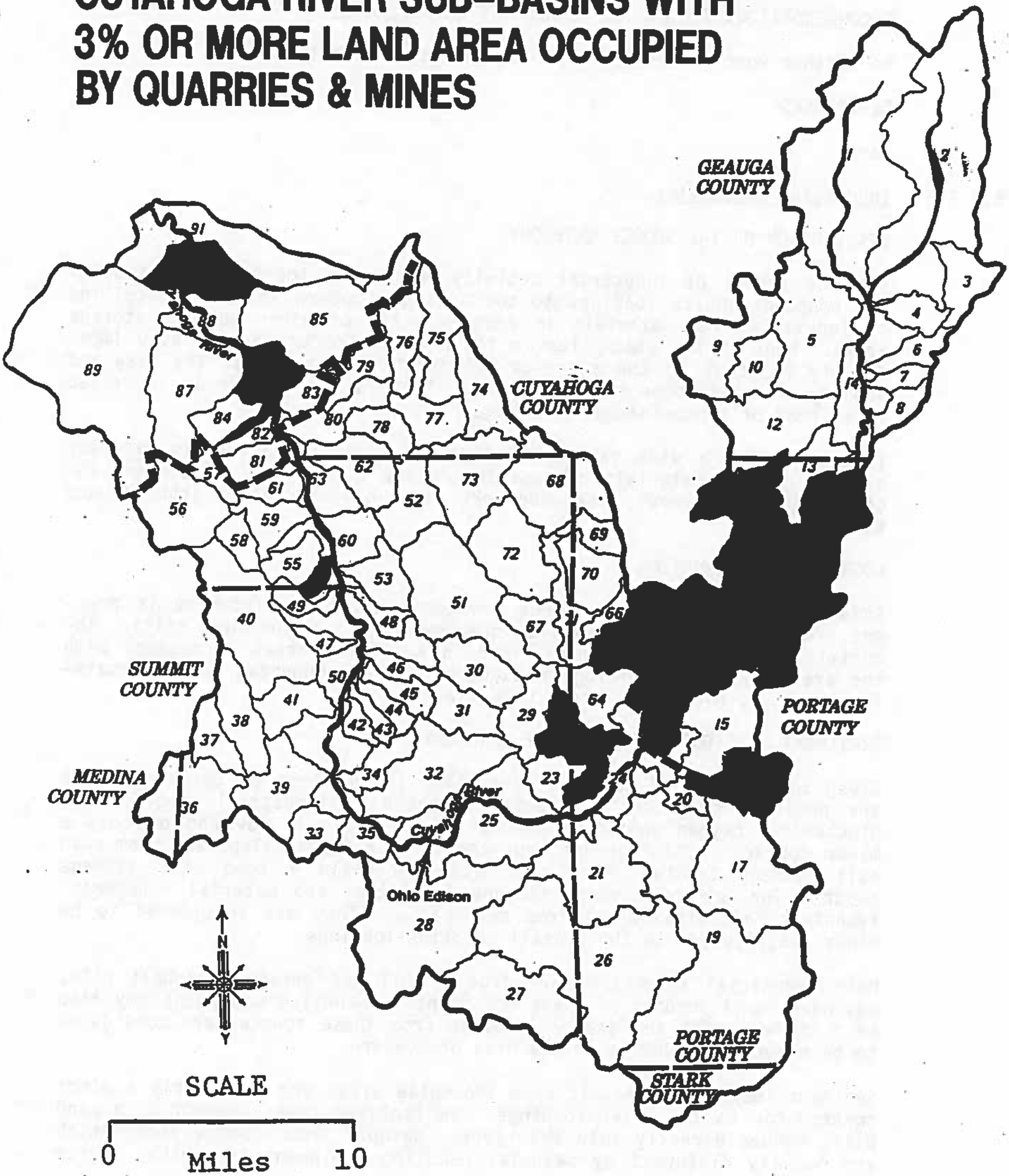
* John Romano. Cuyahoga County Board of Health, Written Communication, August 15, 1991.

Figure: 5-8

CUYAHOGA RIVER SUB-BASINS WITH 3% OR MORE LAND AREA OCCUPIED BY QUARRIES & MINES



SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

No further work or research is recommended at this time.

REFERENCES

None

5.2.3.6 Industrial Stockpiles

DESCRIPTION OF THE SOURCE CATEGORY

The one aspect of industrial activity that poses the largest potential for nonpoint source loadings to the Area of Concern is the stockpiling of industrial raw materials in factory yards or other outdoor storage areas. Many of the stockpiles in the Area of Concern are located immediately adjacent to the river or lakefront to accommodate the ease and economy of water-borne transportation. This factor results in increased likelihood of contaminated runoff reaching the waterways.

Industries use a wide variety of bulk materials which require exterior storage. Those materials of most importance in the Area of Concern include sand and gravel, coal and coke, iron ore, reclaimed asphalt, and salt.

LOCATIONAL INFORMATION

Industrial stockpiling can occur anywhere that heavy industry is present. An inventory of stockpile locations does not currently exist. Industrial land use is shown in Figure 5-9. These areas correspond with the areas where stockpiling is expected to be pronounced due to proximity to water, highways or rail complexes.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

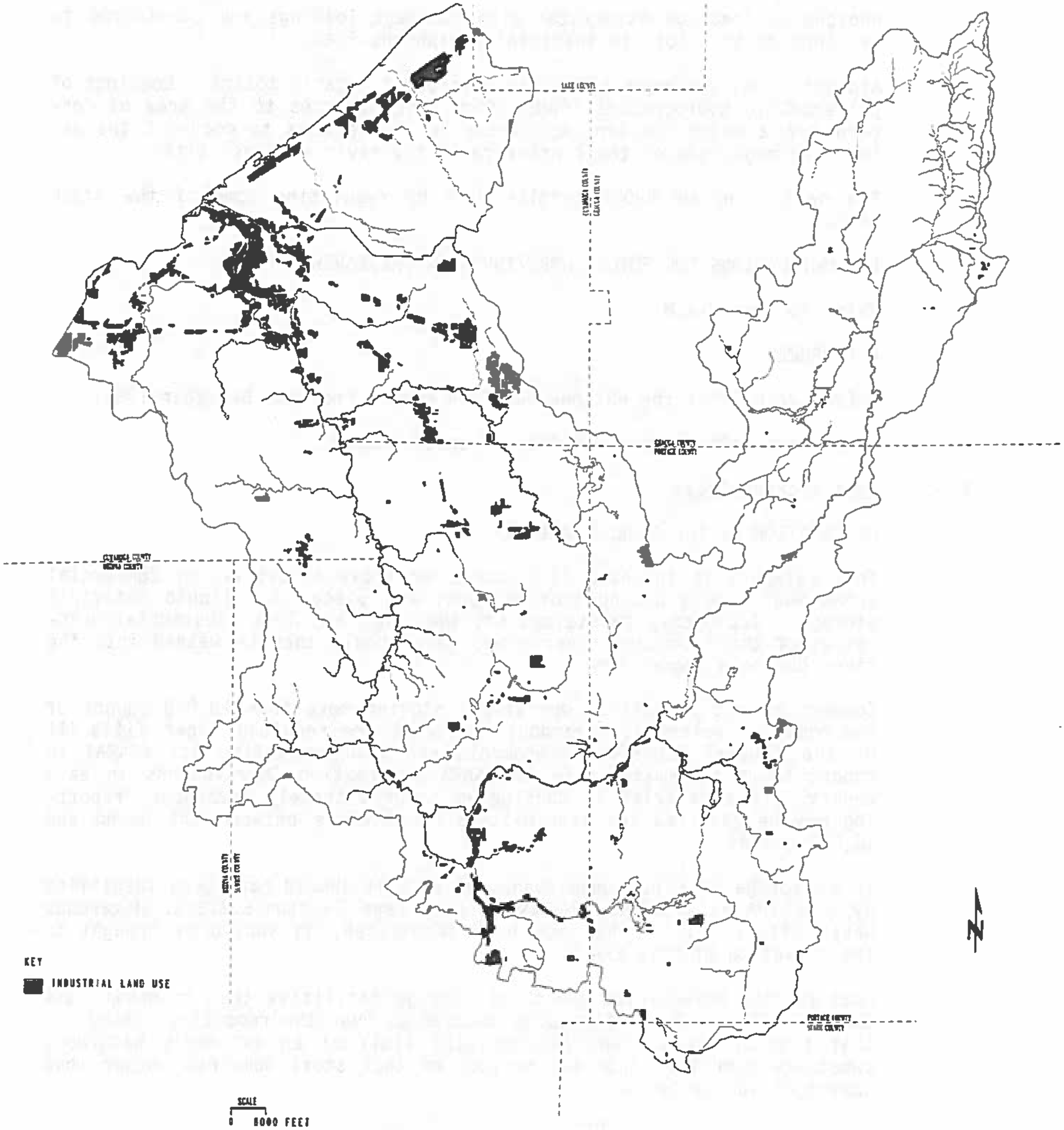
Given the variety of material stockpiled in the Area of Concern, there are numerous pollutant categories affected by industrial runoff. The biochemical oxygen demand of stockpiled materials is low and of only a minor concern. Chloride loadings come from Whiskey Island and from road salt storage depots. Many communities maintain a road salt storage depot. The use of covered storage facilities and material management techniques minimize losses from salt piles. They are considered to be minor contributors to the overall chloride loadings.

Most industrial stockpiles are free of oil and grease. Asphalt piles may have small amounts of these pollutants. Handling equipment may also be a source. Oil and grease loadings from these sources are considered to be minor contributors to the Area of Concern.

Sediment loadings do result from stockpile areas and are likely a minor contributor to the total loadings. In isolated cases, runoff from sand piles washes directly into the river. Washoff from storage yards which are heavily disturbed by material handling equipment is another source of sediment.

Figure: 5-9

CUYAHOGA RIVER BASIN AND LAKE ERIE TRIBUTARIES



1990 INDUSTRIAL LAND USE

The primary heavy metals concern with stockpiles is iron from iron ore piles. Data are unavailable to determine whether or not metals are a problem.

Phosphorus loadings associated with sediment loadings are considered to be minor contributors to the total phosphorus load.

Asphalt, coal and coke piles are sources of organic toxins. Loadings of polyaromatic hydrocarbons (PAHs) from these sources to the Area of Concern are a major concern, but there is little data to document the extent and magnitude of their presence in the river at these sites.

The next round of NPDES permits will be regulating some of the stock piles.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

USEPA, Results of the Nationwide Urban Runoff Program, December 1983.

NOACA Road Salt Storage Facility Inventory Report.

5.2.3.7 Tank Storage Areas

DESCRIPTION OF THE SOURCE CATEGORY

This category is intended to account for those industrial or commercial areas where above ground storage tanks are placed for liquid materials storage. Improperly maintained storage tanks may leak substantial quantities of their contents over time, which could then be washed into the river during a storm event.

Commercial and industrial operations storing more than 10,000 pounds of hazardous or extremely hazardous substance are required under Title III of the federal Superfund Amendments and Reauthorization Act (SARA) to report their transmittals to the SARA Information Coordinators in each county. If a material is considered to be extremely hazardous, reporting may be required for transmittals of anywhere between one pound and 10,000 pounds.

If a storage tank has been abandoned then it should have been identified by Ohio EPA as a potential CERCLA site (see Section 5.2.3.3: Hazardous Waste Sites). If it has not been identified, it should be brought to the attention of Ohio EPA.

What remains unregulated are those storage facilities that transmit less than 10,000 pounds of hazardous substances over the reporting period, or that transmit less than the regulated limit of an extremely hazardous substance over the reporting period, or that store something other than hazardous substances.

LOCATIONAL INFORMATION

At this time the Cuyahoga RAP Nonpoint Source Subcommittee has determined that an inventory of these sites is not warranted, and no locational information is being provided.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Appropriately regulated above ground storage tanks are not expected to contribute to water quality problems. If not regulated appropriately, however, above ground storage tanks could be contributing toxic substances to the Area of Concern in the form of nonpoint source pollution by way of slow leaks or otherwise poorly maintained facilities and poor operating procedures. The smaller volume storage tanks, especially those close to the Area of Concern could be problematic because they remain unregulated. The closer the facility is to the Area of Concern, the greater the opportunity it has to impact water quality. As discussed below, many facilities are required to have Spill Prevention Control and Countermeasure (SPCC) Plans to further reduce the threat to water quality.

SPILL PREVENTION

Under existing regulations (40 CFR 112), owners or operators of non-transportation related onshore and offshore facilities engaged in drilling, producing, gathering, storing, procuring, refining, transferring, distributing or consuming oil and oil products in large quantities* and which, due to their location, could reasonably be expected to discharge oil in harmful quantities into or upon the navigable waters are required to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan.

Ohio law 6111.03R enacted in December of 1988 adopts regulations consistent with 40 CFR 112. Ohio EPA as the designated administrator of oil pollution prevention regulations in Ohio has developed guidelines to assist facilities in the development of their SPCC plans. Ohio EPA reviews the submitted plans and can assess civil penalties of up to $5,000 for violations of oil pollution prevention regulations.

Ohio EPA guidelines for development of an SPCC plan state that the plan should document for each facility:

1) its practices devoted to the prevention of oil spills,

2) its plan of containment should a spill occur, and

3) its plan for removal and disposal of oil.

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* Large quantities" is defined as: underground storage of more than 42,000 gallons or above ground storage of more than 1,320 gallons or any single above ground container which stores more than 660 gallons.

Although the current SPCC regulations apply to oil and oil products only, USEPA is in the process of drafting regulations that include hazardous materials. Ohio EPA is working concurrently to include hazardous materials in its SPCC program. At the same time other federal laws are being drafted that could affect the requirements of the SPCC program. OSHA is writing rules that will require companies handling any of 129 priority pollutants to minimize accident risks and to plan for worst-case accidents. Under the 1990 amendments of the Clean Air Act, many plants will have to submit accident and risk-reduction plans to the USEPA in three to four years. Under the Oil Pollution Act passed in 1990, oil refineries and companies storing hazardous wastes near rivers and streams must now plan for catastrophic events. Prior to promulgating new SPCC requirements, Ohio EPA hopes to understand the requirements of the above mentioned laws to avoid overlap and duplication of requirements.

Hazardous waste generators that store products/byproducts for more than 90 days are required to have SPCC plans under different regulations.

SPECIFIC RECOMMENDATIONS

Refer to Appendix M.

5.2.3.8 Underground Storage Tanks

DESCRIPTION OF THE SOURCE CATEGORY

Underground storage tanks are used to store gasoline, diesel, and other fuels. They are primarily perceived to represent a fire hazard, but may also be a source of pollution to groundwater. Groundwater which has been contaminated by a leaking storage tank may act as a nonpoint source of pollution to surface waters.

The Bureau of Underground Storage Tank Regulations of the Division of State Fire Marshal, Ohio Department of Commerce regulates and monitors all underground storage tanks. They maintain records of all existing tanks, as well as a computer database of all reported leaks since 1987. The data on leaks includes the date reported, and the facility name and address. No information is available on type and amount of pollutant, or impact to groundwater, however.

LOCATIONAL INFORMATION

Underground storage tanks are located throughout the entire watershed, wherever gasoline stations or other facilities that store fuel exist. Their density probably varies with that of the population density, although they may be present in fewer numbers per capita in highly urban areas. The highest densities are probably located in suburban areas. Leaks may occur in any storage tank, and may also be widely scattered throughout the watershed area. There were 210 reported leaks throughout the watershed from 1/1/87 through 7/30/90 (see Table 5-20), and probably many more unreported ones.

There are thousands of underground storage tanks within the watershed, which makes this source very difficult to map, or even list in a table.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

No known comprehensive data exists about the impact of leaking underground storage tanks to ground or surface water in the Area of Concern. Since the tanks are ubiquitous throughout the watershed, however, the potential for contamination certainly exists. Contaminants may include soluble hydrocarbons and additives such as lead and cadmium, which pose a threat to human health.

SPECIFIC RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M

REFERENCES

Ohio Ground Water Protection and Management Strategy, Ohio EPA, October 1986.

Bureau of Underground Storage Tank Regulations, Division of State Fire Marshall, Ohio Department of Commerce.

5.2.3.9 Oil and Gas Wells

DESCRIPTION OF THE SOURCE CATEGORY

Oil and gas wells have been and continue to be developed throughout the Area of Concern and its basin. The area in the immediate vicinity of the well site is often heavily disturbed during well development. Erosion in exposed areas is always a potential problem. Drilling mud pits and brine storage areas can result in the release of pollutants if not properly constructed and maintained or are not properly closed upon completion of drilling. Illegal disposal of brine into area streams can also affect aquatic flora and fauna.

LOCATIONAL INFORMATION

Table 5-21 summarizes recent drilling activity in the basin by minor civil division.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

The inadvertent or illicit release of well field brine has contributed to chloride loadings in the past. The moderate amount of contamination likely to occur in the process of handling and disposing of brine from gas and oil wells is believed to be a minor contributor to the total chloride loading.

The Division of Oil and Gas in the Ohio Department of Natural Resources regulates all phases of oil and gas industry operations pursuant to Chapter 1509 of the Ohio Revised Code. Chapter 1509 provides authority to the Division to enforce rules that assure both resource conservation and environmental protection objectives can be achieved.

TABLE 5-20

LIST OF REPORTED PETROLEUM UNDERGROUND STORAGE TANK RELEASE INCIDENTS (ACCIDENTS/SPILLS) IN CUYAHOGA RIVER BASIN, 1/1/87 to 7/30/90:

COUNTY	COMMUNITY	NUMBER OF INCIDENTS	
Cuyahoga County	- Cleveland	44	
	Parma	12	
	Shaker Heights	8	
	Maple Heights	7	
	Brecksville	6	
	Garfield Heights	5	
	Independence	5	
	Bedford	4	
	Brooklyn	4	
	Bedford Heights	3	
	Solon	3	
	Oakwood	2	
	Parma Heights	2	
	Walton Hills	2	
	Warrensville	2	
	Warrensville Heights	2	
	Brooklyn Heights	1	
	Cuyahoga Heights	1	
	North Randall	1	
	Orange	1	
	Seven Hills	1	
	Valley View	1	Total = 117
Geauga County	- Auburn	1	
	Burton	1	
	East Claridon	1	
	Hambden	1	
	Middlefield	1	
	Newbury	1	Total = 6
Portage County	- Ravenna	10	
	Kent	5	
	Streetsboro	2	
	Aurora	1	
	Brimfield Township	1	
	Hiram	1	
	Mantua	1	Total = 21
Summit County	- Akron	38	
	Richfield	6	
	Tallmadge	4	
	Cuyahoga Falls	3	
	Hudson	3	
	Northfield	3	
	Stow	3	
	Twinsburg	2	
	Macedonia	1	
	Mogadore	1	
	Peninsula	1	
	Silver Lake	1	Total = 66

If drilling, operation, and closure activities are followed consistent with Chapter 1509, gas and oil wells are not expected to be pollution problems. However, there is a real possibility of something going wrong at any given well. Therefore, there exists the potential for the release of oil and grease, excessive sediment, organic toxics and/or heavy metals. The magnitude of any given release could be substantial. Large scale releases that could affect the Area of Concern are expected to be rare occurrences.

The Cuyahoga County Soil and Water Conservation District surveyed 50 oil and gas wells in the county in 1990 and found 7 (14%) to have localized water quality problems caused by soil erosion. One site has been corrected, and ODNR will be informed of the other problem sites.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

Jim Storer, Cuyahoga County Soil and Water Conservation District

ODNR Division of Oil and Gas, Columbus.

5.2.3.10 Waste Injection Wells

DESCRIPTION OF THE CATEGORY

Waste injection wells fall into five groups:

Class I: Hazardous and non-hazardous waste disposal wells

Class II: Brine injection wells

Class III: Salt solution mining wells

Class IV: Hazardous or radioactive waste disposal wells within one-quarter mile of an underground supply of drinking water

Class V: Others: Septic wells, drainage wells, dry wells for septic systems, etc.

ODNR Division of Oil and Gas regulates Classes II and III wells (ORC 1509; OAC 1501) Ohio EPA regulates Classes I, IV and V.

Only Class II and III wells are known to exist in the basin (August 1991). Class II wells are either drilled or converted from an out-of-production oil/gas well soley for the disposal of oil field brine and fluid by-products of oil and gas drilling. Wells can also be drilled and filled for enhanced recovery of oil production.

TABLE 5-21
NUMBER OF WELLS DRILLED AND PRODUCING
OIL AND GAS, BY COUNTY

	Wells Drilled* 1987	1988	1989	1990	Total 87-90
Cuyahoga	0	1	0	0	1
Summit	77	59	54	42	232
Portage	64	53	40	43	200
Geauga	55	57	80	28	170
TOTAL	196	170	124	113	603

*Of the total number of wells drilled, 95% are actually producing.

SOURCE: Ohio Department of Natural Resources, Division of Oil and Gas, Columbus.

Class III wells are those used by the salt industry (Morton, Akzo). The well is drilled and then filled with water to create a brine in the production of salt. There are no data to determine whether or not this class of wells is causing a water quality problem.

LOCATIONAL INFORMATION

As of July 1, 1991 the number of Class II wells by county were as follows:

Cuyahoga	-	1
Summit	-	4
Portage	-	19
Geauga	-	7

These wells have not been located by the RAP Nonpoint Source Subcommittee, but locational information on each well exists at the Division of Oil and Gas, ODNR, Columbus.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Underground injection wells threaten groundwater if they leak. The Underground Injection Control Program, Division of Oil and Gas, ODNR regulates Class II wells to prevent leakages. Activities under this program include: permit determination for Class II wells; compliance reviews; witnessing 100 percent of all mechanical integrity test performed; regular inspection of all Class II wells; witnessing of all critical construction and testing operations by UIC field personnel; well inventory and data management; administration of public participation/information; and representation of the state at the national level.

The Nonpoint Source Subcommittee does not believe that Class II waste injection wells present a nonpoint source pollution problem. If regulated appropriately, they should be a greatly minimized threat to groundwater. The city of Akron's Shalersville Study of brine and deep injection wells found no impact on water quality.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

There are no recommendations for future work.

SOURCES

Tom Tomastik, Ohio Department of Natural Resources, Division of Oil and Gas, Columbus.

City of Akron, Shalersville Study.

5.2.3.11 Pipelines

DESCRIPTION OF THE SOURCE CATEGORY

Pipelines in the Cuyahoga River basin carry gases, liquids and sludge. Both above ground and buried pipelines exist in the basin.

The pipelines transporting natural gas are regulated under the federal Natural Gas Pipeline Safety Act of 1968, and amendments. Pipelines transporting hazardous liquid are regulated under the Hazardous Liquid Pipeline Safety Act of 1979 and the Hazardous Materials Transportation act and amendments.

The U.S. Department of Transportation Research and Special Programs Administration has the authority to regulate pipelines under the aforementioned laws. The Office of Pipeline Safety, which is in the Research and Special Programs Administration administers the pipeline safety program (49 CFR Ch.1, Parts 190-193 and 195).

LOCATIONAL INFORMATION

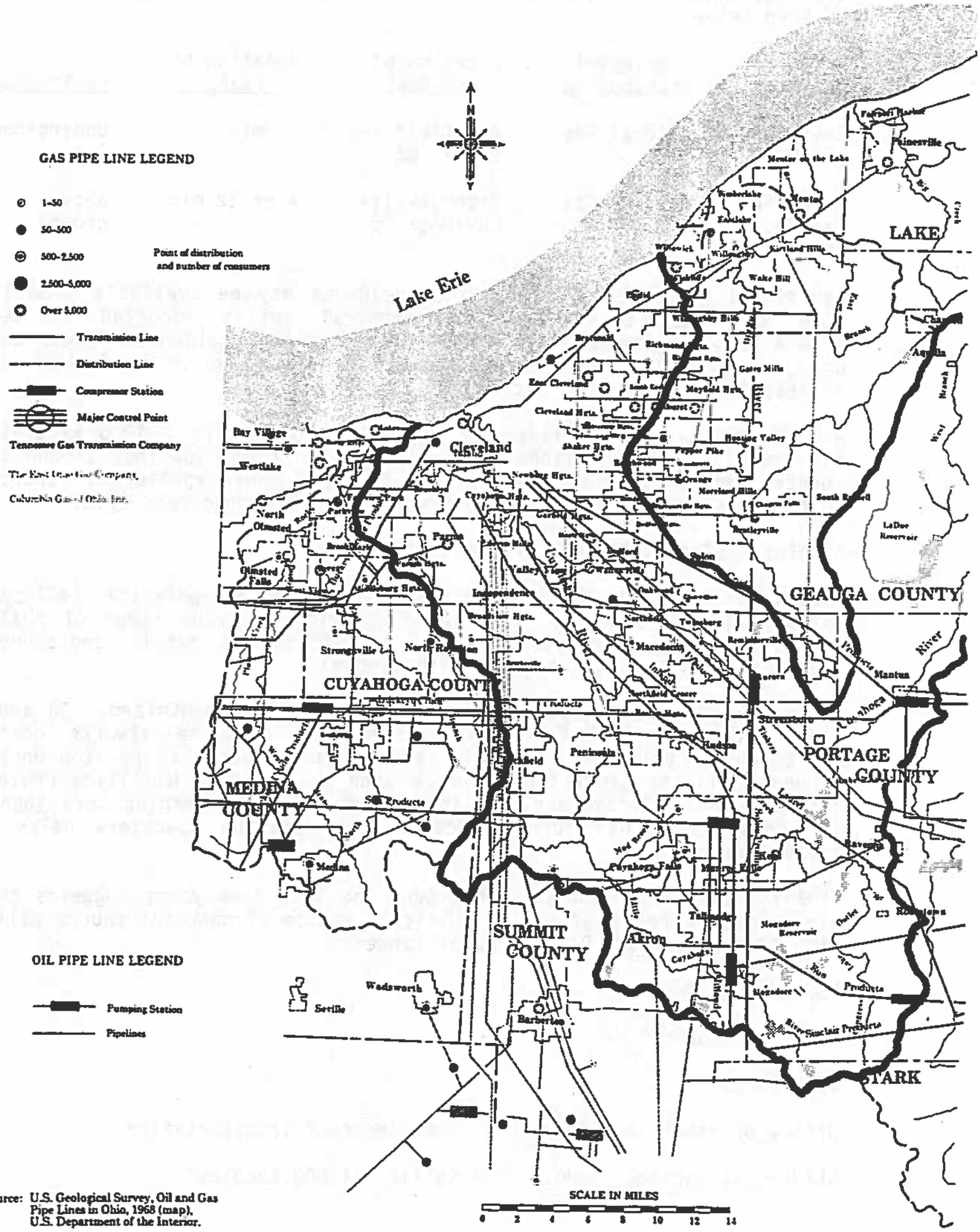
A dated map of gas and oil pipelines that run through the Cuyahoga River basin has been provided (Figure 5-10). A more recent inventory has not been done. There are approximately 20 companies and institutions which operate pipelines. Each would need to be contacted in order to locate their lines and to determine exactly what substances are being transported.

Information on pipeline accidents is, however, readily available through the Office of Pipeline Safety in Washington, D.C. An accident report is required for each failure in a pipeline system (40 CFR 195.50 Subpart B) in which there is a release of the hazardous liquid transported resulting in any of the following:

1. Explosion or fire not intentionally set by the operator.
2. Loss of 50 or more barrels of liquid.
3. Escape to the atmosphere of more than five barrels a day of highly volatile liquids.
4. Death of any person.
5. Bodily harm to any person resulting in one or more of the following:
    a) Loss of consciousness.
    b) Necessity to carry the person from the scene.
    c) Necessity for medical treatment.
    d) Disability which prevents the discharge of normal duties or the pursuit of normal activities beyond the day of the accident.
6. Estimated property damage to the property of the operator or others, or both, exceeding $5,000.

Figure: 5–10

GAS & OIL PIPELINES IN THE CUYAHOGA RAP SOURCE AREA



Source: U.S. Geological Survey, Oil and Gas Pipe Lines in Ohio, 1968 (map), U.S. Department of the Interior.

Two accidents in the four county area of the basin have been reported since 1986. These accidents resulted in transported material escaping directly into the environment. Information on these accidents is summarized below.

Operator	Material Transported	Location of Incident	Duration of Leak	Environment
East Ohio Gas Co.	Natural Gas	Richfield Twp. Summit Co	25 min	Underground
Columbia Gas Co.	Natural Gas	Strongsville, Cuyahoga Co.	4 hr 22 min	above ground

Additional information on pipeline accidents may be available from the Ohio EPA EROS database. Some chemical spills reported in Section 5.2.3.12 below may be the result of pipeline accidents. These data on chemical spills come from the EROS database, which is further described in the following section.

A 1990 report by the Wilderness Society, "100 Spills - 1000 Excuses," documents 5,499,842 gallons of liquid spilled from pipelines around the country between 1989 and March 1990. None of those spills are reported to have occurred in the Cuyahoga River basin or around Lake Erie.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Pipelines which run close to or under water have the potential to impact streams if they rupture. They could contribute a wide range of pollutants, including petroleum products, organic toxics, metals, and conventional contaminants (associated with sludge).

If regulated properly, pipeline accidents should be minimized. In addition, large companies regularly fly over their pipeline networks looking for potential problems. By state law one must contact a one-stop underground utilities protection service such as the Ohio Utilities Protection Service to locate any pipelines before digging anything more than a 12" hole, but close surveillance by the pipeline operators helps to avoid accidents.

Finally, the numbers of accidents over the last five years suggests that pipelines are not a steady, significant source of nonpoint source pollution to the Cuyahoga River Area of Concern.

RECOMMENDATIONS

Refer to Appendix M.

REFERENCES

Office of Pipeline Safety, U.S. Department of Transportation.

Wilderness Society, 1990. "100 Spills - 1,000 Excuses"

5.2.3.12 <u>Chemical Spills</u>

DESCRIPTION OF THE SOURCE CATEGORY

Chemical spills include any accidental spills or unauthorized discharge of chemicals or hazardous materials. The most common type of chemical spill is petroleum products such as diesel fuel, gasoline, fuel oil, and aviation fuel. Spills may occur on land, or directly to a waterway such as a river, stream, or storm sewer.

The Emergency Response Section of the Ohio EPA is the designated reporting point for spills and unauthorized discharges in Ohio. They typically receive reports from private citizens, companies, police and fire departments, and other government agencies, such as the Coast Guard. All information reported is stored in the Emergency Response Online System (EROS) database. Typically the database includes information such as date, location, entities both causing and reporting the spill, waterway, material and amount spilled and recovered, spill size and priority, as well as source and cause for the spill.

LOCATIONAL INFORMATION

Chemical spills can occur anywhere within the basin. Between 1986 and 1990, 9 spills in Geauga County, 54 spills in Summit County, 21 spills in Portage County, and 83 spills in Cuyahoga County have been reported and documented in the EROS database. Table 5-22 summarizes the kinds of spills in each county. Appendix H.8 identifies all the individual spills in the four counties. The source of most incidents reports to the Ohio EPA are trucks, airports, and farms. Trucks may cause a spill during loading or unloading, or may be involved in an accident on the road or unauthorized dumping. Airports are the sites of frequent, although usually small spills of aviation or jet fuel. Farms also appear to be a common source of spills, due to the many types of chemicals, such as pesticides and fertilizers, that are stored and used on farms. The highest percentage of reported spills is in urban areas, particularly near transportation routes and airports, but a significant number also occur in rural areas.

There are virtually limitless potential sources of chemical spills within the watershed, which makes this source very difficult to represent on a map, or even adequately list in a table. The actual reported spills, however have been shown on a map by representing the number or volume of spills that have occurred in each community during the time period 1986-1990.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Chemical spills may represent a significant hazard within the Area of Concern. The potential exists for substantial amounts of toxic materials to be released either directly or indirectly to area streams and rivers. These incidents may be harmful to aquatic organisms and overall water quality. Many more spill incidents probably occur than are reported to the Ohio EPA and recorded in the EROS database.

Table 5-22: Summary of Spills in the Cuyahoga River Basin, 1986-1990.

SPILL SUMMARY 1986-1990: CUYAHOGA COUNTY CUYAHOGA RIVER WATERSHED

SPILL MATERIAL	AMOUNT
Gasoline	9,907 gal
Diesel Fuel	1,360+ gal
Jet or Aviation Fuel	905+ gal
Fuel Oil	2,640 gal
Miscellaneous Oils	73+ gal
Brine	Unknown
Farm Chemicals	Unknown
Miscellaneous Chemicals	27,480+ gal 17,001+ lbs

SPILL SUMMARY 1986-1990: SUMMIT COUNTY - CUYAHOGA RIVER WATERSHED

SPILL MATERIAL	AMOUNT
Gasoline	318+ gal
Diesel Fuel	1,726 gal
Fuel Oil	Unknown
Jet Fuel	10 gal
Crude Oil	168 gal
Brine	12,000+ gal
Farm Chemicals	35+ gal
Miscellaneous Chemicals	10,885 gal. 50 lbs 1 drum

Source: Ohio EPA, Emergency Response Section, Emergency Online Response System (EROS) Database.

Table 5-22: Summary of Spills in the Cuyahoga River Basin, 1986-1990. (Cont.)

SPILL SUMMARY 1986-1990: PORTAGE COUNTY - CUYAHOGA RIVER WATERSHED

SPILL MATERIAL	AMOUNT
Gasoline	69 gal
Diesel Fuel	1,726 gal
Crude Oil	Unknown
Miscellaneous Chemicals	113+ gal 24,000+ lbs

SPILL SUMMARY 1986-1990: GEAUGA COUNTY - CUYAHOGA RIVER WATERSHED

SPILL MATERIAL	AMOUNT
Gasoline	50 gal
Diesel Fuel	10,390 gal
Farm Chemicals	Unknown
Miscellaneous Chemicals	5,000+ gal 2,000 lbs

Source: Ohio EPA, Emergency Response Section, Emergency Online Response System (EROS) Database.

SPECIFIC RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M

Emergency Response Section, Division of Emergency and Remedial Response (DERR), Ohio EPA

Zack Clayton - Health Physicist, Emergency Response Section, Ohio Environmental Protection Agency, Columbus.

5.2.3.13 Home Sewage Systems, Small Commercial Systems and Small Package Plants

DESCRIPTION OF THE SOURCE CATEGORY

Home sewage treatment systems, historically known as septic systems, provide an individual homeowner with the capability to treat and dispose of the wastewater generated by that household. Treatment of the wastewater is typically accomplished with septic tanks by settling of solids and reduction of organic wastes by anaerobic bacteria. Small commercial package plants usually treat sanitary wastewater with aeration systems (aerobic bacteria) to reduce the biochemical oxygen demand, followed by settling of solids and filtration. Home systems and very small package plants are usually designed for on-lot disposal through tile fields utilizing soil adsorbtion and evapo-transpiration. The effectiveness of these systems is limited by soil conditions and lot size. Summit and Geauga Counties generally do not have soils suitable for on-lot disposal. In Cuyahoga County soils are not suitable for on-lot disposal as well, and the majority of systems are designed to discharge the wastewater off the property to a ditch, stormsewer or stream.

Properly designed and maintained systems are not expected to cause problems. However, many systems in the basin have outlived their life expectancy. Improperly functioning off-site discharge systems may release untreated or partially treated wastewater to streams. These are examples of problems that are associated with home sewage treatment systems.

This inventory work is limited to home sewage treatment systems. There are small commercial operations in the basin that have sewage systems that function in the same manner as the home systems. These have not yet been inventoried. Also in the basin are larger sewage treatment systems that are not large enough to be permitted. These systems, known as package plants, treat up to 25,000 gallons of wastewater per day. The effluent from these systems is generally discharged to a stream or stormsewer. Package plants treating under 25,000 gallons per day have been inventoried in Summit and Cuyahoga Counties.

LOCATIONAL INFORMATION

Home sewage treatment systems are scattered throughout the basin. On-site systems do occur in sewered areas, but they do not occur at high densities. A single home system which is poorly maintained or is malfunctioning could create a local problem, but the greater the density of such systems in an area, the greater the potential to impact water quality further downstream.

Table 5-23 reports the number of septic systems in the Cuyahoga River basin by community.

In the nearshore portion of the study area, all communities are served by existing sewerage collection systems. Except for a small portion of Richmond Heights and the small portion of Euclid which is in the study area, all communities are served by the Northeast Ohio Regional Sewer District. The City of Euclid serves these remaining two small areas within the study area.

Table 5-23: 1990 Numbers of Home Sewage Systems in the Cuyahoga River Basin by Community (political units lying mostly or wholly within the basin)

Cuyahoga County	1990 Total Population	1990 Numbers of Systems
Cleveland	505,616	Approx. 25
Brooklyn	11,706	--*
Brook Park	22,865	--
Parma Heights	21,448	--
Seven Hills	12,339	--
Broadview Heights	12,219	397
Brecksville	11,818	783
Valley View	2,137	148
Garfield Heights	31,739	219
Oakwood	3,392	166
Glenwillow	455	102
Solon	18,548	871
Walton Hills	2,371	201
Parma	87,876	--
Brooklyn Heights	1,450	--
Independence	6,607	--
Maple Heights	27,089	--
Bedford Heights	12,131	--
Beachwood	10,677	--
Warrensville Heights	15,745	--
Subtotal of Systems		2,912
Geauga County	81,129	--
(entirely unsewered)		
Summit County		
Akron	210,000	Approx. 1,100
Bath	9,015	2,398
Boston Heights	733	236
Boston Township	1,879	415
Cuyahoga Falls	48,950	1,028
Fairlawn	5,779	Approx. 20
Hudson Village	5,159	44
Hudson Township	11,969	680
Lakemore	2,684	1
Macedonia	7,509	266

*"--" number of systems is undetermined.

Table 5-23 - Continued

<u>Summit County</u> (Cont.)		
Mogadore		19
Munroe Falls	5,359	20
Northfield Center	3,982	230
Northfield Village	3,624	3
Peninsula	562	224
Reminderville	2,163	3
Richfield Village	--	858
Richfield Township	5,010	802
Sagamore Hills	6,503	1,079
Silver Lake Village	3,052	1
Springfield Township	14,773	1,619
Stow	27,702	122
Tallmadge	14,870	103
Twinsburg	9,606	89
Twinsburg Township	1,896	315
Subtotal of Systems		11,675
<u>Portage County</u>		
Kent	28,300	Approx. 25
Aurora Township	9,192	--*
Aurora	790	Approx. 281
Streetsboro	10,143	464
Brimfield	7,554	901
Franklin	6,478	626
Mantua	1,178	741
Randolph	4,970	861
Ravenna	12,069	927
Ravenna Township	8,961	--
Rootstown	6,612	1,008
Shalersville	5,270	565
Suffield	6,312	1,402
Subtotal of Systems		7,801
Total Systems in the Basin		20,388

*"--" number of systems is undetermined.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Home sewage treatment systems throughout the basin can be a significant contributor of phosphorus and nitrogen to the Area of Concern. Additionally, home sewage systems located near water courses can be moderate contributors of bacteria to the Area of Concern.

Fecal coliform counts as high as 2,500,000 per 100 ml have been obtained from drainage conducts in non-sewered areas of Cuyahoga County. Biochemical oxygen demand has been measured at 85 to 200 mg per liter. Approximately 75% of the existing home sewage systems in Cuyahoga County are substandard, and collectively impact the environment proportionally to densities of home systems and dilution rates of the receiving stream. Many of the substandard systems today are providing only primary treatment of the wastewater. Primary treatment is effective in removing 5 to 35% of the biochemical oxygen demand from the waste. The primary treatment components of many of the systems in the basin are grossly undersized, which compounds the problem.

SPECIFIC RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M

REFERENCES USED

Home and Semi-Public Systems: A Significant Contributor to Nonpoint Source Pollution in Cuyahoga County. Cuyahoga County General Health District, 1991.

NEFCO Package Plant Report

NOACA Black River Home Sewage Report

Cuyahoga County General Health District

5.2.3.14 Cropland

DESCRIPTION OF THE SOURCE CATEGORY

The cropland category includes those lands typically associated with grain production, including planting fields, hayland, and farmstead and barn areas.

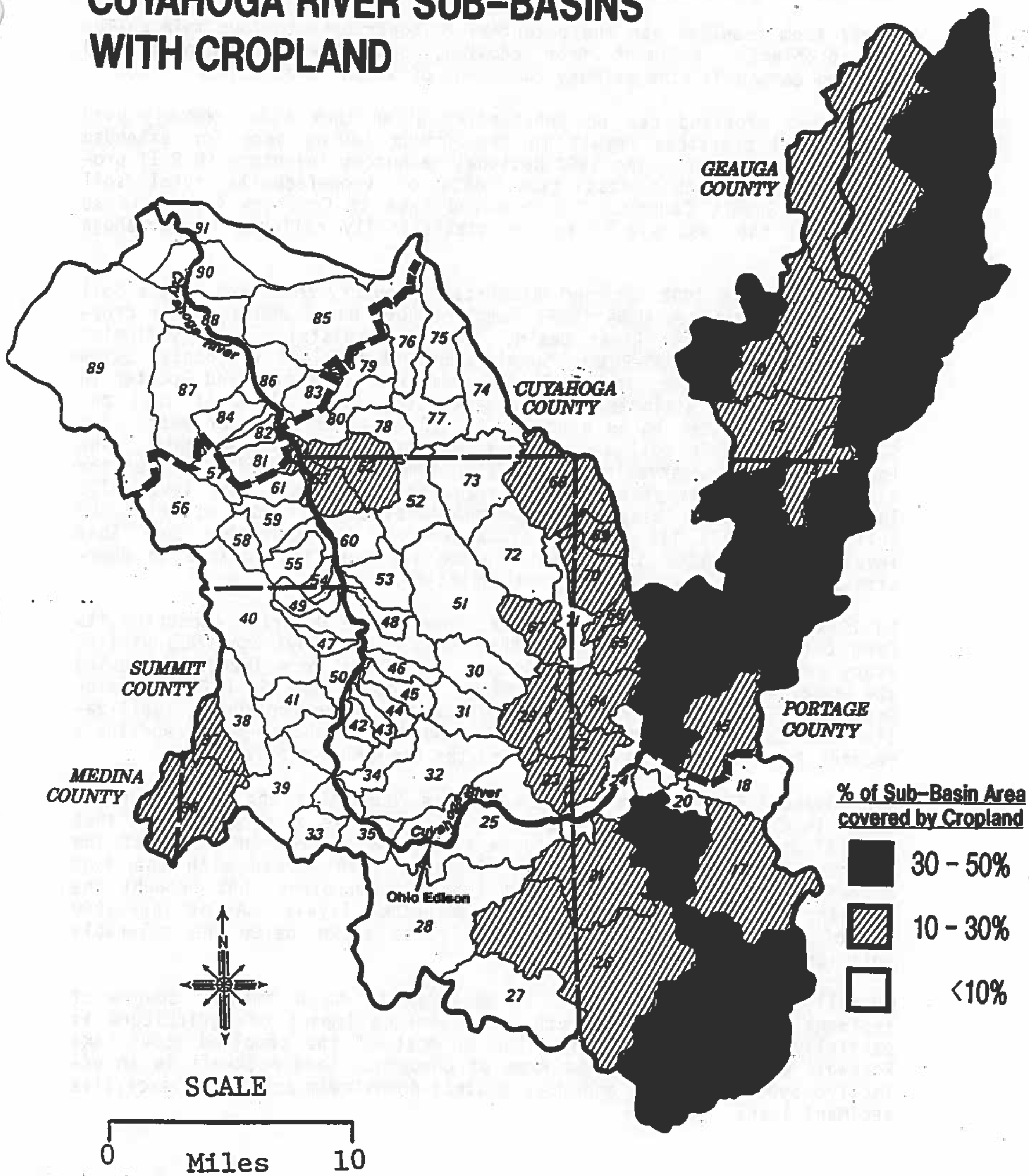
LOCATIONAL INFORMATION

Agricultural lands in the Cuyahoga River Basin are concentrated in Geauga and Portage Counties. Limited areas do exist in Summit County and isolated farmlots also exist in the southern portion of Cuyahoga County. Seven sub-basins have 40% or more of their land devoted to cropland in the watershed. There are 14 sub-basins with 20-40%, and 13 with 10-20%. See Figure 5-11.

In the nearshore portion of the study area, there are roughly 220 acres in agriculture (NOACA, 1977 Land Use Survey). There are 210 acres in agriculture in the area of the East Branch of Euclid Creek, and 10 acres in the Doan Brook sub-basin.

Figure: 5-11

CUYAHOGA RIVER SUB-BASINS WITH CROPLAND



SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Runoff from cropland has the potential to contribute to four main pollutant problems: sediment from erosion, pesticides, phosphorus, and nitrogen compounds (the primary component of which is nitrate).

Erosion on cropland can be substantial given that some commonly used agricultural practices result in the ground laying bare for extended periods of the year. The 1992 National Resources Inventory (N.R.I) provides county reliable statistical data on (non-federal) rural soil losses in Summit County. The cropland base in Cuyahoga County is so small that the 1992 N.R.I. is not statistically reliable for Cuyahoga County.

According to the 1992 National Resources Inventory conducted by the Soil Conservation Service, USDA (SCS) Summit County has 5,800 acres of cropland in the Cuyahoga River Basin. The local district conservationist (SCS) estimates that 85-90% of Summit County's cropland is located below the watershed draining to the Ohio Edison Dam. The cropland located in Summit County is estimated to be generating 21,600 tons of soil per year. This equates to an average of 3.72 tons per acre per year. The SCS sets allowable soil loss limits for each soil mapping unit. The local district conservationist (SCS) in Summit County estimates that the 4 tons per acre per year is the average tolerable soil loss level (T). The allowable soil loss is the maximum level of soil loss at which the soil can maintain its natural productivity. The tolerable soil loss level does not take into consideration the potential damage to downstream levels by the resulting sedimentation.

In 1987 the Cuyahoga Soil and Water Conservation District conducted its Farm Outreach Program. During that summer the Cuyahoga SWCD visited every known farm in Cuyahoga County. The farms were located by using the records of the Valley View Field office of the Soil Conservation Service, USDA, the Cuyahoga County office of the Agricultural Stabilization and Conservation Service, USDA, and the Cuyahoga County Auditor's records for the cropland and woodland tax reduction programs.

The Cuyahoga SWCS's Farm Outreach Program found that the Cuyahoga River Basin in Cuyahoga County has a total of 340 acres of cropland. At that time 37 acres were determined to be eroding at a rate in excess of the tolerable soil loss limits. The district then worked with the land operators to develop and implement conservation plans that brought the cropland to or below the soil loss tolerance levels. As of July 1990 all of the cropland in Cuyahoga County was at or below the tolerable soil loss limits set by the SCS.

Overall, agricultural erosion is believed to be a "minor" source of sediment in the Area of Concern. The limited impact of agriculture is partially due to the concentration of most of the cropland above Lake Rockwell which lies above the Area of Concern. Lake Rockwell is an effective sediment filter and does protect downstream areas from excessive sediment loads.

Runoff containing pesticides from agricultural lands is considered to be a "major" source of loadings in the Area of Concern. Of the pesticides that occur in measurable quantities in the Cuyahoga River, most are used for agricultural purposes.

Phosphorus and nitrogen loadings from agricultural lands are considered to be "intermediate" in their impact. Unit area loadings can be very high. However, the limited magnitude of agriculture in the basin as a whole and the use of at least minimal management practices on much of the land probably tends to moderate fertilizer loadings in the basin.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

Dave Baker

Ohio Phosphorus Reduction Strategy

ACOE Cuyahoga River Restoration Study

USDA Soil Conservation Service. National Resources Inventory

Jim Storer, Cuyahoga County SCS

5.2.3.15 Rural Non-Cropland

DESCRIPTION OF THE SOURCE CATEGORY

Rural non-croplands encompass those land areas characterized by largely open space uses or uses which feature only minimal impervious surface areas. Grasslands (not hayland), wood lots, park areas, outdoor recreational lands (generally limited to golf courses), water and wetland areas constitute the "major" open space uses in the basin. Rural residential areas which involve housing densities of less than one house per acre have also been included in this category. Two uses which are included in this category that generally result in more intense land disturbance are confined animal feedlots and rail or utility rights of way. Recreational horsefarms on small acreages can simulate feed lots. Additionally, any confined small animal facility, including dog kennels can simulate feed lots. Utility rights of way are typically electrical power line aisles with grass or shrub cover. Rail line areas are subject to leaks and spills from rolling stock.

LOCATIONAL INFORMATION

Rural non-croplands are the dominant land use in the Cuyahoga River basin. Approximately 75% of the sub-basins are at least 50% rural non-crop in nature. All but three sub-basins have at least 26%. The lower densities of rural non-croplands lie in highly developed areas where residential, industrial, and/or commercial use are prevalent or in areas of dense agriculture. The most intense areas are in the CVNRA and surrounding areas (Figure 5-12). Fourteen discrete points of soil erosion within the boundaries of CVNRA are identified in Figure 5-13.

Figure 5-14 highlights rural noncrop lands in the nearshore portion of the study area.

These 14 points are among 40 that were identified during a complete inventory of the CVNRA documented in the CVNRA Degraded Site Restoration Plan (revised May, 1987). Natural succession has restored several sites. Several others have been remediated by NPS at a cost of roughly several million dollars. The 14 points mapped have not yet been remediated due to lack of funding or a delay in park ownership of the land on which the site sits. Some sites counted among the 40 cannot be addressed due to ownership issues.

A research idea has been identified to investigate and map discrete points of soil erosion outside the park in the Cuyahoga basin, downstream of the Ohio Edison Dam (RM 45.1).

Confined animal feedlots can be sources of concentrated pollutant loadings. They include portions of dairy, cattle, horse, hog, sheep, and chicken farms. Most of these operations are dispersed in the upper portion of the basin in Geauga and Portage Counties.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

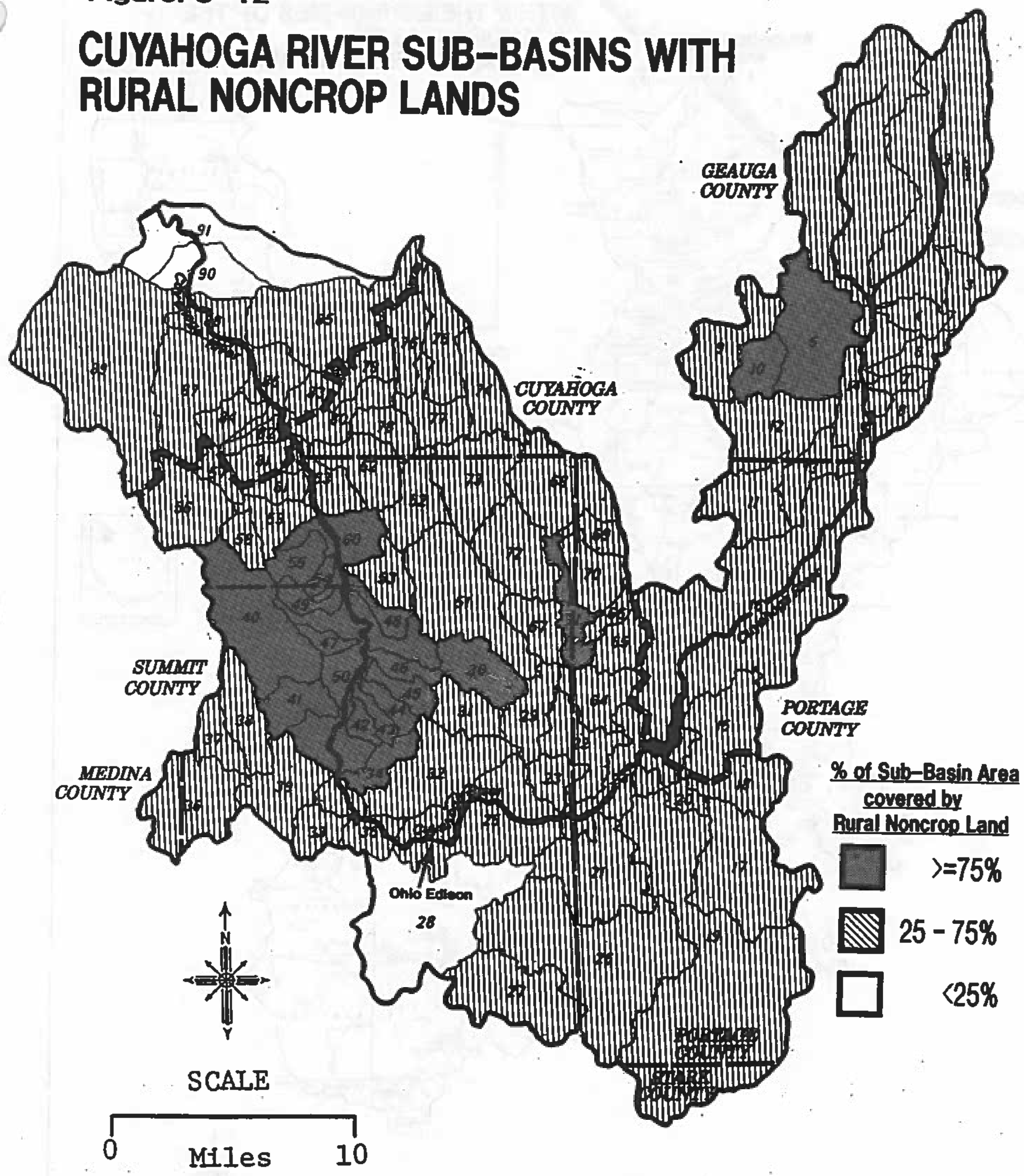
As a whole, rural non-croplands do not represent a significant increase in sediment production over background levels. However, two cases exist where concentrated erosion can occur in the basin on these lands. First, because of the low-intensity with which some lands are used, accelerated local erosion can go unnoticed and unchecked for some time. Second, because steeply sloping areas occur throughout the basin and are prevalent in the stretch lying between the Akron and Cleveland areas. Slope stability problems may contribute to an inherently high erosion potential on these lands. Small disturbances of the vegetation cover or drainage pattern can result in "major" sediment loads from small areas when and if slopes become unstable due to these disturbances.

Farm animals can contribute to the pathogenic load in the river. Bacteria levels in the immediate vicinity of a confined animal site can be severe. The limited scope of animal production in the basin and its concentration in headwater areas means that this source accounts for only a "minor" portion of the flowing pathogen load to the Area of Concern.

Confined animal sites can contribute biochemical oxygen demands on the river. To a lesser degree, so can runoff from low density residential areas. Rural non-cropland does contribute some BOD to the Area of Concern, but the precise amount is unknown.

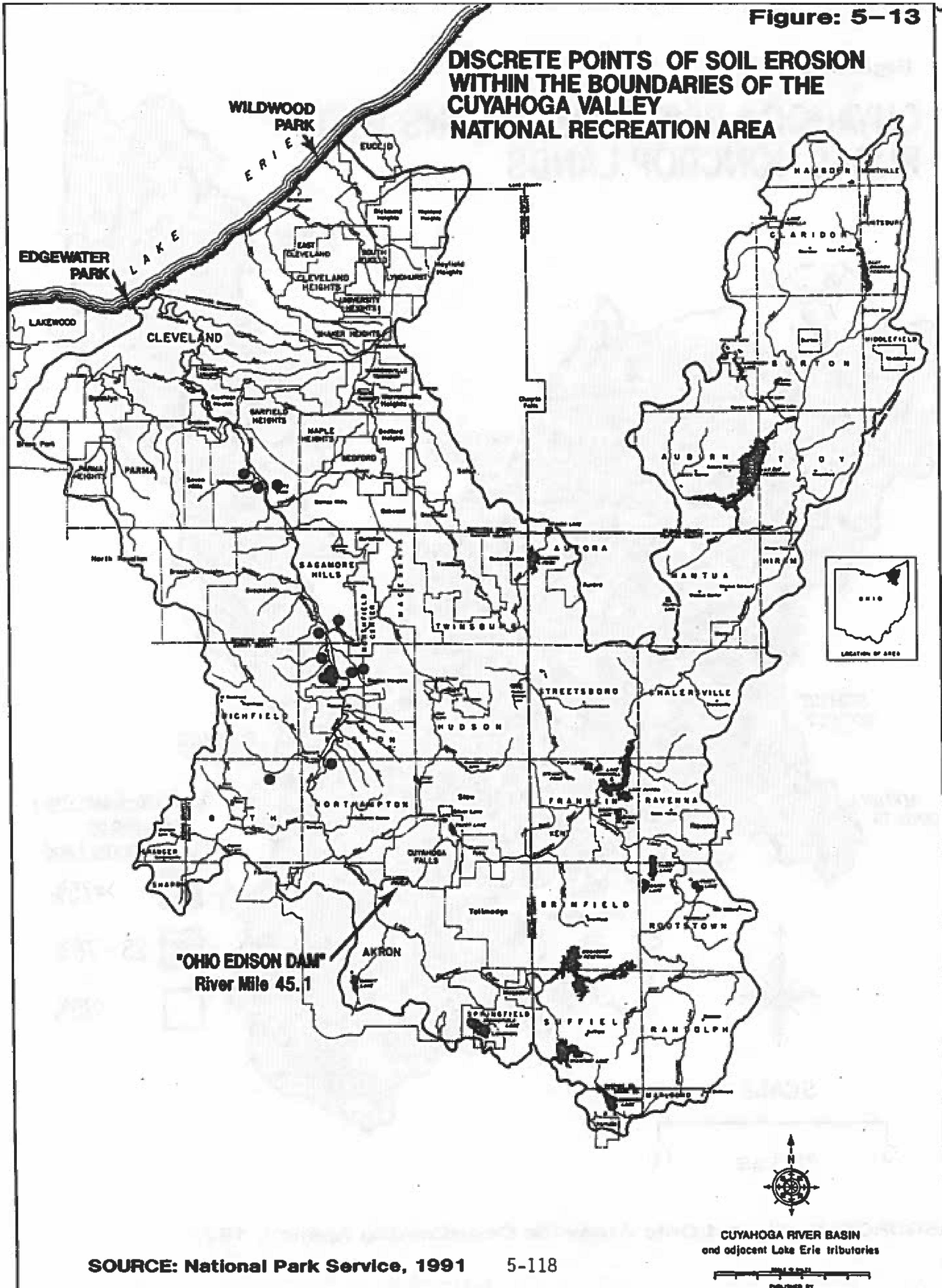
Figure: 5-12

CUYAHOGA RIVER SUB-BASINS WITH RURAL NONCROP LANDS



SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

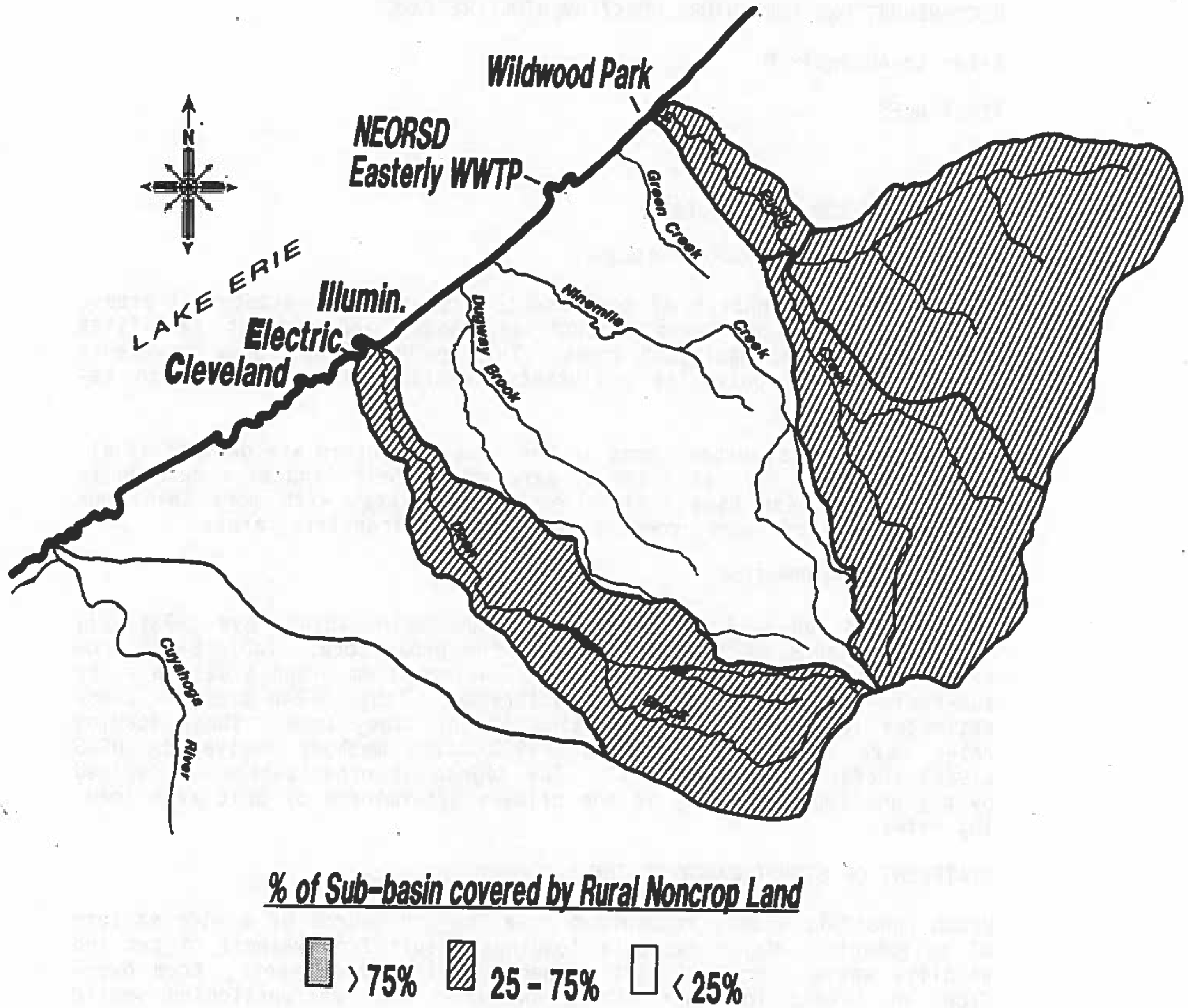
Figure: 5–13



SOURCE: National Park Service, 1991

Figure: 5–14

NEARSHORE AREA SUB-BASINS WITH RURAL NONCROP LANDS



Pesticides are used to a limited degree on rural residential lands. More pronounced loadings can occur from usage on the golf courses, which occur throughout the basin. The total pesticide usage on the low intensity lands encompassed in this category is a known contributor to the total pesticide load in the river, but the amount is unknown.

Increased phosphorus loadings arise from fertilizer use by rural homeowners and golf courses and from domestic animal waste. These loadings are considered to be "intermediate" in comparison with other sources in the basin. Nitrogen compounds are associated with the same sources as phosphorus and are believed to be a "minor" contributor to total loads.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M

REFERENCES

None

5.2.3.16 Runoff from the Urban Cores

DESCRIPTION OF THE SOURCE CATEGORY

The urban cores consist of moderate to high density residential areas, large commercial districts, industrial lands, and support facilities that comprise "metropolitan" areas. This myriad of land uses represents a wide range of potential pollutants available for washoff into receiving waters.

For this analysis, urban cores in the Area of Concern are defined as all sub-basins which have at least 20 percent of their land area devoted to urban uses. These uses include residential areas with more than four dwelling units per acre, commercial areas, and industrial areas.

LOCATIONAL INFORMATION

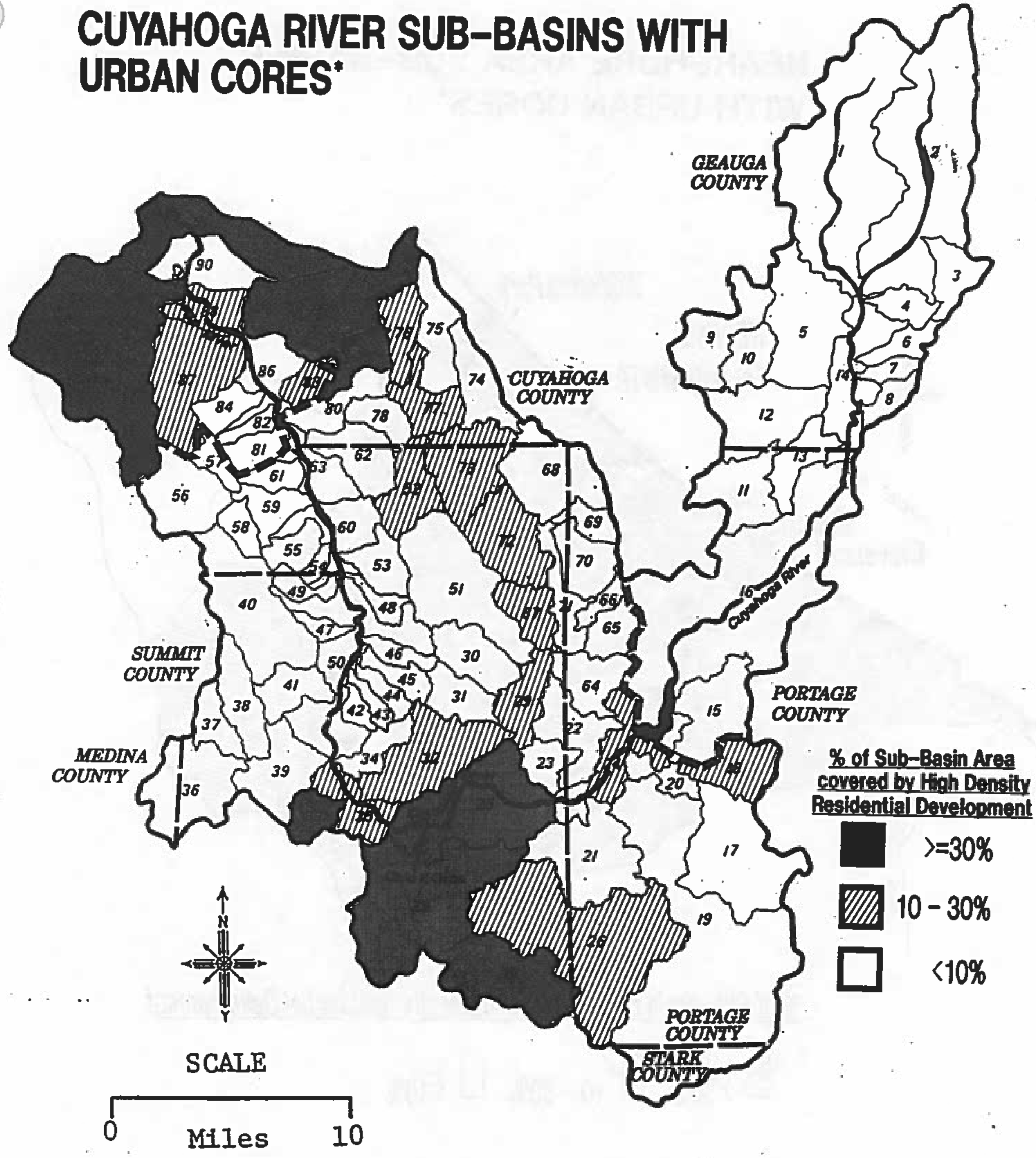
Figures 5-15 and 5-16 illustrate those sub-basins which have relatively large components of the land uses of the urban core. Table 5-24A provides an estimate of select pollutant loadings from urban areas in every sub-basin in the Cuyahoga River watershed. Table 5-24B provides these estimates for the nearshore portion of the study area. These loading rates were calculated by NOACA (1990) from methods derived by USGS (1988) (Refer to Appendix H.1). The degree of urbanization as defined by percent imperviousness is the primary determinate of unit area loading rates.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Urban runoff is widely recognized as a "major" source of a wide variety of pollutants. Major bacteria loadings result from washoff of pet and wildlife wastes, from illicit connections to storm sewers, from overflows or breaks in sewer lines, and from old, malfunctioning septic tanks.

Figure: 5-15

CUYAHOGA RIVER SUB-BASINS WITH URBAN CORES*

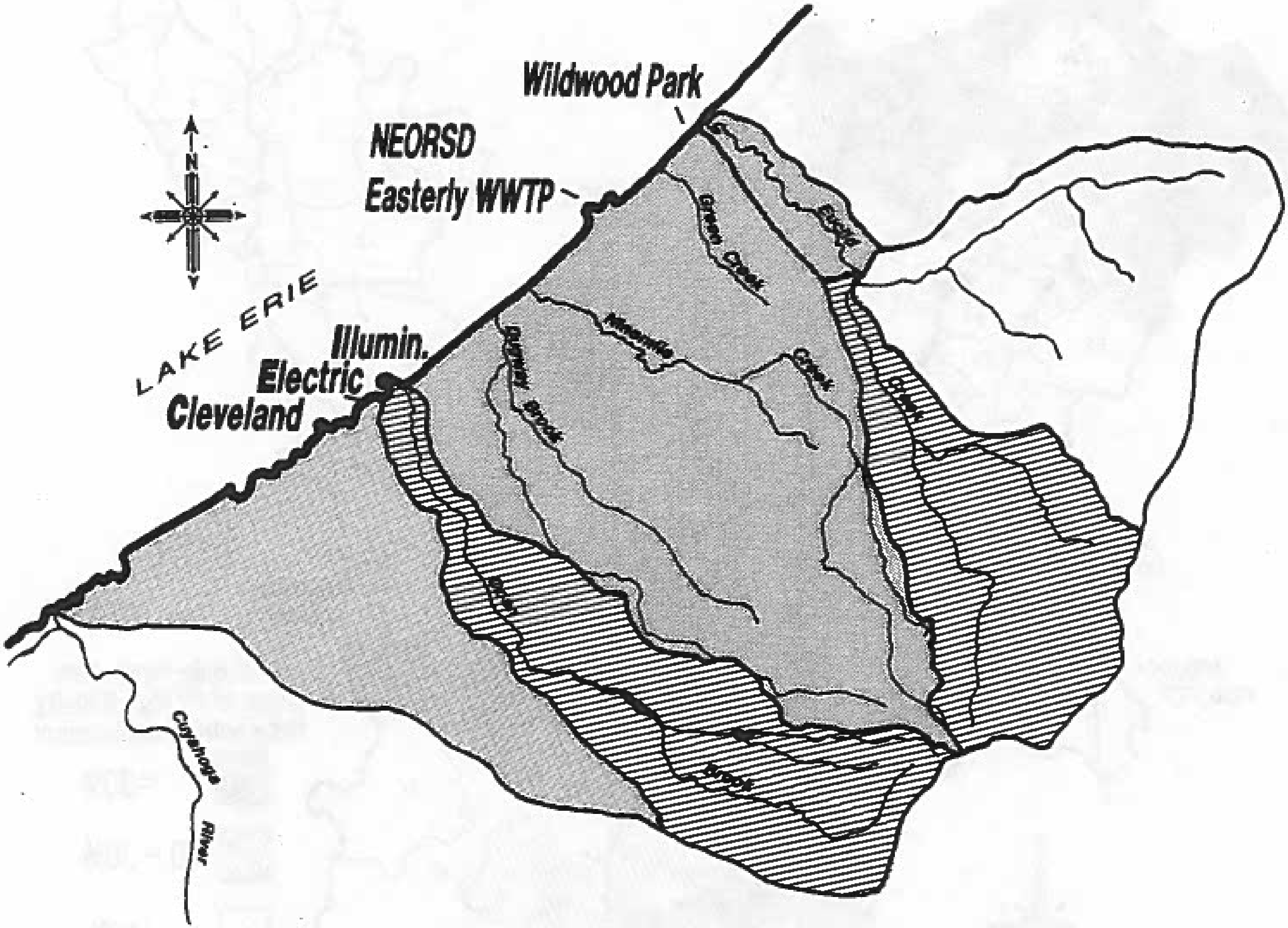


SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

* As measured by the area covered by High Density Residential Development (More than 4 drellin units per acre)

Figure: 5-16

NEARSHORE AREA SUB-BASINS WITH URBAN CORES*



% of Sub-basin covered by High Density Residential Development

> 30%   10 - 30%   < 10%

* As measured by the area covered by High Density Residential Development (more than 4 dwelling units per acre)

TABLE 5-24: ESTIMATES OF SELECT POLLUTANT LOADINGS FROM URBAN AREAS
(MEAN EVENT* LOADING RATES FOR CUYAHOGA RIVER SUB-BASINS)

				LOADS, IN POUNDS									
PERCENT URBAN	BASIN	AREA (sq mi)	PERCENT IMPERVIOUS	CHEMICAL OXYGEN DEMAND	SUSPENDED SOLIDS	DISSOLVED SOLIDS	TOTAL NITROGEN	TOTAL KJELDAHL NITROGEN	TOTAL PHOS-PHORUS	DISSOLVED PHOSPHORUS	COPPER	LEAD	ZINC
>30%	25	19.3	31.2	48,112	90,508	209,949	999	735	325	30	32	107	109.8
	27	12.6	34.1	32,498	59,086	137,065	679	500	212	20	21	73	75.2
	28	17.5	45.0	51,299	82,067	190,369	1,100	816	294	28	29	121	125.1
	33	3.6	29.6	8,807	16,882	39,162	182	134	61	6	6	19	19.9
	79	3.6	39.9	9,940	16,882	39,162	211	156	61	6	6	23	23.6
	85	19.4	41.7	54,707	90,977	211,037	1,164	862	326	30	32	127	131.3
	89	37.4	42.6	106,588	175,388	406,845	2,272	1,684	629	59	62	248	256.9
	91	15.4	57.0	51,975	72,219	167,524	1,145	857	259	24	25	129	134.3
	SUBTOTAL	129		363,926	604,011	1,401,113	7,752	5,744	2,166	202	213	847	876
10–30%	18	6.3	31.4	15,742	29,544	68,533	327	240	106	10	10	35	35.9
	24	8.8	24.5	20,277	41,268	95,728	415	303	148	14	15	44	44.8
	26	31.7	14.9	65,257	148,658	344,839	1,305	949	533	50	52	135	137.6
	29	5.4	12.2	10,769	25,323	58,742	214	155	91	8	9	22	22.4
	32	12.8	20.0	27,976	60,026	139,241	566	413	215	20	21	59	60.5
	35	5.7	18.5	12,241	26,730	62,006	247	180	96	9	9	26	26.3
	52	6.3	21.7	14,047	29,544	68,533	285	206	106	10	10	30	30.6
	67	4.9	12.6	9,818	22,979	53,303	195	142	82	8	8	20	20.5
	72	9.3	12.7	18,656	43,613	101,167	371	269	156	15	15	38	38.9
	73	10.0	15.0	20,610	46,895	108,782	412	300	168	16	17	43	43.5
	76	4.9	36.7	13,030	22,979	53,303	274	202	82	8	8	30	30.5
	77	5.2	17.7	11,062	24,386	56,567	223	162	87	8	9	23	23.6
	83	2.9	19.7	6,316	13,600	31,547	128	93	49	5	5	13	13.6
	87	13.8	31.9	34,685	64,715	150,119	721	531	232	22	23	77	79.4
	88	5.2	38.6	14,140	24,386	56,567	299	221	87	8	9	32	33.4
	SUBTOTAL	133		294,626	624,645	1,448,977	5,983	4,370	2,240	209	220	626	642

*MEAN EVENT=AVERAGE LOAD PER STORM. THE MEAN EVENT VALUE MULTIPLIED BY THE NUMBER OF STORMS PER YEAR (91) PROVIDES THE VALUE OF ANNUAL LOADS. REFER TO APPENDIX H.1 FOR TOTAL ANNUAL LOADS.

TABLE 5-24

PERCENT URBAN	BASIN	AREA (sq mi)	PERCENT IMPERVIOUS	LOADS, IN POUNDS: CHEMICAL OXYGEN DEMAND	SUSPENDED SOLIDS	DISSOLVED SOLIDS	TOTAL NITROGEN	TOTAL KJELDAHL NITROGEN	TOTAL PHOS-PHORUS	DISSOLVED PHOSPHORUS	COPPER	LEAD	ZINC
<10%	1	35.6	3.1	63,802	166,947	387,264	1,242	896	599	56	59	125	127.1
	2	36.4	1.5	64,022	170,699	395,967	1,242	894	612	57	60	125	126.5
	3	5.1	8.5	9,739	23,917	55,479	192	139	86	8	8	20	19.9
	4	3.2	3.6	5,769	15,006	34,810	112	81	54	5	5	11	11.5
	5	15.0	1.5	26,383	70,343	163,173	512	369	252	24	25	51	52.1
	6	3.0	0.7	5,227	14,069	32,635	101	73	50	5	5	10	10.3
	7	1.8	2.2	3,192	8,441	19,581	62	45	30	3	3	6	6.3
	8	2.7	2.2	4,788	12,662	29,371	93	67	45	4	4	9	9.5
	9	9.3	1.1	16,280	43,613	101,167	315	227	166	15	15	32	32.1
	10	4.4	0.7	7,667	20,634	47,864	148	107	74	7	7	15	15.1
	11	7.6	2.8	13,573	35,640	82,674	264	190	128	12	13	27	27.0
	12	10.4	0.5	18,078	48,771	113,133	350	252	175	16	17	35	35.6
	13	4.8	1.6	8,452	22,510	52,215	164	118	81	8	8	16	16.7
	14	10.5	0.8	18,317	49,240	114,221	355	255	177	17	17	36	36.1
	15	9.2	5.3	16,920	43,144	100,080	331	239	155	14	15	33	34.1
	16	48.4	4.3	87,973	226,973	526,505	1,717	1,239	814	76	80	173	176.2
	17	16.6	7.3	31,255	77,846	180,578	614	444	279	26	27	62	63.5
	19	45.5	5.3	83,679	213,374	494,958	1,637	1,182	765	72	75	166	168.4
	20	2.8	15.6	5,812	13,131	30,459	116	85	47	4	5	12	12.3
	21	13.0	10.1	25,295	60,964	141,417	500	363	219	20	21	51	52.1
	22	7.3	9.0	14,022	34,234	79,411	277	200	123	11	12	28	28.7
	23	3.4	17.6	7,225	15,944	36,986	145	106	57	5	6	15	15.4
	30	6.4	9.7	12,394	30,013	69,621	245	177	108	10	11	25	25.5
	31	4.8	11.2	9,461	22,510	52,215	188	136	81	8	8	19	19.6
	34	3.5	7.9	6,636	16,413	38,074	131	94	59	6	6	13	13.5
	36	12.6	9.2	24,259	59,088	137,065	479	347	212	20	21	49	49.8
	37	3.9	6.8	7,300	18,289	42,425	143	104	66	6	6	15	14.8
	38	6.3	13.6	12,772	29,544	68,533	255	185	106	10	10	28	26.8
	39	8.2	16.1	17,120	38,454	89,201	343	250	138	13	14	36	36.3
	40	15.7	9.5	30,334	73,626	170,788	599	434	264	25	26	61	62.3
	41	4.6	6.0	8,530	21,572	50,040	167	121	77	7	8	17	17.2
	42	1.5	1.2	2,629	7,034	16,317	51	37	25	2	2	5	5.2
	43	1.6	3.4	2,878	7,503	17,405	56	40	27	3	3	6	5.7
	44	2.1	1.3	3,685	9,848	22,844	71	51	35	3	3	7	7.3
	45	2.8	1.8	4,942	13,131	30,459	96	69	47	4	5	10	9.8
	46	2.2	1.1	3,851	10,317	23,932	75	54	37	3	4	7	7.6
	47	1.6	9.7	3,099	7,503	17,405	61	44	27	3	3	6	6.4
	48	2.0	4.1	3,627	9,379	21,756	71	51	34	3	3	7	7.3
	49	2.2	3.3	3,952	10,317	23,932	77	56	37	3	4	8	7.9
	50	16.0	3.9	28,946	75,032	174,051	564	407	269	25	26	57	57.9

TABLE 5–24

PERCENT URBAN	BASIN	AREA (sq mi)	PERCENT IMPERVIOUS	LOADS, IN POUNDS: CHEMICAL OXYGEN DEMAND	SUSPENDED SOLIDS	DISSOLVED SOLIDS	TOTAL NITROGEN	TOTAL KJELDAHL NITROGEN	TOTAL PHOS-PHORUS	DISSOLVED PHOSPHORUS	COPPER	LEAD	ZINC
	51	16.4	12.7	32,899	76,908	178,403	655	475	276	26	27	67	68.6
	53	4.5	7.8	8,523	21,103	48,952	168	121	76	7	7	17	17.4
	54	1.1	0.9	1,921	5,158	11,966	37	27	18	2	2	4	3.8
	55	3.3	7.0	6,191	15,475	35,898	122	88	55	5	5	12	12.6
	56	9.0	14.1	18,354	42,206	97,904	366	266	151	14	15	38	38.5
	57	2.3	18.0	4,910	10,786	25,020	99	72	39	4	4	10	10.5
	58	2.6	15.9	5,415	12,193	28,283	109	79	44	4	4	11	11.5
	59	3.9	12.6	7,814	18,289	42,425	155	113	66	6	6	16	16.3
<10%	60	6.8	8.2	12,939	31,889	73,972	255	184	114	11	11	26	26.4
	61	2.5	15.3	5,171	11,724	27,196	104	75	42	4	4	11	10.9
	62	6.6	16.6	13,860	30,951	71,796	278	203	111	10	11	29	29.5
	63	4.8	6.7	8,974	22,510	52,215	176	127	81	8	8	18	18.2
	64	5.8	3.5	10,444	27,199	63,094	203	147	98	9	10	21	20.8
	65	3.9	12.5	7,805	18,289	42,425	155	113	66	6	6	16	16.3
	66	2.0	18.8	4,310	9,379	21,756	87	63	34	3	3	9	9.3
	68	12.0	7.7	22,700	56,274	130,538	447	323	202	19	20	45	46.2
	69	2.7	12.0	5,372	12,662	29,371	107	77	45	4	4	11	11.2
	70	5.9	4.6	10,762	27,668	64,181	210	152	99	9	10	21	21.6
	71	4.6	5.5	8,480	21,572	50,040	166	120	77	7	8	17	17.1
	74	6.4	23.8	14,626	30,013	69,621	299	216	108	10	11	31	32.2
	75	7.2	23.8	16,455	33,765	78,323	336	246	121	11	12	35	36.2
	78	3.6	28.6	8,704	16,882	39,162	180	132	61	6	6	19	19.6
	80	5.0	14.2	10,209	23,448	54,391	204	148	84	8	8	21	21.5
	81	3.3	17.1	6,971	15,475	35,898	140	102	55	5	5	15	14.9
	82	1.5	24.5	3,456	7,034	16,317	71	52	25	2	2	7	7.6
	84	3.3	20.1	7,221	15,475	35,898	146	107	55	5	5	15	15.6
	86	6.0	19.3	13,006	28,137	65,269	263	192	101	9	10	27	28.0
	90	7.3	56.9	24,321	34,234	79,411	535	400	123	11	12	60	62.5
	SUBTOTAL	538		1,025,696	2,524,373	5,855,739	20,233	14,650	9,051	846	889	2,063	2,102
	TOTAL	800		1,684,247	3,753,030	8,705,829	33,968	24,764	13,457	1,258	1,321	3,537	3,620

*MEAN EVENT=AVERAGE LOAD PER STORM. THE MEAN EVENT VALUE MULTIPLIED BY THE NUMBER OF STORMS PER YEAR (91) PROVIDES THE VALUE OF ANNUAL LOADS. REFER TO APPENDIX H.1 FOR TOTAL ANNUAL LOADS.

TABLE 5-2 ESTIMATES OF SELECT POLLUTANT LOADINGS FROM URBAN AREAS
(MEAN EVENT* LOADING RATES FOR NEARSHORE AREA SUB-BASINS)

				LOADS, IN POUNDS									
PERCENT URBAN	BASIN	AREA (sq mi)	PERCENT IMPERVIOUS	CHEMICAL OXYGEN DEMAND	SUSPENDED SOLIDS	DISSOLVED SOLIDS	TOTAL NITROGEN	TOTAL KJELDAHL NITROGEN	TOTAL PHOS-PHORUS	DISSOLVED PHOSPHORUS	COPPER	LEAD	ZINC
>30%	116	12.6	67.49%	48,145	59,141	137,189	1,087	819	212	20	21	125	131
	118	23.2	58.89%	80,137	108,907	252,630	1,774	1,329	391	37	38	201	209
	121	1.5	60.34%	5,363	7,165	16,619	119	89	26	2	3	14	14
	SUBTOTAL			133,645	175,213	406,438	2,980	2,237	629	59	62	340	354
10–30%	117	9.9	43.13%	28,255	46,207	107,186	603	447	166	15	16	66	68
	119	9.4	38.64%	25,445	43,862	101,746	538	397	157	15	15	58	60
	SUBTOTAL			53,700	90,069	208,932	1,141	844	323	30	31	124	128
<10%	120	12.4	24.49%	28,621	58,253	135,129	585	428	209	20	21	62	63
	SUBTOTAL			28,621	58,253	135,129	585	428	209	20	21	62	63
	TOTAL			215,966	323,535	750,499	4,706	3,509	1,161	109	114	526	545

*MEAN EVENT=AVERAGE LOAD PER STORM. THE MEAN EVENT VALUE MULTIPLIED BY THE NUMBER OF STORMS PER YEAR (91) PROVIDES THE VALUE OF ANNUAL LOADS. REFER TO APPENDIX H.1 FOR TOTAL ANNUAL LOADS.

The same sources that generate bacteria loadings also generate "major" biochemical oxygen demand loadings. Oxygen demands also emanate from surface washoff from residential, commercial, and industrial areas.

Chloride loadings from road de-icing practices are addressed in the "Streets and Highways' category. Minor chloride loads can also result from sidewalk and parking area de-icing throughout the urban landscape.

Oil and grease loadings from metropolitan areas are considered to be a "major" contributor to the Area of Concern. High unit area loads are expected from industrial areas, from large parking lots, from illicit disposal of motor oil and other associated wastes, and from commercial operations such as automotive service stations.

Sediment volumes from metropolitan areas are considered to be a "minor" contribution. Large areas are protected by impervious surfaces or by grass lawns. Overland flow which can transport dislodged soil particles is limited due to widespread occurrence of stormsewers.

Urban core areas do contribute some pesticides to the Area of Concern, but the loadings are unknown. Lawn care chemical usage is less common in the intensely urban residential areas of the central cities where households are generally poorer than in the suburbs.

Organic toxins are derived from a variety of industrial and commercial activities or from use by homeowners. They are found in home maintenance and repair solutions, yard care substances and home cleaning solutions. Industries such as rubber, paint, chemicals, and steel contribute organic toxins. Virtually all of the priority pollutants have been found in urban runoff in studies conducted nationwide, in concentrations ranging from very high to barely detectable. It is considered that loadings of organic toxics to the Area of Concern from this source are "intermediate" in impact. Specifically, a significant amount of PAHs come from truck exhausts and runoff from road surfaces.

Metals loadings (e.g., iron, copper, lead and zinc) in metropolitan runoff are a "major" concern in the Area of Concern. Industrial, automotive, and other source loadings are responsible for elevated concentrations of most heavy metals.

Phosphorus loads are relatively "minor" from sources in this category. Nitrogen loads are considered to be "intermediate" and are largely associated with human and animal wastes as well as limited fertilizer applications.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

NOACA (1990). Nonpoint Sources Loading Rate Estimates - Lower Cuyahoga River. Milestone C4.2 USGS (1988) Techniques for Estimation of stormrunoff loads, volumes and selected constituent concentrations in Urban Watersheds in the United States. U.S. Geological Survey Open-File Report 88-191.

5.2.3.17 Runoff from Suburban Areas

DESCRIPTION OF THE SOURCE CATEGORY

The suburban category encompasses those largely residential areas characterized by single-family homes, often laid out in subdivision tracts, and featuring a minimal amount of commercial lands. The category is defined by single-family residential land use with a housing density of greater than one dwelling unit per acre but less than four dwelling units per acre.

Pollutant loadings from suburban areas are those associated with runoff from lawns, residential streets, garages, and small commercial areas. Construction site runoff is important in those areas undergoing urban expansion.

LOCATIONAL INFORMATION

Figure 5-17 locates those sub-basins in the Cuyahoga watershed with the largest concentrations of suburban land use. This figure is based on NOACA 1977 Land Use Data.

Figure 5-18 highlights the suburban areas in the nearshore portion of the study area.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

The loadings of bacteria from suburban areas is considered to be a "major" source contribution to the Area of Concern. There are two components to these loadings: domestic pet wastes and human wastes. The loadings associated with domestic pets are considered to be relatively small but are large enough to be measurable. Human wastes are generally introduced from the effluent of on-site systems which are poorly designed or improperly operated and maintained. (Refer to discussion in 5.2.3.13 on home sewage systems.)

Loadings of biochemical oxygen demand and oil and grease are considered to be "intermediate" in scope. Chlorides from road salt are "minor" as most road miles in this class are secondary priorities for road salt crews. Highways and "major" thoroughfares are the roadways which receive primary attentive from road salt crews. These roadways occur only in limited amounts in suburban neighborhoods. The generally good grass cover common on suburban lawns reduces erosion potential and resultant sediment loads are considered to be "minor".

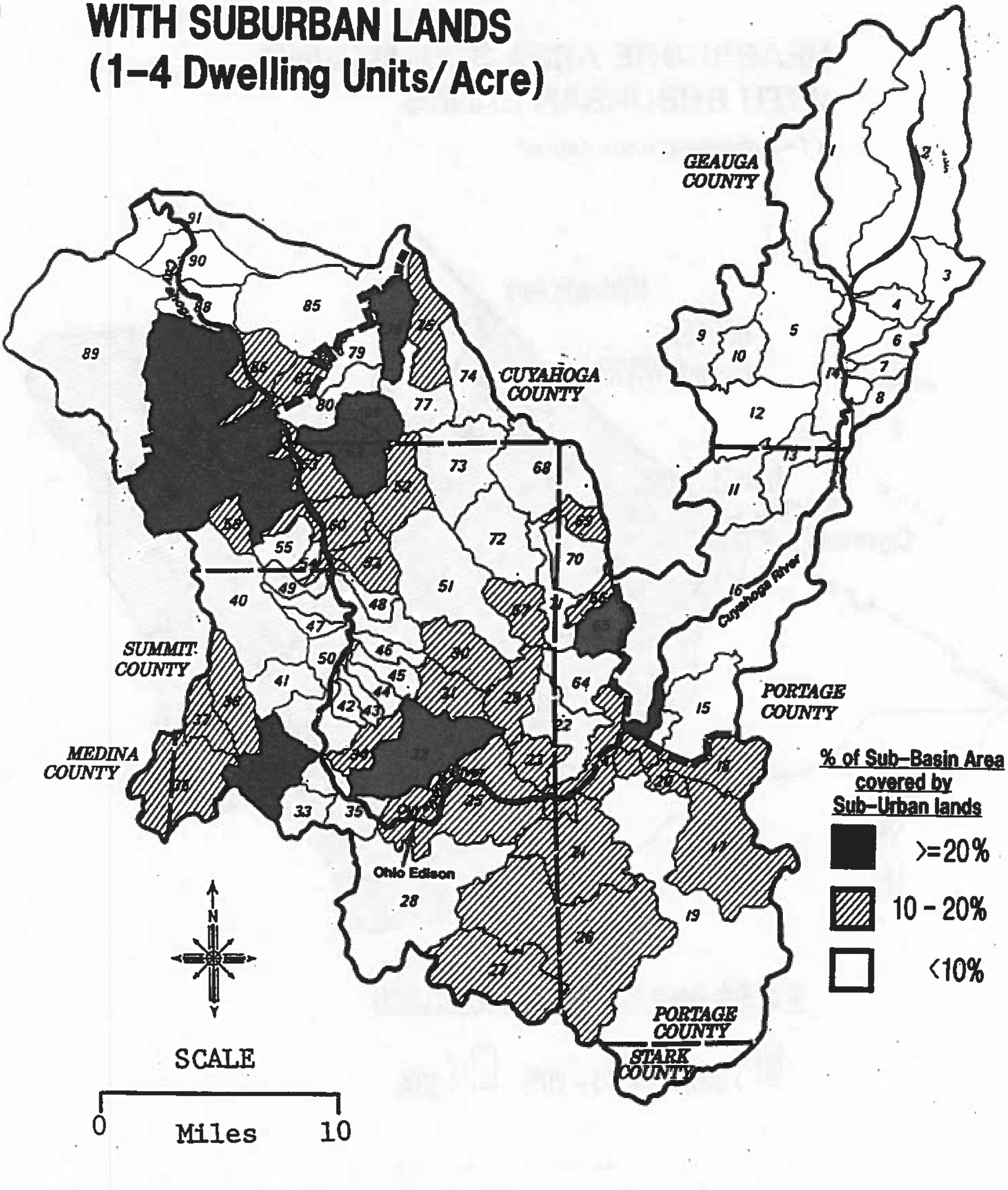
NOACA (1988) estimated the annual usage of lawn-care pesticides to be about 159,000 pounds in Cuyahoga County alone. Since much of the pesticides applied to lawns do not migrate off-site, pesticide loadings to local streams are less than the amounts used.

Pesticide usage on lawns is generally higher in suburban areas relative to the more densely populated metropolitan areas. Loadings of pesticides from this source are considered to be "intermediate" in impact.

Suburban areas are considered to be relatively "minor" sources of organic toxics, heavy metals, phosphorus, and nitrogen compounds.

Figure: 5-17

CUYAHOGA RIVER SUB-BASINS WITH SUBURBAN LANDS (1-4 Dwelling Units/Acre)

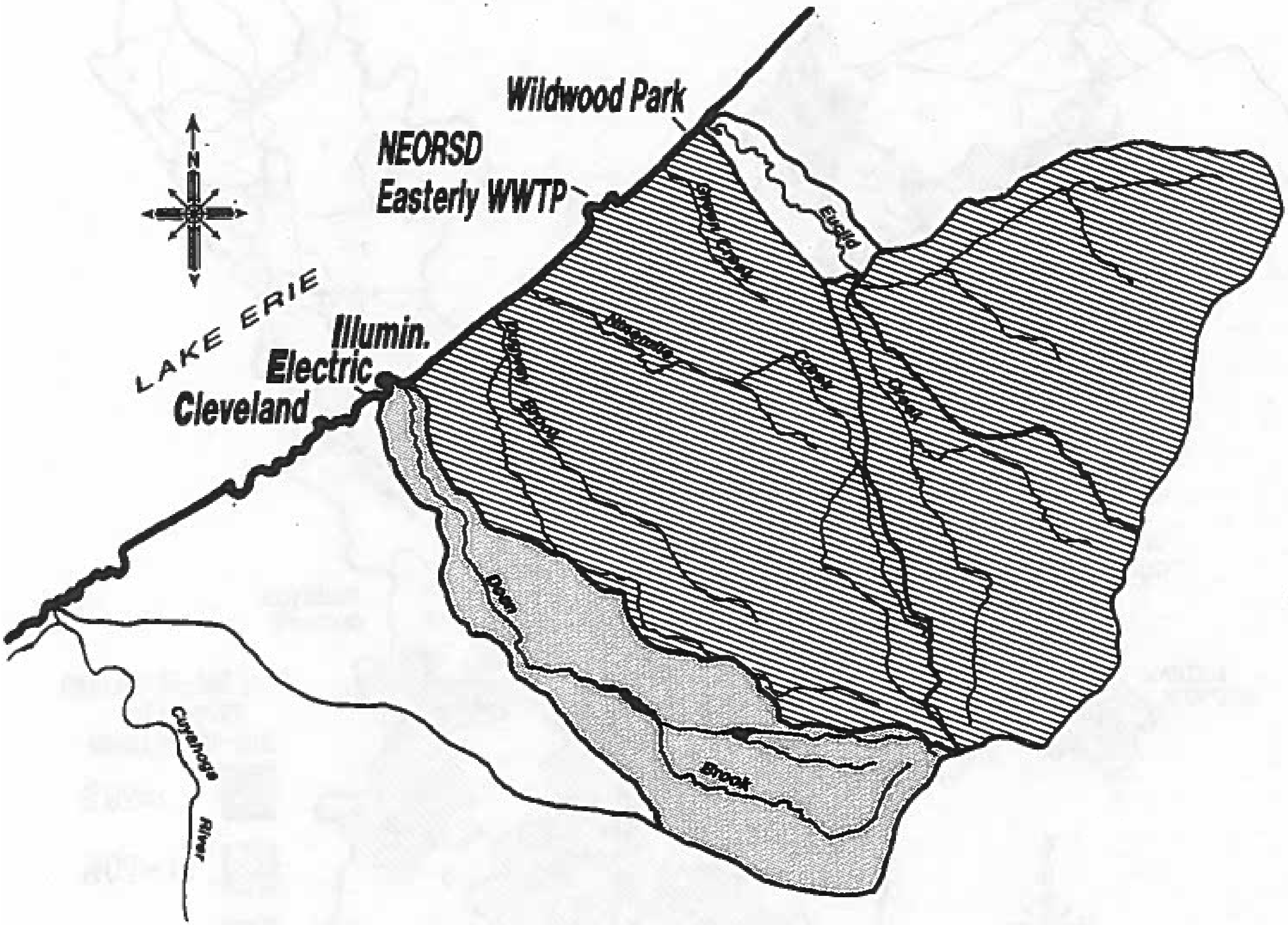


SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

Figure: 5-18

NEARSHORE AREA SUB-BASINS WITH SUBURBAN LANDS

(1-4 dwelling units/acre)



% of Sub-basin covered by Suburban Lands

> 20%   10 - 20%   < 10%

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

NOACA (1988) Report of the NOACA Lawn Care Chemical Task Force

5.2.3.18 Runoff from Streets and Highways

DESCRIPTION OF THE SOURCE CATEGORY

This category includes local, secondary, state route, and interstate highways. It encompasses the roadways themselves, the vehicular traffic which rides on them and the right of way which runs along side of them.

LOCATIONAL INFORMATION

Streets and highways are common throughout the watershed. They transect largely rural areas and are a "major" part of urban areas. Road density generally increases with urban density. See Figure 5-19 for locations of sub-basins with more than five percent of their area occupied by highways.

There are no sub-basins in the nearshore portion of the study area with five percent or more of the land occupied by highways.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

Pollutants are derived from roadway materials, automotive traffic, rights of way maintenance, and road de-icing practices.

Minor loadings of biochemical oxygen demand, sediment, and phosphorus are often associated with roadways. The pesticides emanate from road-side maintenance activities.

The primary source of chloride loadings in the Area of Concern is road de-icing applications of sodium chloride and calcium chloride. This source undoubtedly outweighs all other sources combined.

Oil and grease loadings from cars, buses, and truck related deposits are a "major" contributor to the watersheds total oil and grease load.

Organic toxins are associated with automotive products and are thought to be a "minor" contributor in the Area of Concern. Phosphorus loads from roadside maintenance are also considered to be "minor".

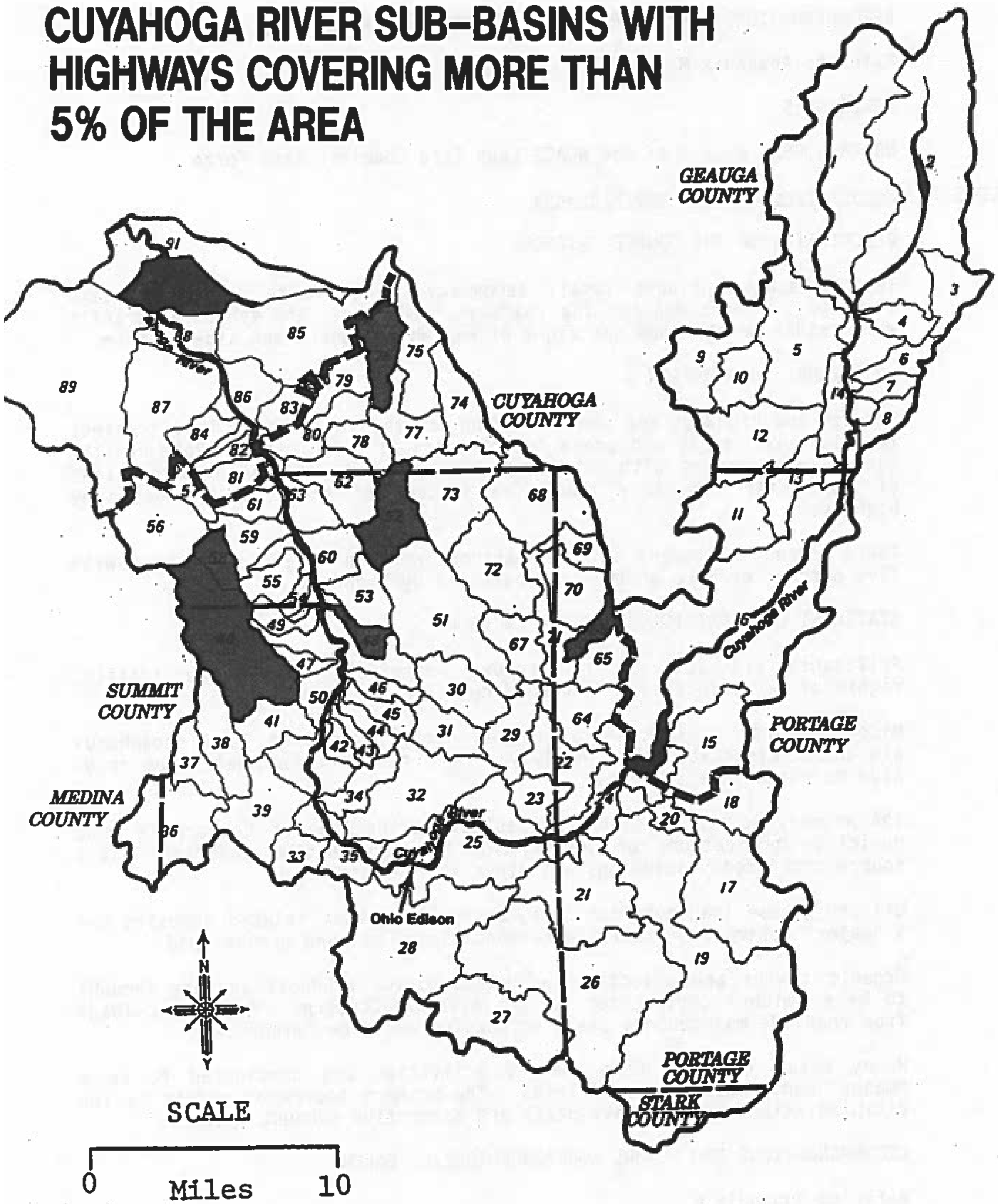
Heavy metal loadings from roadway activities are considered to be a "major" contributor to total loads. The primary source of metals is the disintegration of automotive parts and automotive exhaust systems.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

Figure: 5–19

CUYAHOGA RIVER SUB-BASINS WITH HIGHWAYS COVERING MORE THAN 5% OF THE AREA



SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

5.2.3.19 Runoff from Urban Construction

DESCRIPTION OF THE SOURCE CATEGORY

This category involves those land development activities which result in the new development or redevelopment of residential, commercial, or industrial buildings, roads, and other improvements. The period of concern spans the time from which ground cover is removed from a development site until post-construction seedings have taken root, or pavement has been completed.

Several aspects of the development process pose potential pollution problems. These include erosion on denuded lands, off-site erosion caused by concentrated runoff from the site, and pollutants released from construction materials.

LOCATIONAL INFORMATION

Table 5-25 reports permitted development in the basin by jurisdiction from 1980-1989. The geographic focus of development varies slowly over time with a gradual expansion outward from the urban core area. The majority of permits issued from 1980-1989 were in Cuyahoga County. One should expect a gradual shift in the areas undergoing development if outward population migration continues as expected. Redevelopment in older established areas is intermittent in nature but can be expected to increase with time.

STATEMENT OF SIGNIFICANCE OF THE CATEGORY

The volume of sediment generated on annual basis from construction erosion and stream channel enlargement caused by inadequately controlled runoff from recently developed sites causes construction activity to be a "major" contributor to the overall sediment problem of the Area of Concern.

The Ohio Nonpoint Source Management Program Executive Summary (page 20) states "In comparison with other nonpoint sources of pollution, construction activity has a greater impact per acre on the environment than any other land use. Although construction does not produce the greatest total volume of sediment, it far exceeds all other land uses in sediment produced per acre. Hydrologic impacts of construction activity are also significant and may permanently impair water bodies."

Ohio municipalities have long standing authority to pass and enforce ordinances that regulate soil sediment and increased stormwater runoff from construction sites. This authority derives from Article XVIII, Section 3 of the Constitution of the State of Ohio. In 1979 the state legislature gave county commissioners the authority to adopt, amend and rescind rules establishing standards to abate wind and water erosion of the soil or abate the degradation of the waters of the state by soil sediment on construction sites (Ohio Revised Code Section 307.79). These county rules are limited to only the unincorporated areas of the counties (townships). In order to enforce the rules, county commissioners can seek an injunction by going through the county prosecutors office.

TABLE 5-25

CONSTRUCTION--RESIDENTIAL, COMMERCIAL AND INDUSTRIAL DEVELOPMENT IN THE CUYAHOGA RIVER BASIN, 1980-1989

JURISDICTION	ACRES	APPROX % AREA OF BASIN	TOTAL NEW RESIDENTIAL BLDG PERMITS 1980-1989	TOTAL NEW INDUSTRIAL BLDG PERMITS 1980-1988	TOTAL NEW COMMERCIAL BLDG PERMITS 1980-1988
CUYAHOGA					
BEACHWOOD CITY	2,823.81	0.58%	986	3	40
BEDFORD CITY	3,050.50	0.63%	902	16	41
BEDFORD HEIGHTS	2,763.00	0.57%	1	22	11
BRATENAHL VILLAGE	643.07	0.13%	1	—	—
BRECKSVILLE CITY	12,650.42	2.60%	1139	10	24
BROADVIEW HEIGHTS CITY	8,000.56	1.64%	765	4	16
BROOKLYN CITY	2,712.77	0.56%	64	15	14
BROOKLYN HEIGHTS VILLAGE	1,171.69	0.24%	2	8	13
BROOKPARK CITY	4,823.84	0.99%	3	1	11
CLEVELAND CITY	49,547.41	10.19%	8473	144	82
CLEVELAND HEIGHTS CITY	5184.52	1.07%	392	—	15
CUYAHOGA HEIGHTS VILLAGE	2,107.82	0.43%	0	12	—
EAST CLEVELAND CITY	2,005.31	0.41%	35	1	1
GARFIELD HEIGHTS CITY	4,559.13	0.94%	204	8	21
GLENWILLOW VILLAGE	1,753.16	0.36%	1	1	—
HIGHLAND HEIGHTS CITY	3,206.03	0.66%	379	4	7
INDEPENDENCE CITY	5,973.92	1.23%	247	4	39
LINNDALE VILLAGE	44.10	0.01%	—	2	—
LYNDHURST CITY	2,791.31	0.57%	97	3	6
MAPLE HEIGHTS CITY	3,229.74	0.66%	95	9	30
NEWBURGH HEIGHTS VILLAGE	348.57	0.07%	6	—	—
NORTH RANDALL VILLAGE	484.67	0.10%	2	1	14
NORTH ROYALTON	13,248.17	2.72%	2203	11	2
OAKWOOD VILLAGE	2,120.67	0.44%	63	28	16
ORANGE VILLAGE	2,242.82	0.46%	254	—	9
PARMA CITY	12,415.86	2.55%	1482	15	47
PARMA HEIGHTS CITY	2,544.72	0.52%	228	—	2
RICHMOND HEIGHTS CITY	2,844.73	0.58%	212	2	13
SEVEN HILLS	3,011.37	0.62%	250	—	5
SHAKER HEIGHTS	3,987.03	0.82%	212	—	4
SOLON CITY	12,386.92	2.55%	1822	34	44
SOUTH EUCLID	2,890.90	0.59%	145	—	17
UNIVERSITY HEIGHTS	1,156.22	0.24%	89	—	7
VALLEY VIEW VILLAGE	3,555.61	0.73%	197	14	8
WALTON HILLS VILLAGE	4,202.07	0.86%	106	9	—
WARRENSVILLE HEIGHTS	2,432.89	0.50%	2	9	16
WARRENSVILLE TOWNSHIP	1,895.51	0.39%	—	—	—
SUBTOTAL	190,810.84		21,059	390	575

SOURCE: Bureau of Census

TABLE 5-25

CONSTRUCTION--RESIDENTIAL, COMMERCIAL AND INDUSTRIAL DEVELOPMENT IN THE CUYAHOGA RIVER BASIN, 1980-1989

JURISDICTION	ACRES	APPROX % AREA OF BASIN	TOTAL NEW RESIDENTIAL BLDG PERMITS 1980–1989	TOTAL NEW INDUSTRIAL BLDG PERMITS 1980–1988	TOTAL NEW COMMERCIAL BLDG PERMITS 1980–1988
SUMMIT					
AKRON CITY	—	—	4076	28	297
BATH TOWNSHIP	—	—	—	—	—
BOSTON TOWNSHIP	10951	2.25%	—	—	—
BOSTON HEIGHTS	6892.59	1.42%	17	1	12
CUYAHOGA FALLS	—	—	930	4	71
FAIRLAWN	—	—	38	—	7
HUDSON TOWNSHIP	14143.6	2.91%	—	—	—
HUDSON	2617.9	0.54%	—	—	—
LAKEMORE	—	—	24	2	4
MACEDONIA	6806.3	1.40%	81	—	3
MOGADORE	—	—	20	6	6
MUNROE FALLS	—	—	182	—	—
NORTHAMPTON TOWNSHIP	—	—	—	—	—
NORTHFIELD CENTER	2941.9	0.60%	—	—	—
NORTHFIELD VILLAGE	679.2	0.14%	60	—	9
PENINSULA	1773.4	0.36%	—	—	—
REMINDERVILLE	1487.3	0.31%	94	—	—
RICHFIELD TOWNSHIP	16654.9	3.42%	—	—	—
RICHFIELD VILLAGE	—	—	—	—	—
SAGAMORE HILLS TOWNSHIP	7322.3	1.51%	—	—	—
SILVER LAKE	—	—	38	—	—
SPRINGFIELD TOWNSHIP	—	—	—	—	—
STOW	—	—	1882	33	51
TALLMADGE	—	—	429	30	30
TWINSBURG TOWNSHIP	8010.4	1.65%	—	—	—
TWINSBURG	7322.3	1.51%	1152	27	15
SUBTOTAL			9,023	131	505

SOURCE: Bureau of Census

TABLE 5-25

CONSTRUCTION--RESIDENTIAL, COMMERCIAL AND INDUSTRIAL DEVELOPMENT IN THE CUYAHOGA RIVER BASIN, 1980-1989

JURISDICTION	ACRES	APPROX % AREA OF BASIN	TOTAL NEW RESIDENTIAL BLDG PERMITS 1980-1989	TOTAL NEW INDUSTRIAL BLDG PERMITS 1980-1988	TOTAL NEW COMMERCIAL BLDG PERMITS 1980-1988
PORTAGE					
AURORA	—	—	675	7	22
AURORA TOWNSHIP	—	—	—	—	—
BRADY LAKE	—	—	—	—	—
BRIMFIELD TOWNSHIP	—	—	—	—	—
FRANKLIN TOWNSHIP	—	—	—	—	—
HIRAM TOWNSHIP	—	—	—	—	—
KENT	—	—	438	12	16
MANTUA	865.6	0.18%	—	—	—
MANTUA TOWNSHIP	17025.6	3.50%	—	—	—
RANDOLPH TOWHSHIP	—	—	—	—	—
RAVENNA TOWNSHIP	—	—	—	—	—
RAVENNA	—	—	256	3	8
ROOTSTOWN	—	—	—	—	—
SHALERSVILLE TOWNSHIP	17641.7	3.63%	—	—	—
SUFFIELD TOWNSHIP	—	—	—	—	—
STREETSBORO+S.B.K.	16060.5	3.30%	271	—	—
UNINCORPORATED AREA	—	—	2446	93	211
SUBTOTAL			4,086	115	257
GEAUGA					
AUBURN TOWNSHIP	18916.07	3.89%	266	—	—
AQUILLA VILLAGE	—	—	—	—	—
BURTON TOWNSHIP	—	—	60	—	—
BURTON VILLAGE	—	—	5	—	—
CLARIDON TOWNSHIP	—	—	66	—	—
HAMBDEN TOWNSHIP	—	—	128	—	—
HUNTSBURG TOWNSHIP	—	—	86	—	—
MIDDLEFIELD VILLAGE	—	—	48	—	—
MONTVILLE TOWNSHIP	—	—	62	—	—
MUNSON TOWNSHIP	16582.28	3.41%	231	—	—
NEWBURY TOWNSHIP	17952.05	3.69%	149	—	—
TROY TOWNSHIP	—	—	68	—	—
SUBTOTAL			1,169		
BASIN TOTAL			35,337	636	1,337

SOURCE: Bureau of Census

In 1985 the Ohio State Attorney General, Anthony Celebrezze, Jr. rendered a legal opinion stating that township trustees could pass and enforce these ordinances for individual townships through the zoning regulations (Opinion # 85-053).

Late in 1979 the Division of Soil and Water Conservation, ODNR, promulgated the state's first Urban Pollution Abatement Rules. In 1989 these rules were revised by the Division of Soil and Water Conservation, ODNR and approved by the state legislature. The state rules are applicable only to state funded projects and federally funded projects; however, the Division of Soil and Water Conservation, ODNR encourages local municipalities and counties to pass and enforce them also.

Table 5-26 gives the status of municipalities and counties in regulating soil sediment runoff and increased stormwater runoff from construction sites. It should be noted that passing an ordinance does not solve the problem by itself. These ordinances must also be enforced in a comprehensive manner in order to be effective. Enforcement of these ordinances frequently lags behind the passing of them. (This is due in part to a lack of training of the people who use the ordinances, the lack of desire on the part of politicians and the pressure that is applied to the local officials.)

Table 5-26 highlights those communities whose ordinances meet or exceed state guidelines. In some communities where local ordinances do not meet all elements of state guidelines, SWCD and SCS employees believe that the control measures actually practiced do meet state guidelines. One significant shortcoming in these local ordinances, however, is the lack of suitable enforcement provisions.

The sources of information in Table 5-26 are the local SWCD and SCS staff people.

While only a very small percentage of the watershed is undergoing development at any given time, the very high unit area sediment loading rates can cause severe local impacts on the receiving streams. The long-term channel enlargement often associated with urbanization prolongs the period during which any given construction site continues to impact the receiving stream.

Washoff of organic pollutants from construction materials and debris is an "intermediate" concern in the area. The same is true of the phosphorus lost in concert with soil erosion on the sites.

RECOMMENDATIONS FOR FUTURE WORK/INVENTORY/RESEARCH

Refer to Appendix M.

REFERENCES

Ohio Nonpoint Source Management Program.

Soil and Water Conservation Districts in Cuyahoga, Summit, Portage and Geauga Counties.

Soil Conservation Service, USDA.

Table 5-26: Communities with Construction Site Erosion and Storm Water Runoff Control Ordinances

Municipality	Erosion Control Ordinances	Stormwater Runoff Ordinances
CUYAHOGA COUNTY		
Bratenahl	--	--
Beachwood	--	--
Bedford	--	--
Bedford Heights	--	--
Brecksville	X	X
Broadview Heights	X	X
Brooklyn	--	--
Brooklyn Heights	--	--
Brook Park	X	X
Cleveland	--	--
Cleveland Heights	--	--
Cuyahoga Heights	--	--
East Cleveland	--	--
Euclid	X	X
Garfield Heights	X	X
Glenwillow	--	--
Highland Heights	X	X
Highland Hills	X	X
Independence	X	X
Linndale	--	--
Lyndhurst	X*	X*
Maple Heights	--	--
Mayfield	X*	X*
Mayfield Heights	X	X
Newburgh Heights	--	--
North Randall	--	--
North Royalton	--	--
Oakwood	--	--
Parma	X*	X*
Parma Heights	X*	X*
North Royalton	X*	X*
Richmond Heights	--	--
Seven Hills	X	--
Shaker Heights	X	X
Solon	X	X*
South Euclid	X*	X*
Valley View	--	--
Walton Hills	X	--
Warrensville Heights	--	--

*Ordinance meets or exceeds State Guidelines
Source: SCS and SWCD in 4 counties

Table 5-26: Communities with Construction Site Erosion and Storm Water Runoff Control Ordinances (Continued)

Municipality	Erosion Control Ordinances	Stormwater Runoff Ordinances
GEAUGA COUNTY		
Aquilla	--	--
Burton	--	--
Middlefield	--	--
Punderson Lake	--	--
County (Townships)	X	--
PORTAGE COUNTY		
Aurora	--	--
Brady Lake	X	--
Mantua	X	--
Ravenna	X	--
County (Townships)	X	--
SUMMIT COUNTY		
Akron	X	--
Boston Heights	X	--
Cuyahoga Falls	X	--
Fairlawn	X	--
Hudson (Village)	X	X
Lakemore	X	--
Macedonia	X	--
Munroe Falls	X	--
Northfield	X	--
Peninsula	X	--
Reminderville	X	--
Silver Lake	X	--
Stow	X	X*
Tallmadge	X	X
Twinsburg	X	X
Richfield (Village)	X	X
County (Townships)	X	X
4-COUNTY TOTAL	26/66 (39%)	22/66 (32%)

*Ordinance meets or exceeds State Guidelines
Source: SCS and SWCD in 4 counties

5.2.4 Summary of Sub-Basin Level Data

Much of the preceding analysis on nonpoint source contributions is supported by land use data organized at the sub-basin level.

Many sub-basins contain several land use categories and land uses and their intensities vary from sub-basin to sub-basin. A profile of each sub-basin can be obtained by assigning each land use category a value based on the area it covers in the sub-basin.

The following tables (Table 5-27A and 5-27B) are provided 1) to summarize the land use information presented in the preceding nonpoint source analyses, and 2) to present a profile of each sub-basin with respect to the land uses discussed in that section.

In Table 5-27, sub-basins 1 to 91 are listed down the left-hand column. Some of the land use categories used in Section C are listed across the top of the table. Land use is categorized according to the percent area it occupies in each sub-basin. The following criteria apply to the categorizing:

Rural Noncrop	"major" =	>= 75%
	"intermediate" =	25% - 75%
	"minor" =	< 25%
Agriculture	"major" =	>= 30%
	"intermediate" =	10% - 30%
	"minor" =	< 10%
Suburban	"major" =	>= 20%
	"intermediate" =	10% - 20%
	"minor" =	< 10%
Urban	"major" =	>= 30%
	"intermediate" =	10% - 30%
	"minor" =	< 10%
Industrial	"major" =	>= 15%
	"intermediate" =	5% - 15%
	"minor" =	< 5%
Commercial	"major" =	>= 10%
	"intermediate" =	5% - 10%
	"minor" =	< 5%

A profile of each sub-basin is obtained by looking across the table at the various land uses and their relative scores. For example, agriculture and rural noncrop are "major" land uses in sub-basin 1, while urban core in sub-basin 91 is a "major" land use and suburban and rural uses are "minor". Figure 5-20 is provided to locate each sub-basin in the Cuyahoga River basin. Figure 5-21 is provided to locate each sub-basin in the Nearshore Study area.

TABLE 5-27A LAND USE PROFILE OF EACH CUYAHOGA RIVER SUB-BASIN

SUB BASIN	AREA (ACRES)	RURAL NON-CROP (actual acres)	CROPLAND (actual acres)	SUBURB (actual acres)	URBAN CORE (actual acres)	INDUSTRY (actual acres)	COMMERCE (actual acres)	OTHER* (actual acres)
1	22,770	INTERMED 16,358	INTERMED 5,775	MINOR 130	MINOR 162	MINOR 20	MINOR 261	64
2	23,282	INTERMED 14,754	MAJOR 8,196	MINOR 216	MINOR 0	MINOR 22	MINOR 73	21
3	3,284	INTERMED 1,495	MAJOR 1,300	MINOR 282	MINOR 4	MINOR 58	MINOR 145	0
4	2,062	INTERMED 1,159	MAJOR 855	MINOR 0	MINOR 0	MINOR 6	MINOR 42	0
5	9,569	MAJOR 7,505	INTERMED 1,785	MINOR 140	MINOR 48	MINOR 0	MINOR 9	82
6	1,928	INTERMED 952	MAJOR 972	MINOR 0	MINOR 0	MINOR 0	MINOR 4	0
7	1,156	INTERMED 551	MAJOR 562	MINOR 15	MINOR 0	MINOR 0	MINOR 28	0
8	1,713	INTERMED 904	MAJOR 802	MINOR 5	MINOR 0	MINOR 0	MINOR 2	0
9	5,951	INTERMED 4,141	MAJOR 1,774	MINOR 0	MINOR 0	MINOR 16	MINOR 7	13
10	2,822	MAJOR 2,144	INTERMED 619	MINOR 0	MINOR 0	MINOR 0	MINOR 2	57
11	4,839	INTERMED 2,470	MAJOR 2,081	MINOR 64	MINOR 0	MINOR 11	MINOR 21	192
12	6,647	INTERMED 4,607	INTERMED 1,960	MINOR 59	MINOR 0	MINOR 3	MINOR 10	8
13	3,048	INTERMED 2,137	INTERMED 862	MINOR 35	MINOR 0	MINOR 7	MINOR 0	7
14	6,749	INTERMED 4,292	MAJOR 2,394	MINOR 53	MINOR 0	MINOR 0	MINOR 10	0
15	5,892	INTERMED 4,044	INTERMED 1,248	MINOR 361	MINOR 63	MINOR 5	MINOR 93	78
16	30,973	INTERMED 18,816	MAJOR 9,210	MINOR 1,103	MINOR 143	MINOR 157	MINOR 227	1,317
17	10,597	INTERMED 5,902	INTERMED 3,043	INTERMED 1,097	MINOR 100	MINOR 99	MINOR 102	254
18	4,002	INTERMED 1,415	MINOR 150	INTERMED 578	INTERMED 925	INTERMED 288	MAJOR 484	162
19	29,151	INTERMED 15,097	MAJOR 11,614	MINOR 1,313	MINOR 316	MINOR 111	MINOR 503	197
20	1,810	INTERMED 1,257	MINOR 60	INTERMED 210	MINOR 82	MINOR 22	INTERMED 150	29
21	8,323	INTERMED 4,526	INTERMED 1,710	INTERMED 1,264	MINOR 234	MINOR 67	MINOR 159	363

* "OTHER" includes major highway rights of way, landfills, and quarries and mines

TABLE 5-27A (cont.) LAND USE PROFILE OF EACH CUYAHOGA RIVER SUB-BASIN

SUB BASIN	AREA (ACRES)	RURAL NON-CROP (actual acres)	CROPLAND (actual acres)	SUBURB (actual acres)	URBAN CORE (actual acres)	INDUSTRY (actual acres)	COMMERCE (actual acres)	OTHER* (actual acres)
22	4,655	INTERMED 2,722	INTERMED 861	MINOR 325	MINOR 382	MINOR 25	MINOR 61	279
23	2,202	INTERMED 1,185	INTERMED 256	INTERMED 426	MINOR 126	MINOR 9	MINOR 200	0
24	5,613	INTERMED 2,625	MINOR 282	INTERMED 746	INTERMED 1,163	MINOR 181	MAJOR 552	64
25	12,371	INTERMED 4,155	MINOR 433	INTERMED 1,396	MAJOR 5,071	MINOR 275	INTERMED 829	212
26	20,268	INTERMED 10,722	INTERMED 2,638	INTERMED 3,264	INTERMED 2,005	MINOR 798	MINOR 371	470
27	8,092	INTERMED 2,767	MINOR 236	INTERMED 919	MAJOR 2,534	INTERMED 455	MAJOR 1,074	107
28	11,197	MINOR 2,042	MINOR 28	MINOR 695	MAJOR 5,146	INTERMED 1,098	MAJOR 1,711	477
29	3,461	INTERMED 2,140	INTERMED 380	INTERMED 498	INTERMED 336	MINOR 41	MINOR 53	13
30	4,066	MAJOR 3,032	MINOR 179	INTERMED 462	MINOR 170	MINOR 143	MINOR 69	11
31	3,055	INTERMED 2,160	MINOR 126	INTERMED 556	MINOR 7	INTERMED 153	MINOR 53	0
32	8,214	INTERMED 4,309	MINOR 296	MAJOR 1,779	INTERMED 1,160	MINOR 146	INTERMED 470	54
33	2,293	INTERMED 909	MINOR 97	MINOR 45	MAJOR 1,160	MINOR 0	MINOR 82	0
34	2,229	MAJOR 1,667	MINOR 82	INTERMED 373	MINOR 0	MINOR 0	MINOR 34	73
35	3,668	INTERMED 2,257	MINOR 48	MINOR 340	INTERMED 698	MINOR 51	INTERMED 198	76
36	8,060	INTERMED 4,745	INTERMED 1,680	INTERMED 1,346	MINOR 73	MINOR 0	MINOR 14	202
37	2,490	INTERMED 1,768	INTERMED 327	INTERMED 348	MINOR 0	MINOR 0	MINOR 1	46
38	4,018	INTERMED 2,780	MINOR 333	INTERMED 644	MINOR 0	MINOR 0	MINOR 152	109
39	5,238	INTERMED 3,100	MINOR 316	MAJOR 1,213	MINOR 270	MINOR 29	MINOR 225	85
40	10,077	MAJOR 7,556	MINOR 829	MINOR 797	MINOR 9	MINOR 164	MINOR 224	498
41	2,953	MAJOR 2,346	MINOR 252	MINOR 247	MINOR 0	MINOR 0	MINOR 70	38
42	973	MAJOR 943	MINOR 0	MINOR 30	MINOR 0	MINOR 0	MINOR 0	0
43	1,024	MAJOR 982	MINOR 0	MINOR 42	MINOR 0	MINOR 0	MINOR 0	0

* "OTHER" includes major highway rights of way, landfills, and quarries and mines

TABLE 5-27A (cont.) LAND USE PROFILE OF EACH CUYAHOGA RIVER SUB-BASIN

SUB BASIN	AREA (ACRES)	RURAL NON-CROP (actual acres)	CROPLAND (actual acres)	SUBURB (actual acres)	URBAN CORE (actual acres)	INDUSTRY (actual acres)	COMMERCE (actual acres)	OTHER* (actual acres)
44	1,356	MAJOR 1,326	MINOR 15	MINOR 0	MINOR 0	MINOR 2	MINOR 11	2
45	1,767	MAJOR 1,694	MINOR 0	MINOR 59	MINOR 9	MINOR 0	MINOR 5	0
46	1,399	MAJOR 1,362	MINOR 0	MINOR 36	MINOR 0	MINOR 0	MINOR 1	0
47	995	MAJOR 846	MINOR 30	MINOR 18	MINOR 0	MINOR 0	INTERMED 66	35
48	1,280	MAJOR 1,198	MINOR 0	MINOR 19	MINOR 0	MINOR 0	MINOR 0	63
49	1,409	MAJOR 1,252	MINOR 82	MINOR 50	MINOR 0	MINOR 0	MINOR 0	25
50	10,269	MAJOR 8,769	MINOR 659	MINOR 478	MINOR 12	MINOR 18	MINOR 36	297
51	10,488	INTERMED 7,244	MINOR 722	MINOR 684	MINOR 860	MINOR 305	MINOR 435	238
52	4,028	INTERMED 2,045	MINOR 78	INTERMED 742	INTERMED 741	MINOR 69	MINOR 124	229
53	2,869	INTERMED 2,133	MINOR 140	INTERMED 510	MINOR 0	MINOR 21	MINOR 12	53
54	702	MAJOR 637	MINOR 29	MINOR 14	MINOR 0	MINOR 0	MINOR 0	0
55	2,089	MAJOR 1,891	MINOR 71	MINOR 8	MINOR 0	INTERMED 117	MINOR 2	0
56	5,754	INTERMED 3,810	MINOR 100	MINOR 1,512	MINOR 105	MINOR 75	MINOR 133	19
57	1,450	INTERMED 610	MINOR 31	MAJOR 765	MINOR 0	MINOR 8	MINOR 16	20
58	1,681	INTERMED 1,057	MINOR 43	INTERMED 300	MINOR 0	MINOR 70	INTERMED 130	81
59	2,492	INTERMED 1,798	MINOR 0	MAJOR 488	MINOR 19	MINOR 47	INTERMED 130	10
60	4,365	MAJOR 3,385	MINOR 30	INTERMED 786	MINOR 102	MINOR 29	MINOR 30	3
61	1,616	INTERMED 894	MINOR 44	MAJOR 604	MINOR 22	MINOR 8	MINOR 44	0
62	4,251	INTERMED 2,027	INTERMED 574	MAJOR 1,050	MINOR 325	MINOR 38	INTERMED 220	17
63	3,067	INTERMED 2,066	INTERMED 417	INTERMED 540	MINOR 2	MINOR 38	MINOR 4	0
64	3,693	INTERMED 2,460	INTERMED 909	MINOR 254	MINOR 0	MINOR 8	MINOR 2	60
65	2,501	INTERMED 1,442	INTERMED 295	MAJOR 505	MINOR 10	MINOR 6	INTERMED 139	104

* "OTHER" includes major highway rights of way, landfills, and quarries and mines

TABLE 5-27A (cont.) LAND USE PROFILE OF EACH CUYAHOGA RIVER SUB-BASIN

SUB BASIN	AREA (ACRES)	RURAL NON-CROP (actual acres)	CROPLAND (actual acres)	SUBURB (actual acres)	URBAN CORE (actual acres)	INDUSTRY (actual acres)	COMMERCE (actual acres)	OTHER* (actual acres)
66	1,248	INTERMED 595	INTERMED 204	INTERMED 197	MINOR 11	INTERMED 135	MINOR 14	92
67	3,107	INTERMED 1,923	INTERMED 314	INTERMED 315	INTERMED 414	MINOR 0	MINOR 75	66
68	7,694	INTERMED 5,300	INTERMED 1,197	MINOR 290	MINOR 656	MINOR 3	MINOR 161	87
69	1,738	INTERMED 1,011	INTERMED 248	INTERMED 318	MINOR 77	MINOR 0	INTERMED 84	0
70	3,777	INTERMED 2,588	INTERMED 882	MINOR 127	MINOR 39	MINOR 116	MINOR 8	17
71	2,939	MAJOR 2,509	MINOR 162	MINOR 113	MINOR 22	MINOR 0	MINOR 18	115
72	5,931	INTERMED 4,072	MINOR 506	MINOR 172	INTERMED 574	MINOR 255	MINOR 107	245
73	6,431	INTERMED 4,275	MINOR 328	MINOR 210	INTERMED 924	MINOR 232	MINOR 205	257
74	4,098	INTERMED 2,511	MINOR 92	MINOR 344	MINOR 252	MAJOR 717	MINOR 79	103
75	4,635	INTERMED 2,704	MINOR 104	INTERMED 677	MINOR 148	INTERMED 549	INTERMED 322	131
76	3,162	INTERMED 1,057	MINOR 1	MAJOR 688	INTERMED 437	INTERMED 207	MAJOR 465	307
77	3,346	INTERMED 1,879	MINOR 96	MINOR 37	INTERMED 955	MINOR 95	MINOR 96	188
78	2,298	INTERMED 1,123	MINOR 13	MAJOR 591	MINOR 9	MAJOR 399	MINOR 55	108
79	2,312	INTERMED 676	MINOR 31	MINOR 187	MAJOR 808	INTERMED 138	MAJOR 472	0
80	3,231	INTERMED 2,352	MINOR 127	MINOR 300	MINOR 192	MINOR 125	MINOR 105	30
81	2,115	INTERMED 1,177	MINOR 67	MAJOR 712	MINOR 34	MINOR 11	MINOR 76	38
82	987	INTERMED 517	MINOR 0	MAJOR 341	MINOR 0	INTERMED 118	MINOR 2	9
83	1,824	INTERMED 929	MINOR 49	INTERMED 352	INTERMED 431	MINOR 4	MINOR 58	1
84	2,101	INTERMED 1,012	MINOR 5	MAJOR 944	MINOR 0	MINOR 27	MINOR 53	60
85	12,432	INTERMED 3,182	MINOR 79	MINOR 429	MAJOR 5,452	INTERMED 1,425	MAJOR 1,488	377
86	3,858	INTERMED 1,892	MINOR 164	INTERMED 491	MINOR 198	INTERMED 365	MINOR 172	576
87	8,855	INTERMED 3,061	MINOR 109	MAJOR 2,423	INTERMED 1,709	MINOR 227	MAJOR 981	345
88	3,352	INTERMED 1,010	MINOR 303	MINOR 124	INTERMED 505	MAJOR 1,270	MINOR 93	47
89	23,963	INTERMED 6,531	MINOR 1	MINOR 2,129	MAJOR 9,086	INTERMED 2,452	MAJOR 3,077	687
90	4,668	MINOR 573	MINOR 0	MINOR 73	INTERMED 1,223	MAJOR 1,587	MAJOR 738	474
91	9,835	MINOR 1,085	MINOR 0	MINOR 32	MAJOR 4,620	MAJOR 2,133	MAJOR 1,543	422

* "OTHER" includes major highway rights of way, landfills, and quarries and mines

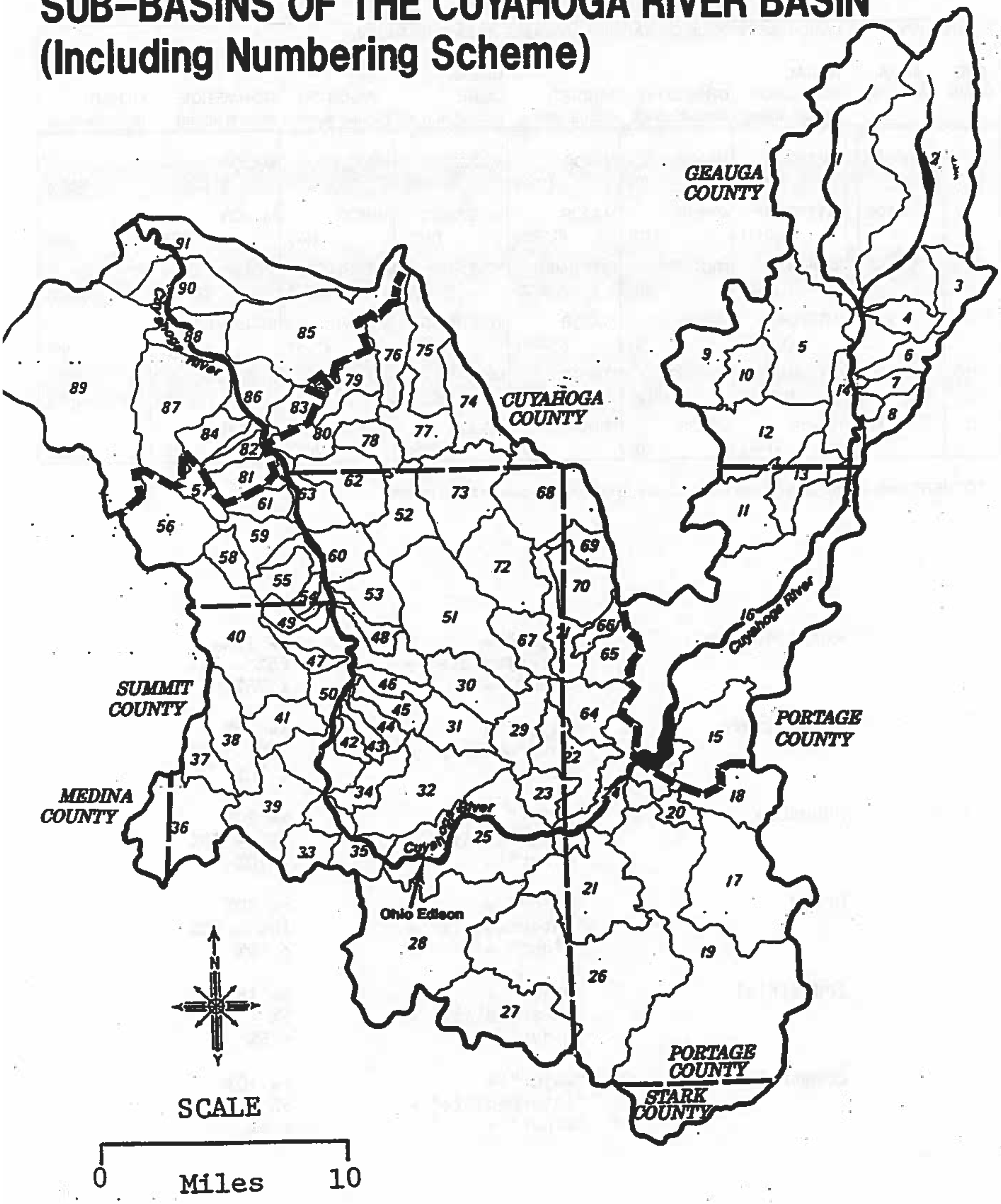
TABLE 5-27B	LAND USE PROFILE OF EACH NEARSHORE AREA SUB-BASIN							
SUB BASIN	AREA (ACRES)	RURAL NON-CROP (actual acres)	CROPLAND (actual acres)	SUBURB (actual acres)	URBAN CORE (actual acres)	INDUSTRY (actual acres)	COMMERCE (actual acres)	OTHER* (actual acres)
116	8,071	MINOR (398)	MINOR (0)	MINOR (111)	MAJOR (3,286)	MAJOR (1,608)	MAJOR (2,302)	(366)
117	6,306	INTERMED (1,611)	MINOR (10)	MAJOR (2,325)	INTERMED (973)	MINOR (57)	MAJOR (1,272)	(58)
118	14,863	MINOR (1,579)	MINOR (0)	INTERMED (1,852)	MAJOR (7,584)	INTERMED (1,153)	MAJOR (2,542)	(153)
119	5,986	INTERMED (1,841)	MINOR (0)	MAJOR (2,009)	INTERMED (1,381)	MINOR (104)	INTERMED (585)	(66)
120	7,950	INTERMED (3,968)	MINOR (210)	MAJOR (2,612)	MINOR (261)	MINOR (93)	INTERMED (730)	(76)
121	978	MINOR (148)	MINOR (0)	MINOR (40)	MAJOR (299)	MAJOR (207)	MAJOR (242)	(42)

* "OTHER" includes major highway rights of way, landfills, and quarries and mines

Rural Noncrop	"major" =	>= 75%
	"intermediate" =	25% - 75%
	"minor" =	< 25%
Agriculture	"major" =	>= 30%
	"intermediate" =	10% - 30%
	"minor" =	< 10%
Suburban	"major" =	>= 20%
	"intermediate" =	10% - 20%
	"minor" =	< 10%
Urban	"major" =	>= 30%
	"intermediate" =	10% - 30%
	"minor" =	< 10%
Industrial	"major" =	>= 15%
	"intermediate" =	5% - 15%
	"minor" =	< 5%
Commercial	"major" =	>= 10%
	"intermediate" =	5% - 10%
	"minor" =	< 5%

Figure: 5-20

SUB-BASINS OF THE CUYAHOGA RIVER BASIN (Including Numbering Scheme)

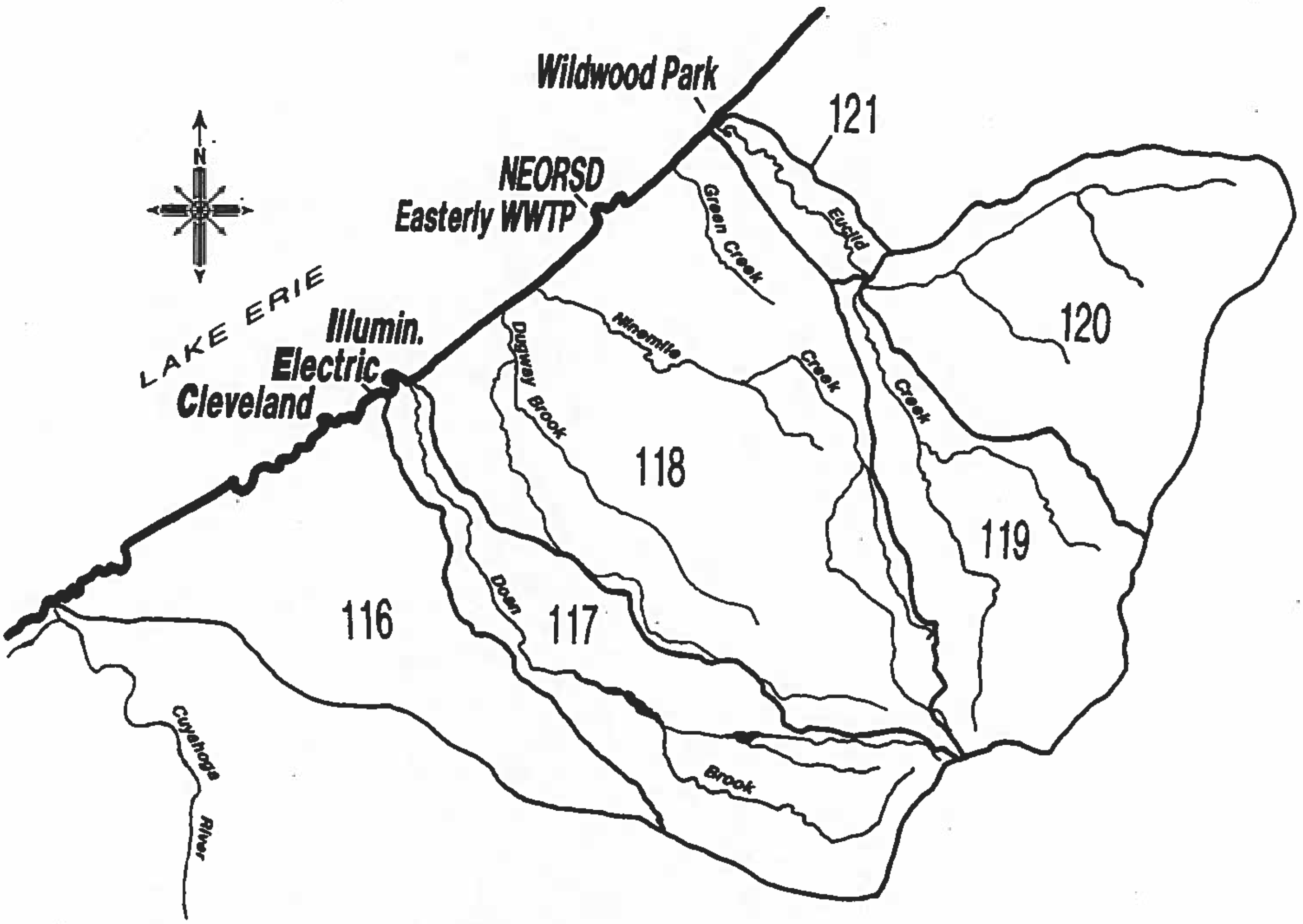


SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

Figure: 5-21

NEARSHORE AREA SUB-BASINS WITH MAJOR TRIBUTARIES

(Including NOACA Numbering Scheme)



116 - Cleveland
117 - Doan Brook
118 - East Cleveland
119 - West Branch, Euclid Creek
120 - East Branch, Euclid Creek
121 - Main Stem, Euclid Creek

5.3. Linkages Between Sources and Impairments

5.3.1 Introduction

A detailed description of the environmental problems in the Area of Concern, including a definition of the 14 beneficial uses identified by the GLWQA Annex 2 that are impaired, is contained in Chapter 4 of the Stage One Report.

In Sections 5.1 and 5.2 are discussions of the types of sources which cause the impairments discussed in Chapter 4. These source types include municipal and industrial point sources, combined sewer overflows, sanitary sewer overflows and plant overflows and bypasses, and 19 categories of nonpoint sources.

Section 5.3, in summary format, attempts to bring these two bodies of information together, the reports of impaired uses on the one hand, and the inventory of sources on the other, in order to develop linkages between sources of pollution in general and the specific impairments which have been documented in the Area of Concern.

Following the logic developed and applied to each declaration of impairment (see Chapter 4: Introduction), a logic was developed and applied for classifying a condition, such as habitat alteration, or contaminant as "Known" or "Suspected." Likewise, a logic was developed for classifying a source as a "Known" or "Suspected" contributor of a listed condition or contaminant.

What follows is a description of Section 5.3.2 and the logic applied in its creation.

1. In 5.3.2 the status of each beneficial use is reported by stream segment. The stream segments are:

    a) Ohio Edison Dam (RM 45.1) to the Navigation Channel (RM 5.6);

    b) the Navigation Channel (RM 5.6 to 0.0);

    c) the Nearshore Area (Edgewater Beach to Wildwood Park). Section 5.3.2 is first organized by Impairment Category and secondarily by Stream Segment.

If a beneficial use is not impaired or if impairment is unknown, it is listed in 5.3.3.

2. For each impairment entry in 5.3.2 there is a list of "Conditions and Contaminants" that are considered to be contributing to the impaired status of the beneficial use. This list was derived primarily from the subcommittee reports on impairments. There is also a list of "Sources" that are contributing those pollutants, or

causing those conditions, documented under "Conditions and Contaminants." The sources were derived from both the impairments reports and the body of work done by the Point and Nonpoint Subcommittees.

Within the section "Conditions and Contaminants" are subsections labelled "Suspected" and "Known." A condition or contaminant is "Known" if it satisfies this condition:

a) there is a specific criterion (e.g., standard) which addresses the concentration, loading, levels or extent of that particular contaminant or conditions,

AND

b) there are sufficient data regarding the presence and extent of that condition or contaminant.

In the event that there is no specific criterion, the Committee may determine that a condition or contaminant is known based on consensus. This has been the case in fish tumors, boating impairments, fishing impairments, aesthetics, and fish habitat.

All other conditions or contaminants for which we lack adequate data or a specific judgement criterion, but have reason to believe they contribute to the impairment fall into the "Suspected" list.

3. For each impairment entry there is a list of "Sources" that are considered to be contributing the above-mentioned conditions or contaminants. A source is "Known" if there are data that confirm the release of the contaminant from that source, or that directly contribute to that condition. In an effort to advance work ahead in Stage Two to identify specific sources of impairments, we have categorized the known sources by the data that is available on each:

   a) The source is known if we have measured data such as the contaminant levels measured in fish tissue or measured effluent levels reported to and stored in Ohio EPA's LEAPS data base;

   b) The source is known if we have modelled or estimated data such as those metals concentrations in urban runoff generated by NURP equations;

   c) The source is known but unquantified if we understand it to be contributing but have not measured its loads or extent of contribution.

Other possible sources are listed under "Suspected."

The table on the next page summarizes the impairment status of all beneficial uses by river segment. Section 5.3.2 follows, with a separate page for each impairment by river segment.

USE IMPAIRMENT SUMMARY TABLE

PAGE

Fish Consumption in the Upper AOC 5-151
Fish Consumption in the Nearshore Area 5-152
Fish Populations in the Upper AOC 5-153
Fish Populations in the Navigation Channel 5-154
Fish Tumors in the Upper AOC 5-155
Fish Tumors in the Navigation Channel 5-156
Fish Tumors in the Nearshore Area 5-157
Benthic Macroinvertebrate Populations in the Upper AOC 5-158
Benthic Macroinvertebrate Populations in the Navigation Channel 5-159
Benthic Macroinvertebrate Populations in the Nearshore Area 5-160
Restrictions on Dredging in the Navigation Channel 5-161
Restrictions on Dredging in the Nearshore Area 5-162
Eutrophication in the Navigation Channel 5-163
Eutrophication in the Nearshore Area 5-164
Beach Closings in the Upper AOC 5-165
Beach Closings in the Navigation Channel 5-166
Beach Closings in the Nearshore Area 5-167
Boating Impairments in the Upper AOC 5-168
Boating Impairments in the Navigation Channel 5-169
Boating Impairments in the Nearshore Area 5-170
Fishing Impairments in the AOC 5-171
Aesthetic Impairments in the Upper AOC 5-172
Aesthetic Impairments in the Navigation Channel 5-173
Aesthetic Impairments in the Nearshore Area 5-174
Phytoplankton Populations in the Upper AOC 5-175
Phytoplankton Populations in the Navigation Channel 5-176
Phytoplankton Populations in the Nearshore Area 5-177
Rish Habitat in the Navigation Channel 5-178
Fish Habitat in the Nearshore Area 5-179

5.3.2 Summary of Source-Impairment Linkages

5.3.2.1(a) IMPAIRMENT CATEGORY: FISH CONSUMPTION (I.1)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Ohio Edison Dam to the Navigation Channel - Unknown (unresolved criteria issue, see Chapter 4.1(i))

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected*
- Based on USEPA Risk Assessment Methodology at Risk Levels Greater Than 10^{-5}** and an assumed consumption rate of 140 grams per day.***

4,4 DDT
4,4 DDD
4,4 DDE
heptachlor epoxide
dieldrin
PCB-1248
PCB-1260
total PCBs

SOURCES:

Known
- Measured:
- Modeled/Estimated:
- Unquantified:
  Nonpoint sources of pesticides
  Nonpoint sources of organic toxics

Suspected
- None

---

* See Chapter 4 for further details of contaminants found in fish tissue.

** USEPA Risk Assessment has not yet been accepted as the criterion by which we measure the impairment, and therefore, contaminants identified by this method are only "suspected."

*** USEPA definition of "average consumption" is 6.5 grams/day.

5.3.2.1(b) IMPAIRMENT CATEGORY: FISH CONSUMPTION (I.1)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Impaired for carp and channel catfish, based on ODH Standards

CONDITIONS AND CONTAMINANTS:

Known
- Based on FDA Guidelines for Commercial Sale of Fish
  PCBs

Suspected
- None

SOURCES:

Known
- Measured:
- Modeled/Estimated:
- Unquantified:
  Nonpoint sources of organic toxics

Suspected
- None

5.3.2.2(a) IMPAIRMENT CATEGORY: FISH POPULATIONS (III.1)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Ohio Edison Dam to the Navigation Channel - Impaired, based on OEPA's IBI and MIwb

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected
- Based on RAP Subcommittee Reports*
  - increasing nutrient levels
  - siltation and blockage of spawning streams
  - residual impacts of past toxicity (Akron WWTP)
  - cadmium
  - chromium
  - lead
  - zinc
  - PAHs
  - PCBs
  - pesticides
  - in-place sediments
  - elevated temperature

- Based on USEPA Water Quality criteria
  - chlorides

SOURCES:

Known
- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/Estimated:
- Unquantified:
  - Increased thermal loads
  - Little Cuyahoga discharge
  - Past Akron WWTP effluent toxicity
  - Nonpoint sources of sediment
  - Nonpoint sources of phosphorus
  - Nonpoint sources of nitrogen compounds
  - Sanitary sewer overflows
  - Combined sewer overflows
  - Nonpoint sources of metals
  - Nonpoint sources of organic toxics
  - Nonpoint sources of pesticides
  - Nonpoint sources of chlorides

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.2(b) IMPAIRMENT CATEGORY: FISH POPULATIONS

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Impaired, based on OEPA's IBI and MIwb

CONDITIONS AND CONTAMINANTS:

Known
- Based on Ohio Water Quality Standards
  - low dissolved oxygen

Known
- Based on Ohio Qualitative Habitat Evaluation Index
  - reduced habitat diversity

Suspected
- Based on Subcommittee Reports*
  - increasing nutrient levels
  - siltation
  - cadmium
  - chromium
  - lead
  - zinc
  - PAHs
  - PCBs
  - pesticides
  - in-place sediment toxicity and oxygen demand
  - elevated temperature
- Based on USEPA Water Quality criteria
  - chlorides

SOURCES:

Known
- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/Estimated:
- Unquantified:
  - Increased thermal loads
  - Effects of sheet piling
  - Effects of concrete bulk heads
  - Effects of rip rap along the shoreline
  - Effects of maintenance dredging activities
  - Effects of turbulence and resuspension caused by freighters
  - Nonpoint sources of biochemical oxygen demand
  - Nonpoint sources of sediment
  - Nonpoint sources of phosphorus
  - Nonpoint sources of nitrogen compounds
  - Sanitary sewer overflows
  - Combined sewer overflows
  - Nonpoint sources of pesticides
  - Nonpoint sources of organic toxics
  - Nonpoint sources of metals
  - Nonpoint sources of chlorides

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.3(a) IMPAIRMENT CATEGORY: FISH TUMORS (IV)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Ohio Edison Dam to the Navigation Channel - Impaired, based on DELT anomalies

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected
- Based on RAP Subcommittee Reports*
  - residual impact of past toxicity (Akron WWTP)
  - PCBs
  - pesticides
  - PAHs
  - heavy metals
    - arsenic
    - beryllium
    - cadmium
    - chromium
    - nickel

SOURCES:

Known
- Measured:
  - Municipal point sources
  - Industrial point sources
- Modeled/Estimated:
- Unquantified:
  - Nonpoint sources of pesticides
  - Nonpoint sources of organic toxics
  - Nonpoint sources of metals
  - Combined sewer overflows
  - Sanitary sewer overflows

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.3(b) IMPAIRMENT CATEGORY: FISH TUMORS (IV)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Impaired, based on DELT anomalies and IJC criteria

CONDITIONS AND CONTAMINANTS:

Known
- Based on Research by P. Bauman, et al.
  - PAHs (known for bullhead populations)
    - fluroanthene
    - phenanthrene
    - benzo(a)athracene
    - benzo(a)pyrene

Suspected
- Based on Subcommittee Reports*
  - PCBs
  - pesticides
  - heavy metals
    - arsenic
    - beryllium
    - cadmium
    - chromium
    - nickel

SOURCES:

Known
- Measured:
  - Municipal point sources
  - Industrial point sources
- Modeled/Estimated:
- Unquantified:
  - Nonpoint sources of organic toxics
  - Nonpoint sources of metals
  - Nonpoint sources of pesticides

Suspected
- None

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.3(c) IMPAIRMENT CATEGORY: FISH TUMORS (IV)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Impaired, based on IJC criteria

CONDITIONS AND CONTAMINANTS:

Known
- Based on Research by P. Bauman et al.
    - PAHs (known for bullhead populations)
        - fluoroanthene
        - phenanthrene
        - benzo(a)anthracene
        - benzo(a)pyrene

Suspected
- Based on Subcommittee Reports*
    - heavy metals
        - arsenic
        - beryllium
        - cadmium
        - chromium
        - nickel
- Based on the Judgement of the Committee**
    - PCBs
    - pesticides

SOURCES:

Known
- Measured:
    - Municipal point sources
    - Industrial point sources
- Modeled/Estimated:
- Unquantified:
    - Nonpoint sources of pesticides
    - Nonpoint sources of organic toxics
    - Nonpoint sources of metals

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

** PCBs and pesticides have been linked to external anomalies. No external anomalies (DELT) data has been collected in the nearshore area, however. Therefore, these contaminants are listed only as "suspected".

5.3.2.4(a) IMPAIRMENT CATEGORY: BENTHIC MACROINVERTEBRATE POPULATIONS (VI)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Ohio Edison Dam to the Navigation Channel - Impaired in Some Locales, based on OEPA's ICI.

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected
- Based on RAP Subcommittee Reports*
  - nutrients (nutrient enrichment)
  - low dissolved oxygen
  - organic enrichment (sewage)
  - iron
  - zinc
  - arsenic
  - manganese
  - sedimentation
  - PCBs
  - toluene
  - PAHs
  - residual impact of past toxicity
- Based on USEPA Water Quality criteria
  - chlorides

SOURCES:

Known
- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/Estimated:
- Unquantified:
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Nonpoint sources of nitrogen compounds
  - Nonpoint sources of phosphorus
  - Nonpoint sources of biochemical oxygen demand
  - Past Akron WWTP effluent toxicity
  - Nonpoint sources of sediment
  - Nonpoint sources of organic toxics
  - Nonpoint sources of metals
  - Nonpoint sources of pesticides
  - Nonpoint sources of chlorides

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.4(b) IMPAIRMENT CATEGORY: BENTHIC MACROINVERTEBRATE POPULATIONS (VI)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Possibly Impaired, no criteria; Ohio EPA's ICI hypothetically applied.

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected
- Based on RAP Subcommittee Reports*
  - nutrients (nutrient enrichment)
  - low dissolved oxygen
  - lack of suitable habitat structure
  - organic enrichment (sewage)
  - iron
  - zinc
  - arsenic
  - manganese
  - sedimentation
  - PCBs
  - toluene
  - PAHs
- Based on USEPA Water Quality criteria
  - chlorides

SOURCES:

Known
- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/Estimated:
- Unquantified:
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Nonpoint point sources of nitrogen compounds
  - Nonpoint sources of phosphorus
  - Nonpoint sources of biochemical oxygen demand
  - Annual dredging
  - Extreme turbulence from shipping
  - Nonpoint sources of sediment
  - Nonpoint sources of organic toxics
  - Nonpoint sources of metals
  - Nonpoint sources of pesticides
  - Nonpoint sources of chlorides

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.4(c) IMPAIRMENT CATEGORY: BENTHIC MACROINVERTEBRATE POPULATIONS (VI)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Impaired

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected
- Based on RAP Subcommittee Reports*
  - nutrients (nutrient enrichment)
  - low dissolved oxygen
  - reduced suitable habitat structure
  - organic enrichment (sewage)
  - iron
  - zinc
  - arsenic
  - manganese
  - sedimentation
  - PCBs
  - toluene
  - PAHs

SOURCES:

Known
- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/Estimated:
- Unquantified:
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Hypolimnic waters of the entire Central Basin at the end of summer
  - Nonpoint point sources of nitrogen compounds
  - Nonpoint sources of phosphorus
  - Nonpoint sources of biochemical oxygen demand
  - Annual dredging
  - Nonpoint sources of sediment
  - Nonpoint sources of organic toxics
  - Nonpoint sources of metals
  - Nonpoint sources of pesticides

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.5(a) IMPAIRMENT CATEGORY: RESTRICTIONS ON DREDGING (VII) - "Requiring Dike Disposal"

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Impaired (where dredging occurs, except RM 5.6 to 5.4)

CONDITIONS AND CONTAMINANTS:

Known
- Based on USEPA Guidelines for Classification of Great Lakes Sediments
  - cadmium
  - chromium
  - lead
  - cyanide
  - zinc
  - oil and grease
  - arsenic
  - copper
  - iron

Suspected
- Based on OEPA's Database on Unimpaired Harbors*
  - barium
  - nickel
  - ammonia
  - PCBs
  - PAHs
  - phthalates
  - benzene
  - toluene
  - clay/silt particles

SOURCES:

Known
- Measured:
  - Municipal point sources
  - Industrial point sources
- Modeled/Estimated:
- Unquantified:
  - Nonpoint sources of oil and grease
  - Nonpoint sources of organic toxics
  - Nonpoint sources of metals
  - Nonpoint sources of nitrogen compounds
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Nonpoint sources of clay and silt

Suspected
- None

---

* Comparison of Cuyahoga River sediments to unimpaired harbors is not yet an accepted criterion by which to measure impairment, and therefore, contaminants identified by this method are only "suspected."

5.3.2.5(b) IMPAIRMENT CATEGORY: RESTRICTIONS ON DREDGING (VII) - "Requiring Dike Disposal"

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Impaired (where dredging occurs)

CONDITIONS AND CONTAMINANTS:

Known
- Based on USEPA Guidelines for Classification of Great Lakes Sediments
  - cadmium
  - chromium
  - lead
  - cyanide
  - zinc
  - oil and grease
  - arsenic
  - copper
  - iron

Suspected
- Based on OEPA's Database on Unimpaired Harbors*
  - barium
  - nickel
  - ammonia
  - PCBs
  - PAHs
  - phthalates
  - benzene
  - toluene
  - clay/silt particles

SOURCES:

Known
- Measured:
  - Municipal point sources
  - Industrial point sources
- Modeled/Estimated:
- Unquantified:
  - Nonpoint sources of oil and grease
  - Nonpoint sources of organic toxics
  - Nonpoint sources of metals
  - Nonpoint sources of nitrogen compounds
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Nonpoint sources of clay and silt

Suspected
- None

---

* Comparison of Cuyahoga River sediments to unimpaired harbors is not yet an accepted criterion by which to measure impairment, and therefore, contaminants identified by this method are only "suspected."

5.3.2.6(a) IMPAIRMENT CATEGORY: EUTROPHICATION OR UNDESIRABLE ALGAE (VIII)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Probably Impaired, based on RAP consensus.

CONDITIONS AND CONTAMINANTS:

Known
- Based on IJC's definition of cultural eutrophication
  - phosphorus
  - suspended solids
  - nitrogen compounds
- Based on Low D.O. Levels Measured in Ship Channel
  - biochemical oxygen demand

Suspected
- None

SOURCES:

Known
- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/Estimated:
- Unquantified:
  - Nonpoint sources of phosphorus
  - Nonpoint sources of nitrogen compounds
  - Nonpoint sources of biochemical oxygen demand
  - Nonpoint sources of suspended solids (sediment)
  - Turbulence from shipping
  - Dredging and resuspension

Suspected
- None

5.3.2.6(b) **IMPAIRMENT CATEGORY: EUTROPHICATION OR UNDESIRABLE ALGAE (VIII)**

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Impaired, based on RAP consensus.

CONDITIONS AND CONTAMINANTS:

Known
- Based on IJC's definition of cultural eutrophication
  - biochemical oxygen demand
  - phosphorus
  - suspended solids
  - nitrogen compounds

Suspected
- None

SOURCES:

Known
- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/Estimated:
- Unquantified:
  - Nonpoint sources of phosphorus
  - Nonpoint sources of nitrogen compounds
  - Nonpoint sources of biochemical oxygen demand
  - Nonpoint sources of suspended solids (sediment)
  - Dredging and resuspension

Suspected
- None

5.3.2.7(a) **IMPAIRMENT CATEGORY: BEACH CLOSINGS (X.1)**

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Ohio Edison Dam to the Navigation Channel <u>Impaired Periodically</u>

CONDITIONS AND CONTAMINANTS:

<u>Known</u>
- Based on Ohio Water Quality Standards for Primary Contact Recreation
  - fecal coliform
  - <u>*E. coli*</u>

<u>Suspected</u>
- None

SOURCES:

<u>Known</u>
- Measured:
- Modeled/Estimated:
- Unquantified:
  - Nonpoint sources of fecal coliform/pathogens
  - Combined sewer overflows
  - Sanitary sewer overflows

<u>Suspected</u>
- None

5.3.2.7(b) IMPAIRMENT CATEGORY: BEACH CLOSINGS (X.1)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Impaired Periodically

CONDITIONS AND CONTAMINANTS:

Known
- Based on Ohio Water Quality Standards for Primary Contact Recreation
  fecal coliform

Suspected
- Based on Ohio Water Quality Standards; Data are lacking
  E. coli

SOURCES:

Known
- Measured:
- Modeled/Estimated:
- Unquantified:
  Nonpoint sources of fecal coliform/pathogens
  Combined sewer overflows
  Sanitary sewer overflows
  Boat Discharges

Suspected
- None

5.3.2.7(c) IMPAIRMENT CATEGORY: BEACH CLOSINGS (X.1)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Impaired Periodically

CONDITIONS AND CONTAMINANTS:

Known
- Based on Ohio Water Quality Standards for Bathing Waters
  fecal coliform

Suspected
- Based on Ohio Water Quality Standards; Data are lacking
  E. coli

SOURCES:

Known
- Measured:
- Modeled/Estimated:
- Unquantified:
  Boat discharges
  Nonpoint sources of fecal coliform/pathogens
  Combined sewer overflows
  Sanitary sewer overflows

Suspected
- None

5.3.2.8(a) IMPAIRMENT CATEGORY: BOATING IMPAIRMENTS (X.2)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Ohio Edison Dam to the Navigation Channel - Impaired Periodically

CONDITIONS AND CONTAMINANTS:

Known
- Based on Ohio Water Quality Standards for primary contact recreation
  - fecal coliform
  - *E. coli*

Known
- Based on RAP consensus
  - suspended solids
  - large garbage
  - natural debris
  - litter
  - oil and grease

Suspected
- None

SOURCES:

Known
- Measured:
  - Municipal point sources
  - Industrial point sources
- Modeled/Estimated:
- Unquantified:
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Nonpoint sources of fecal coliform/pathogens
  - Natural tree fall
  - Illegal dumping/littering
  - Nonpoint Sources of oil and grease

Suspected
- None

5.3.2.8(b) IMPAIRMENT CATEGORY: BOATING IMPAIRMENTS (X.2)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - <u>Impaired Periodically</u>

CONDITIONS AND CONTAMINANTS:

<u>Known</u>
- Based on Ohio Water Quality Standards for Primary Contact Recreation
  - fecal coliform

<u>Known</u>
- Based on RAP consensus
  - suspended solids
  - large natural garbage debris
  - litter
  - oil and grease

<u>Suspected</u>
- Based on Ohio Water Quality Standards; Data are Lacking
  - <u>E. coli</u>

SOURCES:

<u>Known</u>
- Measured:
  - Municipal point sources
  - Industrial point sources
- Modeled/Estimated:
- Unquantified:
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Nonpoint sources of fecal coliform/pathogens
  - Nonpoint sources of suspended solids (sediment)
  - Natural tree fall
  - Illegal dumping/littering
  - Nonpoint Sources of oil and grease

<u>Suspected</u>
- None

5.3.2.8(c) IMPAIRMENT CATEGORY: BOATING IMPAIRMENTS (X.2)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Impaired Periodically

CONDITIONS AND CONTAMINANTS:

Known
- Based on Ohio Water Quality Standards for Primary Contact Recreation
  fecal coliform

Known
- Based on RAP Consensus
  suspended solids
  large garbage and natural debris
  litter
  oil and grease

Suspected
- Based on Ohio Water Quality Standards; Data are Lacking
  E. coli

SOURCES:

Known
- Measured:
  Municipal point sources
  Industrial point sources
- Modeled/Estimated:
- Unquantified:
  Combined sewer overflows
  Sanitary sewer overflows
  Nonpoint sources of fecal coliform/pathogens
  Nonpoint sources of suspended solids (sediment)
  Natural tree fall
  Illegal dumping/littering
  Nonpoint Sources of oil and grease

Suspected
- None

5.3.2.9 IMPAIRMENT CATEGORY: FISHING IMPAIRMENTS (X.3)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Impaired Downstream of Rockside Road (RM 13.2) to the Navigation Channel (RM 5.6) Only

CONDITIONS AND CONTAMINANTS:

Known
- Based on RAP Consensus
  no public access

Suspected
- None

SOURCES:

Known
- Measured:
- Modeled/Estimated:
- Unquantified:
  Urbanization of riparian zone

Suspected
- None

5.3.2.10(a) IMPAIRMENT CATEGORY: AESTHETICS (XI)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Ohio Edison Dam to the Navigation Channel - Impaired

CONDITIONS AND CONTAMINANTS:

Known
- Based on RAP Consensus; Data are Lacking
  - natural debris
  - litter
  - large garbage
  - detergents or other foaming agents
  - suspended solids
  - oil and grease
  - odor
  - any visible industrial spill or discharge
    - colored discharge
    - exposed discharge pipe

Suspected
- None

SOURCES:

Known
- Measured:
  - Industrial Point Sources
  - Municipal Point Sources
- Modeled/Estimated:
- Unquantified:
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Nonpoint sources of suspended solids (sediment)
  - Nonpoint sources of oil and grease
  - Natural tree fall
  - Illegal dumping/littering

Suspected
- None

5.3.2.10(b) IMPAIRMENT CATEGORY: AESTHETICS (XI)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Impaired

CONDITIONS AND CONTAMINANTS:

Known
- Based on RAP Consensus; Data are Lacking
  - natural debris
  - litter
  - large garbage
  - detergents or other foaming agents
  - suspended solids
  - oil and grease
  - odor
  - any visible industrial spill or discharge
    - colored discharge
    - exposed discharge pipe

Suspected
- None

SOURCES:

Known
- Measured:
  - Industrial Point Sources
  - Municipal Point Sources
- Modeled/Estimated:
- Unquantified:
  - Combined sewer overflows
  - Sanitary sewer overflows
  - Nonpoint sources of suspended solids (sediment)
  - Nonpoint sources of oil and grease
  - Natural tree fall
  - Illegal dumping/littering

Suspected
- None

5.3.2.10(c) IMPAIRMENT CATEGORY: AESTHETICS (XI)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Impaired

CONDITIONS AND CONTAMINANTS:

Known
- Based on RAP Consensus; Data are Lacking
    - natural debris
    - litter
    - large garbage
    - detergents or other foaming agents
    - suspended solids
    - oil and grease
    - odor
    - any visible industrial spill or discharge
        - colored discharge
        - exposed discharge pipe

Suspected
- None

SOURCES:

Known
- Measured:
    - Industrial Point Sources
    - Municipal Point Sources
- Modeled/Estimated:
- Unquantified:
    - Combined sewer overflows
    - Sanitary sewer overflows
    - Nonpoint sources of suspended solids (sediment)
    - Nonpoint sources of oil and grease
    - Natural tree fall
    - Illegal dumping/littering

Suspected
- None

5.3.2.11(a) IMPAIRMENT CATEGORY: PHYTOPLANKTON POPULATIONS

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Possibly Impaired

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected
- Based on Subcommittee Report*
  - phosphorus
  - nitrogen
  - low dissolved oxygen
  - suspended solids
  - organic toxics
  - herbicides
  - metals

SOURCES

Known

- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/estimated:
- Unquantified:
  - Nonpoint sources of phosphorus
  - Nonpoint sources of nitrogen compounds
  - Nonpoint sources of organic toxics
  - Nonpoint sources of pesticides
  - Nonpoint sources of metals
  - Nonpoint sources of sediment
  - Nonpoint sources of biochemical oxygen demand
  - Combined sewer overflows
  - Sanitary sewer overflows

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.11(b) IMPAIRMENT CATEGORY: PHYTOPLANKTON POPULATIONS

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Possibly Impaired

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected
- Based on Subcommittee Report*
  - phosphorus
  - nitrogen
  - low dissolved oxygen
  - suspended solids
  - organic toxics
  - herbicides
  - metals

SOURCES

Known
- Measured:
  - Industrial point sources
  - Municipal point sources
- Modeled/estimated:
- Unquantified:
  - Nonpoint sources of phosphorus
  - Nonpoint sources of nitrogen compounds
  - Nonpoint sources of organic toxics
  - Nonpoint sources of pesticides
  - Nonpoint sources of metals
  - Nonpoint sources of sediment
  - Nonpoint sources of biochemical oxygen demand
  - Combined sewer overflows
  - Sanitary sewer overflows

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.11(c) IMPAIRMENT CATEGORY: PHYTOPLANKTON POPULATIONS

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Ohio Edison Dam to the Navigation Channel - Possibly Impaired

CONDITIONS AND CONTAMINANTS:

Known
- None

Suspected
- Based on Subcommittee Report*
    - phosphorus
    - nitrogen
    - low dissolved oxygen
    - suspended solids
    - organic toxics
    - herbicides
    - metals

SOURCES

Known
- Measured:
    - Industrial point sources
    - Municipal point sources
- Modeled/estimated:
- Unquantified:
    - Nonpoint sources of phosphorus
    - Nonpoint sources of nitrogen compounds
    - Nonpoint sources of organic toxics
    - Nonpoint sources of pesticides
    - Nonpoint sources of metals
    - Nonpoint sources of sediment
    - Nonpoint sources of biochemical oxygen demand
    - Combined sewer overflows
    - Sanitary sewer overflows

Suspected
- None

---

* Contaminants are only "suspected" because the link (a scientific rationale or biochemical mechanism) between the cause (condition/contaminant) and the effect (impairment) is not well understood.

5.3.2.12(a) IMPAIRMENT CATEGORY: FISH HABITAT (XIV.1)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Navigation Channel - Impaired

CONDITIONS AND CONTAMINANTS:

Known
- Based on RAP Consensus in Conjunction with OEPA's QHEI
  - past channelization
  - lack of riparian (stream bank) cover
  - silt cover and sedimentation
  - low stream sinuosity (curviness of the stream)
  - low gradient (slope of the channel)
  - loss of natural substrates

Suspected
- None

SOURCES:

Known
- Measured:
- Modeled/Estimated:
- Unquantified:
  - Effects of sheet piling
  - Effects of concrete bulkheads
  - Effects of turbulence and resuspension caused by freighters
  - Effects of concrete and steel sheet piling
  - Effects of annual maintenance dredging
  - Urbanization of riparian zone
  - Nonpoint sources of sediment

Suspected
- None

5.3.2.12(b) IMPAIRMENT CATEGORY: FISH HABITAT (XIV.1)

DEGREE OF IMPAIRMENT BY RIVER SEGMENT: Nearshore Area - Probably Impaired

CONDITIONS AND CONTAMINANTS:

Known
- Based on RAP Consensus in Conjunction with OEPA's QHEI
  - lack of protective habitat
  - silt cover and sedimentation
  - loss of natural substrates

Suspected
- None

SOURCES:

Known
- Measured:
- Modeled/Estimated:
- Unquantified:
  - Effects of rip rap along the shoreline
  - Effects of concrete and steel sheet piling
  - Effects of annual maintenance dredging
  - Urbanization of litoral zone
  - Nonpoint sources of sediment

Suspected
- None

5.3.3 Summary of Unknown or Nonexistant Impairments

Chapter 4 presents data and analyses for most of the 14 use impairments categories. In many cases the analysis of the impairment status is complete for the entire Area of Concern (all three segments of the river and nearshore area). There are a few instances, however, where data exist for two segments of the Area of Concern, but not for all three. Section 5.3.3 summarizes these data gaps (Refer to Chapter 4 for a more detailed discussion of each).

In the nearshore area, the impairment status of fish populations is unknown. In the navigation channel, the impairment status of fish consumption is unknown. From Ohio Edison Dam to Head of Navigation, the impairment status of eutrophication and drinking water are unknown.

More significant data gaps exist in the area of wildlife. There are insufficient data to make any declaration of impairment to wildlife populations, habitat, deformities or reproductive problems, and consumption. Wildlife data are lacking for the entire Cuyahoga River basin.

No impairment is declared for fish and wildlife flavor due to insufficient information throughout the AOC. In this case, lack of "complaint" data indicating flavor problems strongly suggests there is no impairment.

Several impairment categories were declared unimpaired. Fish habitat from Ohio Edison Dam to the Head of Navigation is considered unimpaired. In addition, there was determined to be no added costs to agriculture or industry for the processing of raw water.

Finally, because drinking water is not drawn from the navigation channel or nearshore area, it was decided that the impairment category was "not applicable" to the Cuyahoga RAP.

5.4 Contaminants of Concern

5.4.0 Introduction

The purpose of this section is to present the list of contaminants or conditions which must be addressed in Stage Two and summarize the information available on each. For our purposes, "contaminant of concern" is used in the following way -- it meets one of four listing criteria spelled out in Section 5.4.1.

This section has three parts:

Section 5.4.1 identifies the contaminants of concern and the reason for which a contaminant is of concern. This section also lists the conditions of concern (primarily physical disturbances or the results of contamination).

Section 5.4.1 also organizes the compiled list of contaminants into major categories, identifies in general terms where each contaminant is found in the Area of Concern, and identifies for each contaminant whether loadings data or estimates presently exist. All this information is presented in a summary table, Table 5-28.

Section 5.4.2 presents, where available, loadings data on individual contaminants in a series of tables (5-31 through 5-61).

The intent of the final section, 5.4.3, is to provide a general understanding of the effects of specific contaminants, elaborating on locational, concentration and loadings information presented in Sections 5.3.1 and 5.3.2.

5.4.1 Contaminant of Concern Listing Criteria

There are essentially two origins of contaminants identified in this section. Some contaminants have been identified through local sampling programs in the Cuyahoga Area of Concern as exceeding water quality standards. Others are "known" or "suspected" causes of use impairments. In the second manner, contaminants have been identified which the International Joint Commission has determined are large potential threats to ecosystem or human health anywhere in the Great Lakes basin.

Those contaminants identified from local sampling programs have either been identified as exceeding Ohio EPA Warmwater Habitat Acute Water Quality Standards or they are "known" or "suspected" contributors to use impairments within the usage of these terms developed in Part 5.3.

Exceedances of Ohio EPA Warmwater Habitat Acute Water Quality Standards include (these are indicated in the first column of Table 5-28):

cadmium
chromium
copper
cyanide
dissolved oxygen
iron
lead
oil and grease
zinc

Contaminants identified in 5.3: Source-Impairment Linkages include (these are indicated in the second column of Table 5-28):

ammonia
arsenic
barium
beryllium
benzene
cadmium
chlorides
chromium
copper
cyanide
DDT and metabolites
dieldrin
E. coli
fecal coliform
heptachlor epoxide
hexachlorobenzene
iron
lead
manganese
nickel
nitrogen compounds
oil and grease
PAHs
phosphorus
toluene
total PCBs
zinc

Contaminants which have been identified as potential threats by the IJC come from two lists: GLWQA Annex 1 "Persistent Toxic Substances" and the Great Lakes Water Quality Board's "Critical 11" list.

Contaminants on the Great Lakes Water Quality Agreement Annex 1 "Persistent Toxics Substances" list include (these are indicated in the third column of Table 5-28):

arsenic
cadmium
chlordane
chromium
copper
DDT and metabolites
dieldrin
endrin
fluoride
heptachlor epoxide
iron
lead
lindane
mercury
methoxychlor
mirex
nickel
phthalic acid esters
selenium
total PCBs
total dissolved solids
toxaphene
zinc

Contaminants on the Great Lakes Water Quality Board's "Critical 11" list include (these are indicated in the fourth column of Table 5-28):

2, 3, 7, 8 tetrachlorodibenzo-p-dioxin (TCDD)
2, 3, 7, 8, tetrachlorodibenzofuran (TCDF)
alkylated lead
benzo-a-pyrene
DDT and metabolites
dieldrin
hexachlorobenzene
mercury
mirex
total PCBs
toxaphene

Fifty-two specific contaminants and contaminant categories have been compiled for the Cuyahoga Area of Concern by this method. Some contaminants occur on both lists. Sixteen contaminants identified as exceeding WWH standards or as contributing to use impairments are also found on the IJC's lists. Fourteen contaminants which have been identified as local problems are not found on the IJC's lists. Thirteen contaminants are identified by the IJC but have not been identified locally as exceeding WWH standards or contributing to use impairments.

The fifth through eighth columns of Table 5-28 indicate the specific medium in which a contaminant was found above detection levels in the Area of Concern. This might be in sediment, fish, or the water column. Contaminants which have been found in the air over the Lake Erie basin or reported in local rainfall which could then contribute to their loadings from atmospheric deposition are also reported.

USE OF THE SUMMARY TABLE 5-28

A contaminant is indicated with an "X" in the "Sediment" column if it was found at levels above detection limits anywhere in the Area of Concern during sampling efforts by Ohio EPA in 1985-86 or 1990, or by the Corps of Engineers in 1986, 1989 or 1990. "NA" means a contaminant was not analyzed for; "NF" means it was analyzed for but not found. This information is presented in greater detail in Appendix B.

A contaminant is indicated with an "X" in the "Fish" column if it was found at levels above detection limits during the 1989 RAP Fish Tissue Sampling Program. Again, if a contaminant was not analyzed for, an "NA" is indicated in the "Fish" column, and if a contaminant was analyzed for but not found, an "NF" is indicated. This information is presented in greater detail in Appendix C.

A contaminant is indicated with an "X" in the "Water" column if it was found at levels above detection limits in the water column over the period from 1986-1990. "NA" means a contaminant was not analyzed for; "NF" means it was analyzed for but not found. The data analyzed are contained in the RAP data base, which is described in Chapter 6. A summary of these data is presented in Table 5-29. Table 5-30 further details where sampling occurred, and presents mean values of certain contaminants at each of the sampling stations.

ACUTE VERSUS CHRONIC WATER QUALITY STANDARDS

The acute criterion for each contaminant was used to search the database for water quality standards exceedances. The chronic criterion is a lower value for each contaminant and is based on a 30-consecutive-day average. The data do not exist for any parameter to calculate this average.

Finally, a contaminant is indicated with an "X" in the "Air" column if it was identified in either of the two following studies:

1) 1989. Final Report on Input of Toxic Substances From The Atmosphere to Lake Erie. (Battelle, Columbus, OH)

2) 1991. Rain Quality Study. (NEORSD, as part of its 1991-1992 CSO Study)

The atmospheric pathway is recognized as a potential contributor of many contaminants. However, only those found by these two research efforts have been acknowledged in Table 5-28. The discussion on Atmospheric Deposition in Section 5.2 further details other possible contaminants known to be in the air which at some point could then become loads from atmospheric deposition.

TABLE 5-28
CUYAHOGA AOC CONTAMINANTS OF CONCERN

	ACUTE WWH EXCEEDANCES	SOURCE IMPAIRMENT LINKS	IJC ANNEX 1	WQB "CRIT 11"	FOUND AT LEVELS ABOVE DETECTION IN:				LOADINGS DATA****		
					SEDIMENTS	FISH	WATER	AIR	LEAPs	NURP (APPEND H.1)	RAP DATABASE
METALS											
arsenic		K*	X		X	NA	X	B	X		
barium		S**			X	NA	NA				
beryllium		S			X	NA	NA				
cadmium	X	K	X		X	X	X	B	X		
chromium	X	K	X		X	NF	X	B,N	X		
copper	X	K	X		X	X	X	N	X	X	
iron	X	K	X		X	NA	X	N	X		
lead	X	K	X		X	X	X	B,N	X	X	
lead (alkylated)				X	NA	NA	NA				
manganese		S			X	NA	X		X		
mercury			X	X	X	X	X	B	X		
nickel		S	X		X	NA	X	N	X		
selenium			X		X	NA	NF				
zinc	X	K	X		X	X	X	N	X	X	
CONVENTIONAL POLLUTANTS											
chlorides		S			NA	NA	X		X		
cyanide	X	K			X	NA	X		X		
dissolved solids (total)			X		NA	NA	X		X	X	
fluoride			X		NA	NA	NA		X		
nitrogen compounds		K									
ammonia & organic nitrogen					X	NA	X		X	X	
total nitrogen					NA	NA	X		X	X	
nitrate					NA	NA	X		X		
nitrite					NA	NA	X		X		
oil and grease	X	K			X	NA	X		X		
phosphorus		K			X	NA	X		X	X	
PESTICIDES											
Chlordane			X		X	NF	NF				
DDT and metabolites		S	X	X	X	X	NF	B			
Dieldrin		S	X	X	X	X	NF	B			
Endrin			X		X	X	NF				
Heptachlor epoxide		S	X		X	X	NF				
Lindane (BHC)			X		X	X	NF				
Methoxychlor			X		X	NF	NF				
Mirex			X	X	NA	NF	NA				
Toxaphene			X	X	X	NF	NF				

*K="KNOWN"
**S="SUSPECTED"
***FOUND, BUT NOT ABOVE BACKGROUND LEVELS
****Refer to Tables 5-31 through 5-61 for data on the loadins of these contaminants
B= IDENTIFIED BY THE BATTELLE STUDY
N= IDENTIFIED BY THE NEORSD RAIN SAMPLING STUDY

NF = Not found above detection limits
NA = Not analyzed for

TABLE 5-28 (continued)
CUYAHOGA AOC CONTAMINANTS OF CONCERN

	ACUTE WWH EXCEEDANCES	SOURCE IMPAIRMENT LINKS	IJC ANNEX 1	WQB "CRIT 11"	FOUND AT LEVELS ABOVE DETECTION IN:				LOADINGS DATA****		
					SEDIMENTS	FISH	WATER	AIR	LEAPs	NURP (APPEND H.1)	RAP DATABASE
DIBENZODIOXINS AND DIBENZOFURANS											
2,3,7,8 TCDD				X	X***	NA	NA				
2,3,7,8 TCDF				X	X***		NA				
POLYCHLORINATED BIPHENYLS (PCBs)		K	X	X	X	X	NA	B			
POLYNUCLEAR AROMATIC HYDROCARBONS		S			X	NF					
benzo-a-anthracene		K			X	NF	NF				
benzo-a-pyrene		K		X	X	NF	NF	B			
fluoranthene		K			X	NF	NF				
phenanthrene		K			X	NF	NF				
VOLATILE ORGANIC COMPOUNDS											
benzene		S			X	NF	NF				
toluene		S			X	NF	NF		X		
MISCELANEOUS (Base-Neutral/Acid Extractables)											
hexachlorobenzene				X	X	NF	NF	B			
phthalic acid esters		S	X		X	?	NF		X		
MICROORGANISMS											
Escherichia coli		K					X				
fecal coliform		K					X				X

*K="KNOWN"
**S="SUSPECTED"
***FOUND, BUT NOT ABOVE BACKGROUND LEVELS
****Refer to Tables 5-31 through 5-61 for data on the loadins of these contaminants
B= IDENTIFIED BY THE BATTELLE STUDY
N = IDENTIFIED BY THE NEORSD RAIN SAMPLING STUDY

NF = Not found above detection limits
NA = Not analyzed for

TABLE 5-29

CONVENTIONAL ACUTE WATER QUALITY STANDARDS SAMPLING RESULTS

PARAMETER	WARMWATER HABITAT LIMIT		# SAMPLES	# SAMPLES ABOVE DETECTION LIMIT	# SAMPLES ABOVE WWH LIMIT
ammonia	8.0*	mg/l	569	548	0
arsenic	360	ug/l	91	40	0
cadmium	8.7**	ug/l	638	129	14
chlorides	NL	mg/l	556	556	***
t. chromium	2500**	ug/l	567	72	0
h. chromium	15	ug/l	135	1	1
copper	27**	ug/l	642	196	41
cyanide	46	ug/l	72	27	6
diss oxygen	4	mg/l	556	556	57
tot diss solids	NL	mg/l	525	525	NL
iron	1000	ug/l	372	372	219
lead	220**	ug/l	576	259	1
manganese	NL	mg/l	36	36	NL
mercury	1.1	ug/l	180	33	0
nickel	2200**	ug/l	534	161	0
nitrates	NL	mg/l	190	190	NL
nitrate/nitrite	NL	mg/l	274	274	NL
oil & grease @	10	mg/l	31	29	14
phenol	5300	ug/l	191	29	0
phosphorus	NL	mg/l	539	539	NL
selenium	20	ug/l	12	0	0
silver	3.2**	ug/l	4	0	****
zinc	160**	ug/l	643	615	64

NL No limit has been determined,

* Limit determined using outside mixing zone maximum total ammonia-nitrogen criteria, using the table value for pH=8 and temp. = 27°C. Ninety-five percent of the pH and temp. data were below these values, which would result in higher ammonia limits, thus conservative estimates of exceedances.

** Limit determined using outside mixing zone criteria for water hardness dependent parameter, using table values for hardness ($CaCO_3$) = 150 mg/l. Higher hardness values result in higher metals limits. Ninety percent of the data is above this, which gives a conservative estimate of the water quality standards exceedances.

*** USEPA has recommended an ambient and aquatic life use standard not to exceed an average of 230 mg/l for 4 days, or 860 mg/l more than once in three years. 39 samples exceeded the 230 mg/l (not necessarily on consecutive days and no samples exceeded 860 mg/l.

**** Warmwater Habitat limit for silver is below detection limit, as are the four samples. The number of samples above the WWH limit is, therefore, indeterminable.

@ Sampling done by NEORSD only.

SOURCES: STORET Data, 1986-1991; Ohio EPA 1990 Modeling Survey; Cuyahoga RAP Database, 1986-1991.

TABLE 5-30: PROFILES OF ACUTE WATER QUALITY STANDARDS PARAMETERS
SUMMARY OF STORET DATA: 1986–1991

PARAMETER	WEST RM mean	3RD 3.26 # sample	LOWER RM mean	HARVARD 7.10 # sample	INDEPENDENCE RM mean	13.18 # sample	BOLANZ RM mean	ROAD 33.20 # sample	OLD PORTAGE TRAIL RM mean	40.15 # sample	WARMWATER ACUTE STANDARDS
AMMONIA	1.9	29	0.62	60	0.25	64	0.32	3	0.15	7	8.0 mg/l
ARSENIC (ug/l)	3	10	2.4	10	2.3	12	3	3	2.7	7	360 ug/l
CADMIUM (ug/l)	0.8	26	0.98	55	0.27	59	0.62	9	0.58	13	8.7 ug/l
CHLORIDES	132	22	140.4	56	110.2	60		0	130	1	NL**
T. CHROME (ug/l)	30.4	28	30.2	54	30.2	59	<30	3	<30	7	2500 ug/l
H. CHROME (ug/l)	11.2	16	<10	12		0		0		0	15 ug/l
COPPER (ug/l)	10.8	28	11.6	59	10.9	63	<10	9	9.5	13	27 ug/l
CYANIDE (ug/l)	0.05	15	0.006	28	0.005	27		0		0	46 ug/l
DISS OXYGEN	7.2	29	9.6	60	9.8	63	6.5	3	6.8	7	4 mg/l
TOT DISS SOLIDS	525	28	522	60	462	60	423	3	483	7	NL
IRON (ug/l)	1805	28	2269	59	2567	59	1092	9	1203	13	1000 ug/l
LEAD (ug/l)	9.1	28	6.9	59	5.7	63	5.3	3	11	7	220 ug/l
MANGANESE	133	8	122.5	12	107.9	12	115	3	130	2	NL
MERCURY* (ug/l)	0.25	25	0.11	20		0		0		0	1.1 ug/l
NICKEL (ug/l)	<40	21	40.9	46	45.4	47	<40	3	<40	7	2200 ug/l
NITRATE/NITRITE	3.9	28	3.5	60	2.2	64	2.3	3	1	7	NL
OIL & GREASE	23.2	16	23	13		0		0		0	10 mg/l
PHENOL (ug/l)	23.5	29	22.8	53	19.9	53		0	<20	2	5300 ug/l
PHOSPHORUS	0.19	24	0.25	57	0.25	60	0.21	3	0.12	7	NL
SELENIUM (ug/l)	<2	3	<2	5	3.3	6		0		0	20 ug/l
SILVER* (ug/l)	10	1		0		0		0		0	3.2 ug/l
ZINC (ug/l)	140	28	48.9	59	30.9	63	26.1	9	43.5	13	160 ug/l

All mean values were computed using the detection limit as the value for those samples below detection
"<" indicates that all samples were below detection limits
"*" indicates that no data are available in STORET; data are taken from NEORSD sampling
"**" indicates that no acute warmwater habitat limit has been determined

CONDITIONS OF CONCERN

Each of these conditions of concern was identified in 5.3 Source-Impairment Linkages. "Conditions" are physical disturbances or the result of pollution, which cause or are suspected to be causing a use impairment.

- low dissolved oxygen*
- high chemical oxygen demand**
- high biochemical oxygen demand**
- carbonaceous biochemical oxygen demand**
- high nutrients levels (nutrient enrichment)
- organic enrichment (sewage)
- sedimentation (sediment volume)
- siltation
- clay particles/silt (suspended solids)**
- blockage of spawning streams
- lack/loss of natural substrate/suitable habitat/habitat diversity
- lack/loss of protective habitat
- lack/loss of stream bank cover
- past channelization
- low stream sinuosity (curviness of the stream)
- low gradient (slope of the channel)
- in place sediments (sediments toxicity)
- in place sediment oxygen demand
- residual impacts of past toxicity
- elevated temperature
- large garbage
- natural debris
- litter
- detergents or other foaming agents
- visible industrial spills/discharges (colored)
- exposed discharge pipes
- odor
- lack of public access

*Warmwater habitat criteria exceedances

**Refer to Section 5.4.2, Tables 5-58 through 5-61, for loadings data.

5.4.2 Data on Contaminants of Concern

INTRODUCTION

What follows in this section is a series of tables (5-31 through 5-61) which present loadings data from individual point sources and nonpoint sources.

Each table reports the known dischargers of a single contaminant. Contaminants which are reported in this section are indicated in the three right-hand columns of Table 5-28. In addition, loadings data for four "conditions" listed in 5.4.1 are included in this section. The tables are all formatted such that the dischargers in the head waters of the basin are at the top of the table. Reading down the table, one moves closer to the dischargers at the mouth of the Cuyahoga.

Point Source Loadings Data for the Nearshore Area are incomplete. The Loadings for three municipal wastewater treatment plants (Scottish Highlands, Richmond Park and Pleasant Hills) and four industrial dischargers (G&E Oils, GM Corporation, Glastic, Nottingham Water Treatment Facility and Cleveland Metal Cleaning) were not available at the time these tables were created. These data will be included as they become available.

The tables, beginning on page 5-196, report point source data, and where available, nonpoint source data. Nonpoint source data are only presented for copper, lead, zinc, total suspended solids (TSS), Total Kjeldahl Nitrogen (TKN), total nitrogen (TN), and phosphorus. Though these loadings data are based on estimates, the relative size of the nonpoint load estimates are surprisingly large when compared to the point source load estimates.

Total Loadings Estimates (Kg/Year) from the Cuyahoga RAP Study Area*

	Point Sources***	Nonpoint Sources	Contaminants** Removed by Sediment Dredging (kg/yr)
Copper	8,283 (13%)	54,000 (87%)	24,000
Lead	6,962 (6%)	115,000 (94%)	38,000
Zinc	60,160 (28%)	151,000 (72%)	187,000
TSS	3,148,301 (1%)	359,996,000 (99%)	
TKN	3,603,753 (74%)	1,289,000 (26%)	504,000
TN	NA	1,409,000	
Phosphorus	299,060 (53%)	263,000 (47%)	890,000

* Total load estimates do not include CSO loads. These load estimates are under development.

** Estimates derived using sediment volume of 422,500 cubic yards and contaminant concentration (Mg/Kg dry weight) based on 1986 Army Corps data (average of 10 samples).

*** Loadings data from nearshore area point sources are incomplete.

The nonpoint source loadings estimates which are available demonstrate the significance of nonpoint sources of pollution in the Cuyahoga River watershed. It is problematic, however, to report "Total Loadings" of known contaminants. Point source and nonpoint source loadings are estimated differently. There is more confidence in the point source estimates figures, because they were generated based on locally measured effluent concentrations. The nonpoint source loadings estimates were generated based on models developed in smaller, urban watersheds located elsewhere in the country. Furthermore, flow and instream concentration data and knowledge of background levels of certain contaminants are absent. Loadings information should be verified by flow volume and instream concentrations measurements. The previous table provides estimates of the amount of contaminants removed from the channel and harbor bottom during dredging. Some portion of the contaminants do not settle in the sediments but are carried into the lake.

CSO loadings are presently unavailable. The estimates of contaminant loads from untreated point sources which enter the water via combined sewer overflows are not included in these totals. Combined sewers, on the other hand, provide the benefit of carrying contaminated stormwater from urban areas to the treatment plants for treatment. Under rainfall conditions which are not likely to result in combined sewer overflows, the nonpoint source loadings from urban areas could be over-estimated, where combined sewers carry the rainwater to treatment plants.

Furthermore, nonpoint source loadings data are largely incomplete, and a summation of individual loadings data could lead to a misinterpretation of the significance of the known sources in the Cuyahoga Watershed.

NONPOINT SOURCE LOADINGS DATA

The nonpoint source loadings reported in 5.4.2 are based on estimates generated at the level of the sub-basin using 1983 USEPA NURP equations (refer to Appendix H-1 for a complete discussion of this methodology). Loadings data exist only for copper, lead, zinc, dissolved solids, ammonia and total kjeldahl nitrogen, total nitrogen, and phosphorus.

For purposes of reporting nonpoint source loadings to the Cuyahoga mainstem, sub-basins of the Cuyahoga basin were aggregated into eight segments. The sub-basins making up each segment are as follows:

Segment 1	Sub-basins 01 - 16
Segment 2	17 - 25
Segment 3	25 - 35
Segment 4	36 - 50
Segment 5	51 - 62
Segment 6	63 - 84
Segment 7	85 - 88
Segment 8	89 - 91

(Figure 22 graphically presents the area of the Cuyahoga basin contained within each segment.)

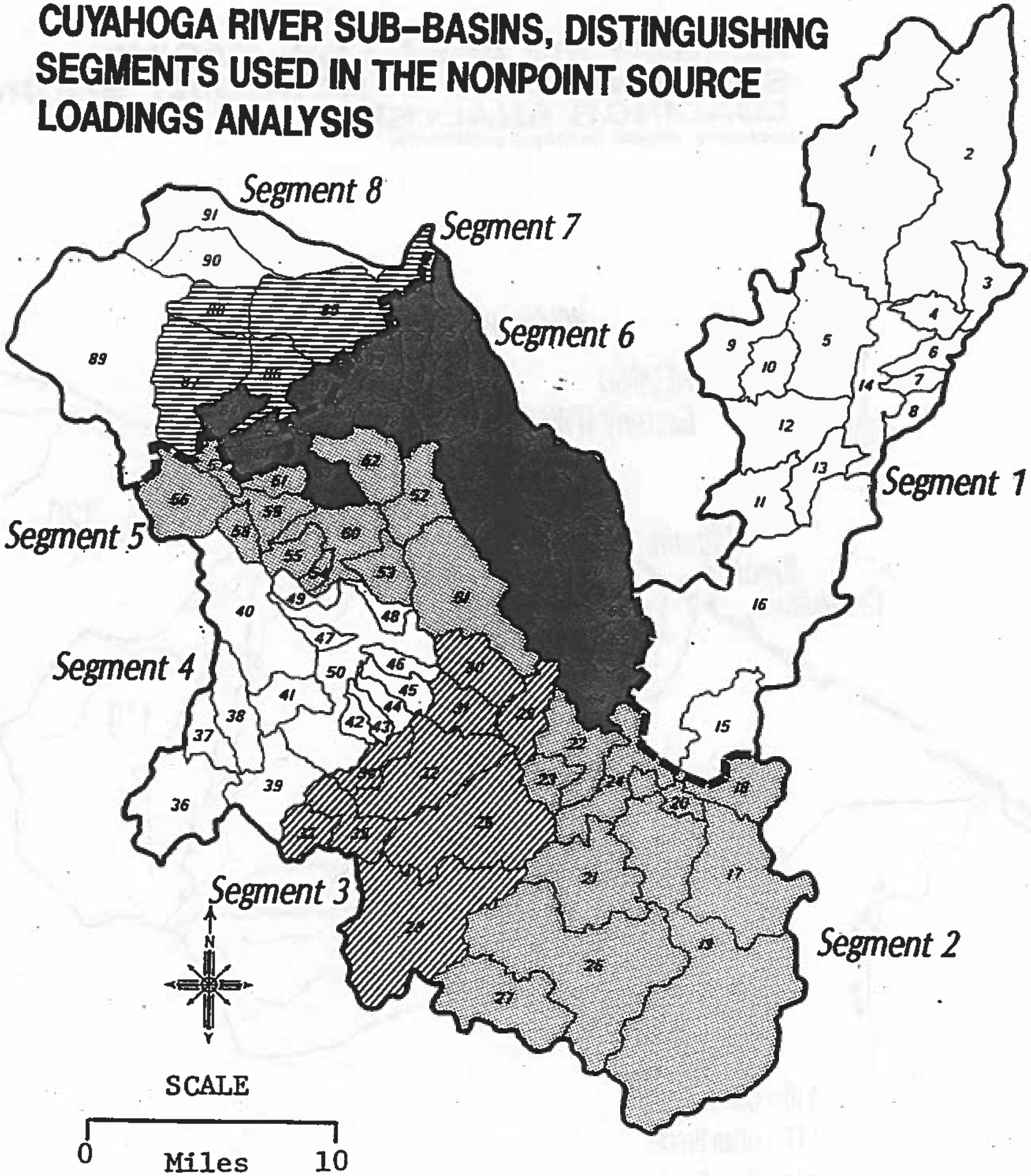
The nearshore portion of the Study Area is included in "Segment 9". This is an area which covers 69 square miles to the northeast of the Cuyahoga River basin. It consists of six sub-basins (Figure 23). For convenience, the NEORSD Westerly Treatment Plant's loadings are included in Segment 9 even though it is located on the west of the Cuyahoga River mouth. Data for the Nearshore Area is incomplete. The loadings for three municipal wastewater treatment plants (Scottish Highlands, Richmond Park and Pleasant Hills) and four industrial dischargers (G&E Oils, GM Corporation, Glastic, Nottingham Water Treatment Facility and Cleveland Metal Cleaning) were not available at the time these tables were created. These data will be included as they become available.

Confidence or Uncertainties

The NURP equations were developed from data collected in very small drainage basins, generally less than one square mile in size. Extrapolation of these equations for use on the large drainage basin used in the RAP program can result in substantial overestimation or underestimation of loading rates. Values reported for individual subbasins are most subject to large error. Segment summations have a larger degree of confidence associated with them and can be considered representative of the relative order of magnitude of nonpoint source loadings. Caution needs to be exercised when using the absolute numbers as they may be subject to an estimated error range of one order of magnitude or more.

Figure: 5–22

CUYAHOGA RIVER SUB-BASINS, DISTINGUISHING SEGMENTS USED IN THE NONPOINT SOURCE LOADINGS ANALYSIS

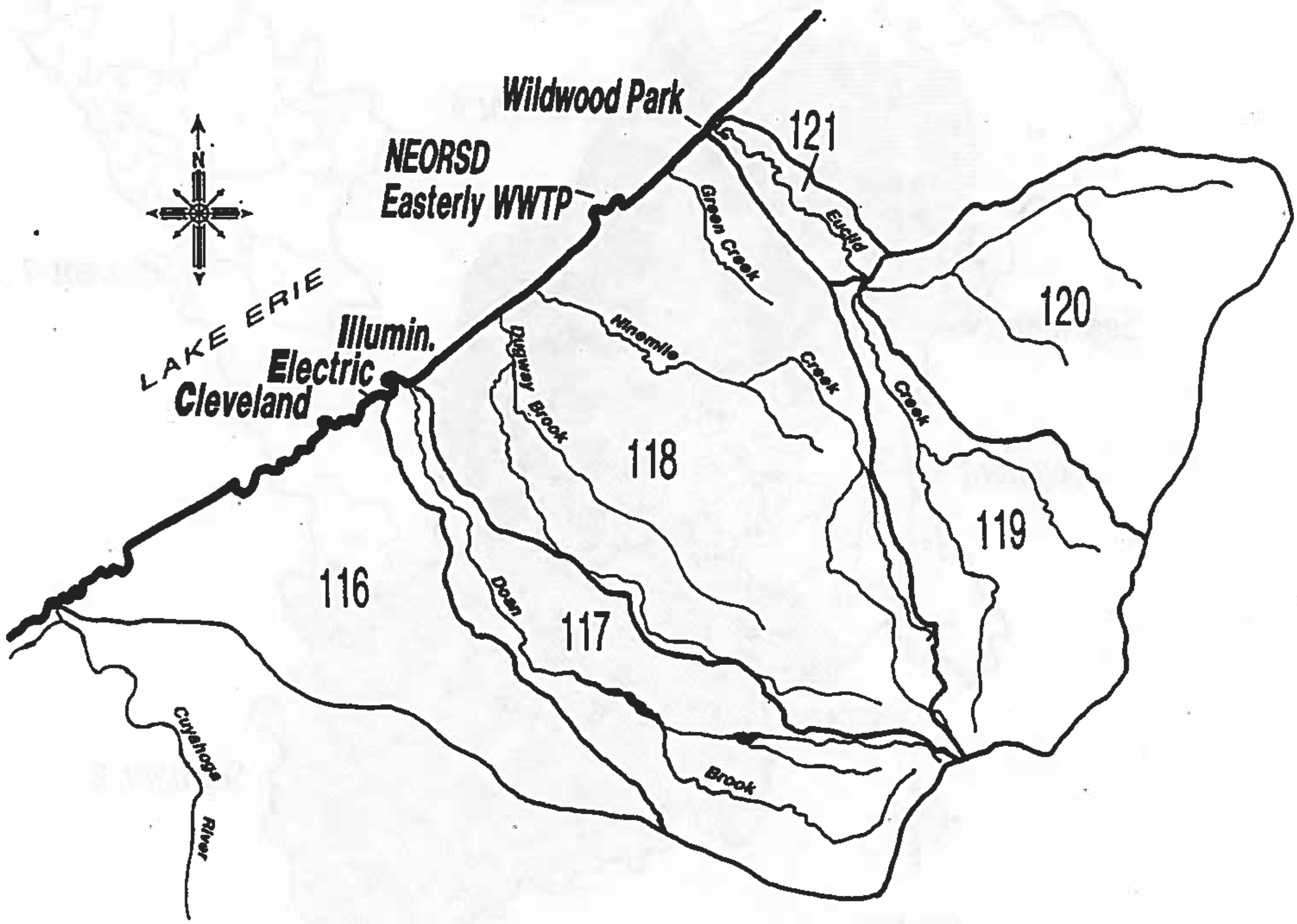


SOURCE: Northeast Ohio Areawide Coordinating Agency, 1978

Figure: 5-23

NEARSHORE AREA SUB-BASINS: SEGMENT 9 IN THE NONPOINT SOURCE LOADINGS ANALYSIS

(Including NOACA Numbering Scheme)



116 - Cleveland
117 - Doan Brook
118 - East Cleveland
119 - West Branch, Euclid Creek
120 - East Branch, Euclid Creek
121 - Main Stem, Euclid Creek

POINT SOURCE LOADINGS DATA

The information on point source loads was generated from the 1989 Ohio EPA LEAPs data base. The number reported in the tables in every case is the "extended total load". This is the total annual load estimated when less than 12 months of data were observed. Where monthly samples were below detection limit, a "zero" was used in the calculation of the extended total load.

LIMITATIONS TO THE LOADINGS FIGURES IN THESE TABLES

As it is the case that both the nonpoint source numbers and point source numbers presented in the tables are estimates, it is important to bear in mind that there are varying degrees of uncertainty behind each number. There are uncertainties in the sampling and measuring techniques of the contaminant concentrations, as well as in calculating and reporting average and total loads.

LIMITATIONS TO SUMMING LOADINGS FIGURES

By summing all loads presented in one table, one can estimate a total load of that contaminant from known sources in the basin. However, because the fate of each contaminant is not always understood, it is inappropriate to assume that the loads are cummulative as one moves down the river toward the mouth. It is possible, for example, for some portion of a load to settle along the way, to evaporate, or to die off, and not make it all the way to Lake Erie.

Bearing in mind all the uncertainties and unknowns, these tables should be valuable as planning tools and reveal differences in the relative volumes of point and nonpoint source contributions.

LOADINGS AND CONCENTRATIONS DATA

Tables 5-31 through 5-61	Page
Metals	
Arsenic (Table 5-31)	5-198
Cadmium (Table 5-32)	5-199
Chromium (Table 5-33)	5-200
Copper (Table 5-34)	5-204
Iron (Table 5-35)	5-206
Lead (Table 5-36)	5-208
Manganese (Table 5-37)	5-210
Mercury (Table 5-38)	5-211
Nickel (Table 5-39)	5-212
Zinc (Table 5-40)	5-214
Conventional Pollutants	
Chloride (Table 5-41)	5-217
Cyanide (Table 5-42)	5-218
Dissolved Solids (Table 5-43)	5-220
Residue (Dissolved 105C) (Table 5-44)	5-221
Fluoride (Table 5-45)	5-222
Nitrogen Compounds	
Ammonia (Table 5-46)	5-223
Total Kjeldahl Nitrogen (Table 5-47)	5-225
Total Nitrogen (Table 5-48)	5-274
Nitrate (Table 5-49)	5-228
Nitrite (Table 5-50)	5-229
Oil and Grease (Table 5-51)	5-230
Phosphorus (Table 5-52)	5-234
Dissolved Phosphorus (Table 5-53)	5-238
Volatile Organic Compounds	
Toluene (Table 5-54)	5-239
Phenol (Table 5-55)	5-240
Miscellaneous	
Bis-2-Eth Phth (Table 5-56)	5-241
Microorganisms	
Fecal Coliform Concentrations (Table 5-57)	5-242
Conditions	
Biochemical Oxygen Demand (Table 5-58)	5-245
Carbonaceous Biochemical Oxygen Demand (Table 5-59)	5-247
Chemical Oxygen Demand (Table 5-60)	5-249
Suspended Solids (Table 5-61)	5-251

LOADINGS AND CONCENTRATIONS DATA TABLES

TABLE 5-31

CONTAMINANT/CONDITION: **ARSENIC (As TOTAL, ug/l)**
Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)
Contaminant removal mechanisms:
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)					231				
56.8-42.2	Lake Rockwell to Little Cuy.								
45.0	Mainstem	Point Source	Industrial	OH Ed. Gorge Plant				231	M1
SEGMENT 3 (123 sq mi)									
42.3-37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)									
16.4-11.6	Tinkers Creek to Mill Creek								
SEGMENT 7 (44 sq mi)									
11.5-7.3	Mill Creek to Big Creek								
SEGMENT 8 (60 sq mi)					16				
7.2-0.0	Big Creek to Lake Erie								
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				16	M1
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-32

CONTAMINANT/CONDITION:	**CADMIUM (Cd TOTAL, ug/l)**
Notes on temporal/spatial nature:	(NONPOINT SOURCE DATA UNAVAILABLE)
Contaminant removal mechanisms:	
Criteria:	

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					0				
100.1-56.9	Upstream Lake Rockwell Dam								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				0	M1
SEGMENT 2 (104 sq mi)					4				
56.8-42.4	Lake Rockwell to Little Cuy.								
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				1	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				0	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				3	M1
SEGMENT 3 (123 sq mi)					54				
42.3-37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				54	M1
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					28				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				2	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				21	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				0	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				4	M1
16.4	On Tinkers Creek	Point Source	Industrial	Hukill Chemical Co.				0	M1
SEGMENT 7 (44 sq mi)					963				
11.5-7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				962	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				0	M1
SEGMENT 8 (60 sq mi)					16				
7.2-0.0	Big Creek to Lake Erie								
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				16	M1
SEGMENT 9					2,104				
	Nearshore	Point Source	Municipal	NEORSD Westerly				231	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				1,506	M1

TABLE 5-33a

CONTAMINANT/CONDITION: **CHROMIUM (TOTAL AND TOTAL RECOVERABLE, ug/l)**

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8-42.4	Lake Rockwell to Little Cuy.								
53.9	Mainstem	Point Source	Municipal	Kent WWTP				60	M1
SEGMENT 3 (123 sq mi)									
42.3-37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)									
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				59	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				37	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				14	M1
SEGMENT 7 (44 sq mi)									
11.5-7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				2,966	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				0	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
8.4	Mainstem	Point Source	Industrial	Amer. Steel and Wire				46	
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				10	M1
SEGMENT 9									
	Nearshore	Point Source	Municipal	NEORSD Westerly				721	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				448	M1

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-33b

CONTAMINANT/CONDITION: **CHROMIUM (HEX-VAL, ug/l)**
Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)
Contaminant removal mechanisms:
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					0				
100.1-56.9	Upstream Lake Rockwell Dam								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				0	M1
SEGMENT 2 (104 sq mi)					0				
56.8-42.4	Lake Rockwell to Little Cuy.								
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				0	M1
SEGMENT 3 (123 sq mi)					72				
42.3-37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				72	M1
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					0				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				0	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				0	M1
SEGMENT 7 (44 sq mi)					23				
11.5-7.3	Mill Creek to Big Creek								
8.4	Mainstem	Point Source	Industrial	Amer. Steel and Wire				23	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9					1,076				
	Nearshore	Point Source	Municipal	NEORSD Easterly				1,076	M1

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-33c

CONTAMINANT/CONDITION: **CHROMIUM (TRI-VAL, ug/l)**
Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)
Contaminant removal mechanisms:
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					15				
100.1-56.9	Upstream Lake Rockwell Dam								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				15	M1
SEGMENT 2 (104 sq mi)					6				
56.8-42.4	Lake Rockwell to Little Cuy.								
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				6	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP					
SEGMENT 3 (123 sq mi)					180				
42.3-37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				180	M1
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					59				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				53	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				7	M1
SEGMENT 7 (44 sq mi)									
11.5-7.3	Mill Creek to Big Creek								
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9					2,186				
	Nearshore	Point Source	Municipal	NEORSD Westerly				2,186	M1

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-33d

CONTAMINANT/CONDITION: CHROMIUM (HEX-DIS, ug/l)

Notes on temporal/spatial nature: ·

Contaminant removal mechanisms: (NONPOINT SOURCE DATA UNAVAILABLE)

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)					0				
56.8-42.4	Lake Rockwell to Little Cuy.								
53.9	Mainstem	Point Source	Municipal	Kent WWTP				0	M1
SEGMENT 3 (123 sq mi)									
42.3-37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					52				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				0	
16.4	On Tinkers Creek	Point Source	Industrial	Hukill Chemical Co.				52	M1
SEGMENT 7 (44 sq mi)					986				
11.5-7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				986	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9					243				
	Nearshore	Point Source	Municipal	NEORSD Westerly				243	M1

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-34

CONTAMINANT/CONDITION: **COPPER (TOTAL and TOTAL RECOVERABLE, ug/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	TOTAL LOADINGS (kg/year) Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					14,564				
100.1–56.9	Upstream Lake Rockwell Dam	Nonpoint Source				14,528			E1
58.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				36	M1
SEGMENT 2 (104 sq mi)					6,388				
56.8–42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				6,356			E1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				4	
53.9	Mainstem	Point Source	Municipal	Kent WWTP				4	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				24	
SEGMENT 3 (123 sq mi)					9,611				
42.3–37.3	Little Cuy. to Yellow Creek	Nonpoint Source				908			E1
42.3	Little Cuyahoga	Nonpoint Source					5,448		E1
39.8	Mud Brook	Nonpoint Source					2,724		E1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				531	M1
SEGMENT 4 (83 sq mi)					5,448				
37.2–24.3	Yellow Creek to Brandywine	Nonpoint Source				2,724			E1
37.2	Yellow Creek	Nonpoint Source					1,816		E1
33.1	Furnace Run	Nonpoint Source					908		E1
SEGMENT 5 (65 sq mi)					4,540				
24.2–16.5	Brandywine to Tinkers Creek	Nonpoint Source				908			E1
24.2	Brandywine	Nonpoint Source					1,816		E1
20.9	Chippewa Creek	Nonpoint Source					1,816		E1

TABLE 5-34

CONTAMINANT/CONDITION: COPPER (TOTAL and TOTAL RECOVERABLE, ug/l)

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
					TOTAL LOADINGS (kg/year)				
SEGMENT 6 (118 sq mi)					7,550				
16.4–11.6	Tinkers Creek to Mill Creek	Nonpoint Source				908			E1
16.4	Tinkers Creek	Nonpoint Source				6,356			E1
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				53	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				112	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				164	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				56	M1
16.4	On Tinkers Creek	Point Source	Industrial	Hukill Chemical Co.				1	
SEGMENT 7 (44 sq mi)					6,720				
11.5–7.3	Mill Creek to Big Creek	Nonpoint Source				1,816			E1
11.5	Mill Creek	Nonpoint Source					1,816		E1
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				3,068	M1
8.4	Mainstem	Point Source	Industrial	Amer. Steel and Wire				19	
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				1	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				0	M1
SEGMENT 8 (60 sq mi)					3,676				
7.2–0.0	Big Creek to Lake Erie	Nonpoint Source				1,816			E1
7.2	Big Creek	Nonpoint Source					1,816		E1
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				46	M1
SEGMENT 9					4,278				
	Nearshore	Point Source	Municipal	NEORSD Westerly				677	
	Nearshore	Point Source	Municipal	NEORSD Easterly				2,928	
	Nearshore	Point Source	Municipal	Euclid WWTP				559	
		Nonpoint Source				*114*			

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-35a

IRON (TOTAL and TOTAL RECOVERABLE, ug/l)

(NONPOINT SOURCE DATA UNAVAILABLE)

Notes on temporal/spatial nature:
Contaminant removal mechanisms:
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8-42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)					25				
42.3-37.3	Little Cuy. to Yellow Creek								
39.8	On Trib Of Mud Brook	Point Source	Industrial	Dillon Precast Syst.				22	M1
39.8	On Trib Of Mud Brook	Point Source	Industrial	Dillon Precast Syst.				3	M1
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					1,436				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				1,436	M1
SEGMENT 7 (44 sq mi)									
11.5-7.3	Mill Creek to Big Creek								
8.4	Mainstem	Point Source	Industrial	Amer. Steel and Wire				12,163	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-35b

CONTAMINANT/CONDITION: **IRON (SUSPENDED, ug/l)**
Notes on temporal/spatial nature:
Contaminant removal mechanisms:
Criteria:

(NONPOINT SOURCE DATA UNAVAILABLE)

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8-42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)									
42.3-37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (66 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)									
16.4-11.6	Tinkers Creek to Mill Creek								
SEGMENT 7 (44 sq mi)					1				
11.5-7.3	Mill Creek to Big Creek								
11.5	On Mill Creek	Point Source	Industrial	Doylestwn H2O Plant				1	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-36

CONTAMINANT/CONDITION: **LEAD (TOTAL and TOTAL RECOVERABLE, ug/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					29,986				
100.1-56.9	Upstream Lake Rockwell Dam	Nonpoint Source				29,964			E1
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				22	M1
SEGMENT 2 (104 sq mi)					17,282				
56.8-42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				17,252			E1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				1	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				26	M1
52.6	Mainstem	Point Source	Municipal	Fish Creek WWTP				4	M1
SEGMENT 3 (123 sq mi)					9,257				
42.3-37.3	Little Cuy. to Yellow Creek	Nonpoint Source				2,724			E1
42.3	Little Cuyahoga	Nonpoint Source					1,816		E1
39.8	Mud Brook	Nonpoint Source					4,540		E1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				177	M1
SEGMENT 4 (58 sq mi)					12,712				
37.2-24.3	Yellow Creek to Brandywine	Nonpoint Source				4,540			E1
37.2	Yellow Creek	Nonpoint Source					5,448		E1
33.1	Furnace Run	Nonpoint Source					2,724		E1
SEGMENT 5 (85 sq mi)					11,804				
24.2-16.5	Brandywine to Tinkers Creek	Nonpoint Source				2,724			E1
24.2	Brandywine	Nonpoint Source					5,448		E1
20.9	Chippewa Creek	Nonpoint Source					3,632		E1
SEGMENT 6 (113 sq mi)					3,964				
16.4-11.6	Tinkers Creek to Mill Creek	Nonpoint Source				1,816			E1
16.4	Tinkers Creek	Nonpoint Source					1,816		E1
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				8	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				247	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				36	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				30	M1
16.4	On Tinkers Creek	Point Source	Industrial	Hukill Chemical Co.				1	M1

TABLE 5-36

CONTAMINANT/CONDITION: **LEAD (TOTAL and TOTAL RECOVERABLE, ug/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	TOTAL LOADINGS (kg/year) Mainstem	Tributary	Point	Data Type
SEGMENT 7 (44 sq mi)					18,526				
11.5-7.3	Mill Creek to Big Creek	Nonpoint Source							
11.5	Mill Creek	Nonpoint Source				5,448			E1
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly			5,448		E1
8.4	Mainstem	Point Source	Industrial	Amer. Steel and Wire				2561	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				64	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				3	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical					
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				0	M1
SEGMENT 8 (60 sq mi)					18,203				
7.2-0.0	Big Creek to Lake Erie	Nonpoint Source							
7.2	Big Creek	Nonpoint Source				8,172			E1
4.7	Mainstem	Point Source	Industrial	LTV Steel			9,988		E1
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				17	M1
								25	M1
SEGMENT 9					4,265				
	Nearshore	Point Source	Municipal	NEORSD Westerly					
	Nearshore	Point Source	Municipal	NEORSD Easterly				620	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				2584	M1
		Nonpoint Source				526		536	M1

M1= Ohio EPA 1989 LEAPs Data

E1= USEPA 1983 NURP Equations, adopted by USGS

TABLE 5-37

CONTAMINANT/CONDITION: **MANGANESE (SUSPENDED, ug/l)**

(NONPOINT SOURCE DATA UNAVAILABLE)

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8-42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)									
42.3-37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)									
16.4-11.6	Tinkers Creek to Mill Creek								
SEGMENT 7 (44 sq mi)					2				
11.5-7.3	Mill Creek to Big Creek								
11.5	On Mill Creek	Point Source	Industrial	Doylestwn H2O Plant				2	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
7.2	On Big Creek	Point Source	Industrial	General Motors					
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-38

CONTAMINANT/CONDITION: **MERCURY (Hg TOTAL, ug/l)**
Notes on temporal/spatial nature:
Contaminant removal mechanisms: (NONPOINT SOURCE DATA UNAVAILABLE)
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					1				
100.1–56.9	Upstream Lake Rockwell Dam								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				1	M1
SEGMENT 2 (104 sq mi)					2				
56.8–42.4	Lake Rockwell to Little Cuy.								
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				0	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				1	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				0	M1
SEGMENT 3 (123 sq mi)					7				
42.3–37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				7	M1
SEGMENT 4 (63 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
37.2	Yellow Creek	Nonpoint Source							
33.1	Furnace Run	Nonpoint Source							
SEGMENT 5 (65 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
24.2	Brandywine	Nonpoint Source							
20.9	Chippewa Creek	Nonpoint Source							
SEGMENT 6 (113 sq mi)					3				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				1	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				1	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				0	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				1	M1
SEGMENT 7 (44 sq mi)					21				
11.5–7.3	Mill Creek to Big Creek								
10.6	Mainstem	Point Source	Municipal	NEORSD Southerly				21	M1
SEGMENT 8 (60 sq mi)									
7.2–0.0	Big Creek to Lake Erie								
SEGMENT 9					86				
	Nearshore	Point Source	Municipal	NEORSD Westerly				7	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				25	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				5	M1

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-39

CONTAMINANT/CONDITION: **NICKEL (TOTAL and TOTAL RECOVERABLE, ug/l)**

(Nonpoint Soure Data Unavailable)

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					57				
100.1–56.9	Upstream Lake Rockwell Dam								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				57	M1
SEGMENT 2 (104 sq mi)					182				
56.8–42.4	Lake Rockwell to Little Cuy.								
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				6	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				80	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				96	M1
SEGMENT 3 (123 sq mi)					517				
42.3–37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				517	M1
SEGMENT 4 (83 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					280				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				79	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				152	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				26	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				25	M1

TABLE 5-39

CONTAMINANT/CONDITION: NICKEL (TOTAL and TOTAL RECOVERABLE, ug/l)
Notes on temporal/spatial nature: (Nonpoint Source Data are Unavailable)
Contaminant removal mechanisms:
Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 7 (44 sq mi)					15,049				
11.5–7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				14,483	M1
8.4	Mainstem	Point Source	Industrial	Amer. Steel and Wire				125	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				214	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				1	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				177	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				15	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				4	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				25	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				5	M1
SEGMENT 8 (60 sq mi)									
7.2–0.0	Big Creek to Lake Erie								
SEGMENT 9					13,330				
	Nearshore	Point Source	Municipal	NEORSD Westerly				1,645	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				10,504	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				1,182	M1

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-40a

CONTAMINANT/CONDITION: ZINC (TOTAL and TOTAL RECOVERABLE, ug/l)

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					30,194				
100.1-56.9	Upstream Lake Rockwell Dam	Nonpoint Source				29,964			E1
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				230	M1
SEGMENT 2 (104 sq mi)					18,539				
56.8-42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				18,160			E1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				10	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				82	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				287	M1
SEGMENT 3 (123 sq mi)					34,025				
42.3-37.3	Little Cuy. to Yellow Creek	Nonpoint Source				2,724			E1
42.3	Little Cuyahoga	Nonpoint Source					18,160		E1
39.8	Mud Brook	Nonpoint Source					5,448		E1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				7,693	M1
SEGMENT 4 (83 sq mi)					12,712				
37.2-24.3	Yellow Creek to Brandywine	Nonpoint Source				4,540			E1
37.2	Yellow Creek	Nonpoint Source					4,540		E1
33.1	Furnace Run	Nonpoint Source					3,632		E1
SEGMENT 5 (66 sq mi)					11,804				
24.2-16.5	Brandywine to Tinkers Creek	Nonpoint Source				2,724			E1
24.2	Brandywine	Nonpoint Source					5,448		E1
20.9	Chippewa Creek	Nonpoint Source					3,632		E1
SEGMENT 6 (113 sq mi)					22,177				
16.4-11.6	Tinkers Creek to Mill Creek	Nonpoint Source				2,724			E1
16.4	Tinkers Creek	Nonpoint Source					18,160		E1
16.4	On Tinkers Creek	Point Source	Hukill Chemical Corp.					3	M1
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				367	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				518	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				281	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				125	M1
SEGMENT 7 (44 sq mi)					28,948				
11.5-7.3	Mill Creek to Big Creek	Nonpoint Source				5,448			E1
11.5	Mill Creek	Nonpoint Source					5,448		E1
8.4	Mainstem	Point Source	American Steel & Wire					345	M1
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				17,670	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				36	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				2	M1

TABLE 5–40a

CONTAMINANT/CONDITION: ZINC (TOTAL and TOTAL RECOVERABLE, ug/l)

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 8 (60 sq mi)					19,820				
7.2-0.0	Big Creek to Lake Erie	Nonpoint Source				8,172			E1
7.2	Big Creek	Nonpoint Source					10,896		E1
4.7	Mainstem	Point Source	Industrial	LTV Steel				359	M1
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				394	M1
SEGMENT 9					32,303				
	Nearshore	Point Source	Municipal	NEORSD Westerly				2,860	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				26,162	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				2,736	M1
		Nonpoint Source				*545*			

M1= Ohio EPA 1989 LEAPs Data

E1= USEPA 1983 NURP Equations, adopted by USGS

TABLE 5-40b

CONTAMINANT/CONDITION: ZINC (DISSOLVED, ug/l)
Notes on temporal/spatial nature:
Contaminant removal mechanisms: (NONPOINT SOURCE DATA UNAVAILABLE)
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1–56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8–42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)									
42.3–37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (66 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)									
16.4–11.6	Tinkers Creek to Mill Creek								
SEGMENT 7 (44 sq mi)									
11.5–7.3	Mill Creek to Big Creek								
SEGMENT 8 (60 sq mi)					1,518				
7.2–0.0	Big Creek to Lake Erie								
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				1,518	M1
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-41

CONTAMINANT/CONDITION: **CHLORIDE (Cl, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms: (NONPOINT SOURCE DATA UNAVAILABLE)

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1–56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.6–42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)									
42.3–37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (66 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)									
16.4–11.6	Tinkers Creek to Mill Creek								
SEGMENT 7 (44 sq mi)					42,029,077				
11.5–7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	NEORSD Southerly WWTP					42,029,077	M1
SEGMENT 8 (60 sq mi)									
7.2–0.0	Big Creek to Lake Erie								
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-42a

CONTAMINANT/CONDITION: CYANIDE (CN, mg/l)
Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)
Contaminant removal mechanisms:
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1–56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)					92				
56.8–42.4	Lake Rockwell to Little Cuy.								
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				0	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				27	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				65	M1
SEGMENT 3 (123 sq mi)									
42.3–37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					152				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				23	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				123	M1
16.4	On Tinkers Creek	Point Source	Industrial	Hukill Chemical Corp.				6	M1
SEGMENT 7 (44 sq mi)									
11.5–7.3	Mill Creek to Big Creek								
SEGMENT 8 (60 sq mi)					14,779				
7.2–0.0	Big Creek to Lake Erie								
5.7	Mainstem	Point Source	Industrial	LTV Steel				14,779	M1
SEGMENT 9					16,020				
	Nearshore	Point Source	Municipal	NEORSD Westerly				5,660	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				10,360	M1

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-42b

CONTAMINANT/CONDITION: CYANIDE (FREE CN, mg/l)

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					0				
100.1-56.9	Upstream Lake Rockwell Dam								
60.3	Mainstem	Point Source	Industrial	Cormax Metal Treat.				0	M1
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				0	M1
SEGMENT 2 (104 sq mi)									
56.8-42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)					0				
42.3-37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				0	M1
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					0				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				0	M1
SEGMENT 7 (44 sq mi)									
11.5-7.3	Mill Creek to Big Creek								
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-43

CONTAMINANT/CONDITION: **DISSOLVED SOLIDS (TOTAL, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					93,209,832				
100.1-56.9	Upstream Lake Rockwell Dam	Nonpoint Source				93,209,832			E1
SEGMENT 2 (104 sq mi)					46,605,824				
56.8-42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				46,605,824			E1
SEGMENT 3 (123 sq mi)					55,413,424				
42.3-37.3	Little Cuy. to Yellow Creek	Nonpoint Source				5,753,088			E1
42.3	Little Cuyahoga	Nonpoint Source					36,448,028		E1
39.8	Mud Brook	Nonpoint Source					13,212,308		E1
SEGMENT 4 (83 sq mi)					37,436,840				
37.2-24.3	Yellow Creek to Brandywine	Nonpoint Source				14,381,812			E1
37.2	Yellow Creek	Nonpoint Source					13,932,352		E1
33.1	Furnace Run	Nonpoint Source					9,122,676		E1
SEGMENT 5 (65 sq mi)					29,909,057				
24.2-16.5	Brandywine to Tinkers Creek	Nonpoint Source				9,123,584			E1
24.2	Brandywine	Nonpoint Source					12,224,404		E1
20.9	Chippewa Creek	Nonpoint Source					7,999,480		E1
20.9	On Chippewa	Point Source	Industrial	Morton Salt Co.				561,589	M1
SEGMENT 6 (113 sq mi)					50,694,548				
16.4-11.6	Tinkers Creek to Mill Creek	Nonpoint Source				4,943,152			E1
16.4	Tinkers Creek	Nonpoint Source					45,751,396		E1
SEGMENT 7 (44 sq mi)					19,954,208				
11.5-7.3	Mill Creek to Big Creek	Nonpoint Source				11,235,592			E1
11.5	Mill Creek	Nonpoint Source					8,718,616		E1
SEGMENT 8 (60 sq mi)					27,010,276				
7.2-0.0	Big Creek to Lake Erie	Nonpoint Source				10,201,380			E1
7.2	Big Creek	Nonpoint Source					16,808,896		E1
SEGMENT 9					*750,449*				
	Nearshore	*Nonpoint Source*				*750,449*			

M1= Ohio EPA 1989 LEAPs Data
E1= USEPA 1983 NURP Equations, adopted by USGS

TABLE 5-44

CONTAMINANT/CONDITION: **RESIDUE (DISSOLVED-105 C, mg/l)**

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILALBE)

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8-42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)					7,961,264				
42.3-37.3	Little Cuy. to Yellow Creek								
42.3	On Little Cuyahoga	Point Source	Industrial	Diamond Crystal Salt Co.				7,940,207	M1
39.8	On Mud Brook	Point Source	Dillon Precast Syst.					20,364	M1
39.8	On Mud Brook	Point Source	Dillon Precast Syst.					693	M1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				0	M1
SEGMENT 4 (53 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					138,140				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Zircoa Products					138,140	M1
SEGMENT 7 (44 sq mi)					134,400,130				
11.5-7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				134,400,130	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-45

CONTAMINANT/CONDITION: **FLUORIDE (F TOTAL, mg/l)**
Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)
Contaminant removal mechanisms:
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1–56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8–42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)									
42.3–37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)									
16.4–11.6	Tinkers Creek to Mill Creek								
SEGMENT 7 (44 sq mi)					1371				
11.5–7.3	Mill Creek to Big Creek								
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				1371	M1
SEGMENT 8 (60 sq mi)									
7.2–0.0	Big Creek to Lake Erie								
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-46

CONTAMINANT/CONDITION: **AMMONIA (NH_3-N, mg/l)**

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					8,257				
100.1-56.9	Upstream Lake Rockwell Dam								
88.0	On Tare Creek	Point Source	Municipal	Middlefield WWTP				6,468	M1
87.5	Mainstem	Point Source	Industrial	Burton Rubber Plant				4	M1
83.3	On Bridge Creek	Point Source	Municipal	Burton Lakes WWTP				3	M1
83.3	On Bridge Creek	Point Source	Industrial	Johnson Plastic Corp.				35	M1
69.2	Mainstem	Point Source	Municipal	Mantua WWTP				1,717	M1
63.5	On Infirmary Creek	Point Source	Municipal	Infirmary Creek WWTP				15	M1
60.0	On Unknown Tributary	Point Source	Municipal	Portage Co. Home				16	M1
SEGMENT 2 (104 sq mi)					44,818				
56.8-42.4	Lake Rockwell to Little Cuy.								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				6,977	M1
56.8	On Breakneck Creek	Point Source	Municipal	Sandy Lake WWTP				129	M1
56.8	On Breakneck Creek	Point Source	Municipal	Village Estates M.H.P.				346	M1
56.8	On Breakneck Creek	Point Source	Municipal	Baronwood WWTP				668	M1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				1,603	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				28,896	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				6,199	M1
SEGMENT 3 (123 sq mi)					142,724				
42.3-37.3	Little Cuy. to Yellow Creek								
39.8	On Mud Brook	Point Source	Industrial	Dillon Precast Syst.				26	M1
39.8	On Mud Brook	Point Source	Municipal	Mobile Manors M.H.P.				3,433	M1
39.8	On Mud Brook	Point Source	Municipal	CT Colony WWTP				142	M1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				139,123	M1
SEGMENT 4 (58 sq mi)					2,037				
37.2-24.3	Yellow Creek to Brandywine								
37.2	On Yellow Creek	Point Source	Municipal	Robinwood Hills WWTP				106	M1
33.1	On Furnace Run	Point Source	Municipal	Richfield Hills WWTP				118	M1
28.4	Mainstem	Point Source	Municipal	Midwest Coliseum WWTP				1,813	M1
SEGMENT 5 (65 sq mi)					8,053				
24.2-16.5	Brandywine to Tinkers Creek								
24.2	On Brandywine	Point Source	Municipal	Hudson WWTP				5,886	M1
20.9	On Chippewa	Point Source	Municipal	Seville WWTP				2,167	M1

TABLE 5-46

CONTAMINANT/CONDITION: AMMONIA (NH_3-N, mg/l)

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 6 (113 sq mi)					24,878				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				8,361	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				6,713	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				5,617	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				3,371	M1
16.4	On Tinkers Creek	Point Source	Municipal	Roseland Estates WWTP				553	M1
16.4	On Tinkers Creek	Point Source	Industrial	Cajon Company				150	M1
16.4	On Tinkers Creek	Point Source	Municipal	Aurora Shores WWTP				114	M1
SEGMENT 7 (44 sq mi)					173,250				
11.5–7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				173,027	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				133	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				89	M1
SEGMENT 8 (60 sq mi)					721,894				
7.2–0.0	Big Creek to Lake Erie								
5.7	Mainstem	Point Source	Industrial	LTV Steel				716,768	M1
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				5,126	M1
SEGMENT 9					1,951,787				
	Nearshore	Point Source	Municipal	NEORSD Westerly				389,077	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				1,368,933	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				193,777	M1

M1= Ohio EPA 1989 LEAPs Data

AMMONIA LOADS REPORTED TO OHIO EPA BUT NOT RECORDED IN TABLE

Scottish Highlands WWTP (Cuy.), 22.7
Richmond Park WWTP (Cuy.), 71.2
Bolingbrook Allotment (Por.), 718.7
City of Burton WWTP (Gea.), 471.7
Jacques Mobile Home Park, 203.0
Spring Valley Plant (Sta.), 31.8
Valley Hill Mobile Home Park, no load figure
Richfield Sewage Facility (Furnace Run), no load figure
Pasquale Food Co. (Natalina), no load figure
City of Burton WWTP, 471.7 (3PB00066)

TABLE 5-47

CONTAMINANT/CONDITION: **TOTAL KJELDAHL NITROGEN (mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					226,156				
100.1-56.9	Upstream Lake Rockwell Dam	Nonpoint Source				214,288			
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				11,868	M1
SEGMENT 2 (104 sq mi)					171,266				
56.8-42.4	Lake Rockwell to Little Cuy.					120,764			
53.9	Mainstem	Point Source	Municipal	Kent WWTP				36,562	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				13,939	M1
SEGMENT 3 (123 sq mi)					427,726				
42.3-37.3	Little Cuy. to Yellow Creek	Nonpoint Source				16,344			
42.3	Little Cuyahoga	Nonpoint Source					124,396		
39.8	Mud Brook	Nonpoint Source					36,320		
37.5	Mainstem	Point Source	Municipal	Akron WWTP				250,666	M1
SEGMENT 4 (83 sq mi)					93,524				
37.2-24.3	Yellow Creek to Brandywine	Nonpoint Source				33,596			
37.2	Yellow Creek	Nonpoint Source					37,228		
33.1	Furnace Run	Nonpoint Source					22,700		
SEGMENT 5 (65 sq mi)					341,408				
24.2-16.5	Brandywine to Tinkers Creek	Nonpoint source				40,860			
24.2	Brandywine	Nonpoint source					278,756		
20.9	Chippewa	Nonpoint source					21,792		

TOTAL LOADINGS (kg/year) applies to columns Total, Mainstem, Tributary, Point.

TABLE 5–47

CONTAMINANT/CONDITION: **TOTAL KJELDAHL NITROGEN (mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
						TOTAL LOADINGS (kg/year)			
SEGMENT 6 (113 sq mi)					210,301				
16.4–11.6	Tinkers Creek to Mill Creek	Nonpoint source				14,528			
16.4	Tinkers Creek	Nonpoint source					128,028		
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				12,844	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				36,567	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				11,580	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				6,754	M1
SEGMENT 7 (44 sq mi)					740,119				
11.5–7.3	Mill Creek to Big Creek	Nonpoint source				39,044			
11.5	Mill Creek	Nonpoint source					35,412		
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				665,663	M1
SEGMENT 8 (60 sq mi)					121,672				
7.2–0.0	Big Creek to Lake Erie	Nonpoint Source				51,756			
7.2	Big Creek	Nonpoint Source					69,916		
SEGMENT 9					*2,560,819*				
	Nearshore	Point Source	Municipal	NEORSD Westerly				527,958	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				1,740,339	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				289,013	M1
		Nonpoint Source				*3,509*			

M1= Ohio EPA 1989 LEAPs Data

E1= USEPA 1983 NURP Equations, adopted by USGS

TABLE 5-48

CONTAMINANT/CONDITION:	**NO2+NO3 (N-TOTAL, mg/l)**
Notes on temporal/spatial nature:	
Contaminant removal mechanisms:	
Criteria:	

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
						TOTAL LOADINGS (kg/year)			
SEGMENT 1 (207 sq mi)					297,824				
100.1–56.9	Upstream Lake Rockwell Dam	Nonpoint Source				297,824			E1
SEGMENT 2 (104 sq mi)					166,164				
56.8–42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				166,164			E1
SEGMENT 3 (123 sq mi)					241,528				
42.3–37.3	Little Cuy. to Yellow Creek	Nonpoint source				22,700			E1
42.3	Little Cuyahoga	Nonpoint Source					168888		E1
39.8	Mud Brook	Nonpoint Source					49940		E1
SEGMENT 4 (83 sq mi)					128,936				
37.2–24.3	Yellow Creek to Brandywine					46,308			E1
37.2	Yellow Creek	Nonpoint Source					50848		E1
33.1	Furnace Run	Nonpoint Source					31780		E1
SEGMENT 5 (65 sq mi)					108960				
24.2–16.5	Brandywine to Tinkers Creek					33,596			E1
24.2	Brandywine	Nonpoint Source					45400		E1
20.9	Chippewa Creek	Nonpoint Source					29964		E1
20.9	On Chippewa Creek	Point Source	Village of Seville WWTP					0	M1
SEGMENT 6 (113 sq mi)					195,220				
16.4–11.6	Tinkers Creek to Mill Creek	Nonpoint Source				19,976			E1
16.4	Tinkers Creek	Nonpoint Source					175244		E1
SEGMENT 7 (44 sq mi)					101,696				
11.5–7.3	Mill Creek to Big Creek					53,572			E1
11.5	Mill Creek						48124		E1
SEGMENT 8 (60 sq mi)					163,440				
7.2–0.0	Big Creek to Lake Erie					69,916			E1
7.2	Big Creek						93524		E1
SEGMENT 9					*4,706*				
.	Nearshore	*Nonpoint Source*				*4,706*			

M1= Ohio EPA 1989 LEAPs Data
E1= USEPA 1983 NURP Equations, adopted by USGS

TABLE 5-49

CONTAMINANT/CONDITION: **NITRATE (NO3-N, mg/l)**
Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)
Contaminant removal mechanisms:
Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)					63,381				
56.8-42.4	Lake Rockwell to Little Cuy.								
56.8	On Breakneck Creek	Point Source	Industrial	Hamilton Kent Mfg. Co.				8290.4	
58.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				2232.8	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				52,858	M1
SEGMENT 3 (123 sq mi)					528,254				
42.3-37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				528,254	M1
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (66 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					108,580				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				34,781	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				73,799	M1
SEGMENT 7 (44 sq mi)					2,374,154				
11.5-7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				2,374,154	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9					578,820				
	Nearshore	Point Source	Municipal	NEORSD Westerly				31,929	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				546,891	

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-50

CONTAMINANT/CONDITION: NITRITE (NO2-N, mg/l)

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1–56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)					4,857				
56.8–42.4	Lake Rockwell to Little Cuy.								
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				27.2	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				4,830	M1
SEGMENT 3 (123 sq mi)					24,022				
42.3–37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				24,022	M1
SEGMENT 4 (63 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					1,847				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				1,030	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				817	M1
SEGMENT 7 (44 sq mi)					2,374,154				
11.5–7.3	Mill Creek to Big Creek								
10.6	Mainstem	Point Source	Municipal	NEORSD Southerly				2,374,154	M1
SEGMENT 8 (60 sq mi)									
7.2–0.0	Big Creek to Lake Erie								
SEGMENT 9					578,820				
	Nearshore	Point Source	Municipal	NEORSD Westerly				31,929	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				546,891	M1

M1= Ohio EPA 1989 LEAPs Data

Table 5-51a

CONTAMINANT/CONDITION: OIL AND GREASE (TOTAL, mg/l)
Notes on temporal/spatial nature: (Nonpoint Source Data are unavailable)
Contaminant removal mechanisms:
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					8,436				
100.1–56.9	Upstream Lake Rockwell Dam								
88.0	On Tare Creek	Point Source	Municipal	Middlefield WWTP				2,006	M1
88.0	On Tare Creek	Point Source	Industrial	Johnson Rubber Co.				572	M1
88.0	On Tare Creek	Point Source	Industrial	Johnson Rubber Co.				28	M1
83.3	On Bridge Creek	Point Source	Industrial	Johnson Plastic Corp.				4,209	M1
69.2	Mainstem	Point Source	Municipal	Mantua WWTP				1,622	M1
SEGMENT 2 (104 sq mi)					30,569				
56.8–42.4	Lake Rockwell to Little Cuy.								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				14,811	M1
56.8	On Breakneck Creek	Point Source	Industrial	Colonial Rubber Co.				956	M1
56.8	On Breakneck Creek	Point Source.	Industrial	Hamilton Kent Mfg. Co.				536	M1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				1,706	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				11,418	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				0	M1
45.0	Mainstem	Point Source	Industrial	OH Ed. Gorge Plant				1,141	M1
SEGMENT 3 (123 sq mi)					266,687				
42.3–37.3	Little Cuy. to Yellow Creek								
42.3	On Little Cuyahoga	Point Source	Industrial	B.P. Oil Co.				60	M1
42.3	On Little Cuyahoga	Point Source	Industrial	B.P. Oil Co.				20	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Motor Wheel Corp.				54	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Motor Wheel Corp.				28	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Sun Refine & Mktg				43	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Shell Oil Co.				60	M1
42.3	On Little Cuyahoga	Point Source	Industrial	General Tire & Rubber				5	M1
42.3	On Little Cuyahoga	Point Source	Industrial	General Tire & Rubber				4	M1
42.3	On Little Cuyahoga	Point Source	Industrial	General Tire & Rubber				7	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Goodyear Tire & Rubber				176,787	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Covington Capital Corp.				655	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Firestone Tire & Rubber				539	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Firestone Tire & Rubber				1,275	M1
39.8	On Mud Brook	Point Source	Industrial	Dillon Precast Syst.				51	M1
39.8	On Mud Brook	Point Source	Industrial	Dillon Precast Syst.				3	M1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				85,047	M1
SEGMENT 4 (83 sq mi)					267				
37.2–24.3	Yellow Creek to Brandywine								
33.1	On Furnace Run	Point Source	Municipal	Richfield Hills WWTP				0	M1
33.1	On Furnace Run	Point Source	Industrial	Truck World Inc.				9	M1
28.4	Mainstem	Point Source	Municipal	Midwest Coliseum WWTP				259	M1

Table 5-51a

CONTAMINANT/CONDITION: OIL AND GREASE (TOTAL, mg/l)

Notes on temporal/spatial nature: (nonpointsource data are unavailable)

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 5 (65 sq mi)					6,438				
24.2–16.5	Brandywine to Tinkers Creek								
24.2	On Brandywine	Point Source	Municipal	Hudson WWTP				6,438	M1
SEGMENT 6 (118 sq mi)					24,830				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				7,967	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				4,367	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				3,930	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				8,000	M1
16.4	On Tinkers Creek	Point Source	Municipal	Aurora Shores WWTP				0	M1
16.4	On Tinkers Creek	Point Source	Industrial	Chrysler Corp.				567	M1
SEGMENT 7 (44 sq mi)					483,062				
11.5–7.3	Mill Creek to Big Creek								
11.5	On Mill Creek	Point Source	Industrial	Marathon Petrol. Co.				0	M1
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				477,751	M1
8.9	Mainstem	Point Source	Industrial	B.P. Oil Co.				6	M1
8.4	Mainstem	Point Source	Industrial	American Steel & Wire				5,305	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				0	M1
SEGMENT 8 (60 sq mi)					580,208				
7.2–0.0	Big Creek to Lake Erie								
6.0	Mainstem	Point Source	Industrial	LTV Steel				229,349	M1
5.7	Mainstem	Point Source	Industrial	LTV Steel				95,968	M1
5.4	Mainstem	Point Source	Industrial	LTV Steel				18,475	M1
5.1	Mainstem	Point Source	Industrial	LTV Steel				143,715	M1
5.1	Mainstem	Point Source	Industrial	LTV Steel				77,620	M1
4.7	Mainstem	Point Source	Industrial	LTV Steel				1,994	M1
4.5	Mainstem	Point Source	Industrial	LTV Steel				12,596	M1
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				492	M1

Table 5-51a

CONTAMINANT/CONDITION: OIL AND GREASE (TOTAL, mg/l)
Notes on temporal/spatial nature: (nonpoint source data are unavailable)
Contaminant removal mechanisms:
Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 9					745,258				
	Nearshore	Point Source	Municipal	NEORSD Westerly				116,026	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				548,456	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				80,775	M1

M1= Ohio EPA 1989 LEAPs Data

<u>O&G LOADS REPORTED TO LEAPs, BUT NOT INCLUDED IN TABLE</u>

LTV Steel Strip Mill Area Non-contact Colling Water---Outfall 19 (3ID00003), 52.3
LTV Steel Central Treatment System Effluent and Stormwater---Outfall 2 (3ID00017), 52429.7
Aurora Terminal and Transportation, Inc., on Tinkers Creek, no load figure
Truckstops of America, unnamed trib, no load figure (3IN00074)
Pasquale Food Co. (Natalina), no load figure (3IH00066)
Marathon Oil Co (Brecksville Terminal), 0.0 (3IG00038)
City of Burton WWTP, 2274.0 ((3PB00066)

Table 5-51b

CONTAMINANT/CONDITION: OIL AND GREASE (Freon extracted-gravimetric, mg/l)
Notes on temporal/spatial nature: (nonpoint source data are unavailable)
Contaminant removal mechanisms:
Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					2				
100.1–56.9	Upstream Lake Rockwell Dam								
60.3	Mainstem	Point Source	Industrial	Cormax Metal Treat. Co.				2	M1
SEGMENT 2 (104 sq mi)									
56.8–42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)									
42.3–37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (83 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (66 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					1,358				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Industrial	Stouffer's Food				1,253	M1
16.4	On Tinkers Creek	Point Source	Industrial	Unocal Chemicals				105	M1
SEGMENT 7 (44 sq mi)					26				
11.5–7.3	Mill Creek to Big Creek								
11.5	On Mill Creek	Point Source	Industrial	Youngstown Hardchrome				26	M1
SEGMENT 8 (60 sq mi)					10,748				
7.2–0.0	Big Creek to Lake Erie								
7.2	On Big Creek	Point Source	Industrial	General Motors				10,748	M1
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-52a

CONTAMINANT/CONDITION: **PHOSPHORUS-TOTAL (P-WET, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					157,169				
100.1-56.9	Upstream Lake Rockwell Dam	Nonpoint Source				144,372			E1
88.0	On Tare Creek	Point Source	Municipal	Middlefield WWTP				1,844	M1
88.0	On Tare Creek	Point Source	Industrial	Hans Rothenbuhler, Inc.				2,519	M1
87.5	Mainstem	Point Source	Industrial	Burton Rubber Proc.				10	M1
83.3	On Bridge Creek	Point Source	Industrial	Johnson Plastic Corp.				59	M1
83.3	On Bridge Creek	Point Source	Industrial	Johnson Plastic Corp.				8,050	M1
83.3	On Bridge Creek	Point Source	Municipal	Burton Lakes WWTP				42	M1
80.3	Mainstem	Point source	Industrial	Cormax Metal Treat.				9	M1
69.2	Mainstem	Point Source	Municipal	Mantua WWTP				264	M1
SEGMENT 2 (104 sq mi)					98,645				
56.8-42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				71,732			E1
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				2,382	M1
56.8	On Breakneck Creek	Point Source	Industrial	Colonial Rubber Co.				62	M1
56.8	On Breakneck Creek	Point Source	Industrial	Hamilton Kent Mfg. Co.				528	M1
56.8	On Breakneck Creek	Point Source	Industrial	White Rubber Co.				4	M1
56.8	On Breakneck Creek	Point Source	Industrial	Teledyne Monarch Co.				0	M1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				709	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				2,946	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				1,976	M1
45.0	Mainstem	Point Source	Industrial	OH Ed. Gorge Plant				18,201	M1
45.0	Mainstem	Point Source	Industrial	OH Ed. Gorge Plant				106	M1
SEGMENT 3 (123 sq mi)					127,296				
42.3-37.3	Little Cuy. to Yellow Creek	Nonpoint Source				8,172			E1
42.3	Little Cuyahoga	Nonpoint Source					56,296		E1
42.3	On Little Cuyahoga	Point Source	Industrial	Sun Refine & Mktg				4	M1
42.3	On Little Cuyahoga	Point Source	Industrial	RCA Rubber Co.				76	M1
42.3	On Little Cuyahoga	Point Source	Industrial	RCA Rubber Co.				74	M1
42.3	On Little Cuyahoga	Point Source	Industrial	RCA Rubber Co.				0	M1
42.3	On Little Cuyahoga	Point Source	Industrial	RCA Rubber Co.				0	M1
42.3	On Little Cuyahoga	Point Source	Industrial	RCA Rubber Co.				0	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Akron Metal Prod.				2	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Akron Metal Prod.				2	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Hilltop Aggregate				426	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Republic Chem. Corp.				1,483	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Covington Capital Corp.				54	M1
42.3	On Little Cuyahoga	Point Source	Industrial	B.F. Goodrich				1,032	M1
39.8	Mud Brook	Nonpoint Source					20,884		E1
39.8	On Mud Brook	Point Source	Industrial	Bemis Co., Inc.				4	M1
39.8	On Mud Brook	Point Source	Industrial	Bemis Co., Inc.				10	M1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				38,780	M1

TABLE 5-52a

CONTAMINANT/CONDITION: **PHOSPHORUS-TOTAL (P-WET, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 4 (83 sq mi)					66,618				
37.2-24.3	Yellow Creek to Brandywine	Nonpoint Source				21,792			E1
37.2	Yellow Creek	Nonpoint Source					29,964		E1
33.1	Furnace Run	Nonpoint Source					14,528		E1
33.1	On Furnace Run	Point Source	Municipal	Richfield Hills WWTP				180	M1
33.1	On Furnace Run	Point Source	Industrial	Truck World Inc.				3	M1
28.4	Mainstem	Point Source	Municipal	Midwest Coliseum WWTP				171	M1
SEGMENT 5 (65 sq mi)					49,336				
24.2-16.5	Brandywine to Tinkers Creek	Nonpoint Source				13,620			E1
24.2	Brandywine	Nonpoint Source					19,068		E1
24.2	On Brandywine	Point Source	Municipal	Hudson WWTP				2,812	M1
20.9	Chippewa	Nonpoint Source					12,712		E1
20.9	On Chippewa	Point Source	Industrial	Village of Seville WWTP				1,125	M1
SEGMENT 6 (113 sq mi)					87,861				
16.4-11.6	Tinkers Creek to Mill Creek	Nonpoint Source				7,264			E1
16.4	Tinkers Creek	Nonpoint Source					70,824		E1
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				2,431	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				2,264	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				1,687	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				1,560	M1
16.4	On Tinkers Creek	Point Source	Municipal	Aurora Shores WWTP				1,284	M1
16.4	On Tinkers Creek	Point Source	Industrial	Chrysler Corp.				40	M1
16.4	On Tinkers Creek	Point Source	Industrial	Stouffer's Food Corp.				14	M1
16.4	On Tinkers Creek	Point Source	Industrial	Zircoa Products				180	M1
16.4	On Tinkers Creek	Point Source	Industrial	Zircoa Products				1	M1
16.4	On Tinkers Creek	Point Source	Industrial	Zircoa Products				1	M1
16.4	On Tinkers Creek	Point Source	Industrial	Filmco Industries				2	M1
16.4	On Tinkers Creek	Point Source	Industrial	Hukhill Chem. Corp.				6	M1
16.4	On Tinkers Creek	Point Source	Industrial	Cajon Co.				303	M1
16.4	On Tinkers Creek	Point Source	Industrial	Unocal Chemicals				2	M1
SEGMENT 7 (44 sq mi)					155,037				
11.5-7.3	Mill Creek to Big Creek	Nonpoint Source				17,252			E1
11.5	Mill Creek	Nonpoint Source					13,620		E1
11.5	On Mill Creek	Point Source	Industrial	Marathon Petrol. Co.				0	M1
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				123,555	M1
8.4	Mainstem	Point Source	Industrial	American Steel & Wire				609	M1

TABLE 5-52a

CONTAMINANT/CONDITION: PHOSPHORUS-TOTAL (P-WET, mg/l)

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
SEGMENT 8 (60 sq mi)					41,947				
7.2–0.0	Big Creek to Lake Erie	Nonpoint Source				15,436			E1
7.2	Big Creek	Nonpoint Source					26,332		E1
6.5	Mainstem	Point Source	Industrial	Elco Lubricant Corp.				16	M1
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				163	M1
SEGMENT 9					*161,832*				
	Nearshore	Point Source	Municipal	NEORSD Westerly				27,384	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				118,915	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				14,372	M1
		Nonpoint Source				*1,161*			

M1= Ohio EPA 1989 LEAPs Data
E1= USEPA 1983 NURP Equations, adopted by USGS

PHOS. LOADS REPORTED TO OHIO EPA BUT NOT RECORDED IN TABLE

Pasquale Food Co. (Natalina), no load figure (3IH00066)
Bolingbrook Allotment WWTP (Por.), 235.3
Red Fox WWTP (Por.), 118.9
H-W Industries, 38.1 (3IR00045)
City of Burton WWTP, 1103.6 (3PB00066)

TABLE 5-52b

CONTAMINANT/CONDITION: **TOTAL PHOSPHORUS (PO4, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms: (NONPOINT SOURCE DATA UNAVAILABLE)

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8-42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)					8				
42.3-37.3	Little Cuy. to Yellow Creek								
39.8	On Mud Brook	Point source	Industrial	Dillon Precast Syst.				7.7	M1
39.8	On Mud Brook	Point source	Industrial	Dillon Precast Syst.				0.4	M1
SEGMENT 4 (83 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)									
16.4-11.6	Tinkers Creek to Mill Creek								
SEGMENT 7 (44 sq mi)									
11.5-7.3	Mill Creek to Big Creek								
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

Table 5-53

CONTAMINANT/CONDITION: **DISSOLVED PHOSPHORUS**
Notes on temporal/spatial nature:
Contaminant removal mechanisms:
Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
						TOTAL LOADINGS (kg/year)			
SEGMENT 1 (207 sq mi)					13,620				
100.1–56.9	Upstream Lake Rockwell Dam	Nonpoint Source				13,620			E1
SEGMENT 2 (104 sq mi)					6,356				
56.8–42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				6,356			E1
SEGMENT 3 (123 sq mi)					8,172				
42.3–37.3	Little Cuy. to Yellow Creek	Nonpoint source				908			E1
42.3	Little Cuyahoga	Nonpoint Source					5448		E1
39.8	Mud Brook	Nonpoint Source					1816		E1
SEGMENT 4 (83 sq mi)					5,448				
37.2–24.3	Yellow Creek to Brandywine					1,816			E1
37.2	Yellow Creek	Nonpoint Source					1816		E1
33.1	Furnace Run	Nonpoint Source					1816		E1
SEGMENT 5 (65 sq mi)					4540				
24.2–16.5	Brandywine to Tinkers Creek					908			E1
24.2	Brandywine	Nonpoint Source					1816		E1
20.9	Chippewa Creek	Nonpoint Source					1816		E1
SEGMENT 6 (113 sq mi)					7,264				
16.4–11.6	Tinkers Creek to Mill Creek	Nonpoint Source				908			E1
16.4	Tinkers Creek	Nonpoint Source					6356		E1
SEGMENT 7 (44 sq mi)					2,724				
11.5–7.3	Mill Creek to Big Creek					1,816			E1
11.5	Mill Creek						908		E1
SEGMENT 8 (60 sq mi)					3,632				
7.2–0.0	Big Creek to Lake Erie					908			E1
7.2	Big Creek						2724		E1
SEGMENT 9					*109*				
	Nearshore	***Nonpoint Source***				*109*			

M1= Ohio EPA 1989 LEAPs Data
E1= USEPA 1983 NURP Equations, adopted by USGS

TABLE 5-54

CONTAMINANT/CONDITION: **TOLUENE (TOTAL, ug/l)**

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)

Contaminant removal mechanisms:

Criteria:

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1–56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)									
56.8–42.4	Lake Rockwell to Little Cuy.								
SEGMENT 3 (123 sq mi)									
42.3–37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (63 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					9.1				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Hukill Chemical Corp.					9.1	M1
SEGMENT 7 (44 sq mi)									
11.5–7.3	Mill Creek to Big Creek								
SEGMENT 8 (60 sq mi)									
7.2–0.0	Big Creek to Lake Erie								
7.2	On Big Creek	Point Source	Industrial	General Motors					
SEGMENT 9									
	Nearshore								

TOTAL LOADINGS (kg/year): Total, Mainstem, Tributary, Point.

M1= Ohio EPA 1989 LEAPs Data

TABLE 5-55

CONTAMINANT/CONDITION: **PHENOL (TOTAL RECOVERABLE, total ug/l)**

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1–56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)					609				
56.8–42.4	Lake Rockwell to Little Cuy.								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				230	M1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				10	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				82	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				287	M1
SEGMENT 3 (123 sq mi)					7,693				
42.3–37.3	Little Cuy. to Yellow Creek								
37.5	Mainstem	Point Source	Municipal	Akron WWTP				7,693	M1
SEGMENT 4 (83 sq mi)									
37.2–24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2–16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					1,290				
16.4–11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				367	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				518	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				281	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				125	M1
SEGMENT 7 (44 sq mi)					17,708				
11.5–7.3	Mill Creek to Big Creek								
10.6	Mainstem	Point Source	Municipal	NEORSD Southerly				17,670	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				36	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				2.1	M1
SEGMENT 8 (60 sq mi)					752				
7.2–0.0	Big Creek to Lake Erie								
4.7	Mainstem	Point Source	Industrial	LTV Steel				359	M1
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				394	M1
SEGMENT 9					31,758				
	Nearshore	Point Source	Municipal	NEORSD Westerly				2,860	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				26,162	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				2,736	M1

TABLE 5-56

CONTAMINANT/CONDITION: **BIS-2-ETHYLHEXAL PHTHALATE (TOTAL, ug/l)**

Notes on temporal/spatial nature: (NONPOINT SOURCE DATA UNAVAILABLE)

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)									
100.1-56.9	Upstream Lake Rockwell Dam								
SEGMENT 2 (104 sq mi)					0				
56.8-42.4	Lake Rockwell to Little Cuy.								
53.9	Mainstem	Point Source	Kent WWTP					0	M1
SEGMENT 3 (123 sq mi)									
42.3-37.3	Little Cuy. to Yellow Creek								
SEGMENT 4 (88 sq mi)									
37.2-24.3	Yellow Creek to Brandywine								
SEGMENT 5 (65 sq mi)									
24.2-16.5	Brandywine to Tinkers Creek								
SEGMENT 6 (113 sq mi)					848				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				833	M1
16.4	On Tinkers Creek	Point Source	Industrial	Hukill Chemical Corp.				0	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts. WWTP				16	M1
SEGMENT 7 (44 sq mi)									
11.5-7.3	Mill Creek to Big Creek								
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9									
	Nearshore								

M1= Ohio EPA 1989 LEAPs Data

TABLE 5–57

CONTAMINANT/CONDITION: **FECAL COLIFORM BACTERIA (#/100ml)**
CONCENTRATIONS

Notes on data: All concentrations represent geometric means of a weekly or monthly sampling program. sampling runs specifically targeting rain storms were not used. All values were obtained from between 5 and 35 data points.

Notes on temporal/spatial nature:

Contaminant removal mechanisms: Die–off of organisms, also possibly settling into sediment

Criteria: Bathing Waters: geometric mean not to exceed 100#/100ml and 200#/100ml in 10% of samples

Primary Contact Recreation: geomentric mean not to exceed 1000#/100ml and and 2000#/100ml in 10% of samples

SOURCES — INSTREAM CONCENTRATIONS

River Mile	Tributary	Tributary	Concentration (#/100 ml)	Data Type	Average Discharge (cfs)	Data Type
SEGMENT 4 (83 sq mi)						
37.2–24.3	Yellow Creek to	Brandywine				
37.2	Yellow Creek		326	M1	29	M1
33.1	Furnace Run		126	M1	19	M1
32.3	Robinson Run		128	M1	1.4	M1
31.5	Oak Hill Run		30	M1	0.2	M1
31.4	Langes Run		64	M1	0.7	M1
29.5	Dickerson Run		74	M1	1.5	M1
28.0	Salt Run		60	M1	2.3	M1
27.4	Haskell Run		78	M1	0.8	M1
26.8	Peninsula Run		72	M1	0.2	M1
26.5	Boston Run		120	M1	2.6	M1
26.2	Spring Creek		328	M1	1.7	M1
25.5	Columbia Creek		80	M1	1.7	M1
SEGMENT 5 (65 sq mi)						
24.2–16.5	Brandywine Creek	to Tinkers Creek				
24.2	Brandywine Creek		946		22	M1
20.9	Chippewa Creek		285	M1,2	16	M1
18.1	Sagamore Creek		767	M1	4.6	M1
SEGMENT 6 (113 sq mi)						
16.4–11.6	Tinkers Creek to	Mill Creek				
16.4	Tinkers Creek		1062	M1,2	999	M2
16.2	Brookside Run		498	M1	6.1	M1
14.6	Stone Run		640	M1	2.7	M1
13.6	Mainstem – Old Rockside Road Gagin		279	M2	835	M4

M1 – CVNRA data 1986–1990
M2 – NEORSD data 1990
M3 – OEPA data 1990
M4 – USGS data (historic)
M5 – ODH data 1986–1990

TABLE 5-57

CONTAMINANT/CONDITION: **FECAL COLIFORM BACTERIA (#/100ml)**
CONCENTRATIONS

Notes on data: All concentrations represent geometric means of a weekly or monthly sampling progra sampling runs specifically targeting rain storms were not used. All values were obtained from between 5 and 35 data points.

Notes on temporal/spatial nature:

Contaminant removal mechanisms: Die-off of organisms, also possibly settling into sediment

Criteria: Bathing Waters: geometric mean not to exceed 100#/100ml and 200#/100ml in 10% of samples

Primary Contact Recreation: geomentric mean not to exceed 1000#/100ml and and 2000#/100ml in 10% of samples

SOURCES

INSTREAM CONCENTRATION

River Mile	Tributary	Tributary	Concentration (#/100 ml)	Data Type	Average Discharge (cfs)	Data Type
SEGMENT 7 (44 sq mi)						
11.5–7.3	Mill Creek to	Big Creek				
11.5	Mill Creek		4659	M2	1.9	M2
11.4	Mainstem – E71st & Canal Road		285	M2		
11.3	Mainstem – Chlorine Access Bridge		439	M2		
9.7	Mainstem – Southwest Interceptor		292	M2		
7.9	Mainstem – River Smeltiing and Refin		327	M2		
7.9	West Creek		95	M2	1.9	M2
SEGMENT 8 (60 sq mi)						
7.2–0.0	Big Creek to	Lake Erie				
7.2	Big Creek		4000	M2	7.3	M2
7.1	Mainstem – Lower Harvard Avenue		387	M2		
5.6	Mainstem – Newburg & SS RR		593	M2		
4.5	Mainstem – Turn Basin		1480	M3		
3.3	Mainstem – West 3rd		1163	M3		
1.5	Mainstem – Columbus Avenue		365	M3		
0.95	Mainstem – Center Street		471	M3		
0.4	Mainstem – Between Shooters and Fa		621	M3		
0.3	Old River Bed		447	M3		
0.0	Mouth		275	M3		

M1 – CVNRA data 1986–1990
M2 – NEORSD data 1990
M3 – OEPA data 1990
M4 – USGS data (historic)
M5 – ODH data 1986–1990

TABLE 5-57

CONTAMINANT/CONDITION: **FECAL COLIFORM BACTERIA (#/100ml)**
CONCENTRATIONS

Notes on data: All concentrations represent geometric means of a weekly or monthly sampling program. sampling runs specifically targeting rain storms were not used. All values were obtained from between 5 and 35 data points.

Notes on temporal/spatial nature:

Contaminant removal mechanisms: Die-off of organisms, also possibly settling into sediment

Criteria: Bathing Waters: geometric mean not to exceed 100#/100ml and 200#/100ml in 10% of samples

Primary Contact Recreation: geomentric mean not to exceed 1000#/100ml and and 2000#/100ml in 10% of samples

SOURCES					INSTREAM CONCENTRATIONS	
River Mile	Tributary	Tributary	Concentration (#/100 ml)	Data Type	Average Discharge (cfs)	Data Type
Lake Erie(LM)						
1186.9	Buoy 11		301	M3		
1187.0	Buoy 14		286	M3		
1184.3	Buoy 2		37	M3		
1185.1	Buoy 6		126	M3		
1186.3	Buoy 9		249	M3		
1184.2	East 55th		129	M3		
1185.0	Lakeside Yacht Club		44	M3		
1188.3	Whiskey Island		254	M5		
1189.8	Edgewater – East		75	M5		
1190.0	Edgewater – West		59	M5		
1178.6	Euclid Beach		128	M5		
1180.0	White City		173	M5		

M1 – CVNRA data 1986–1990
M2 – NEORSD data 1990
M3 – OEPA data 1990
M4 – USGS data (historic)
M5 – ODH data 1986–1990

TABLE 5-58

CONTAMINANT/CONDITION: BIOCHEMICAL OXYGEN DEMAND (5 DAY, mg/l)
Notes on temporal/spatial nature: (Nonpoint Source Data Unavailable)
Contaminant removal mechanisms:
Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					73,809				
100.1-56.9	Upstream Lake Rockwell Dam	Nonpoint Source							
87.5	Mainstem	Point Source	Burton Rubber Proc., Inc.						
88.0	On Tare Creek	Point Source	Municipal	Middlefield WWTP				99	M1
88.0	On Tare Creek	Point Source	Industrial	Hans Rothenbuhler, Inc.				9,650	M1
84.9	On West Branch	Point Source	Municipal	Aquilla Village WWTP				3,243	M1
83.3	On Bridge Creek	Point Source	Municipal	Burton Lakes WWTP				2,183	M1
83.3	On Bridge Creek	Point Source	Industrial	Johnson Plastic Corp.				39	M1
								58,596	M1
SEGMENT 2 (104 sq mi)					93,075				
56.8-42.4	Lake Rockwell to Little Cuy.	Nonpoint Source							
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				23,027	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				28,157	M1
	On Plum Creek	Point Source	Municipal	Brentwood WWTP				702	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				41,189	M1
SEGMENT 3 (123 sq mi)					644,919				
42.3-37.3	Little Cuy. to Yellow Creek	Nonpoint Source							
42.3	Little Cuyahoga	Nonpoint Source							
42.3	On Little Cuyahoga	Point Source	Industrial	Firestone Tire & Rubber				1,078	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Firestone Tire & Rubber				3,339	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Goodyear Wingfoot Facil.				12	M1
39.8	On Mud Brook	Point Source	Industrial	Dillon Precast Syst.				271	M1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				639,619	M1
SEGMENT 4 (69 sq mi)					2,002				
37.2-24.3	Yellow Creek to Brandywine								
37.2	On Yellow Creek	Point Source	Industrial	Westmont Woods WWTP				160	M1
33.1	On Furnace Run	Point Source	Municipal	Richfield Hills WWTP				567	M1
33.1	On Furnace Run	Point Source	Municipal	Pine Valley Care Ctr.				1,053	M1
29.0	On Boston Run	Point Source	Municipal	Bostonian Motel				172	M1
29.0	On Boston Run	Point Source	Municipal	Foder's Country Inn				50	M1
SEGMENT 5 (65 sq mi)					45,123				
24.2-16.5	Brandywine to Tinkers Creek								
24.2	On Brandywine	Point Source	Municipal	Hudson WWTP				39,318	M1
20.9	On Chippewa	Point Source	Municipal	Seville WWTP				5,787	M1
17.0	Mainstem	Point source	Industrial	Standard Oil				18	M1
SEGMENT 6 (113 sq mi)					58,982				
16.4-11.6	Tinkers Creek to Mill Creek								
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				19,798	M1

TABLE 5-58

CONTAMINANT/CONDITION: **BIOCHEMICAL OXYGEN DEMAND (5 DAY, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				37,275	M1
16.4	On Tinkers Creek	Point Source	Industrial	Cajon Company				83	M1
16.4	On Tinkers Creek	Point Source	Municipal	Southern Estates WWTP				336	M1
16.4	On Tinkers Creek	Point Source	Municipal	Echo Hills WWTP				1,470	M1
SEGMENT 7 (44 sq mi)					1,589				
11.5-7.3	Mill Creek to Big Creek								
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				1,589	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9					1,754,172				
	Nearshore	Point Source	Municipal	NEORSD Westerly				1,621,375	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				132,798	M1

M1= Ohio EPA 1989 LEAPs Data

Reported to Ohio EPA but not recorded in table above

Spring Valley Plant (Sta.), 60.9

TABLE 5-59

CONTAMINANT/CONDITION: CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND (5 DAY, mg/l)
(NON POINT SOURCE DATA UNAVAILABLE)

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					10,630				
100.1–56.9	Upstream Lake Rockwell Dam								
88.0	On Tare Creek	Point Source	Municipal	Middlefield WWTP				8,121	M1
84.9	On West Branch	Point Source	Municipal	Aquilla Village WWTP				1,644	M1
84.9	On West Branch	Point Source	Municipal	Plymouth Acres WWTP				31	M1
83.3	On Bridge Creek	Point Source	Municipal	Burton Lakes WWTP				31	M1
69.2	Mainstem	Point Source	Municipal	Mantua WWTP				583	M1
63.5	On Infirmary Creek	Point Source	Municipal	Infirmary Creek WWTP				58	M1
60.0	On Unknown Tributary	Point Source	Municipal	Portage Co. Home				163	M1
SEGMENT 2 (104 sq mi)					27,985				
56.8–42.4	Lake Rockwell to Little Cuy.								
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				6,282	M1
56.8	On Breakneck Creek	Point Source	Municipal	Sandy Lake WWTP				867	M1
56.8	On Breakneck Creek	Point Source	Municipal	Village Estates M.H.P.				252	M1
56.8	On Breakneck Creek	Point Source	Municipal	Baronwood WWTP				2,536	M1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				1,720	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				16,328	M1
SEGMENT 3 (123 sq mi)					340,526				
42.3–37.3	Little Cuy. to Yellow Creek								
39.8	On Mud Brook	Point Source	Municipal	Mobile Manors M.H.P.				2,684	M1
39.8	On Mud Brook	Point Source	Municipal	CT Colony WWTP				1,097	M1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				236,745	M1
SEGMENT 4 (83 sq mi)					4,200				
37.2–24.3	Yellow Creek to Brandywine								
37.2	On Yellow Creek	Point Source	Municipal	Colony Hills WWTP				30	M1
37.2	On Yellow Creek	Point Source	Municipal	Westmont Woods WWTP				116	M1
37.2	On Yellow Creek	Point Source	Municipal	Robinwood Hills WWTP				347	M1
33.1	On Furnace Run	Point Source	Municipal	Richfield Hills WWTP				602	M1
33.1	On Furnace Run	Point Source	Municipal	Pine Valley Care Center				1,238	M1
29.0	On Boston Run	Point Source	Municipal	Bostonian Motel				35	M1
28.4	Mainstem	Point Source	Municipal	Midwest Coliseum WWTP				1,834	M1
SEGMENT 5 (65 sq mi)					23,789				
24.2–16.5	Brandywine to Tinkers Creek								
24.2	On Brandywine	Point Source	Municipal	Hudson WWTP				20,458	M1
20.9	On Chippewa	Point Source	Municipal	Seville WWTP				3,332	M1
SEGMENT 6 (113 sq mi)					53,264				
16.4–11.6	Tinkers Creek to Mill Creek								

TABLE 5-59

CONTAMINANT/CONDITION: **CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND (5 DAY, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				16,776	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				16,521	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				10,972	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				33,153	M1
16.4	On Tinkers Creek	Point Source	Municipal	Roseland Estates WWTP				3,556	M1
16.4	On Tinkers Creek	Point Source	Municipal	Aurora Shores WWTP				2,307	M1
SEGMENT 7 (44 sq mi)					354,754				
11.5-7.3	Mill Creek to Big Creek								
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				354,754	M1
SEGMENT 8 (60 sq mi)									
7.2-0.0	Big Creek to Lake Erie								
SEGMENT 9					1,007,993				
	Nearshore	Point Source	Municipal	NEORSD Easterly				1,007,993	M1

LOADS REPORTED TO OHIO EPA (LEAPS) BUT NOT RECORDED ABOVE

M1= Ohio EPA 1989 LEAPs Data

ODOT Park #4-32, 12.9
ODOT Park #4-39, 59.1
Scottish Highlands WWTP (Cuy.), 1730.9
Richmond Park WWTP (Cuy.), 1200.7
Bolingbrook Allotment (Por.), 543.7
Red Fox WWTP (Por.), 369.1
Rivermoor (Por.), 35.7
City of Burton WWTP (Gea.),1369.0
Broadwood Hills (Gea.), 253.7
Jacques Mobile Home Park, 356.2
Spring Valley Plant (Sta.), 58.9
Valley Hill Mobile Home Park, no load figure
Richfield Sewage Facility (Furnace Run), no load figure

TABLE 5-6D

CONTAMINANT/CONDITION: CHEMICAL OXYGEN DEMAND (mg/l)

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
						TOTAL LOADINGS (kg/year)			
SEGMENT 1 (207 sq mi)					15,293,444				
100.1–56.9	Upstream Lake Rockwell Dam	Nonpoint Source				15,293,444			E1
SEGMENT 2 (104 sq mi)					8,643,311				
56.8–42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				8,399,908			E1
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				89,697	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				0	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				153,707	M1
SEGMENT 3 (123 sq mi)					15,638,868				
42.3–37.3	Little Cuy. to Yellow Creek	Nonpoint Source				1,144,080			E1
42.3	Little Cuyahoga	Nonpoint Source					8,145,668		E1
42.3	On Little Cuyahoga	Point Source	Gencorp, Inc.					121.6	M1
39.8	Mud Brook	Nonpoint Source					2,503,356		E1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				3,545,643	M1
SEGMENT 4 (83 sq mi)					6,528,980				
37.2–24.3	Yellow Creek to Brandywine					2,379,868			E1
37.2	Yellow Creek	Nonpoint Source					2,538,768		E1
33.1	Furnace Run	Nonpoint source					1,605,344		E1
SEGMENT 5 (65 sq mi)					5,456,264				
24.2–16.5	Brandywine to Tinkers Creek	Nonpoint Source				2,414,372			E1
24.2	Brandywine	Nonpoint Source					2,291,792		E1
20.9	Chippewa	Nonpoint Source					749,100		E1
SEGMENT 6 (113 sq mi)					10,501,641				
16.4–11.6	Tinkers Creek to Mill Creek	Nonpoint Source				990,628			E1
16.4	Tinkers Creek	Nonpoint Source					8,756,752		E1
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				295,810	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				206,399	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				113,102	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				136,331	M1
16.4	On Tinkers Creek	Point Source	Industrial	Hukill Chemical Corp.				2620.5	M1
SEGMENT 7 (44 sq mi)					11,945,943				
11.5–7.3	Mill Creek to Big Creek	Nonpoint Source				2,554,204			E1
11.5	Mill Creek	Nonpoint Source					2,280,012		E1
10.8	Mainstem	Point Source	Municipal	NEORSD Southerly				7,131,727	M1
SEGMENT 8 (60 sq mi)					7,555,488				

TABLE 5-60

CONTAMINANT/CONDITION: **CHEMICAL OXYGEN DEMAND (mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	Total	Mainstem	Tributary	Point	Data Type
7.2	Big Creek	Nonpoint Source					4,403,800		E1
SEGMENT 9					*9,633,515*				
	Nearshore	Point Source	Municipal	NEORSD Westerly				3,340,528	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				6,077,022	M1
	Nearshore	Point Source	Municipal	Euclid WWTP		*215,966*			
		Nonpoint Source							

TOTAL LOADINGS (kg/year)

M1= Ohio EPA 1989 LEAPs Data

E1= USEPA 1983 NURP Equations, adopted by USGS

TABLE 5-61

CONTAMINANT/CONDITION: **SUSPENDED SOLIDS (RESIDUE TOTAL NONFILTERED, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 1 (207 sq mi)					40,214,144				
100.1–56.9	Upstream Lake Rockwell Dam	Nonpoint Source				40,182,632			E1
88.0	On Tare Creek	Point Source	Municipal	Middlefield WWTP				14,841	M1
88.0	On Tare Creek	Point Source	Industrial	Johnson Rubber Co.				1,045	M1
88.0	On Tare Creek	Point Source	Industrial	Johnson Rubber Co.				78	M1
88.0	On Tare Creek	Point Source	Industrial	Johnson Rubber Co.				144	M1
88.0	On Tare Creek	Point Source	Industrial	Johnson Rubber Co.				77	M1
88.0	On Tare Creek	Point Source	Industrial	Hans Rothenbuhler, Inc.				12,320	M1
84.9	On West Branch	Point Source	Municipal	Aquilla Village WWTP				808	M1
84.9	On West Branch	Point Source	Municipal	Plymouth Acres WWTP				115	M1
83.3	On Bridge Creek	Point Source	Municipal	Burton Lakes WWTP				196	M1
83.3	On Bridge Creek	Point Source	Industrial	Johnson Plastic Corp.				0	M1
80.3	Mainstem	Point Source	Industrial	Cormax Metal Treat.				6	M1
69.2	Mainstem	Point Source	Municipal	Mantua WWTP				1,204	M1
63.5	On Infirmary Creek	Point Source	Municipal	Infirmary Creek WWTP				260	M1
60.0	On Unknown Tributary	Point Source	Municipal	Portage Co. Home				419	M1
SEGMENT 2 (104 sq mi)					20,184,361				
56.8–42.4	Lake Rockwell to Little Cuy.	Nonpoint Source				20,091,316			E1
56.8	On Breakneck Creek	Point Source	Municipal	Ravenna WWTP				22,641	M1
56.8	On Breakneck Creek	Point Source	Municipal	Sandy Lake WWTP				2,816	M1
56.8	On Breakneck Creek	Point Source	Municipal	Village Estates M.H.P.				655	M1
56.8	On Breakneck Creek	Point Source	Industrial	Hamilton Kent Mfg. Co.				297	M1
56.8	On Breakneck Creek	Point Source	Municipal	Baronwood WWTP				8,095	M1
56.8	On Breakneck Creek	Point Source	Industrial	Colonial Rubber Co.				3,173	M1
56.0	Unnamed Tributary	Point Source	Municipal	Twin Lakes WWTP				6,052	M1
53.9	Mainstem	Point Source	Municipal	Kent WWTP				9,867	M1
	On Plum Creek	Point Source	Municipal	Brentwood WWTP				1,149	M1
52.5	Mainstem	Point Source	Municipal	Fish Creek WWTP				31,986	M1
45.0	Mainstem	Point source	Industrial	OH Ed. Gorge Plant				4,311	M1

TABLE 5-61

CONTAMINANT/CONDITION: **SUSPENDED SOLIDS (RESIDUE TOTAL NONFILTERED, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 3 (123 sq mi)					25,806,585				
42.3–37.3	Little Cuy. to Yellow Creek	Nonpoint Source				2,479,748			E1
42.3	Little Cuyahoga	Nonpoint Source					15,712,032		E1
42.3	On Little Cuyahoga	Point Source	Industrial	Hilltop Aggregate				22,015	M1
42.3	On Little Cuyahoga	Point Source	Industrial	General Tire & Rubber				5	M1
42.3	On Little Cuyahoga	Point Source	Industrial	General Tire & Rubber				6	M1
42.3	On Little Cuyahoga	Point Source	Industrial	General Tire & Rubber				13	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Goodyear Tire & Rubber				599,558	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Diamond Crystal Salt Co.				153,698	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Canal Place, Ltd.				2,221	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Firestone Tire & Rubber				3,592	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Firestone Tire & Rubber				21,685	M1
42.3	On Little Cuyahoga	Point Source	Industrial	Goodyear Wingfoot Facil.				34	M1
39.8	Mud Brook	Nonpoint Source					5,695,884		E1
39.8	On Mud Brook	Point Source	Municipal	Mobile Manore M.H.P.				6,620	M1
39.8	On Mud Brook	Point Source	Municipal	CT Colony WWTP				1,667	M1
39.8	On Mud Brook	Point Source	Industrial	Dillon Precast Syst.				1,179	M1
39.8	On Mud Brook	Point Source	Industrial	Dillon Precast Syst.				150	M1
37.5	Mainstem	Point Source	Municipal	Akron WWTP				606,478	M1
SEGMENT 4 (83 sq mi)					18,147,965				
37.2–24.3	Yellow Creek to Brandywine					6,198,916			E1
37.2	Yellow Creek	Nonpoint Source					6,006,420		E1
37.2	On Yellow Creek	Point Source	Municipal	Colony Hills WWTP				49	M1
37.2	On Yellow Creek	Point Source	Industrial	Westmont Woods WWTP				217	M1
37.2	On Yellow Creek	Point Source	Industrial	Robinwood Hill				552	M1
33.1	Furnace Run	Nonpoint source					3,933,456		E1
33.1	On Furnace Run	Point Source	Municipal	Richfield Hills WWTP				397	M1
33.1	On Furnace Run	Point Source	Municipal	Pine Valley Care Ctr.				752	M1
29.0	On Boston Run	Point Source	Municipal	Bostonian Motel				117	M1
29.0	On Boston Run	Point Source	Municipal	Foder's Country Inn				36	M1
28.4	Mainstem	Point Source	Municipal	Midwest Coliseum WWTP				7,073	M1
SEGMENT 5 (66 sq mi)					12,787,922				
24.2–16.5	Brandywine to Tinkers Creek	Nonpoint Source				3,933,456			E1
24.2	Brandywine	Nonpoint Source					5,270,032		E1
24.2	On Brandywine	Point Source	Municipal	Hudson WWTP				130,238	M1
20.9	Chippewa	Nonpoint Source					3,448,584		E1
20.9	On Chippewa	Point Source	Municipal	Seville WWTP				5,580	M1
17.0	Mainstem	Point source	Industrial	Standard Oil				32	M1

TABLE 5-61

CONTAMINANT/CONDITION: **SUSPENDED SOLIDS (RESIDUE TOTAL NONFILTERED, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

SOURCES

River Mile	Tributary	General Source (A)	General Source (B)	Specific Source	TOTAL LOADINGS (kg/year) Total	Mainstem	Tributary	Point	Data Type
SEGMENT 6 (113 sq mi)					21,955,992				
16.4-11.6	Tinkers Creek to Mill Creek	Nonpoint Source				2,131,076			E1
16.4	Tinkers Creek	Nonpoint Source					19,722,668		E1
16.4	On Tinkers Creek	Point Source	Municipal	Solon Central WWTP				24,611	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford Hts WWTP				10,216	M1
16.4	On Tinkers Creek	Point Source	Industrial	Chrysler Corp.				2,322	M1
16.4	On Tinkers Creek	Point Source	Municipal	Twinsburg WWTP				21,849	M1
16.4	On Tinkers Creek	Point Source	Municipal	Bedford WWTP				30,932	M1
16.4	On Tinkers Creek	Point Source	Municipal	Roseland Estates WWTP				3,887	M1
16.4	On Tinkers Creek	Point Source	Industrial	Cajon Company				178	M1
16.4	On Tinkers Creek	Point Source	Municipal	Aurora Shores WWTP				3,748	M1
16.4	On Tinkers Creek	Point Source	Municipal	Southern Estates WWTP				641	M1
16.4	On Tinkers Creek	Point Source	Municipal	Echo Hills WWTP				3,420	M1
16.4	On Tinkers Creek	Point Source	Industrial	Stouffer's Food				445	M1
SEGMENT 7 (44 sq mi)					9,040,790				
11.5-7.3	Mill Creek to Big Creek	Nonpoint Source				4,843,272			E1
11.5	Mill Creek	Nonpoint Source					3,759,120		E1
11.5	On Mill Creek	Point Source	Industrial	Youngstown Hardchrome				15	M1
11.5	On Mill Creek	Point Source	Industrial	O'Brien Cut Stone				29	M1
10.6	Mainstem	Point Source	Municipal	NEORSD Southerly				406,871	M1
8.4	Mainstem	Point Source	Industrial	American Steel & Wire				24,293	M1
7.4	Mainstem	Point Source	Industrial	Harshaw Chemical				7,191	M1
7.3	Mainstem	Point Source	Industrial	Harshaw Chemical				0	M1
SEGMENT 8 (60 sq mi)					12,667,101				
7.2-0.0	Big Creek to Lake Erie	Nonpoint Source				4,398,352			E1
7.2	Big Creek	Nonpoint Source					7,245,840		E1
5.7	Mainstem	Point Source	Industrial	LTV Steel				1,017,844	M1
4.7	Mainstem	Point Source	Industrial	LTV Steel				2,344	M1
4.4	Mainstem	Point Source	Industrial	Zaclon, Inc.				2,722	M1
SEGMENT 9					2,910,252				
	Nearshore	Point Source	Municipal	NEORSD Westerly				586,820	M1
	Nearshore	Point Source	Municipal	NEORSD Easterly				1,655,992	M1
	Nearshore	Point Source	Municipal	Euclid WWTP				344,903	M1
		Nonpoint Source				*323,535*			

M1 = Ohio EPA 1989 LEAPs Data

TABLE 5-61

CONTAMINANT/CONDITION: **SUSPENDED SOLIDS (RESIDUE TOTAL NONFILTERED, mg/l)**

Notes on temporal/spatial nature:

Contaminant removal mechanisms:

Criteria:

LOADS REPORTED TO LEAPS, BUT NOT INCLUDED IN THE TABLE

ODOT Park #4-32, 34.1
ODOT Park #4-39, 160.0
Scottish Highlands WWTP (Cuy.), 3712.6
Richmond Park WWTP (Cuy.), 2319.9
Bolingbrook Allotment (Por.), 1451.4
Red Fox WWTP (Por.), 4347.1
Rivermoor (Por.), 196.0
City of Burton WWTP (Gea.), 2276.0
Broadwood Hills (Gea.), 483.5
Jacques Mobile Home Park, 3672.0
Spring Valley Plant (Sta.), 78.2
Valley Hill Mobile Home Park, no load figure
Richfield Sewage Facility (Furnace Run), no load figure
Pasquale Food Co. (Natalina), no load figure

5.4.3 Effects of Contaminants of Concern

INTRODUCTION

In Table 5-28, the list of specific contaminants of concern has been divided into nine major categories. These are metals, conventional pollutants, pesticides, dibenzodioxins/dibenzofurans, PCBs, PAHs, volatile organic compounds, a miscellaneous category and microorganisms.

Each major category is discussed below. The intent of this discussion is to provide a general understanding of the effects of each contaminant. Furthermore, this discussion elaborates on the locational, concentration and loading information which is presented in Table 5-28, Tables 5-29 and 5-30, and the loadings data presented in Section 5.4.2 (Tables 5-31 through 5-61).

METALS

Most of the metals listed in Table 5-28 occur naturally in the rock and soil materials of the Cuyahoga River basin. They typically travel to surface water attached to eroded soil particles. Metals become further concentrated in the water column because they are used extensively in the manufacturing process for household and industrial products. Many metals are emitted into the atmosphere from combustion and industrial emissions. These can then contribute to the concentrations in the water column via atmospheric deposition.

In the Area of Concern, cadmium, chromium, copper, lead, mercury and zinc have been found across all four media--sediments, fish, water and air. Five metals cadmium, chromium, copper, iron and lead have been found at times over the past six years in concentrations which exceed state-established standards for the protection of wildlife. Six metals--arsenic, cadmium, chromium, copper, iron and lead are found in the sediments in concentrations which result in their classification as "heavily polluted," requiring confined disposal.

The metals barium, beryllium, and alkylated lead have not been sampled in any of the available data, and so levels of these metals are unknown. Arsenic, total chromium, manganese, mercury, nickel, and selenium have been sampled for, but none of the samples were above the Warm Water Habitat (WWH) acute limit for aquatic life (manganese has no WWH acute limit). Hexavalent chromium and lead each had one sample point which exceeded the WWH limit. Lead can be found naturally in trace amounts in water, and may also come from old lead pipes, or from industrial sources such as zinc galvanizing. It has been detected in rain water samples, generally in amounts below the WWH acute limit.

Cadmium was detected at levels above the WWH acute limit in 14 of 638 samples. Cadmium has not been detected in any samples of rain water. The most common point sources of cadmium are discharges from metal plating industries.

Copper and zinc have been detected at levels above WWH acute limits in 14 of 642 and 64 of 643 samples respectively. Both have been detected in samples of rain water at levels close to the WWH acute limits. Both may come from industrial sources, such as zinc galvanizing, and although necessary in trace amounts, may be toxic to aquatic life at higher levels.

Iron is very prevalent in the Northeast Ohio area. Most waters naturally contain fairly high levels of iron, and samples in the Cuyahoga River showed WWH acute limit exceedances in 219 of 372 samples collected. Iron was detected in all of the rain water samples collected by the NEORSD, and has many sources, both natural and man-made.

NEORSD's Southerly WWTP has been unable to meet the limits established in their 1988 NPDES discharge permit for some metals, particularly cadmium, copper, and zinc. The District has performed site-specific studies which give preliminary indication that the levels of metals currently being discharged by the plant are not toxic to aquatic life in the area.* Studies of the Cuyahoga River near the Southerly WWTP conducted by the Ohio EPA throughout the summer of 1990 also revealed that instream chemical specific water quality criteria were being achieved at that time, although the effluent was in some cases exceeding the NPDES permit limits.

CONVENTIONAL POLLUTANTS

This is a class that covers a wide variety of pollutants and conditions. The Committee has identified the following contaminants that fall under the heading of "Conventional Pollutants": chlorides, cyanide, dissolved solids, fluoride, nitrogen compounds (ammonia and organic nitrogen, nitrates and nitrites), oil and grease, and phosphorus.

There are both natural and anthropogenic sources of all these contaminants. A primary source of chlorides in surface waters is the salting of streets in the winter. Although there is no WWH standard for chlorides, USEPA has recommended an ambient and aquatic life use standard of 230 mg/l over a four-day period. Limited sampling has been done and it is suspected that this criteria may be regularly exceeded in urban areas where large amounts of salt are used.

No samples of the available data have been analyzed for fluoride, so levels are unknown.

No WWH limits have been established for phosphorus, nitrates, or nitrites, except that they should be at levels which do not contribute to eutrophication or do not violate Ohio Water Quality Standards "5 Freedoms" (See Appendix F-9).

There is also no maximum limit established for total dissolved solids.

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*Southerly NPDES Cuyahoga River Study-Metals Toxicity Study. Battelle, 1990.

Dissolved oxygen levels are often quite low in the river, and 57 of 556 samples were below the WWH acute standard of 4 mg/l. This is due to high loadings of BOD and resident Sediment Oxygen Demand (SOD). Point sources, as well as CSOs and storm sewers, are known to carry high loads of BOD, as well as organic sediments which add to the SOD.

Cyanide has shown up in water samples, and 6 of the 72 samples available had levels which exceeded the WWH acute limit. Sources of cyanide could be coking operations.

Ammonia has historically been a significant problem in the Cuyahoga River. Reductions of major point sources of ammonia have improved conditions in the past five years. In the samples taken since 1986, no individual violations of the acute WWH standards have been evident in the Cuyahoga river itself. The overall average of samples is 0.82 mg/l, which just exceeds the most conservative value (0.80 mg/l) for the WWH 30-day average chronic limit. Very high levels of ammonia - up to 130 mg/l - are still found in some of the tributaries, such as Burke Brook and Morgan Run, however. These may impact areas at their confluences with the Cuyahoga, but no sampling has been done to confirm this.

Oil and grease continue to be ubiquitous pollutants throughout the river. Fourteen out of 31 samples analyzed for oil and grease exceeded the WWH limit of 10 mg/l. There are many sources of oil and grease, including industrial point sources, CSOs and nonpoint sources.

PESTICIDES

Nine pesticides have been identified by the Cuyahoga RAP Committee as contaminants of concern, primarily because IJC has included them in Annex 1: Persistent Toxic Substances. Two, DDT and Dieldrin are also on the "Critical 11" list. The RAP Fish Tissue Survey team included these nine pesticides in their 1989 analysis of contaminants in fish tissue, and found DDT and metabolites, Dieldrin, and heptachlor epoxide at levels that exceed certain USEPA guidelines (refer to Appendix C for a detailed discussion of USEPA's risk assessment methodology and the RAP results).

DDT, a chlorinated hydrocarbon insecticide, was at one time the most widely used chemical for the control of insect pests. It was used for more than 30 years. Its forms included powders, emulsions, and encapsulations. The use of DDT was discontinued in 1973 after being banned by USEPA.

DDT is a persistent, fat-soluble pesticide. Because of its persistent nature, hydrophobic properties and solubility in lipids, DDT and its metabolites are concentrated by aquatic organisms at all trophic levels. DDT has several metabolites. The two most frequently found in nature are TDE (DDD or Rhothane), and DDE. DDT and metabolites, and dieldrin have also been found in the AOC sediments and are known to be in the air.

Endrin and Lindane were found in the fish tissue samples, but a low levels. Chlordane, methoxychlor, and toxaphene were analyzed for in fish tissue but not found.

Dieldrin was formerly used as an insecticide. Both manufacture and use was discontinued in the United States (prior to 1983).

Heptachlor epoxide is not commercially available in the United States. It is a biproduct of heptachlor oxidation. EPA cancelled registration of pesticides containing this compound (prior to 1983) with the exception of its use through subsurface ground insertion for termite control and the dipping of roots or tops of non-food plants.

DIBENZODIOXINS AND DIBENZOFURANS (CHLORINATED DIOXINS)

Chlorinated dioxins consist of about 75 different chemical compounds, of which 2,3,7,8-TCDD is the most toxic. 2,3,7,8-TCDD is formed as a by-product in the manufacture of 2,4,5-trichlorophenol, which was produced in the Great Lakes Basin and used for the manufacture of some phenoxy herbicides, including 2,4,5-T (trichlorophenoxy acetic acid). Environmental problems associated with 2,3,7,8-TCDD are the result of past disposal of wastes associated with the production of 2,4,5-trichlorophenol. There are two notable "hot spots" for this toxic chemical, namely the Niagara and the Saginaw River Basins. Point source discharges and/or chemical disposal sites are the probable source of this contaminant. (1982 Report on Great Lakes Water Quality)

A large present day source of 2,3,7,8-TCDD are pulp and paper mills. (1989 Ohio Sea Grant Fact Sheet). There are no pulp and paper mills in the Cuyahoga basin, nor are there any permitted dischargers of 2,3,7,8-TCDD.

Other chlorinated dioxins are formed in the combustion of certain chemical compounds by a process not fully understood. This would implicate the atmosphere as a potential medium for dispersal of these substances.

The Water Quality Board in its 1985 Report on Great Lakes Water Quality identified 2,3,7,8-TCDD and 2,3,7,8-TCDF as two of "11 critical pollutants." Thus they are listed as Cuyahoga AOC contaminants of a concern, although neither has been identified as a local problem. Limited sediment sampling for 2,3,7,8-TCDD and 2,3,7,8-TCDF was done, but nothing above background levels were found.

POLYCHLORINATED BIPHENYLS (PCBs)

PCBs are mixtures of chlorinated biphenyls with different degrees of chlorination. They are relatively insoluble in water and adhere readily and strongly to sediments, soils, and are soluble in fatty tissue. Because they are nonflammable and have useful heat exchange and electrical insulation properties, they have been used extensively in the electrical industry in capacitors and transformers. They were also used in hydraulic, lubricating and cutting oil formulations as well as in pesticide formulations, adhesives, plastics, inks, paints, and sealants. The use of PCBs, except in certain closed systems, has been banned in the United States since the late 1970s.

Although banned, PCBs continue to enter the water in leachate from landfills, products containing PCBs which are still being used, and atmospheric fallout. PCBs are ubiquitous, probably due in part to its presence in the atmosphere.

In the Area of Concern PCBs have been found in the sediments and in the fish. 1986 levels of PCBs in channel catfish and carp caught in Lake Erie were high enough to effect a ban on the consumption of these species. The 1989 RAP fish tissue survey found PCB 1248 and PCB 1260 in fish tissue sampled, no violations of the Ohio Department of Health standard for PCBs.

POLYNUCLEAR AROMATIC HYDROCARBONS (PAHs)

Polynuclear aromatic hydrocarbons (PAHs) are a diverse class of compounds consisting of substituted polycyclic and heterocyclic aromatic rings. PAHs are formed as a result of incomplete combustion of organic compounds. The PAHs are compounds such as benzo(a)pyrene, benzo(a)anthracene, fluoranthene and phenanthrene.

PAHs are present in the environment from both natural sources and human activities. As a group, they are widely distributed in the environment.

PAHs adsorb strongly onto suspended particulates and biota and their transport will be determined largely by the patterns of sediment deposition and resuspension in the aquatic system. PAHs dissolved in the water column are believed to degrade by direct photolysis at a rapid rate. The fate of those PAHs which accumulate in the sediment is thought to be biodegradation and biotransformation by benthic organisms.

PAHs, particularly benzo(a)pyrene, benzo(a)anthracene, fluoranthene and phenanthrene have been documented to cause liver tumors in fish. In the Area of Concern, PAHs are suspected as a cause of tumors on local fish. PAHs have been found in sediments of the Area of Concern, but were not found in the fish sampled in the 1989 RAP Fish Tissue Survey. It is difficult to find PAHs in tissue because they are rapidly metabolized by the organism.

VOLATILE ORGANIC COMPOUNDS

Benzene has been found in the area of concern specifically in sediment samples. Benzene is one of the most commonly produced and used chemicals in the United States. It can be found in both industrial and domestic settings.

Benzene is produced as a by-product in the coking of coal. It is a colorless to light yellow, non-polar, highly flammable liquid and has been classified as having a potential carcinogenic risk to humans.

Benzene is only slightly soluble in water and is used in various industrial processes. It is used as a solvent for various waxes, resins, oils and for the manufacture of paints and varnishes. However, its biggest use may be in gasoline.

It is speculated that sediment contamination could be the result of spills of gasoline from pipelines, underground storage tanks, above ground storage tanks (terminals), and surface spills to storm sewers. Furthermore, Cleveland used to be a major producer of oil and gasoline products at terminals located along the Cuyahoga River. Past spills and leaks may have caused additional contamination in the Area of Concern. Atmospheric deposition may be yet another significant source of benzene contamination.

Toluene is a benzene derivative and is also known as methylbenzene. It too is a flammable colorless liquid with a benzene-like odor. Toluene, like benzene is slightly soluble in water.

In the manufacturing process, toluene is used in a wide range of applications, from the formation of explosives to use as an industrial solvent. It plays an important role as a solvent for paints and coatings and is also used in lacquers. Toluene is also found in gasoline, typically as a gasoline additive.

Sources of toluene could include industrial spills, and spills of gasoline from the above mentioned sources. Also washing or evaporation of paint and paint products from industrial and household usages.

Both are suspected to be causing use impairments in the Area of Concern. They have been found in the area sediments but were not found in 1989 fish tissue samples.

MISCELLANEOUS

Hexachlorobenzene was identified by the Water Quality Board as one of "11 Critical Pollutants," but it has not been identified as a local problem. It has been found in the sediments, but not in the fish.

Hexachlorobenzene is also known as perchlorobenzene. In pure form, hexachlorobenzene is found as a white crystal and is insoluble in water.

Hexachlorobenzene is primarily used as a wood preservative and a fungicide for seeds.

Phthalic acid esters are a whole family of chemicals. One of the esters found in the area of concern is bis-2-ethylhexyl phthalate. It is widely used as a plasticizer for many resins and elastomers. Examples would include the "plastic" plumbing (both water and waste-water) used in modern building techniques.

Phthalic acid esters are listed as persistent toxic substances in Annex 1. They suspected to be the cause of a persistent toxicity problem downstream of Akron. Di-n-Butyl Phthalate was found by the ACOE (1989-90) in all eight sample sites downstream of RM 8.0. Bis-2-Ethylhexyl Phthalate was found at RMs 0.3, 7.1 and the Old River bed, and 35.3 and 37.2 directly downstream of Akron. Both contaminants were analyzed for throughout the Area of Concern.

MICROORGANISMS

Refer to Appendix I.1 for a complete discussion on the nature and extent of fecal coliform and E. coli as contaminants.

CHAPTER 6
OVERVIEW OF CUYAHOGA RAP RELATED TECHNICAL WORK

6.0 Introduction

This chapter describes technical work undertaken in support of RAP goals with the direction of, or in collaboration with, the Cuyahoga RAP Technical Committee during the time period October 1, 1988 through June 30, 1991.*

Several initiatives were pursued during this time frame including the following:

- Development of a RAP bibliography and data base;
- Hydrodynamic model development
- Investigations of select high priority use impairments of the AOC for which limited data existed including:
  - bacteriological surveys
  - fish tissue analysis;
- Ohio EPA intensive survey; and
- Combined sewer overflow initiatives in Cleveland and Akron.

The technical work reported here involved the collaboration of several local, state and federal public agencies involved in the Cuyahoga RAP. At the outset, the Cuyahoga RAP group confronted a large technical research agenda with very limited resources committed to the process. The Technical Committee established a program which has, to date, produced a substantial body of work, and which is ongoing. This approach included:

- Heightened coordination of ongoing Cuyahoga River-oriented field research in which public agencies were already engaged or had programmed.
- Development of a consensus among local, regional, state and federal public agencies, in concert with key private industries, on priorities for additional work needed during Stage One.
- Collaboration of technical resources of these agencies in the execution of the Stage One research program, focusing on selected use impairment evaluation objectives and model development.

By these means, fragmented approaches to water quality investigations were unified. In consequence, the resources available were concentrated and in effect leveraged a more comprehensive effort than would have been possible with the respective agencies operating on their own.

The technical work program that has been developed is reflected in several documents that are cited throughout the chapter and listed in the bibliography. Much of the completed work reported in summary form here is reported in detail in Chapters 4 and 5 and their supporting appendices.

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* This chapter will be updated as additional work is completed.

6.1 Technical Task Groups

Five technical task groups were organized to carry out the work activities reported here.[1] These included:

- o A Fish Tissue Task Group whose principal objective was to evaluate existing data on toxics in area fish and develop and implement a monitoring program to fill data gaps to determine if fish consumption is impaired in the Area of Concern;
- o Middle Upper Cuyahoga Area of Concern Task Group (Akron area) whose principal objective was to coordinate ongoing water quality studies in the river stretch above Independence Road during 1989-1990. Its focus was on bacterial data collection;
- o A Lower Cuyahoga Task Group whose principal objective was to coordinate ongoing water quality studies below Independence Road. 1990 objectives included a coliform study and data gathering to support modeling; and
- o A Modeling Task Group whose principal objective was to develop a mathematical model of transport and fate of pollutants in the lower Cuyahoga River with an emphasis on oxygen demanding substances.
- o A Bibliography Task Group to prepare a comprehensive bibliography of documents relevant to preparing a Remedial Action Plan for the lower Cuyahoga River. Annotations were added to assist CCC work groups in identifying useful documents and in determining their availability.

The research carried out by these task groups is summarized below. See Chapter 9 for identification of Task Group participants.

6.2 Bibliography/Data Base Development

The bibliography task group submitted its report in August 1989. A bibliography with 488 entries was compiled on a computer data base. Each entry contains 16 types of information. Annotations have been provided for 235 records. Keywords and codes have been formulated for 21 area and 549 subject annotations. An alphabetic listing of subject keywords has been developed which contains 989 entries.[2] The bibliography is updated in conjunction with search for water quality data. Efforts will continue to maintain and update it. (Refer to Appendix O).

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1 Cuyahoga Remedial Action Plan Coordinating Committee (CCC), 1989. Work Program of the Cuyahoga Remedial Action Plan Coordinating Committee, Approved December 14, 1989. Cleveland, OH. (Typescript)

2 Henderson, P.H., 1989. Progress Report on Cuyahoga RAP Bibliography: Report to Cuyahoga RAP Steering Committee from the Bibliography Task Group. August 16, 1989. Cleveland, OH. (Typescript)

WATER QUALITY DATA BASE

A computerized water quality data base was developed for the Cuyahoga RAP. Parameters include conventional pollutants and standard water quality field measurements, metals, bacteria, and nitrogen and phosphorus compounds. Data collected between 1986 to the present are included in the data base. Reasonably complete data are reported for 50 sites in the Area of Concern, including 20 sites in the Cuyahoga River Mainstem below Rockside Road to the mouth, 10 sites in the Lake Erie inner harbor area, 15 sites in the major tributaries to the lower Cuyahoga River, and 5 sites at public beaches along Lake Erie. More limited data are also available for the Cuyahoga River above Rockside Road.[3]

Information in this data base is available for background trend analyses. The data support the evaluation of local water quality problems and as input to the Ohio EPA led modeling effort for the Cuyahoga River*.

6.3 Hydrodynamic Model Development

Cuyahoga RAP participants recognized early on that efforts needed to be directed toward building a model to properly frame and quantify the linkages between contributing sources and in-stream conditions and their effect on beneficial uses. Water quality planners familiar with the Cuyahoga River have long recognized the need for a good model of the system. Indeed low flow dissolved oxygen modeling had been pursued in the river in the seventies as part of the water quality management planning effort carried out pursuant to Section 303e and 208 of the Clean Water Act.[4] The complexities of the river-lake interactions and the hydrodynamics of the river itself have overwhelmed previous efforts to model the system. The RAP process was viewed as a fresh opportunity to address the river model issue utilizing the very latest modeling techniques.

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* Access to the data base is available via:
Planning Department
Northeast Ohio Regional Sewer District
3826 Euclid Avenue
Cleveland, OH 44115

3 Ohio EPA DWQPA. Letter from S. Amragy to L. Stumpe dated December 7, 1989 re data base needs for Cuyahoga River model; NEORSD Cuyahoga River Water Quality Databases. January 1990.

4 Ohio EPA. 1974. Cuyahoga River Basin Waste Load Allocation Report for the State of Ohio 303(e) Continuing Planning Process for Water Quality Management; NOACA, 1979. Low flow dissolved oxygen modelling in the Middle Cuyahoga River. Technical Appendix A31.

6.3.1 Seminar

A Cuyahoga River Modeling Seminar was convened in Cleveland, Ohio on October 26, 1989. Seven local and out-of-state modelers gave presentations on: (a) the potential uses of a model for the Cuyahoga RAP effort and other water quality management objectives, and (b) the assumptions and limitation of models. The seminar culminated a three day program which involved reconnaissance of the lower river and harbor area, and several meetings of a Cuyahoga RAP Modeling Task Group.[5]

The Modeling Task Group proceeded to develop a consensus on objectives for building a model for the Cuyahoga River. These were reflected in a work plan prepared by Ohio EPA for a Cuyahoga River Modeling Study.[6]

6.3.2 Modeling Objectives

The overall aim of the modeling effort was to develop a WASP4 water quality model* to assess the impact of point and nonpoint source dischargers on water quality in the lower Cuyahoga River. Ohio EPA intends to employ the model to support the NPDES process, the evaluation of use designation and water quality standard criteria, and the evaluation of Cuyahoga River RAP Stage 2 alternatives. This effort is planned for a four year period (October 1989 through September 1993.)

Activities begun during the first year included; (a) design of a WASP4 compatible data base format; (b) compilation of and input to the data base of all relevant stream and discharger data; and (c) design and execution of a data collection program for modeling. In order to acquaint committee members with the WASP4 modeling system, a three day training session was held in Columbus, Ohio in January 1990. Staff from Ohio EPA, NEORSD and NOACA were trained in the use of the model by USEPA personnel from the modeling laboratory at Athens, Georgia.

6.3.3 1990 Activities

Data collected during the 1990 summer field season included (a) routine sampling of physical and chemical parameters weekly at twelve sites; (b) flow measurements on two tributaries, Big Creek and Mill Creek, and the mainstem (at head of navigation (RM 5.6)); (c) measurement of sediment oxygen demand at six sites in the ship

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* WASP4 is the USEPA-developed system that models stream water quality under dynamic conditions.

5 NEORSD. 1989. Cuyahoga River Modeling Seminar, Cleveland State University, October 26, 1989. Cleveland, OH (Typescript)

6 NEORSD. 1989. Memorandum from J.D. Graves to Cuyahoga RAP Modeling Committee; 11/20/89 Meeting Minutes (Typescript)

channel; (d) stream geometry measurements; and (e) measurements of in-stream decay rates.[7]

6.3.4 1991 Objectives

Data projected for collection during the summer 1991 season included additional routine sampling, measurements of sediment oxygen demand, in stream decay rates, sediment sampling, and measurement of mixing in the ship channel.

Other activities projected to be completed during the second year of the program included model calibration, model simulations, point source impact assessment and sensitivity analysis to determine data gaps.[8]

6.3.5 Future Directions

Work projected for the third and fourth year includes (a) efforts to assess nonpoint source impacts on water quality and (b) application of the model to evaluate Stage 2 alternatives for the Cuyahoga RAP.[9] This will require calibrating the model for conditions of high river flow.

6.4 Use Impairment Evaluations

The focus of field investigations has been on use impairments which have a potential direct affect on human health but for which only limited data exist.[10] This focus is necessary given limited resources. Two issues emerge following this logic*:

What is the frequency and extent of elevated levels of bacteria in areas of the Area of Concern where populations swim or boat?

What toxic contaminants are found in fish in levels sufficiently elevated to pose a health risk through human consumption?

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* It is worth noting that restrictions on drinking water is not addressed. Public water supply intakes are located outside the Area of Concern, and both the Cleveland Water Department and Akron Water Department databases are robust.

7 Ohio EPA DWQPA. 1990. Memorandum from S. Amragy to Cuyahoga RAP Modeling Committee: Ohio EPA Cuyahoga River Modeling Project: FFY 1990 Progress Report, August 30, 1990 (Typescript).

8 Ohio EPA DWQPA. 1991. Memorandum from G. Martin to Cuyahoga RAP Modeling Committee RC: Cuyahoga River Update Meeting April 18, 1991.

9 NEORSD. 1989. Memo from J. Graves.

10 CCC Work Program; Cuyahoga River Community Planning Organization Strategy for Funding Fish Tissue Analysis. (September 1990).

The following sections describe activities undertaken to help answer these questions.

6.4.1 Bacteria Survey Objectives[11]

This study had several objectives:

1. Quantify the fecal coliform bacteria levels during dry weather conditions (no rain for at least 72 hours) throughout the Cuyahoga River Area of Concern;

2. Determine whether the river is now meeting the Ohio EPA Primary Contact Recreation standard during dry weather conditions;

3. Measure the extent to which the bacteria levels become elevated following rain-induced combined sewer overflows, urban stormwater runoff, and treatment-plant bypassing;

4. Determine how many days following a rain event it takes for bacteria levels to return to levels that meet the recreation standards;

5. Determine whether it is possible to develop a method to predict the instantaneous bacteriological conditions in the river based on precipitation, river flow, turbidity, etc.;

6. Identify other dry weather and/or wet weather sources of sanitary sewage.

6.4.1.1 1989 Study in the Middle Cuyahoga River Area of Concern (Akron Area)[12]

During 1989 the study focused on a thirty mile stretch of the river from Akron to Independence, Ohio (RM 42.6 to 13.2). Participants included the City of Akron, University of Akron, National Park Service staff from the Cuyahoga Valley National Recreation Area, the Ohio Department of Health and the Ohio EPA. Eleven sites were sampled during dry weather conditions on thirteen dates between April and October 1989. Six stations were sampled following five rain events where samples were collected over three consecutive days to track recovery. The full report with results can be found in Appendix I.2.

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11 CCC Draft Stage 1 Appendix I Summary of 1989 Bacterial Conditions in the Cuyahoga River, River Mile 42.6 to 13.2.

12 CCC Draft Stage 1 Appendix I Summary of 1989 Bacterial Conditions in the Cuyahoga River, River Mile 42.6 to 13.2.

6.4.1.2 1990 Study[13]

During 1990 the study area expanded to include the entire Cuyahoga River Area of Concern including the nearshore area of Lake Erie, with an emphasis on the portion of the river below Independence, Ohio. Participants included NEORSD, NOACA, the National Park Service, the Ohio Department of Health and Ohio EPA. Twenty-seven sites were sampled, including seventeen river sites and ten nearshore area sites. Twelve river sites were sampled on 21 days, and 5 river sites were sampled on 12 days. In addition, the three uppermost river sites were sampled five times a week over a seven month period from April to October. In the nearshore area, two sites were sampled seventeen times and eight were sampled five times. The full report can be found in Appendix I.1. Results are summarized below.

6.4.1.3 Results and Future Work

Data collected show that the bacteria levels established for Water Quality standards for Recreational Uses are exceeded periodically all along the river and nearshore zones of the Area of Concern. In general, low bacteria counts are found during dry weather periods throughout most of the Area of Concern. High bacteria counts may result from combined sewer overflows and nonpoint source runoff during wet weather periods. A wet weather period is defined as a day when the weighted precipitation is 0.20 inches or more and the following two days.[14]

During 1991 the bacteria studies continued. Ohio EPA intensive surveys will analyze for fecal coliform bacteria as lab allocations allow. Plans are to monitor 7 sites from Burton-Middlefield, and 25 sites from Kent to the navigation channel, and 15 assorted surveys in the navigation channel (see p. 6-12 below). The City of Akron will monitor conditions at sites on the Ohio Canal and Little Cuyahoga River four times during wet weather periods. The NEORSD effort will focus on its CSO monitoring project and regular maintenance monitoring.

The 1991 CVNRA effort included three sites (Ira, Boston, and Old Rockside Road) with daily sampling during dry weather conditions. Cuyahoga Street and Front Street sites will be sampled following rain events to identify pollutant sources. In addition the CVNRA plans floating sites on the Little Cuyahoga for the same purpose. The CVNRA also plans a special five-day survey at Peninsula, Zelenski Court - Boston Mills, and the Canal.

Finally, the USGS in cooperation with several participants in the Cuyahoga RAP process, initiated a four-year study in the Cuyahoga River to model fecal indicator measures (see p. 6-10 below).

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13 CCC Draft Stage 1 Appendix I Summary of 1990 Bacterial Conditions in the Cuyahoga River and Nearshore Area.

14 CCC Draft Stage One, Appendix I: Summary of 1991 Bacterial Conditions in the Cuyahoga River and Nearshore Area.

6.4.2 Fish Tissue Analysis Objectives

In 1989, the Cuyahoga RAP Fish Tissue Work Group developed a protocol for fish tissue collections to determine whether or not consuming fish caught from the Area of Concern poses a significant risk to human health.[15]

The purpose of the three year Cuyahoga RAP Fish Tissue study are to:

1. Determine the types of compounds that have accumulated in the edible portion of Cuyahoga River fish.

2. Determine the concentrations of those compounds that have accumulated in the edible portion of Cuyahoga River fish.

3. Compare collection stations within the AOC to determine if there are significant differences among various sections of the AOC.

4. Attempt to develop sufficient information to make recommendations to the RAP concerning additional fish tissue work that may be needed.[16] The information developed should have usefulness for future work that addresses the following issues:

    a) Determine if the consumption of fish from the Cuyahoga River poses a significant risk to human health.

    b) Determine if there is a significant risk to human health, and which species and which size classes of fish pose those risks.

Ultimately the goals of the effort will be to:

- o Determine the general area of the river basin that may contribute significant amounts of contaminants that have accumulated in fish tissue; and

- o Compare the Cuyahoga River fish tissue results from the AOC to results from other watersheds and areas to determine if there are significant differences among those sampling sites.

6.4.2.1 1989 Study

Fish were collected at seven sites in the Cuyahoga River during October 1989 with primary emphasis on the middle river area. Three to five fish of the same species and weight class, including two representative bottom feeders and two sport fish, were collected at each

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15 CCC Draft Stage One, Appendix C: Cuyahoga RAP Fish Tissue Sampling Protocol.

16 CCC Draft Stage One, Appendix C: Cuyahoga RAP Fish Tissue Sampling Protocol.

site. Resources for the collection and analysis of the samples and the interpretation of the results were supplied by Ohio EPA, ODNR, ODH, NEORSD, the City of Akron and CVNRA. Samples collected during 1989 were analyzed for percent lipid content, cadmium, chromium, lead, mercury, zinc, all organic priority pollutants (40 CFR part 122 Appendix D Table III), and all other tentatively identified compounds in Ohio EPA's mass spectrophotometer library. This effort was coordinated with USEPA's Bio-marker Study which is investigating sublethal effects on fish caused by environmental insults.

Ten volatile organic compounds (VOCs) were identified in fish tissue samples. In general, these compounds were present at very low concentrations. There are no U.S. Food and Drug Administration (FDA) action levels for any of the compounds detected. Twelve pesticides and PCB compounds were identified in the fish tissue samples. These compounds generally existed at very low concentrations, none of which exceeded any current FDA action levels.

Heavy metals in fish often receive the most concern from public health officials and the community, due to their potential for acute health effects. As expected, the highest levels were found in bottom feeding fish. The samples were analyzed for six heavy metal contaminants. The only metal which is regulated by FDA is mercury. The mercury concentrations detected in these samples did not approach or exceed FDA action levels. A summary of the compounds identified, the number of samples, and their concentration ranges are listed in Appendix C.I.[17]

6.4.2.2 1990 Study

During 1990 the sampling sites were expanded to fifteen locations including seven Lake Erie sites, six Cuyahoga River sites and two sites in nearby Lake Erie tributaries as reference sites. Sampling took place during September and October 1990. The Cuyahoga River Community Planning Organization joined the organizations listed above who contributed resources to the fish tissue program.[18]

Collection and analytical methodologies remained the same. Laboratory analysis of the 1990 fish samples is expected to be completed during the fall of 1991.

6.4.2.3 Future Activities[19]

Fish sampling in the third year will be scoped contingent upon results of the first two years effort and available resources. Beyond that, recommendations for further fish tissue collection and analysis are dependent upon results obtained during the first three years.

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17 CCC Draft Stage One Appendix C: Cuyahoga River Fish Tissue Evaluation.

18 Ibid.

19 Text of this section is excerpted from: CCC Draft State One Appendix C: Recommendations for Additional Subcommittee Efforts.

Tests consistently producing concentrations of parameters below levels considered to be of concern may be minimized in future analyses so that available resources may be appropriately redirected. An evaluation of the presence of contaminants of concern below method detection limits in the fish fillets may be conducted by measuring levels in fish organs where bio-concentration occurs. The USEPA Environmental Monitoring System Laboratory in Cincinnati is to provide assistance and guidance in this data collection and interpretation.

6.4.2.4 Possible Future Areas of Study Suggested

Creel surveys specifically targeted at fishing within the Area of Concern should be conducted to evaluate types, amounts, locations, and preparations of fish caught and consumed. Attempts should be made to identify segments of the population routinely consuming local fish, (i.e., subsistence fisherman) and, therefore, potentially at greater risk from any contaminants that may be present. Once such a segment is identified, human epidemiological studies, including blood tests, fat analyses, etc., could be conducted to determine to what extent contaminants may be present at a higher rate in these people than in the general population. Care must be taken to avoid drawing premature conclusions about the sources of any contamination detected when factors other than fish tissue consumption could be contributory.

There is also a need to address risk perceptions of fisherman and the problem of risk communication to affected populations.

The establishment of a long-term fish tissue monitoring program for the Area of Concern is recommended. Guidance for the frequency and focus of a long-term program should be provided by the first three years of fish tissue collection and analysis. If funding were available, further study could incorporate additional analyses, such as of whole fish, skinned fillets, cooked fish, seasonal variation, etc.

Fish tissue work summarized here is documented in Appendix C.

6.5 U.S. Geological Survey Cuyahoga River Bacteriological Study[20]

This investigation involves the U.S. Geological Survey as lead investigator with local financial and inkind cooperation provided by Akron, NEORSD and the RAP participants. High bacteria counts are experienced in many areas of the Great Lakes and their tributaries after rainfall and runoff, producing potentially unhealthful water quality conditions for water contact recreation. These elevated levels are associated with contamination of surface waters by sewage and pathogenic microorganisms. During periods of runoff, recreational-quality conditions

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20 Text of this section is excerpted from: USGS Ohio District Office 1991 Proposal Summary Revised January 1991: E. Coli Modeling on the Cuyahoga River.

can deteriorate rapidly due to transport of contaminated storm waters and combined-sewer overflows to the lakes and their tributaries. For example, recreational use of the Cuyahoga River (within the Area of Concern) is supported by water quality conditions that meet water quality criteria during dry weather, but is not supported after rainfall and runoff because of sewage and associated bacterial contamination. The suitability of the Cuyahoga River and other surface waters for recreation is evaluated based upon levels of fecal-indicator bacteria found in representative samples.

The goals of this project are to develop a tool for use by resource managers to predict fecal-indicator bacteria levels under rainfall and runoff conditions.

In the first two years of this four-year project the objectives are to quantify the relative importance of riverine processes including transport, die-off, sedimentation, and resuspension of Escherichia coli (E. coli) and fecal coliform bacteria in a segment of the Cuyahoga River. In the third and fourth years, measurements of these processes will be applied in a model simulation of the river to predict when levels of E. coli and fecal coliform bacteria will exceed established safe levels during and after runoff periods.

The proposed work will be financially supported by three independent public agencies and one non-profit organization: the USGS Water Resources Division, the City of Akron, the Northeast Ohio Regional Sewer District, and the Cuyahoga River Community Planning Organization.

The U.S. Geological Survey's Ohio District Office will be responsible for the major part of the data collection activities and all modeling and report preparation and publication for the project. The three public agencies and one nonprofit organization are collaborating to fund this project and will cooperate and coordinate their activities within the study area to accomplish the objectives of the project. The three local agencies are involved with the Cuyahoga River Remedial Action Plan.

6.6 Ohio EPA 1991 Intensive Survey for the Lower Cuyahoga River and Shipping Channel[21]

The Cuyahoga River Basin will be monitored during 1991 as part of the five-year basin approach adopted statewide by the Ohio EPA. This approach enables the agency to focus major resources on selected watersheds once every five years. NPDES permitting is one of the primary objectives, but other water quality issues and needs are also addressed, such as key issues identified by the RAP. The entire mainstem of the Cuyahoga River from Burton to the mouth will be assessed,

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21 Text of this section is adapted from Ohio EPA DWQPA Memorandum dated June 17, 1991 from T. Mount to Lower Cuyahoga Task Group re: 1991 Lower Cuyahoga and Shipping Channel Study Plan.

plus several tributaries. Ohio EPA's objective is, therefore, to evaluate water quality standards both within and above the Area of Concern. The surveys will incorporate chemical testing of water and sediments plus biomonitoring of fish and benthic macroinvertebrates. The biological monitoring evaluates the health of the aquatic communities present in the river and is reflective of the overall health of the ecosystem.

The study areas covered in the plan include the industrial areas of Akron and Cleveland as well as the Cuyahoga Valley National Recreation Area. The objectives of the 1991 study are as follows:

- to assess impacts of various sources and determine the need for further remediation with an emphasis on NPDES permitting,
- to evaluate CSO impacts and document water quality recovery in the Akron area,
- to continue to determine chemical and biological trends at historical sites, both spatially and temporally,
- to sort out causes and sources of impact in the industrial areas in Cleveland,
- to collect physical and chemical data in the shipping channel required for water quality modeling,
- to gather data needed to designate a use for the shipping channel, and
- to assess several source-impact areas in Lake Erie near the mouth of the Cuyahoga.

Biological monitoring was conducted in the mainstem in successive years between 1984 and 1988. The 1991 survey will represent the first complete follow-up survey since 1984, and the results will show how much progress, if any, has been made towards full attainment of the Warmwater Habitat (WWH) aquatic life use in the mainstem.

Modeling is in progress for two areas of the Cuyahoga River. As noted above a WASP4 complex model is being developed for a dissolved oxygen (D.O.) simulation of the shipping channel. A QUAL2E model for a D.O. simulation of the mainstem from the NEORSD Southerly WWTP to the shipping channel is also underway.*

The aquatic life use designation in the shipping channel (presently undesignated) is scheduled to be determined by September 1992. The results of the D.O. simulations will be used to support the use designation process. Existing biological and physical habitat data will be used to supplement this activity.

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* QUAL2E is USEPA's model for evaluating water quality in streams under steady state conditions.

6.6.1 Water Quality

Chemical water samples will be collected six times in the upper reaches of the study area (Lake Rockwell to Big Creek) and 15 times in the lower reaches (Big Creek to mouth) at a total of 32 sites. Fecal coliform bacteria will be collected at selected sites as resources allow by Ohio EPA NEDO and analyzed by the Ohio Department of Health.

Three decay-rate surveys to support modeling activities will cover 28 sites (many of which overlap the chemical sites). The surveys include one survey under low-flow conditions (<200 cfs at Independence), one rain event, and one non-flow-dependent survey restricted to the shipping channel. Composite samples instream and at several point sources will be collected during these surveys.

Datasondes programmed to measure temperature, conductivity, pH, and dissolved oxygen are scheduled to be deployed as part of regular modeling surveys in the lower reaches. In the upper reaches, sites are assigned a high/medium/low priority. The goal is to deploy datasondes at least three times in high priority sites, two times at medium priority sites, and one time at low priority sites. Datasonde use in the upper reaches will be coordinated through the study team leader.

Sediment samples to be collected at 30 sites will be analyzed for metals, volatile organics, BNAs, PCBs, and pesticides. Additional sediment samples for metals analysis will be collected to study spatial and temporal variability of sediment characteristics.

6.6.2 Macroinvertebrate Communities

Ohio EPA will undertake both quantitative analyses using an artificial substrate methodology and qualitative analyses using natural substrate sampling methods at 27 sites including 24 sites on the Cuyahoga mainstem and three in the Lake Erie near shore area.

6.6.3 Fish Communities

The 27 sites sampled for macroinvertebrates will also be sampled for fish. Sample frequency will be three times for boat sites and two times for wading sites.

6.7 Northeast Ohio Regional Sewer District's CSO Characterization Study

A $4.4 million planning study on combined sewer overflows was initiated by the NEORSD in February, 1991.[22] The NEORSD service area includes 75 square miles served by combined sewers and 121 points where combined sewers can overflow to the environment during a rainstorm. This study will be a two-year effort which seeks to:

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22 NEORSD 1990 Request for Proposal: Combined Sewer Overflow Facilities Plan Phase I. November 1990.

a. Improve the operation of the existing combined sewer system.

b. Develop CSO control strategies which address water quality concerns in selected study areas. The six early action study areas are:

1. E. 55th at Lake Erie - CSO discharges to Lake Erie
2. Lakeshore Blvd. at E.156th - CSO discharges to Lake Erie
3. St. Clair at E.185th - CSO discharges to Euclid Creek
4. Cranwood Pump Station Area - CSO discharges to Mill Creek
5. E.173rd at Elmer Avenue - CSO discharges to Mill Creek
6. W.45th at Memorial Shoreway - CSO discharges to Old Cuyahoga Riverbed

c. Begin the development of a Master Plan for CSO control in the NEORSD service area.

This effort is described in more detail in Chapter 7.

6.8 City of Akron's CSO Characterization Study

The City of Akron launched a study in July 1991 to characterize CSOs which discharge into the Ohio Canal between Summit Lake and the Little Cuyahoga River.[23] The study will focus on seven CSOs, serving approximately 3,582 acres, which overflow into the Ohio Canal. The study product will be a report which will provide the following:

a. An overview of the sanitary, combined and storm sewer sewer systems with emphasis on the combined sewer system, overflows and storm sewer outlets in the study area;

b. An overview of the impacts on the rest of the system by the combined system and vice versa;

c. An understanding of the hydraulics of the combined sewer interceptor, racks and overflows within the study area;

d. A summary of the Ohio Canal water quality based on existing data and data generated as part of this study;

e. A summary of the impacts on and by current, planned and potential development along the Canal and along the combined sewer interceptor;

f. A discussion of current and proposed State and Federal regulations regarding combined sewer overflows (CSO's) and the impact to the combined sewer system in the study area;

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23 City of Akron's Proposal for Engineering Services for the Ohio Canal Overflow Study, prepared by Havens and Emerson, Inc. July 10, 1991.

g. A summary of CSO abatement measures which may be needed and/or required; and

h. Detailed plan of study for future analysis of the study area including a detailed flow monitoring, sampling and modeling program.

This effort is described in more detail in Chapter 7.

6.9 Sediment Bioassays and Related Work

The NEORSD is performing bioassays on sediment samples taken in the navigation channel of the Cuyahoga River and nearshore areas of Lake Erie. This effort complements the sediment chemistry work undertaken by Ohio EPA and funded by USEPA (see above summary of intensive survey). NEORSD sediment analysis includes seive size and Total Organic Carbon. The sediment bioassay work will take six months to a year to complete.

The University of Akron is developing a new analytical technique to screen sediment bioassay results using microtex and nitrifying bacteria. Appendix G-6 contains a preliminary report from the University of Akron of 12 sediment samples performed in the summer of 1991.

The results of this collaborative effort of Ohio EPA, USEPA, NEORSD and the University of Akron will be combined in a single report which examines chemical concentrations vs. actual toxicity in Cuyahoga River Area of Concern sediments.

6.10 Ongoing Issues

6.10.1 Use Designation for Navigation Channel

Ohio EPA's intensive survey and low flow river modeling activities will be the basis for proposing appropriate use designations for the Cuyahoga ship channel.

A task group of the RAP Technical Committee will be assembled to review the technical basis and consider other technical factors which affect the development of appropriate use designation for the ship channel.

6.10.2 Wet Weather Modeling

Ohio EPA's initial work is focused on development of a model for projecting conditions during low river flow conditions.

The model will need to be calibrated for periods of high river flow. The present lack of good flow data in the lower section of the river makes high flow modeling difficult. This limitation will be greatly reduced with the recent installation of a new permanent flow monitoring site at the head of the navigation channel. The model could also be used to investigate issues of transport and fate for specific pollutants of concern which are identified in the RAP process.

The goal is to understand the impact of nonpoint sources of pollution as well as storm sewer and CSOs, as well as the benefits of controls.

6.11 Summary of Collaborating Agencies

This chapter reports on a wide range of collaborative efforts among agencies involved in the Cuyahoga RAP process. Table 6-1 summarizes the roles of collaborating agencies involved in the Cuyahoga RAP technical work activities described in this Chapter.

TABLE 6-1

SUMMARY OF AGENCIES COLLABORATING IN THE TECHNICAL WORK ACTIVITIES**
OF THE CUYAHOGA RIVER REMEDIAL ACTION PLAN

	Bibliography	Water Quality Data Base	Water Quality Model	Bacteria Survey	Fish Tissue Survey	Sediment Quality	Bacteria Die Off Mod
Ohio EPA	P T D	F D	P F L M T D	P F R M T D	P F M L R T D $	P R M D F	P –
ODNR	--	--	--	--	P F T	--	--
ODH	--	D	--	P L	P T R	--	--
CVNRA	--	F D	--	P R F L D M	P F $	--	P –
USEPA	--	--	T F	--	T	L	--
USGS	--	--	P F L T D $	P F R L*	--	--	P $ L F R M
OWDA	--	--	--	--	--	--	$
Akron	--	D	--	P F L T D R M D	P $	--	P $
NEORSD	P M D	F M D	P F	P F L T D R M	P F M R $ L	P R $ D	P $
NOACA	P D	--	P F	P T F M R $	--	--	--
Univ of Akron	--	--	--	P F L	--	L	--
CRCPO	--	--	--	--	$	P R D	P $
CVCC	P R M D	--	--	--	--	--	--
Harshaw Chemical	D P	P T	--	--	--	--	--
US Fish & Wildlife	--	--	--	--	P T	--	--
Ohio Lake Erie Fund	--	--	--	--	$	--	--
SCS, USDA,	P D R T	--	--	--	--	--	--

P – Planning and Analysis
F – Field Sampling or Data Compilation
L – Laboratory Support Services
R – Report Writing
M – Management
T – Technical Assistance
D – Data Input
$ – Provided Financing

* Starting FFY 1992

** See Chapter 10 for the indivduals who participated in various technical work activities.

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CHAPTER 7
RESEARCH PRIORITIES AND AGENDA

7.1 Background

This chapter summarizes research priorities for fully addressing issues of Stage One documentation in the Cuyahoga Area of Concern. In Section 7.3, it also sets forth an urgent research agenda that in the judgement of the Committee warrants immediate implementation.

Annex 2.4 of the Great Lakes Water Quality Agreement specifies that a Stage One Report should define the beneficial uses that are impaired, the degree and extent of such impairments, the causes of the impairments and all the known sources of pollutants involved. Because the Coordinating Committee is unable to resolve all of the complex issues involved with identifying impairments and their sources at this time in Stage One, it recognizes a need to develop research priorities to fully satisfy Stage One requirements. Priority issues that are readily apparent now to be addressed in Stage Two and Three are also identified.

The Plan Drafting Committee, assigned responsibility for coordination of the plan drafting process by the Coordinating Committee, approached the identification of impairments and their sources through six subcommittees (Biota Impairments, Recreation Impairments, Toxics Consumption Impairments Socio-economic Impairments, Point Sources and Nonpoint Sources). Those subcommittees drafting the impairment-specific report elements addressed the listing criteria, the data used, the degree and extent of the impairment, contaminants of concern, the degree of confidence in the declaration of impairment and research needs to better define the impairment or increase the level of confidence in the declaration. In the course of addressing all of these issues, subcommittee members were encouraged to report any research needs or ideas that surfaced in the deliberations.

Those subcommittees drafting the source-specific report elements addressed descriptions of the sources, the geographic scope of the sources, the kinds of substances originating from the sources (and the loads when known), and suggestions for research or inventorying to enhance the database. Again each of these issues had the potential for spawning a research need or idea and committee members were encouraged to report research ideas that surfaced in the process.

Needs for additional research also developed as the RAP technical work advanced. These are documented in Chapter 6, and also included in the research priorities presented here.

Finally, the PDC identified research needs as part of the work of a task group that was mobilized to document source-impairment linkages.

Out of the report drafting effort, about 70 impairment-based research needs and 43 source-based research ideas were identified. These are documented in full in Appendix M. Of these 113 research suggestions, a number of ideas are of priority to the RAP process for one or more of the following reasons:

- it addresses a Stage One information deficiency;
- it will help to evaluate an anticipated remedial option in Stage Two;
- it will set underway a needed program for recovery monitoring during Stage Three; or
- it directly addresses a human health or ecosystem health list/ delist criterion.

The Plan Drafting Committee determined those priority research needs by evaluating the impairment-based and source-based research suggestions developed by its subcommittees against specific criteria described below.

EVALUATION OF IMPAIRMENT-BASED RESEARCH

The impairment-based research needs were evaluated against these specific criteria:

1) Is the research important to furthering the identification of an impairment?

2) Is the research important to furthering the identification of a cause of impairment?

3) Is the research important to furthering the identification of a source of impairment?

4) Does the research aid significantly in the development of a standard for evaluating the impairment of beneficial uses?

5) Does the research significantly advance the ability to evaluate a possible remedial option in Stage Two?

6) Does the research contribute significantly to the capacity to monitor conditions or changes in conditions during Stage Three?

Finally, the overall importance of the research to help in addressing human health concerns and ecosystem health concerns in the Cuyahoga River Area of Concern was taken into account.

EVALUATION OF SOURCE-BASED RESEARCH

The source-based research needs were more specifically evaluated against a source's overall importance with respect to the magnitude of its impact or perceived impact on the Area of Concern, and the significance of its impact on human health or the ecosystem.

RESEARCH PRIORITIES

The impairment-based and source-based research priorities that emerged from this evaluation process follow in 7.2. These include 37 impairment-based research priorities and 11 source-based research priorities.

RESEARCH AGENDA

Section 3 is a research agenda that reflects issues warranting immediate investigation. These comprise a short range research agenda which will help bring closure to the most important Stage One reporting requirements.

7.2 Research Priorities (These are not organized in order of priority)

7.2.1 These research needs will further the identification of impairments specific to meeting criteria in the GLWQA Annex 2.

1. Conduct a thorough community survey of seasonal fish in and use of the navigation channel and nearshore area.

2. Develop a model of fecal coliform transport and die off under a variety of flow and weather conditions for the Area of Concern.

3. Determine the threat of combined low level contaminants to human health from fish consumption.

4. Conduct creel surveys specifically targetted at fishing within the Area of Concern to evaluate types, amounts, locations, and preparations of fish caught and consumed.

5. Determine the actual threats to human health and safety caused by recreational contact with toxics which have historically entered Area of Concern waters and those which could enter the waters.

6. Investigate the extent to which the Cuyahoga River sediments are acting as a source of contamination, or a sink for contaminants, and the degree to which dredging activity resuspends contaminants in the water column.

7. Conduct tissue studies of various wildlife species inhabiting the basin to determine whether common pollutants such as mercury, cadmium, PCBs, hexachlorobenzene or certain other organics

are present, and the extent to which such compounds are impacting the wildlife populations in the basin.

8. Conduct sediment and water column bioassays with fish to determine cause and effect of contamination that is possibly present on various species.

9a. Conduct liver histopathic studies (internal examination) on fish from the Ohio Edison Dam (RM 44.5) to the Navigation Channel.

b. Conduct liver histopathic studies plus DELT anomalies assessment (external examination) of fish in the nearshore area outside of the breakwall area.

10. Conduct sediment bioassays at unimpaired harbor areas to establish expected performance levels at other control sites within the central basin of Lake Erie.

11. Conduct sediment bioassays with benthic macroinvertebrates of river sediments to evaluate if sediment toxicity is a problem to these organisms.

12. Conduct more frequent E. coli testing, and coliform testing in general, at beaches during the recreation season for two to three years to accurately portray the status of impairment to swimming.

13. Determine if anglers in the Area of Concern seek fish for food or merely for recreation.

14. Conduct a thorough survey of the fish populations of the nearshore area, revisiting at least those sites previously surveyed in past studies.

15a. Collect more current recreation visitation data which are specific to the Area of Concern.

b. Collect better facility data for the Area of Concern.

7.2.2 These research needs will help to identify sources of known impairments in the Cuyahoga Area of Concern.

1. Conduct studies to quantify various sources of PAHS.

2. Determine the exact sources of high bacteria levels during various weather conditions, e.g., rainfall events, wind direction, temperature, etc.

3. Standardize the selection of sampling location, collection methods (such as those for sample composting, etc.) and analysis methods (such as those for particle size determination, etc.) across institutions and agencies in order to increase comparability and significance of the sediment data.

4a. Create an inventory of industrial stockpile locations and types using a combination of bridge, boat and air surveys. Initial emphasis should be placed on the highly industrial areas of Cleveland and Akron.

b. Assess runoff potential from located sites of industrial stockpiles that store materials of concern, particularly those that have PAH compounds.

5a. Those potentially hazardous waste sites (listed on Ohio EPA's 1990 Unregulated Sites Master List) in the basin given a medium or high priority ranking under Ohio EPA's priority assessment should be further investigated as soon as possible. Ohio EPA maintains files on many of these sites, and the file should be reviewed for information on specific materials and quantities present at the site. If no information exists for a site or if a preliminary review of the file suggests the presence of contaminants of concern, it is recommended that Ohio EPA investigate that site.

b. Those potentially hazardous waste sites located over areas of high groundwater pollution potential should be investigated. ODNR's DRASTIC maps for the four counties should be obtained as they become available and reviewed with Ohio EPA's Unregulated Sites Master List to locate such sites.

c. Those low priority potentially hazardous waste sites (listed as such on Ohio EPA's 1990 Unregulated Sites Master List) should also receive attention. At a later date, the Ohio EPA files on these sites should be reviewed for the presence of contaminants of concern.

6. Develop models which would be useful for assessing NPS best management practices.

7a. Research the loadings of contaminants from atmospheric deposition to the land and water in the Cuyahoga River basin.

b. Research the contaminant contributions of local sources to the air (stationary point, area and mobile).

8. Using USACOE and NOACA erosion rate estimation procedures, develop a consensus on the locations and extent of highly eroding lands, and produce loading estimates of sediment to the river.

9. Refine the loadings estimates of pollutants associated with agricultural (crop) lands.

10. Review historical aerial photos to locate landfills in the Cuyahoga River basin that have not been identified.

11. Support county-level program efforts to better identify water quality problem areas.

12. Conduct research and demonstration projects in the areas of high soil erosion and soil slippage rates in the middle Cuyahoga River. The purpose of the research is to develop cost-effective methods to reduce the soil loss and sediment delivery to the Area of Concern.

13. Map discrete points of erosion outside the CVNRA in the Cuyahoga River basin below the Ohio Edison Dam (RM 45.1).

14a. Establish CSO/storm sewer loading rates to the river for "contaminants of concern" (See Section 5.4).

b. Determine the relative contribution of contaminant loads contributed by point sources versus nonpoint sources in CSO/storm sewer effluent.

15a. Develop methods of verifying site specific nonpoint source loadings estimates to the Cuyahoga River generated by NURP equations.

b. Verify site specific point source loadings estimates to the Cuyahoga River generated with LEAPs data.

16. Determine the percentage of the contaminant loadings in the waste water stream going to POTWs contributed by households versus industries.

17. Develop high flow models for evaluating impacts of contaminant loads under wet weather conditions.

7.2.3 <u>These research needs will address needed standards which in the judgment of the Committee are currently inadequate</u>.

1. Investigate methods of risk assessment as they apply to establishing restrictions on fish consumption.

2. Research and establish standards for contaminant levels of compounds in fish and wildlife not yet regulated for safe consumption purposes.

3. Define the health impacts of water pollution associated bacteria on recreationists.

What levels of bacteria really seem to generate problems?

What are the health effects? What age groups are most affected?

What percent of the users seem to be affected?

4. Conduct sediment bioassays to improve information regarding sediment conditions (toxicity, levels of contamination) and its affects on biota.

5. Establish a set of criteria for sediment classification (degree of contamination) based on cause and effect studies, bioassays, bioaccumulation/tissue analysis, etc.

6. Develop a sentinel species for the Area of Concern to facilitate the signal of environmental problems such as contamination of food source or loss of habitat.

7. Develop a Recovery Indicator for Lake Erie estuaries (mouths and navigation channels) and nearshore areas to establish practical attainment goals.

8. Collect data to better define the aesthetic problem. Measurable values for these impairments to aesthetics should be developed so that standards can be defined.

7.2.4 <u>These research needs will help to identify and evaluate remedial options for the Cuyahoga Area of Concern during Stage Two</u>.

1. Develop a dissolved oxygen model of the river (See Chapter 6).

2. Identify segments of the population routinely consuming local fish and, therefore, potentially at greater risk from any contaminants that may be present.

3. Collect data to identify any reduction in phosphorus loading since the restrictions on phosphorus in household detergents went into effect in Ohio on January 1, 1990. Research additional strategies to reduce phosphorus loadings to the river.

4. Examine the incidents of accidental spills and discharges for possible quantification of frequency and severity of impacts to water quality, biota and recreational uses of the water.

5. Determine the number of occurrences of medical refuse found on the Area of Concern beaches there have been and when.

7.2.5 These research needs will support monitoring requirements in the Cuyahoga Area of Concern during Stage Three.

1. Establish a long-term fish consumption monitoring program for the Area of Concern.

2. Continue fish community surveys to document improvements in composition, structure and overall health resulting from corrections.

3. Conduct periodic follow-up benthic macroinvertebrate community structure surveys to determine improvements, if any.

4. Continue to compile trends data on beach closings, warnings, and exceedances of water quality standards in the vicinity of beaches.

5. Conduct more frequent *E. coli* testing in the Area of Concern. Determine after 2 to 3 years of intensive data collection the most appropriate times to monitor for bacteria to determine when to post warnings to swimmers and water contact recreationists.

6. Establish a time series data set to monitor periphyton in the Area of Concern.

7. Continue to collect data (monitoring phytoplankton) at the water treatment plant intakes.

7.3 Research Agenda

The purpose of this second level of review was to identify key research priorities for a shorter range research agenda which will help bring closure to the most important Stage One reporting requirements. The research items in this are a subset and refinement of those found in the research priorities list, Section 7.2.

The following criteria were applied to establish a research agenda.

1) Is the research feasible (is funding and expertise reasonably available)?

2) Is closure in 1-2 years possible?

3) Is the research unique to the Cuyahoga Area of Concern (a local issue only)?

As a strategy to implement the RAP research agenda, the committee will identify agencies, universities, industries and organizations that could assist in either carrying out specific research or by providing funding. The research agenda will be circulated among these entities with the hope that appropriate RAP research agenda items are incorporated with their own research or funding agendas.

(Research proposals are not in priority order.)

IMPAIRMENT-BASED RESEARCH AGENDA

1. Establish a long-term fish consumability monitoring program for the Area of Concern. Guidance for the frequency and focus of a long-term program (collection and analysis of fish tissue) should be provided by the first three years (1989, 1990, 1991) of fish tissue collection and analysis by Ohio EPA, ODH and NEORSD and the City of Akron.

2. Creel surveys specifically targetted at fishing within the Area of Concern should be conducted to evaluate types, amounts, locations, and preparations of fish caught and consumed.

3. Define the geographic distribution of anglers in the Area of Concern. Determine whether pollution or perceptions of pollution are a factor in how anglers seek opportunities to fish. Determine if anglers seek fish for food or merely for recreation.

4a. Conduct tissue studies of various species other than fish inhabiting the basin to determine whether common pollutants such as mercury, cadmium, PCBs, hexachlorobenzene, or certain other organics are present, and the extent to which such compounds are impacting the wildlife populations in the basin. Dead chick tissue collected from rookeries could be useful.

b. Develop sentinel species for the Area of Concern to facilitate the signal of environmental problems such as contamination of food source or loss of habitat.

5a. Conduct liver histopathic studies on fish from the Ohio Edison Dam (River Mile 45.1) to Navigation Channel.

b. Conduct liver histopathic studies (internal examination) plus DELT anomalies assessment (external examination) of fish in the nearshore area outside of the breakwall area.

6. Develop a Recovery Indicator for Lake Erie Estuaries (mouths and navigation channels) and nearshore areas to establish practical attainment goals.

7. Conduct sediment bioassays at unimpaired harbor areas to establish expected performance levels at other control sites within the central basin of Lake Erie. Research the effects of the local sediments on the aquatic and benthic communities.

8. Compile trend data on beach closings, warnings and standards exceedances in the vicinity of beaches.

9. Bacteria

   a) Develop a model of fecal coliform transport and die off under a variety of flow and weather conditions.

   b) Conduct more frequent <u>E. coli</u> testing in conjunction with fecal coliform data collection.

   c) Determine after two to three years of intensive data collection the actual status of impairment to swimming and contact recreation.

   d) Determine after two to three years of intensive data collection the most appropriate times to monitor for bacteria to determine when to post warnings or close beaches.

   e) Determine the exact sources of high bacterial levels during various weather conditions, e.g., rainfall events, wind direction, temperature, etc.

10. Collect current recreation visitation data which are specific to the Area of Concern.

11. Quantify amounts and sources of debris.

12. Research the components of the Sediment Oxygen Demand in the Channel.

13a. Create an inventory of industrial stockpile locations and types using a combination of bridge, boat and air surveys. Initial emphasis should be placed on the highly industrial areas of Cleveland and Akron.

b. Assess runoff potential from located sites of industrial stockpiles that store materials of concern, particularly those that have PAH compounds.

14a. Ohio EPA should revisit each site on the Unregulated Sites Master List and reevaluate each using USEPA's HRSII criteria.

b. Those potentially hazardous waste sites (listed on Ohio EPA's 1990 Unregulated Sites Master List) in the basin given a medium or high priority ranking under Ohio EPA's priority assessment should be further investigated as soon as possible. Ohio EPA maintains files on many of these sites, and the file should be reviewed for information on specific materials and quantities present at the site. If no information exists for a site or if a preliminary review of the file suggests the presence of contaminants of concern, it is recommended that Ohio EPA investigate that site.

c. Those potentially hazardous waste sites located over areas of high groundwater pollution potential should be investigated. ODNR's DRASTIC maps for the four counties should be obtained as they become available and reviewed with Ohio EPA's Unregulated Sites Master List to locate such sites.

d. Those low priority potentially hazardous waste sites (listed as such on Ohio EPA's 1990 Unregulated Sites Master List) should also receive attention. At a later date, the Ohio EPA files on these sites should be reviewed for the presence of contaminants of concern.

15a. Research the loadings of contaminants from atmospheric deposition to the land and water in the Cuyahoga River basin.

b. Research the contaminant contributions of local sources to the air (stationary point, area and mobile).

16. Develop methods of verifying site specific nonpoint source loadings estimates to the Cuyahoga River generated by NURP equations.

POINT SOURCE RESEARCH AGENDA

17a. Establish CSO/storm sewer loadings rates to the river for "contaminants of concern." (See Section 5.4.)

b. Determine the relative contribution of contaminant loads contributed by point sources versus nonpoint sources in CSO/storm sewer effluent.

18. Verify site specific point source loadings estimates to the Cuyahoga River generated with LEAPs data.

19. Determine the percentage of the contaminant loadings in the waste water stream going to POTWs contributed by households versus industries.

20. Develop high flow models for evaluating impacts of contaminant loads under wet weather conditions.

CHAPTER 8
WATER QUALITY MANAGEMENT ACTIVITIES IN THE CUYAHOGA RIVER BASIN

8.1 Background: Cuyahoga River in the 1950s

A report on a comprehensive study of water pollution on the streams of the Cuyahoga River basin was reviewed to provide historical information on point source controls on the river.* The study outlined in this report occurred from 1954-1956. The discussion which follows summarizes key study findings and provides a brief comparison between 1954-56 point source controls and current conditions.

The water pollution study referenced in this report was performed by the Division of Sanitary Engineering, Ohio Department of Health. Data was collected during the last half of 1954 and the summer of 1956. The study covered the entire Cuyahoga River drainage basin, and centered on outlining the sources and effects of discharges of sanitary sewage and industrial wastes to streams in the basin.

At the time of the study, the Ohio Department of Health had adopted a policy of primary treatment of all sewage. When reviewing the contents of this report, it is apparent that although primary treatment of all sewage was the goal at that time, not all facilities met this goal.

Based on a 1950 census, it was estimated that sanitary sewage from 834,000 persons residing within the basin was treated at sixteen sewage treatment plants. Of the 15 treatment plants discharging directly to streams in the Cuyahoga basin, six provided primary treatment, with the remaining nine providing higher than primary treatment levels. The 16th discharged directly to Lake Erie. Untreated sewage from the City of Tallmadge, the Village of Monroe Falls and portions of the City of Cleveland discharged to streams in the basin. For comparison, in 1989, approximately 90 sewage treatment works serving in excess of 1,000,000 persons are within the Cuyahoga River or its tributaries. Today, all treatment plants are to provide a minimum of secondary treatment.

In 1954, significant quantities of industrial wastes were discharged into the Cuyahoga River basin. Untreated sanitary sewage from industrial establishments in the Flats area of Cleveland and from commercial buildings in Cleveland's Public Square area discharged directly to the Cuyahoga River. Various industries in the basin discharged organic, inorganic and acid wastes to the Cuyahoga River and tributaries without treatment. In 1989, approximately 90 industrial and/or commercial establishments had point source discharges to the Cuyahoga River basin. Each entity had an NPDES permit for its discharge, which outlined treatment, testing and reporting requirements.

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* Report of Water Pollution Study of the Cuyahoga River Basin: 1954-1956, prepared by the Sewage and Industrial Wastes Unit, Division of Sanitary Engineering. Ohio Department of Health, August 1960.

The effects of sewage and industrial discharges to the Cuyahoga River basin in the 1950s was obvious. Many miles of the river were devoid of oxygen. Lack of oxygen in the river obviously has a detrimental effect on all life forms within the river. Figure 8-1 provides a comparison of dissolved oxygen trends in the Cuyahoga River in 1954 vs. 1984. Dramatic improvements have been noted as a result of point source controls, with a corresponding improvement in the aquatic community. Additional data on dissolved oxygen levels in the Cuyahoga River continues to be collected.

In addition to dissolved oxygen problems in the river during the 1950s, the discharge of acid wastes at various points in the river reduced alkalinity levels by 50%. Thermal pollution problems were noted in various stretches of the river and oil, grease and tar deposits were prevalent.

In summary, serious pollution problems were noted in the Cuyahoga River basin during the 1950s. Untreated wastewater and inadequate treatment facilities contributed to the overall poor condition of the river. Data tables are provided in Appendix G listing historical sources of municipal pollution (Tables III A-F) and industrial pollution (Table IV) as noted in the 1954-56 study.

8.2 Summary of National Pollution Discharge Elimination System (NPDES)

8.2.1 History

Up until 1972, the emphasis in Federal legislation had been oriented toward water quality standards. With the enactment of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) a number of fundamental changes in the approach to achieving clean water were instituted. One of the most significant changes was from an emphasis on the ambient quality of streams to direct control of effluents through the establishment of regulations and standards which form a basis for the issuance of discharge permits. In addition, the 1972 Amendments required the development of pretreatment guidelines and standards to provide a uniform approach to the control of industrial pollutants introduced into publicly owned treatment works (POTWs).

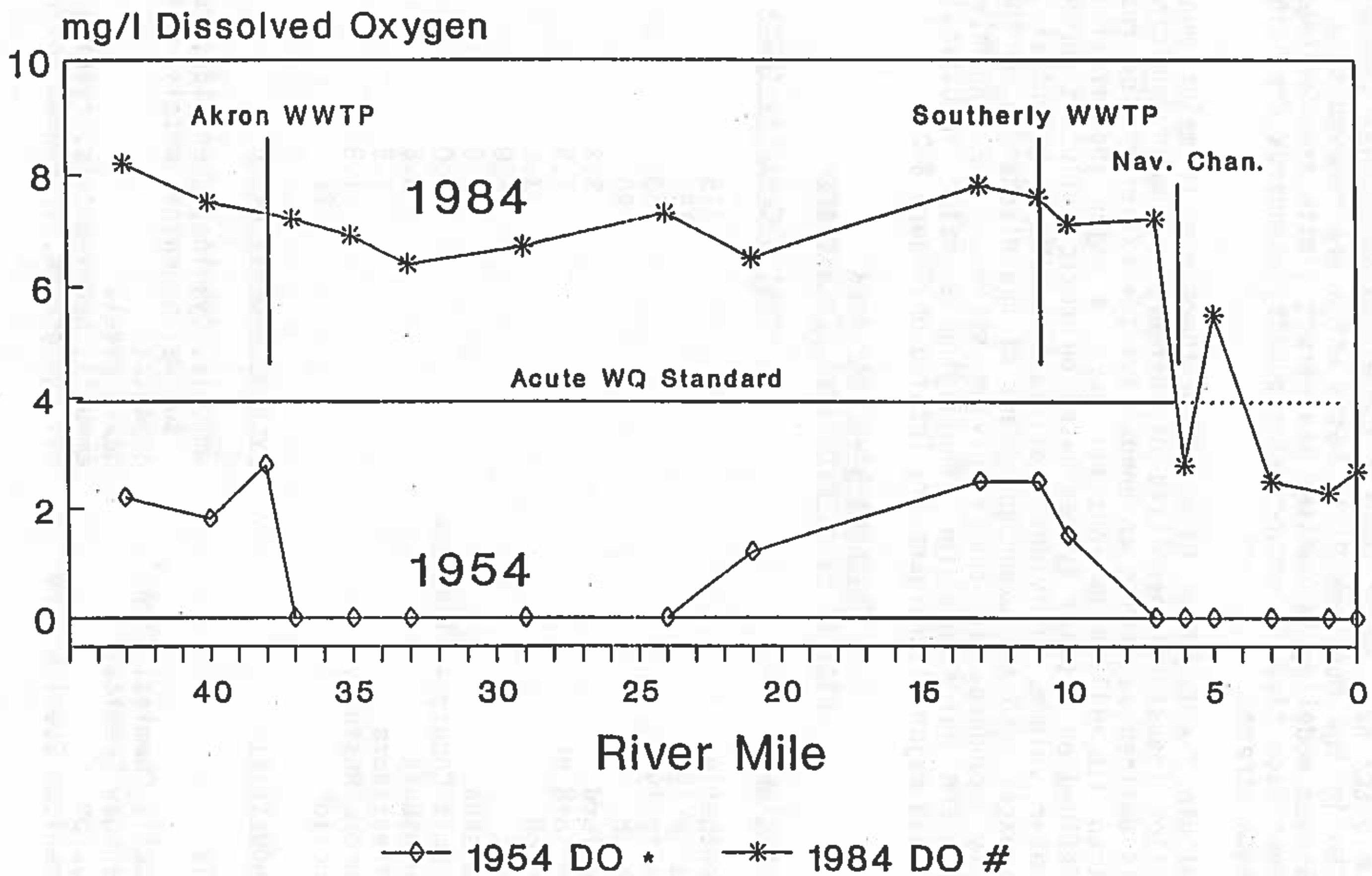
Public Law 92-500 established a national system for preventing, reducing, and eventually eliminating water pollution. By the creation of the National Pollutant Discharge Elimination System (NPDES), the Act has required that all point sources (including POTWs) obtain a permit for the discharge of wastewaters to the navigable waters of the United States.

As an additional measure designed to protect the quality of navigable waters, Public Law 92-500 also contains provisions that require regulating the pretreatment of non-domestic wastewaters contributed to POTWs.

The NPDES permit for each discharger regulates the degree of treatment necessary to protect stream uses, requires daily laboratory analysis

Figure: 8–1

CUYAHOGA RIVER DISSOLVED OXYGEN TRENDS



* One day grab samples
# Average of five sampling runs

DATA COMPILED BY OHIO EPA

to monitor compliance with specified treatment levels, and ensures the proper methods of sludge disposal are employed.

Ohio EPA has issued about 4,400 discharge permits statewide and about 150 in the Cuyahoga River basin which are renewed on a 5-year cycle. Stream modeling is updated and permit limits are reviewed for adjustment each time to ensure water quality standards are being achieved in each stream.

Within the Cuyahoga River basin there are 13 major municipal and 6 major industrial permitted dischargers. A major municipal discharger is defined as having an annual average existing flow rate of greater than 1.0 million gallons per day. A major industrial discharger is defined on a point system based on toxic pollutant potential, wastewater volume, individual pollutant loadings, potential public health impacts, and the expected effect of the discharges on the water quality standards in the receiving stream. See Appendix G7 for the U.S.EPA guidelines for identifying a major industrial discharger. These major dischargers are located on Figure 8-2.

Cuyahoga River RAP Area
List of Major Permitted Dischargers

Municipal	Design Capacity (MGD)
Southerly	175
Easterly	155
Westerly	50
Akron	90
Bedford	3.2
Bedford Hts.	7.5
Solon	3.6
Kent	5.0
Ravenna	2.8
Summit County - Fishcreek	4.0
Twinsburg	3.6
Streetsboro	2.5
Aurora Westerly	1.3
Euclid	22

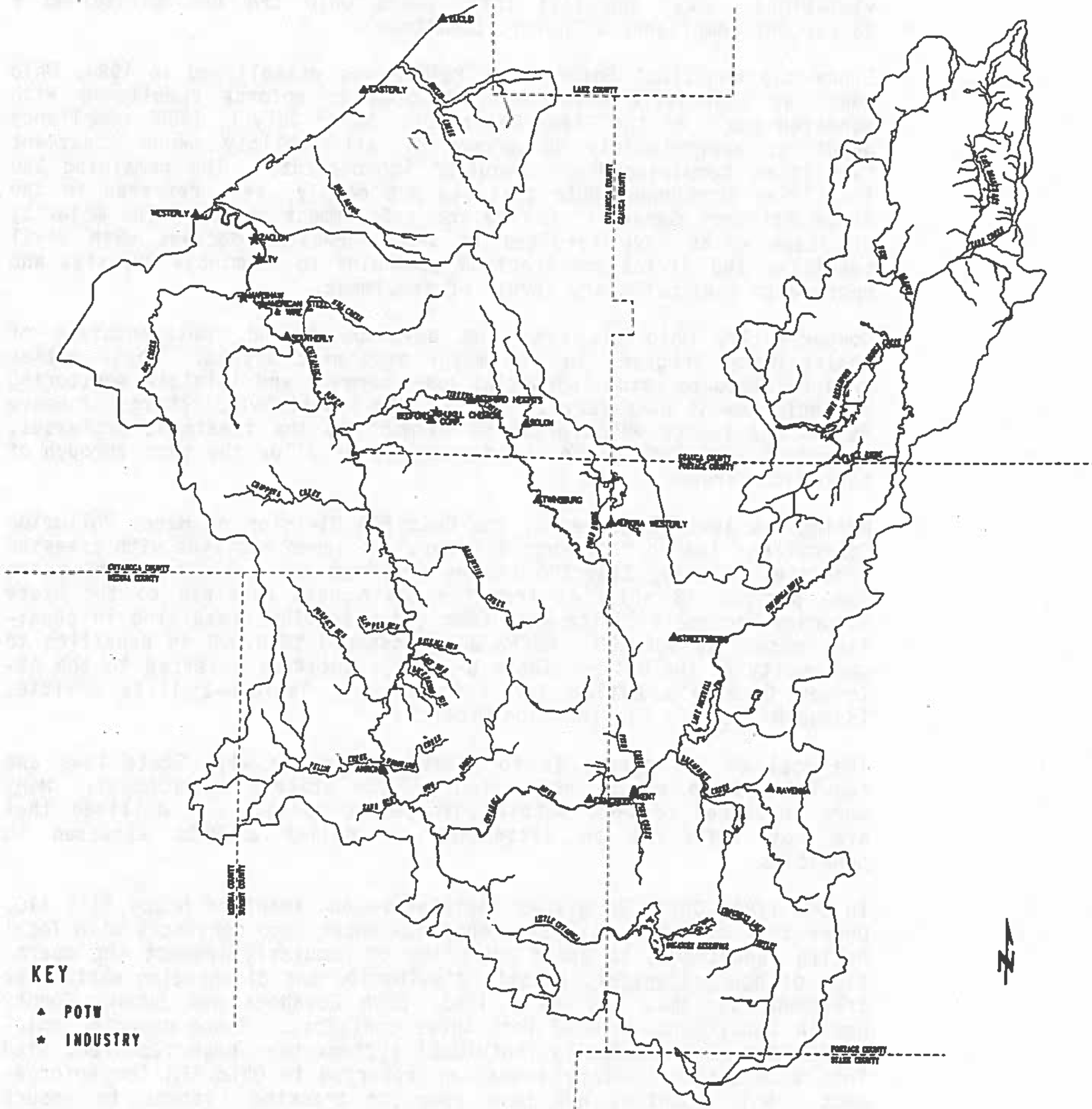
Industrial	Type of Process Waste
LTV	ammonia, cyanide, phenolics, suspended solids, organics, metals, oil and grease
Hukill Chemical Corp.*	organics
Harshaw Chemical*	heavy metals
Zaclon	ammonia, heavy metals, cyanide
American Steel & Wire**	oil and grease, suspended solids

* In the last five years, these entities have tied most of their process wastes into NEORSD sewers.

** American Steel and Wire recycles most of its process water and discharges to the river infrequently.

Figure: 8-2

MAJOR* PERMITTED DISCHARGERS IN THE CUYAHOGA RAP STUDY AREA



KEY

▲ POTW

★ INDUSTRY

* POTW'S – annual average flow greater than 1.0 mgd
INDUSTRY – point system based on toxic pollutant potential, wastewater volume, individual pollutant loadings, potential public health impacts and expected effects of the discharges on the water quality standards in the receiving stream.

** American Steel and Wire recycles most of its process water and discharges infrequently

8.2.2 Ohio EPA's Statewide Enforcement Program

To maintain compliance with NPDES permits held by all major industrial and municipal discharges, Ohio has committed to initiate appropriate enforcement action to resolve any significant effluent or schedule violations. Over the last three years Ohio EPA has maintained a 98 percent compliance with this commitment.

Since the Municipal Enforcement Policy was established in 1984, Ohio began an aggressive enforcement program to enforce compliance with mandated goals of the Clean Water Act. As of July 1, 1988, compliance deadline, approximately 85 percent of all publicly owned treatment facilities completed their required improvements. The remaining 260 facilities throughout Ohio that did not comply, were referred to the State Attorney Generals' Office for enforcement action. The majority of these cases have resulted in signed consent decrees with civil penalties and strict construction schedules to eliminate bypasses and upgrade to meet necessary levels of treatment.

Concurrently, Ohio was requiring development and implementation of Pretreatment Programs in all major treatment system. These cities were required to issue industrial user permits and initiate monitoring and enforcement necessary to control the industrial discharge of heavy metals and toxics which might be harmful to the treatment processes, interfere with safe disposal of sludges, or allow the pass through of toxics to streams.

During the last three years, the Ohio EPA Division of Water Pollution Control has issued "Findings & Orders" to seven entities with assessed penalties totaling $140,500 in the Cuyahoga River basin. During the same period, 18 entities from the basin were referred to the State Attorney General's Office with four cases settled, resulting in penalties exceeding $85,500. USEPA also assessed $250,000 in penalties to one entity in the basin. Table 8-1 lists entities referred to the Attorney General's Office for enforcement. Table 8-2 lists entities issued Director's Findings and Orders.

The goal of the Agency is to attain compliance with State laws and regulations to ensure protection of the State's environment. Many more instances of more subtle enforcement methods are utilized that are not reflected in litigation or dollar amounts assessed in penalties.

In May 1984, Ohio EPA gained legislative enactment of House Bill 110. Under this bill the Ohio EPA could now enter into contracts with local health departments to grant authority to regularly inspect the operation of <u>nonresidential</u>, on-site dissipation and discharging wastewater treatment systems. In early 1985, both Cuyahoga and Summit County Health Department entered into these contracts. Since program implementation countless faulty individual systems have been repaired, tied into accessible sanitary sewer, or referred to Ohio EPA for enforcement. Both counties now have computer tracking systems to ensure regular pumping of all residential and non-residential septic systems.

Table 8-3 is a summary of elimination of, upgrades to, or new permitted dischargers in the Cuyahoga River basin.

Table 8-1: Entities Referred for Enforcement Action

Municipal

Macedonia
Euclid*
Akron**
Aurora*
Hudson - to be abandoned (94)
Portage County* - Baronwood
Co. Home - to be abandoned (91)
Village Estates - abandoned (90)
Cuyahoga County - Richmond Park
- Scottish Highlands
- Hickory Hill
- Pepper Pike
Ravenna
Twinsburg
Solon Northeast
NEORSD Westerly**

Industrial

Lite Metals* - Ravenna
Lincoln Electric *

*State cases still pending.
**Federal cases still pending.

SOURCE: Ohio EPA Division of Water Pollution Control

Table 8-2: Entities Issued Director's Findings and Orders

General Electric - Tungsten Plant
Conrail
Climax Specialty Metals
United Ready Mix
Zaclon
Kent WWTP
Solon Central WWTP
Akron WWTP

SOURCE: Ohio EPA Division of Water Pollution Control

Table 8-3: Summary of Permitted Dischargers Elimination, Upgrades and New Permit Holders

Abandoned	Upgraded	New
GEAUGA COUNTY		
None	Burton (78) Middlefield (91) Middlefield Cheese (90)	None
PORTAGE COUNTY		
Gillie Estates (86) Rolling Estates (86) Arrowhead (86) Humphrey Park (85) Aurora - Geauga Lake (88) Walden (88) Four Seasons (79) Aurora Acres (88) Brimfield - Brimfield Plaza (81) Beechcrest (81) Holiday Inn (81) West Park (87) Village Estates (90)	Ravenna (92) Kent (86) Mantua (88) Portage Co. - Bolingbrook (88) Red Fox (88) Franklin Hills (88) County Home (88) Aurora Central (90)	Streetsboro (86) Aurora W. (88)
SUMMIT COUNTY		
Northfield (87) Hawthorne State Hsp (87) Tallmadge (81) Summit County - Hudson #6 (87) Nagy #7 (87) Macedonia #9 (88) Macedonia #15 (88) Greenwood Village #23 (86) Renee Estates Richfield (91) Roseland Estates (91) Hudson #5 (88)	Twinsburg (89) Hudson Village (88) Akron (86)	None

SOURCE: Ohio EPA DWPQ

Table 8-3: <u>Summary of Permitted Dischargers Elimination, Upgrades and New Permit Holders</u>

Abandoned	Upgraded
CUYAHOGA COUNTY	
Maple Heights (85)	Solon central (80)
Sharbon-Seven Hills (85)	Bedford (87)
Brecksville (85)	Bedford Hts. (84)
Walton Hills (85)	Southerly (87)
Solon - NE (89)	
Seneca Club Apts. (87)	
Broadview Hts. (86)	
Vineyard Apts. (87)	
Valley View Industrial Unsewered Area (90)	
Garfield Hts. Industrial Unsewered Area (91)	
Furhmeyer Rd. Plant	
E. Pleasant Valley Rd. Plant (Independence)	
Hawthorne Den	
Hub Parkway (Valley View)	
Strathmore (Valley View)	
Briarwood (Broadview Hts.)	
Bramblewood (Broadview Hts.)	
Avery Meadows (Broadview Hts.)	
St. Sava's (Broadview Hts.)	
Tollis Parkway Apts. (Broadview Hts.)	
Wallings Rd. School (Broadview Hts.)	
Royalton Hts. (North Royalton)	

Industrial Abandonment	Industrial Improvements Since 1985 or Planned*
Allside	
Bedford Anodizing	
Hukill-partial	
Ferro Co.	
Elco Co.	
Aluminum Smelting & Refractory	
Wabash Alloys	
HARSHAW-PARTIAL	
Norandex	
Great Lakes Etching	

*Information provided in Appendix G.1: Permitted Dischargers Survey Responses

8.3 Pretreatment Program

In the mid 1980's Ohio EPA approved the establishment of Pretreatment Programs at all cities in the basin with Wastewater Treatment Plant designed at 5.0 MGD capacity or greater. The Ohio EPA regulates categorical industries discharging to cities without approved Pretreatment Programs. Federal categorical pretreatment standards regulate the maximum level of pollutants certain industries can discharge to POTWs. Categorical pretreatment standards now exist for 34 industrial categories.

The cities with approved pretreatment programs were required to issue industrial user permits and initiate monitoring and enforcement necessary to control the industrial discharge of heavy metals and toxics which might be harmful to the treatment process, interfere with safe disposal of sludges, or allow the pass through of toxics to streams.

Within the Cuyahoga River RAP Area there are nine cities with approved pretreatment programs.

CITIES WITH PRETREATMENT PROGRAMS

The following includes (1) a list of cities within the Cuyahoga River RAP Area with approved Pretreatment Programs, (2) a list of pretreatment permits issued by Ohio EPA to industries within cities which do not have approved program. A significant industrial user (SIU) is generally defined as IU who has the potential to significantly impact the city's wastewater treatment plant. SIU's include all IU's subject to federal categorical pretreatment standards and IU's with discharges of 25,000 gallons per day or more of process wastewater to the city.

A. Municipal Permittees with Pretreatment Programs*

Akron
Bedford Hts.
Euclid
Kent
NEORSD
Ravenna
Solon
Summit County
Twinsburg

B. Permitted Indirect Dischargers in Cities with no Approved Program

Ben Venue Laboratories - Bedford
Lucas Aerospace - Aurora

* The industries required to pretreat, prior to discharging to POTWS, are listed by receiving POTW in Appendix G2.

8.4 Regionalization of Point Source Treatment

In the past, smaller "package" treatment plants or "on-site" (i.e., septic tank) systems have been utilized to provide wastewater treatment services to smaller communities and/or commercial/industrial establishments.

The construction of new interceptor sewers in portions of the Cuyahoga River Area of Concern has resulted in a trend towards "regionalization" of point source treatment.

As interceptor sewers have been constructed, many of the smaller, less-efficient package plants and on-site systems have been taken out of service. Incoming wastewater to these facilities are now being routed to an available sewer system, with flows eventually routed to larger wastewater treatment plants. Many responses to the point source survey (which was sent to all permitted point source dischargers in the Cuyahoga River watershed) indicated that tie-ins to a nearby sewer had taken place or were planned for the near future.

Examples of regionalization of point source treatment can be cited. In the NEORSD service area, interceptor construction has enabled the NEORSD to expand its service area. Communities such as Richfield, Olmsted Falls, Pepper Pike and Orange have recently joined the NEORSD. Various on-site systems and package plants will be eliminated once these communities tie-in to the NEORSD system.

Construction of the NEORSD-owned Cuyahoga Valley Interceptor, Heights/Hilltop Interceptor and Southwest Interceptor has eliminated (or will (eliminate) a variety of on-site systems, package plants, larger community wastewater treatment plants, pump stations, industrial discharges, and sanitary overflows.

8.4.1 Local Agency Planning Efforts

8.4.1.1 NEORSD

8.4.1.1.1 Control of Separate Sanitary Sewer Overflows

In the NEORSD Service Area, two types of sewer systems exist. In the late 1800s and early 1900s, stormwater runoff and sanitary sewage (from residential, commercial and industrial establishments) were routed to a single sewer known as a combined sewer. Most sewers within the City of Cleveland are combined sewers.

In the early to mid-1900s, sewer design practices changed. Instead of combining the stormwater flows with sanitary sewage in a single pipe, each flow component was separated. One sewer was provided for conveying stormwater runoff to a nearby water body while a separate sewer was utilized to collect the sanitary sewage portion for routing to a nearby wastewater treatment plant. Most suburban sewer systems within the NEORSD service area utilize separate sanitary and storm sewers. A number of separate sanitary sewer overflows exist within the separate sewer system, mainly to prevent basement flooding from occurring during wet weather. These overflows are routed to nearby water bodies.

Prior to the 1980s, separate sanitary sewage generated from the suburban communities in the NEORSD service area was routed through the combined sewer system on its way to various wastewater treatment plants. Beginning in 1985, two major separate sanitary interceptor sewer construction projects, the Heights/Hilltop and Southwest Interceptor projects, were initiated to route the separate sanitary sewage portion directly to the NEORSD's Easterly which directly discharges to Lake Erie near the eastern boundary of the Area of Concern and Southerly Wastewater Treatment plants respectively, bypassing the combined sewer system. In addition to interceptor construction, relief sewer and rehabilitation projects are being performed by the NEORSD and by local communities in an effort to control the occurrences of separate sanitary sewer overflows. The following discussion highlights these efforts:

HEIGHTS/HILLTOP AND SOUTHWEST INTERCEPTORS AND ASSOCIATED INTER-COMMUNITY RELIEF SEWER PROJECTS

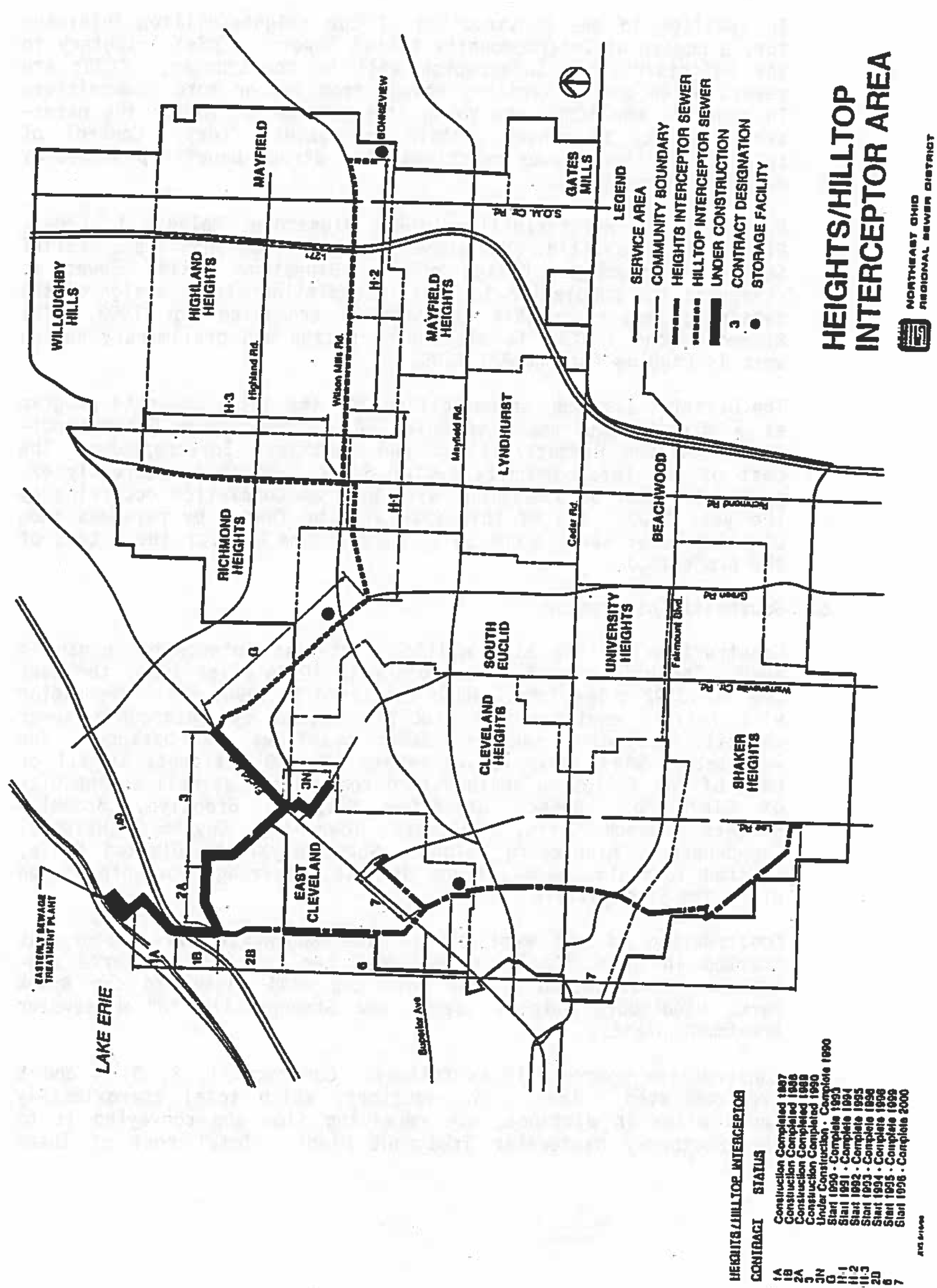
o Heights/Hilltop Interceptor

Construction of the $185 million Heights/Hilltop Interceptor began in 1985. This interceptor will total approximately 22 miles in length. Water pollution problems caused by inadequate sewer capacity in the eastern suburbs and sections of Cleveland will be alleviated when the interceptor is completed in the year 2000.

The interceptor will serve approximately 252,000 residents in all or parts of the following communities: Beachwood, Cleveland, Cleveland Heights, East Cleveland, Gates Mills, Highland Heights, Lyndhurst, Mayfield Heights, Mayfield Village, Pepper Pike, Richmond Heights, Shaker Heights, South Euclid, and University Heights. Sanitary sewage from these communities will be routed directly to the NEORSD Easterly Wastewater Treatment Plant.

The progress of construction is as follows: Contracts 1A, 1B, 2A, 3 and 3N have been completed. (Hilltop Contract 3, a $21.8 million contract is located within the cities of Cleveland and East Cleveland. 3N, a $1.8 million contract is located within the City of East Cleveland.) Construction of Hilltop Contract G started in January 1991. (This project will extend along Green Road and Euclid Avenue in Cleveland to Anderson Road in South Euclid.) (Figure 8-3 shows the project and current progress.)

Figure: 8-3



HEIGHTS/HILLTOP INTERCEPTOR AREA
NORTHEAST OHIO REGIONAL SEWER DISTRICT
LEGEND
SERVICE AREA
COMMUNITY BOUNDARY
HEIGHTS INTERCEPTOR SEWER
HILLTOP INTERCEPTOR SEWER
UNDER CONSTRUCTION
3 CONTRACT DESIGNATION
STORAGE FACILITY
HEIGHTS / HILLTOP INTERCEPTOR
CONTRACT STATUS
1A Construction Completed 1987
1B Construction Completed 1988
2A Construction Completed 1988
3 Construction Completed 1990
3N Under Construction - Complete 1990
Q Start 1990 - Complete 1993
H-1 Start 1991 - Complete 1994
H-2 Start 1992 - Complete 1995
H-3 Start 1993 - Complete 1996
2B Start 1994 - Complete 1998
6 Start 1995 - Complete 1999
7 Start 1996 - Complete 2000
LAKE ERIE
EASTERLY SEWAGE TREATMENT PLANT
EAST CLEVELAND
CLEVELAND HEIGHTS
SOUTH EUCLID
UNIVERSITY HEIGHTS
SHAKER HEIGHTS
RICHMOND HEIGHTS
LYNDHURST
BEACHWOOD
MAYFIELD HEIGHTS
HIGHLAND HEIGHTS
WILLOUGHBY HILLS
MAYFIELD
GATES MILLS
BONNIEVIEW
Superior Ave
Highland Rd.
Wilson Mills Rd.
Mayfield Rd.
Cedar Rd.
Richmond Rd.
Green Rd.
Fairmount Blvd.
Warrensville Ctr. Rd.
Lee Rd.

In addition to the construction of the Heights/Hilltop Interceptor, a number of Intercommunity Relief Sewers (ICRSs) tributary to the Heights/Hilltop Interceptor will be constructed. ICRSs are sewers which convey sanitary sewage from two or more communities. In general, the ICRSs are being constructed to provide the necessary capacity to convey certain wet-weather flows. Control of separate sanitary sewer overflows is a direct benefit provided by many of these sewers.

Design of the Heights/Hilltop ICRSs Bluestone, Belvoir 1, Cedar, Plainfield, Mayfield, Warrensville 1 and Warrensville 2 Relief Sewers is ongoing. Design of the Bluestone Relief Sewer is scheduled for completion in 1991. Completion of the design of the remaining sewers in this contract is scheduled for 1992. The Richmond Road 1 ICRS is also under design and preliminary design work is ongoing for the 3A1 ICRS.

The District assumed responsibility for the intercommunity program as a direct requirement of Ohio EPA's Construction Grant conditions for the Heights/Hilltop and Southwest Interceptors. The cost of the Intercommunity Relief Sewer Program is currently expected to total $115 million, with program completion occurring by the year 2000. All of this work will be funded by revenues from District sewer service charges. (See Figure 8-4 for the extent of the projects.)

o Southwest Interceptor

Construction of the $147 million Southwest Interceptor began in 1985. The Main Leg of this project is 10.46 miles long; the West Leg is 13.92 miles long. When completed in 1994, this interceptor will relieve environmental problems caused by inadequate sewer capacity including sanitary sewer overflows and backups. The interceptor will serve approximately 284,000 residents in all or part of the following southwestern communities as well as the City of Cleveland: Berea, Broadview Heights, Brooklyn, Brooklyn Heights, Brook Park, Columbia Township, Cuyahoga Heights, Independence, Middleburg Heights, North Royalton, Olmsted Falls, Olmsted Township, Parma, Parma Heights, Riveredge Township, Seven Hills and Strongsville.

Construction of the West Leg of the Southwest Interceptor was started in June of 1990. The West Leg consists of three contracts. Construction of the West Leg will eliminate the Brook Park, Middleburg Heights, Berea and Strongsville "A" wastewater treatment plants.

Construction progress is as follows: Contracts 1, 2, 3, 4 and 5 are completed. These five sections, which total approximately seven miles in distance, are receiving flow and conveying it to the Southerly Wastewater Treatment Plant. Total cost of these

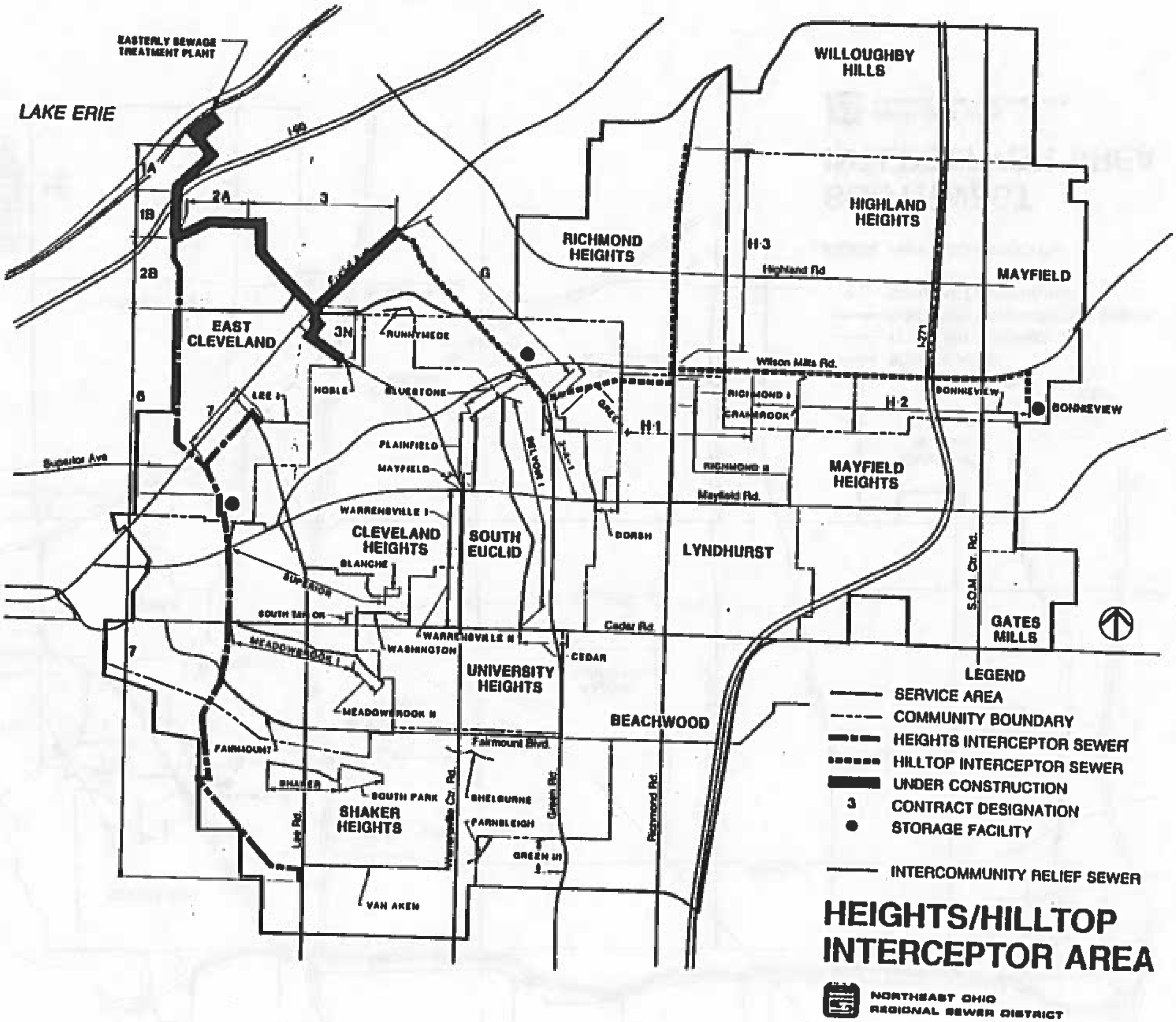


Figure: 8-4

HEIGHTS/HILLTOP INTERCEPTOR

INTERCOMMUNITY PROJECT	YEAR OF COMPLETION
Runnymede	1993
Bluestone	1994
Green II	1994
3-A-I	1994
Dorsh	1994
Plainfield	1995
Mayfield	1995
Warrensville I	1995
Warrensville II	1995
Richmond I	1995
Belvoir I	1996
Cedar	1996
Cranbrook	1997
Bonnieview	1997
Lee I	1998
Superior	1999
Meadowbrook I	2000
Fairmount	2000
Shaker	2000
Fernsleigh	2000
Noble	2000
Richmond II	2000
Blanche	2000
Washington	2000
South Park	2000
Green III*	2000
Meadowbrook II	2000
South Taylor	2000
Shelburne	2000
Van Aken	2000

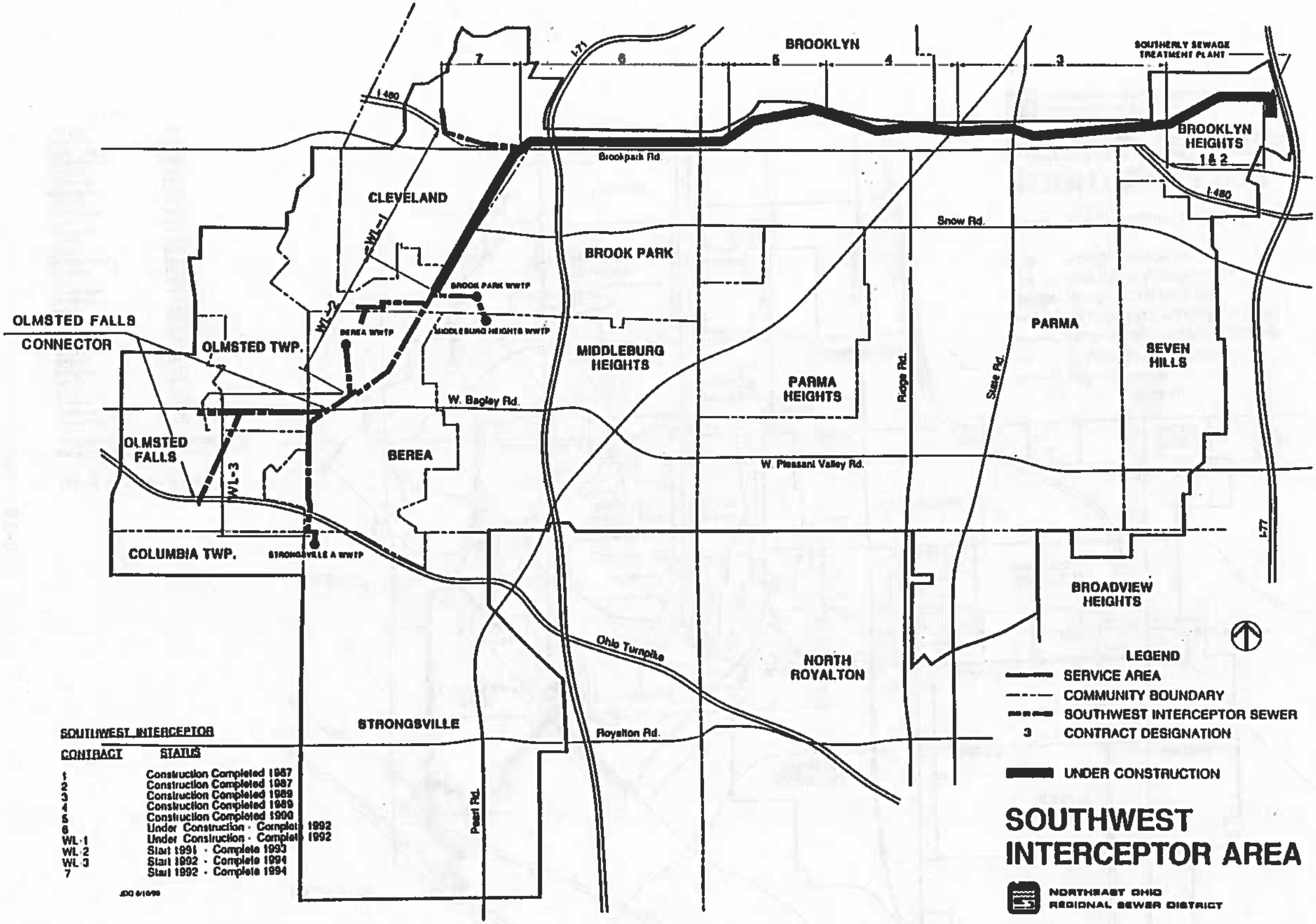
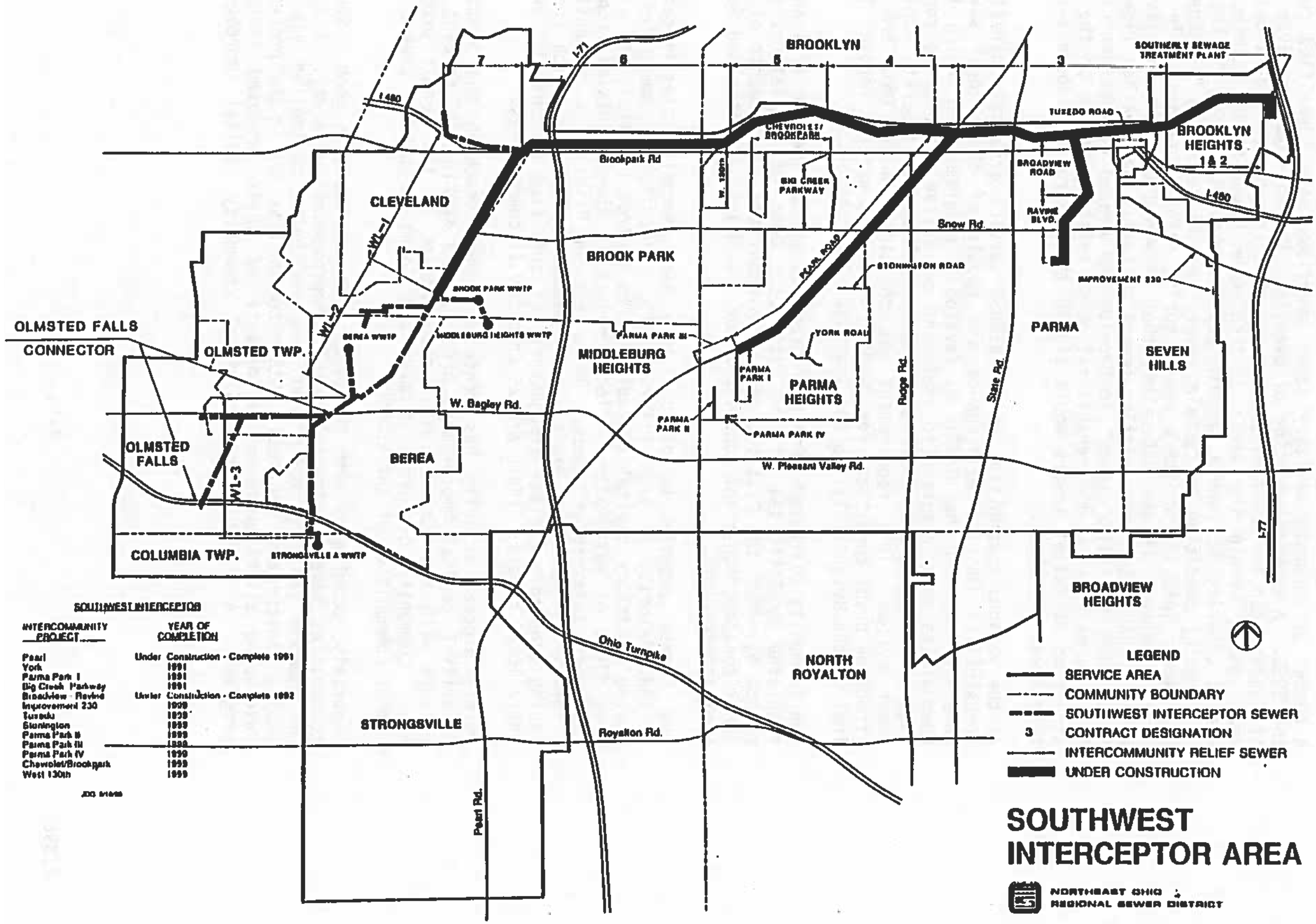

BROOKLYN
SOUTHERLY SEWAGE TREATMENT PLANT
7
6
5
4
3
I-71
I-480
Brookpark Rd.
BROOKLYN HEIGHTS
1 & 2
CLEVELAND
WL-1
WL-2
BROOK PARK
BROOK PARK WWTP
BEREA WWTP
MIDDLEBURG HEIGHTS WWTP
OLMSTED FALLS
CONNECTOR
OLMSTED TWP.
MIDDLEBURG HEIGHTS
PARMA HEIGHTS
PARMA
SEVEN HILLS
Snow Rd.
Ridge Rd.
State Rd.
W. Bagley Rd.
OLMSTED FALLS
WL-3
BEREA
W. Pleasant Valley Rd.
COLUMBIA TWP.
STRONGSVILLE A WWTP
I-77
BROADVIEW HEIGHTS
Ohio Turnpike
NORTH ROYALTON
STRONGSVILLE
Royalton Rd.
Pearl Rd.
SOUTHWEST INTERCEPTOR
CONTRACT STATUS
1 Construction Completed 1987
2 Construction Completed 1987
3 Construction Completed 1989
4 Construction Completed 1989
5 Construction Completed 1990
6 Under Construction - Complete 1992
WL-1 Under Construction - Complete 1992
WL-2 Start 1991 - Complete 1993
WL-3 Start 1992 - Complete 1994
7 Start 1992 - Complete 1994
JDG 6/10/90
LEGEND
SERVICE AREA
COMMUNITY BOUNDARY
SOUTHWEST INTERCEPTOR SEWER
3 CONTRACT DESIGNATION
UNDER CONSTRUCTION
SOUTHWEST INTERCEPTOR AREA
NORTHEAST OHIO REGIONAL SEWER DISTRICT

Figure: 8–5



SOUTHWEST INTERCEPTOR

INTERCOMMUNITY PROJECT	YEAR OF COMPLETION
Pearl	Under Construction - Complete 1991
York	1991
Parma Park I	1991
Big Creek Parkway	1991
Broadview - Ravine	Under Construction - Complete 1992
Improvement 230	1998
Tuxedo	1998
Stonington	1998
Parma Park II	1998
Parma Park III	1998
Parma Park IV	1999
Chevrolet/Brookpark	1999
West 130th	1999

JDO 9/16/88

Figure: 8–6

A number of separate sanitary sewer overflows were identified during the SSES. A complete listing of overflows in the Cuyahoga River Area of Concern can be found in Section IV of this report. Additionally, many sewers within the areas studied were found to be lacking the needed capacity to convey certain wet-weather flows (due to the deteriorating condition of certain sewers and the resulting "leakage" of stormwater into the sanitary sewers during rainfall events). In certain instances, it was determined that it would be cost-effective to either rehabilitate the existing sewers to reduce wet-weather flows or to provide a "relief sewer" to provide the needed wet-weather capacity. In many cases, the rehabilitation of existing sewers or the construction of relief sewers would aid in the control of separate sanitary sewer overflows.

As the various communities in the NEORSD service area have direct responsibility for the maintenance and repair of their local sewers, Ohio EPA required the NEORSD to develop a program under which local communities were required to implement corrective measures to control excessive wet-weather flows and overflows from the separate sanitary sewer system. This requirement was contained in the Ohio EPA construction grant conditions for funding (i.e., 75 percent Federal funding) of the Heights/Hilltop and Southwest Interceptors.

The Community Discharge Permit Program was established in 1986 and is regulated by Title III of the District's Code of Regulations as a method by which the District could implement the requirements of Ohio EPA's construction grant conditions for the Heights/Hilltop and Southwest Interceptors.

The Permit program is divided into two community classifications called "Priority I" and "Priority II". Priority I communities are facing mandatory capital expenditures to control overflows and excessive flows of wastewater in local sewers in the Heights/Hilltop and Southwest Interceptor areas. There are 14 Priority I communities. Priority II communities are all other member communities which are not facing mandatory capital expenditures at this time to control flows in their local sewers. There are 25 Priority II communities.

Permit program activity has centered around tracking the mandatory Priority I capital improvement projects and seeking 100 percent compliance with the administrative requirements of the permit program. Also, Community Discharge Permits are being issued to several new member communities of the NEORSD.

Generally, compliance with the permit program has been good. Several communities have substantial capital improvements underway. A number of separate sanitary sewer overflows are being controlled via community construction projects. Other communities are in the process of developing alternatives or refinements of their proposed technical programs. A schedule for individual community capital improvements has been incorporated into the NEORSD's construction grant requirements. As a result, the District will be forced to take appropriate actions to insure that communities do meet their discharge permit requirements. Revisions to sections of Title III of the District's Code of Regulations have recently been made. Most revisions deal with compliance with Community Discharge Permit requirements.

8.4.1.1.2 Control of Combined Sewer Overflows

The area's earliest sewers, primarily those built within the City of Cleveland, and portions of surrounding suburbs, are combined sewers. Combined sewers are those which carry both sanitary and industrial wastewater and stormwater in a single pipe.

These sewers were designed to allow normal dry-weather flow to go to the treatment plants. During a rainstorm the volume of water in the combined sewer increases dramatically. When the capacity of the sewer is exceeded, combined sewers overflow directly to the environment. The NEORSD service area includes 75 square miles of area served by combined sewers. There are 121 points in the Cuyahoga River Area of Concern (within the NEORSD service area) where combined sewers can overflow to the environment during a rain shower. Figure 8-7 is a depiction of a typical fixed weir regulator device found in a combined sewer. When flow within the sewer exceeds the height of the weir during wet-weather, a combined sewer overflow occurs. During normal dry-weather conditions, flow is routed to the treatment plant via the dry-weather outlet.

Beginning the 1920s, separate sewer systems were built. Separate storm sewers route stormwater directly to nearby streams. Separate sanitary sewers route sewage to treatment plants, however, often via the old combined sewer system.

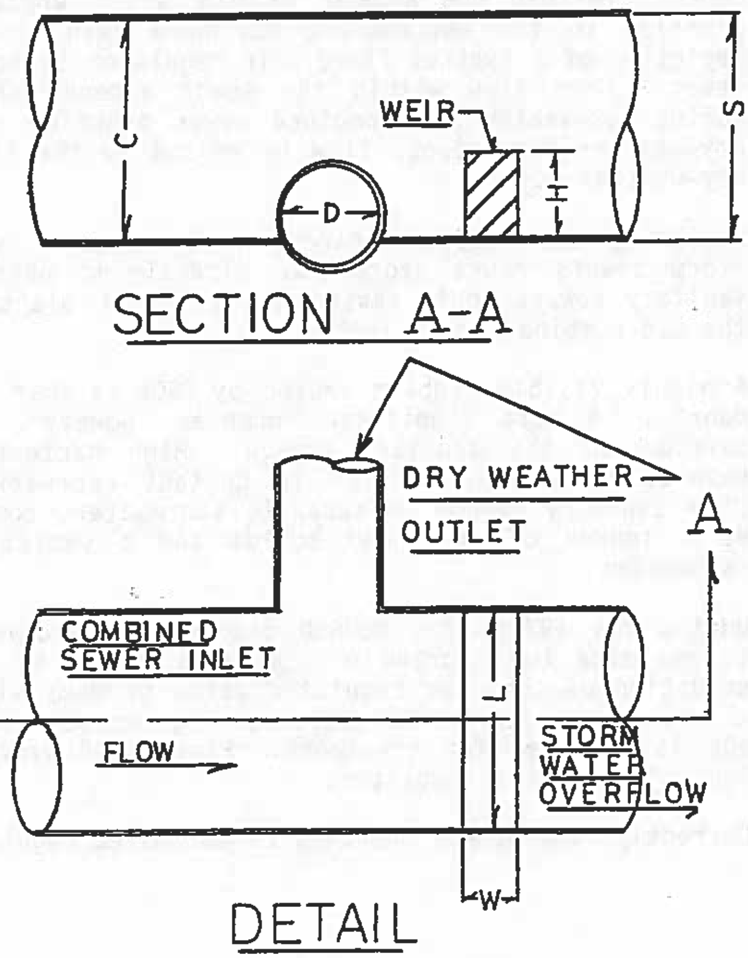
A highly visible problem caused by CSOs is that of floating matter and debris. A more significant problem, however, is that of bacteria carried in the sanitary sewage. High bacteria counts pose health hazards to people involved in contact recreation such as swimming. Like sanitary sewage or separate stormwater, combined sewage can also be a source of suspended solids and a variety of other pollutant parameters.

During the 1970s, the NEORSD pioneered the development of technology to maximize the storage of combined sewage in existing pipes. Construction of computer regulated gates or dams within the sewer system allows some sewage to be stored during storms. After storms, the sewage is released for treatment. Figure 8-8 provides a schematic of a typical automated regulator.

Currently, the NEORSD operates 29 automated regulator systems.

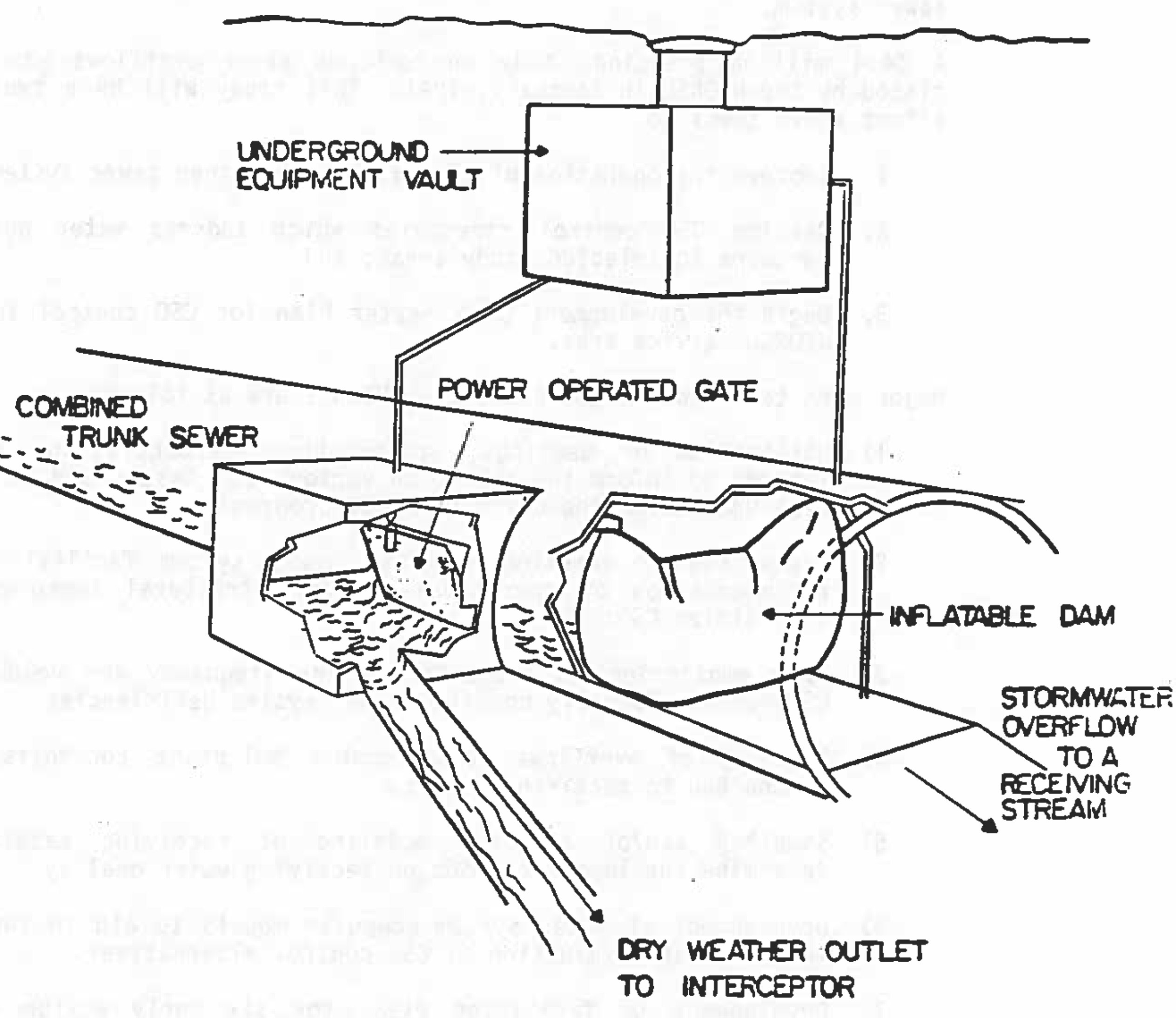
Figure: 8-7

FIXED PERPENDICULAR WEIR



5-7

Figure: 8–8



Typical Control and Monitoring Regulator

At the Westerly Wastewater Treatment Plant, a storage facility has been constructed to capture combined sewer overflows. This has resulted in dramatic water quality improvements at Edgewater State Park.

The Heights/Hilltop and Southwest Interceptors, now partially complete, transport separate sanitary sewer wastewater directly to the treatment plants. This removes some of the load from the combined sewer system.

A $4.4 million planning study on combined sewer overflows was initiated by the NEORSD in February, 1991. This study will be a two-year effort which seeks to:

1. Improve the operation of the existing combined sewer system;

2. Develop CSO control strategies which address water quality concerns in selected study areas; and

3. Begin the development of a Master Plan for CSO control in the NEORSD service area.

Major work tasks in the CSO Facilities Plan I are as follows:

1) Utilization of meetings, presentations, brochures and newsletters to inform the public on various CSO issues and to provide updates on the District's CSO program.

2) Evaluation of existing combined sewer system facilities and recommendation of operational and/or structural improvements to minimize CSOs.

3) Flow monitoring to characterize the frequency and volume of CSOs and to identify combined sewer system deficiencies.

4) Sampling of overflows to determine pollutant concentrations discharged to receiving waters.

5) Sampling and/or computer modeling of receiving waters to determine the impact of CSOs on receiving water quality.

6) Development of sewer system computer models to aid in the development and evaluation of CSO control alternatives.

7) Development of facilities plans for six early action study areas. Detailed studies will be performed resulting in recommended CSO control alternatives for each study area. The six early action study areas are as follows:

1. E.55th at Lake Erie - CSO discharges to Lake Erie
2. Lakeshore Blvd. at E.156th - CSO discharges to Lake Erie
3. St. Clair at E.185th - CSO discharges to Euclid Creek
4. Cranwood Pump Station Area - CSO discharges to Mill Creek
5. E.173rd at Elmer Avenue - CSO discharges to Mill Creek
6. W.45th at Memorial Shoreway - CSO discharges to Old Cuyahoga Riverbed

8) Identification of future study needs (i.e., Facilities Plan Phase II) to complete the District's CSO Master Plan. The Facilities Plan Phase II study is likely to involve more detailed computer modeling efforts and the in-depth evaluation of the most promising CSO control alternatives.

A considerable field effort (i.e., data gathering) is taking place during 1991. This field effort is designed to provide sufficient data to support the development, evaluation and recommendation of CSO control alternatives. Following the review of the recommended CSO control alternatives, a phased construction period is envisioned.

8.4.1.2 Akron

TREATMENT PLANT IMPROVEMENTS

Appendix G-4 documents improvements to the Akron Wastewater Treatment Plant from 1980 to 1990. Pending improvements to the plant are also summarized.

In part a result of facility improvements over the past decade, including the initation of an industrial pretreatment program, there have been improvements in the quality of the final effluent from the Akron plant. Appendix G-5 is a series of graphs which document improvements over the last several years in effluent concentrations of dissolved oxygen, conventional pollutants and metals. Also in this data set is historical information on the average MGD and maximum rates of inflow and effluent from 1987 to 1991.

SANITARY SEWER OVERFLOW ELIMINATION PROJECTS

Appendix G-4 includes a summary of sanitary sewer overflow elimination projects in the Akron service area.

CSO STUDY

The City of Akron launched a study in July 1991 to characterize CSOs which discharge into the Ohio Canal between Summit Lake and the Little Cuyahoga River. The study will focus on seven CSOs, serving approximately 3,582 acres, which overflow into the Ohio Canal. The study product will be a report which will provide the following:

a. An overview of the sanitary, combined and storm sewer sewer systems with emphasis on the combined sewer system, overflows and storm sewer outlets in the study area;

b. An overview of the impacts on the rest of the system by the combined system and vice versa;

c. An understanding of the hydraulics of the combined sewer interceptor, racks and overflows within the study area;

d. A summary of the Ohio Canal water quality based on existing data and data generated as part of this study;

e. A summary of the impacts on and by current, planned and potential development along the Canal and along the combined sewer interceptor;

f. A discussion of current and proposed State and Federal regulations regarding combined sewer overflows (CSO's) and the impact to the combined sewer system in the study area;

g. A summary of CSO abatement measures which may be needed and/or required; and

h. Detailed plan of study for future analysis of the study area including a detailed flow monitoring, sampling and modeling program.

8.4.2 State Agency Changes to Permit Regulations

The following six discussions pertain to changes to or adaptions in the state management of pollution sources.

8.4.2.1 Operator Certification

Ohio is developing legislation to improve long term permit compliance. Proposed amendments to Chapter 6111 of the Ohio Revised code include authorization to require certification of operators of industrial and pretreatment process treatment facilities as well as of analysts in charge of wastewater labs.

8.4.2.2 Storm Sewer Pollution Control

Effective December 16, 1990 regulations were promulgated by the U.S. Environmental Protection Agency to control storm sewer pollution in separate sanitary sewer areas for municipalities over 100,000 population and for most industrial plant sites. This will effect the Akron and Cleveland service areas. These regulations will require obtaining a permit for discharging storm water, submitting management plans to reduce pollutants in run-off, and stopping illegal connections to storm drains. This rule will start the process for reducing and preventing one of the major remaining water quality problems.

8.4.2.3 Combined Sewer Overflow Control (CSO)

In response to a national policy of CSO abatement, Ohio EPA adopted its CSO strategy in November, 1990. A new emphasis will be placed in future renewal NPDES permits to require improved operation and management of CSO control systems to eliminate stream impairments due to CSO discharges.

8.4.2.4 Basin Approach to Stream Modeling

Beginning in 1991, Ohio will convert its random 5-year rotation of discharge permit renewals to a basin approach. In the future, each major basin will be modeled and the permits within each basin will be renewed all at once. This will allow a more detailed, more effective modeling effort in each basin with maximum input by the regulated permittees.

8.4.2.5 Antidegradation Policy

Under Section 3745-1-05 of the Ohio Water Quality Standards, where Ohio EPA has demonstrated that existing water quality is better than the criteria prescribed in these rules and exceeds those levels necessary to support propagation of fish, shellfish and wildlife, and recreation in and on the water, the agency is required through the NPDES permit system to maintain and protect existing water quality. Strict interpretation of this rule by Ohio EPA may have an impact on future industrial corrections within certain sections of the Cuyahoga River basin, particularly those designated as state resource waters.

8.4.2.6 Toxic Substances Control

The Division of Water Quality Planning and Assessment (DWQPA) and the Division of Water Pollution Control (DWPC) developed a strategy to control the discharge of toxic substances to surface waters. This strategy has been approved by USEPA and the DWPC started to implement this strategy in 1988. As required by the Water Quality Act of 1987, Ohio EPA identified streams which are impaired by the discharge of toxic substances. Individual Control Strategies (ICSs) are required to be issued to dischargers which are causing the stream impairment. A typical ICS should include limits which are protective to aquatic life and human health and a compliance schedule to meet these limits.

Additionally, as required by the strategy, major dischargers with the potential for toxic dischargers will be issued permits with toxicity monitoring requirements. DWPC is tracking and reviewing these toxicity monitoring permit requirements and will be initiating any necessary actions to eliminate unacceptable effluent toxicity and to return these facilities to compliance with their permit requirements.

8.4.2.7 Pollution Prevention Policy and Strategy

On October 27, 1990, Congress passed the Pollution Prevention Act of 1990. Under this bill programs will be developed to collect and disseminate information and provide financial assistance to states to promote pollution prevention activities.

"Pollution prevention" is the use of source reduction techniques in order to reduce risk to public health, safety and welfare and the environment and, as a second preference, the use of environmentally sound recycling to achieve these same goals. Pollution prevention includes waste minimization and addresses cross-media transfers of contaminants, pollutants or releases, toxic chemicals, industrial or hazardous waste from one environmental medium such as air, land or water to another.

There are significant opportunities for industry to reduce or prevent pollution at the source through cost-effective changes in production, operation, and raw material use. Such changes offer industry substantial savings in reduced raw material, pollution control and risks to worker health and safety.

Ohio EPA recently formed a new section in the Division of Solid and Hazardous Waste Management to coordinate pollution prevention activities at Ohio EPA.

CHAPTER 9: COMMUNITY INVOLVEMENT ACTIVITIES AND EVENTS

9.0 Introduction

This chapter documents public involvement in the RAP. The CCC Public Involvement Strategy can be found in Appendix J.1

9.1 Background

The 1987 amendments to the Great Lakes Water Quality Agreement confirmed a public role in the development of Remedial Action Plans:

> "The Parties (Governments of Canada and the United States), in cooperation with State and Provincial Governments, shall ensure that the public is consulted in all actions undertaken pursuant to this Annex*"

Ohio EPA convened the first public meeting on the Cuyahoga River Remedial Action Plan on November 10, 1987 at Brecksville High School in Broadview Heights, Ohio. Representatives from the IJC, USEPA, Ohio EPA, NEORSD, NOACA, NEFCO, and SAIC were present to describe the RAP planning process and opportunities for public involvement. Approximately 100 people attended this meeting.

In September 1988 the Cuyahoga River Coordinating Committee was appointed by Ohio EPA to assist Ohio EPA in the preparation of the Cuyahoga River RAP. Ohio EPA's objective behind creating the Coordinating Committee and appointing its membership was to see that the RAP was developed as a community effort, incorporating as much community consensus as possible.

Among other functions, the Committee was appointed to and did provide a forum for the involvement of the widest possible community interests in the definition of the specific water quality goals that should aimed at, and assist Ohio EPA in building support for implementation of the RAP.

Toward this end a Communications Work Group was created at the first Coordinating Committee meeting in September 1988. The Work Group operated as a subcommittee of the Coordinating Committee, reporting to the Chairman.

The RAP's first public communications activity was the October 1988 boat trip on the Lower Cuyahoga to announce the creation of the Cuyahoga Coordinating Committee. The Work Group also developed a Cuyahoga RAP brochure to describe the RAP process for the Cuyahoga River, to serve as an information piece throughout the Committee process and to invite citizens participation in the development of goals for the river.

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* Annex 2: Remedial Action Plans and Lakewide Management Plans, Section 2e, GLWQA.

9.2 1989 Activities

9.2.1 Events

Two public events were organized in 1989. The first was a train tour in May of the mid-Cuyahoga River to inspect water quality conditions between the City of Akron's Wastewater Treatment Plant and the north end of the Cuyahoga Valley National Recreation Area, followed by a tour of Akron's Wastewater Treatment Plant.

The second event was a boat trip on June 22 in the Lower Cuyahoga River area to highlight clean-up efforts since the famous 1969 fire on the river.

Additionally a Cuyahoga RAP booth was organized for the Cleveland Boat Show in January and, in conjunction with Flats Oxbow, a booth at the Riverfest in July.

9.2.2 Public Information Materials

The Communications Work Group developed materials for broad public distribution: A Cuyahoga RAP brochure to describe the RAP process for the Cuyahoga River, to serve as an information piece throughout the Committee process and to invite citizen participation in the development of goals for the river; and a technical bulletin distributed at the mid-Cuyahoga River tour in May.

9.2.3 Speaker's Bureau

A speaker's bureau was established to elicit opportunities to explain the RAP process through presentations at meetings of local organizations. The contacts were made by both members of the Communications Work Group and Ohio EPA. Between 40 and 60 presentations to environmental, recreational and community organizations were delivered during 1989 and 1990.

9.2.4 Creation of List of Organizations

A subcommittee of the Communications Work Group surveyed the community to add representative organizations and individuals to the data base of public officials, agencies and responsible parties for community decision-making. This list became the resource list for all general mailings on RAP activities and information. It was used to recruit co-sponsorship for the RAP Public Involvement Workshops. This list was greatly expanded through extended outreach to civic and service organizations as a result of RAP public workshops planning.

9.2.5 Development of Slide Presentation

Working with Kent State University and Ohio EPA, the Communications Work Group developed a slide presentation to augment RAP-related speaking engagements.

9.2.6 CCC Community Involvement Work Program Element

The Communications Work Group participated in the development of a program scope, task goal and detailed work program for community involvement which was incorporated into the Work Program of the Cuyahoga River Coordinating Committee and approved by the Coordinating Committee on December 14, 1989 (Appendix L).

9.3 Reorganization of the Communications Work Group to Form the Community Involvement Committee

With the Coordinating Committee approval of the Work Program in December, 1989, the Communications Work Group was reorganized to form the Community Involvement Committee.

The Coordinating Committee's Work Program identifies involvement from the general public and the business and governmental agencies, including key elected officials involved with the Cuyahoga River and nearshore areas of Lake Erie, as an essential element of the Remedial Action Plan.

The encouragement of a perspective that promotes the environmental, economic and social benefits of a clean river was a key strategy for community involvement identified in the Work Program.

The Community Involvement Committee of the Cuyahoga Coordinating Committee was established to develop and coordinate the broad public involvement and education program generally called for in the development of the Remedial Action Plan. The Community Involvement Committee includes members of the Coordinating Committee and others. Subcommittees of the Community Involvement Committee include a Public Workshops Subcommittee, a Publications Subcommittee and a Media/Events Planning Subcommittee. Specifically the Community Involvement Committee is responsible for carrying out community involvement activities in Task Goal C of the Work Program.

9.4 1990 Activities

9.4.1 June 1990 Workshops

In 1990 the Community Involvement Committee (CIC) sponsored a series of workshops in June and participated in the planning of a follow-up workshop in January 1991.

Both the June 1990 and January 1991 workshops were geared to reach a broad audience. Over 1,500 invitations to each event were mailed to local elected officials; state and federal representatives; environmental, waterbased, and community organizations; members and observers of the Cuyahoga River Coordinating Committee; educational institutions; and any other individuals that had expressed interest in becoming involved in the RAP. In addition, the events were publicized through radio and newspaper announcements. Approximately 200 people attended the June series of workshops, and 120 people attended the January 1991 workshop.

The goals of the June 1990 workshops were to gain ideas and suggestions from the general public and identified stakeholders in the Cuyahoga River concerning water quality problems, impaired uses of the river, and goals for the Cuyahoga River RAP. Another goal of the workshops was to elicit suggestions from participants concerning continued public participation in the RAP process.

Consultants were hired to assist with the planning and implementation of the June 1990 workshops. Funding for the consultants was made possible through the Cuyahoga River Community Planning Organization (CRCPO) in large part by a grant to CRCPO from the George Gund Foundation.

The workshops in June 1990 were held in three locations: Cleveland (to the north), Akron (to the south), and Hudson (central to the Area of Concern). The workshops at all three sites had the same format and varied only slightly. At all locations an introductory session of approximately 30-45 minutes contained an introduction by the local coordinator, a briefing on the goals of the RAP process outlining the public role, and an audio/visual presentation on Cuyahoga River water quality. At the Cleveland and Hudson workshops an historical ecosystem perspective was also included in the introductory session. Following the introductory session, small group participation sessions of approximately two hours were held. An evaluation form and on-going interest survey were distributed for completion during the small group sessions. The CIC assisted in the design and final implementation of the workshops.

The consultants, with input from the CIC, drafted a report detailing the planning and results of the workshops. From the comments generated in the small group participation sessions, the consultants compiled a list of issues and problems raised. These issues and problems can be found in the Workshops Report document (Appendix J.2).

As part of the on-going interest survey distributed during the small group sessions (Exhibit 9-1), participants were given the opportunity to provide their ideas on goals for river. From these responses the consultants compiled a list of "goals for the river" which can be found in Appendix J.1. All goals express the desire for improvements and some degree of elimination of pollution to the river and lake. Some participants expressed goals of maximum clean-up levels, advocating zero discharge of pollutants and drinking water quality throughout the Area of Concern. Others advocated a diversity of uses of the river, with economic based limits to clean-up. Goals of habitat restoration and the development of recreational uses were heard from all three workshop areas.

Participants at this first series of workshops expressed a concern that the comments made during the discussions be taken into consideration and used by the RAP committees. Toward this end the CIC designed a procedure by which all problems and issues raised would be reviewed and responded to by the Plan Drafting Committee.

Between June 1990 and January 1991 substantial progress was achieved in preparation of the Stage One report. The Plan Drafting Committee and the CIC organized a follow-up workshop in January 1991. This workshop had the dual purpose of reporting on progress in the development of the Stage One Report and how the effort responded to concerns raised by the public. The meeting had a further purpose which was to respond to the community's expressed need for more information about the environmental, social and economic issues being addressed by the RAP.

The CIC in cooperation with the Plan Drafting Committee began the planning and design for this workshop in the fall of 1990.

9.4.2 Friends of the Crooked River

A group of citizens who shared common goals for the river and participated in these workshops organized shortly thereafter to form an advocacy group on behalf of the river. In the first year they developed a mission statement for the organization and, among many river-oriented activities, organized a clean-up day and a number of canoe trips along various sections of the river. Membership to the organization is open to the public.

9.4.3 Public Information Materials

With assistance from Ohio EPA the CIC developed a newsletter that was published in the Spring of 1990. The Northeast Ohio Areawide Coordinating Agency (NOACA) also published a newsletter that focused on the Cuyahoga RAP.

9.4.4 Events

The CIC organized a Cuyahoga RAP booth for Earthday at the Cleveland Metro Parks Zoo in April, 1990.

EXHIBIT 9-1

On-Going Interest Survey
June 1990 Public Involvement Workshops

CUYAHOGA RIVER
REMEDIAL ACTION PROGRAM

ON-GOING INTEREST SURVEY

Name______________________________ Phone______________

Address____

Workshop Location_______________________ Date____________

Issue	Response
I would like to receive a full copy of the Workshop report or a summary version?	Full copy____ Summary copy___
I would like to be considered a resource for the Committee to call upon? If yes, in what capacity?	Yes___ No ___ If yes, how:
My major concerns and/or areas of interest with respect to the river are?	Agriculture __ Fishing __ Drinking Water__ Sewers __ Flooding __ Dredging __ Ground Water __ Industry __ Recreation __ Landfills__ Navigation __ Habitat __ Waste Water __ Toxins __ Wildlife __ Wetlands __ Waterfront Development __ Other________________
I am interested in being informed of interim events concerning the RAP process?	Yes ___ No ___ Contact me at:
I will participate in the next series of RAP workshops?	Yes___ No ___
My suggestions to further involve the public in the RAP process are:	Suggestions:
My goals for the river are:	Goals:

9.5 1991 Activities of the Community Involvement Committee

9.5.1 January 1991 Workshops

As noted above, the CIC and the Plan Drafting Committee worked jointly in the planning, design and implementation of the January 1991 workshop.

This workshop was held on one full day. More than 30 resource people and keynote speakers were on hand to give presentations and answer questions. The workshop was held in a place approximately halfway between Akron and Cleveland and conveniently accessible to many in the RAP community.

Roughly 120 people attended this workshop. From a show of hands during the welcoming address, it was estimated that 50 or so participants that day had attended one of the RAP workshops held in June 1990.

The January 1991 workshop was held in part to follow up with those participants who, at the earlier workshops, expressed the desire to see how the RAP committees were incorporating their comments into the process. Many attending in June also expressed a need for more information on the environmental, social and economic issues the RAP process is addressing.

Therefore, a primary objective of this workshop was to share with the public the information the RAP had gathered to date for the Stage One Report and to engage the public in the development of the Stage One Report. A series of discussion groups began with brief presentations by Plan Drafting Committee members of the current information available.

Attendees were able to participate in discussion groups that focused on one of six topics: recreation impairments, biota impairments, toxics consumption issues, socio-economic issues, point sources of pollution, and nonpoint sources of pollution. Following each presentation a substantial amount of time was allocated for questions and answers, and discussion of issues and concerns raised by the participants in response to the presentation. In addition to the presenter, other RAP community resource people were on hand in each discussion group to respond to participants' concerns or questions about any aspect of the subject.

A workshop summary was drafted in which the comments and questions generated during the discussion groups are compiled (Appendix J.3). A Plan Drafting Committee member was present in each of the discussion groups to hear concerns and respond to questions. Many questions were answered during the workshop. Concerns that identified information gaps or needed research have been included as research suggestions in Chapter 7.

9.5.2 Events

The CIC organized a Cuyahoga RAP booth for Earthday at the Cleveland Metro Parks Zoo in April and for Conservation Day at the Zoo in June. Five thousand people attended Earthday in April. The RAP provided support to the Friends of the Crooked River "River Day" clean-up in April as well as leadership and organizational support to "Riversweep," part of a waterfront clean-up sponsored by ODNR in June. Four hundred and fifty people participated in "Riversweep."

9.5.3 Public Involvement Strategy

The CIC developed a Public Involvement Strategy for the CCC and recommended it for approval. The strategy can be found in Appendix J.1.

9.5.4 Community Involvement Staff Support

The Cuyahoga River Community Planning Organization (CRCPO) hired a part-time public involvement coordinator in March.

The initial role of the public involvement coordinator is to provide input to the Coordinating Committee's public involvement strategy, assist the CIC with the design, planning, and organization of conferences and workshops, drafting of newsletters, bulletins, brochures, etc., organize media coverage, and facilitate the participation of target groups in the RAP process.

Appendix J.4 is a compilation of all public information materials produced.

Media attention on the Cuyahoga RAP over the past three years has generally been good. Appendix J.5 is a compendium of news articles written on RAP and related issues.

CHAPTER 10
LIST OF PLAN PARTICIPANTS AND CONTRIBUTORS

10.0 Introduction

This chapter identifies the individuals who have participated on various committees in the development of the Stage One Report. These included members of the Coordinating Committee as well as additional members of the public. As noted in Chapter 2, an important element in the Coordinating Committee's community involvement strategy was the active recruitment and involvement of informed and/or interested members of the public directly in the planning process. The organizational structure of the Coordinating Committee and its subcommittees is discussed in Chapter 2. Also refer to the Committee's Work Program (Appendix L). Reported elsewhere (in Appendix N) are the activities of the Cuyahoga River Community Planning Organization, the non-profit organization established to support development of the RAP with community involvement, scientific research and staff support.

The committees reported here include:

10.1 Coordinating Committee as of November, 1991 and prior members since

10.2 Plan Drafting Committee of the CCC

Biota Impairments Subcommittee of the PDC
Nonpoint Source Subcommittee of the PDC
Point Source Subcommittee of the PDC
Recreation Impairments Subcommittee of the PDC
Socio-economic Subcommittee of the PDC
Toxics Consumption Subcommittee of the PDC
Source-Impairments Linkages Task Group of the PDC
Task Group of the PDC to review the SAIC Report text specific to Chapter 3

10.3 Community Involvement Committee of the CCC

10.4 Technical Committee of the CCC

10.1 Cuyahoga River Coordinating Committee, As of November, 1991

Greg Studen, Chair*

Kenneth Alvey, Ohio Department of Natural Resources
Virginia Aveni*, Cuyahoga County Planning Commission
David Beach, Sierra Club
John Beeker,** Northeast Ohio Areawide Coordinating Agency
Darnell Brown, Cleveland Department of Public Utilities
James Brueggeman, Cuyahoga County Sanitary Engineer's Office
Bill Bryant, Greater Cleveland Growth Association
Edith Chase*, League of Women Voters
Emeline Clawson, Cleveland Waterfront Coalition
Jim Cowden*, Great Lakes Tomorrow
Dave Crandell*, Akron Public Utilities Bureau
John Debo, Cuyahoga Valley National Recreation Area, USDI
John Etchison, LTV Steel
Joe Hadley, Northeast Ohio Four County Regional Planning Agency
Gordon Hall, Lake Carriers Association
Pete Henderson*, Cuyahoga Valley Community Council
Kathy Kellums, Flats Oxbow Association
Jeff Lintern, Summit County Sanitary Engineer's Office
John Mack, American Steel and Wire
Mark Moloney, U.S. Environmental Protection Agency
Elaine Marsh, Friends of the Crooked River
Don Miles, Ohio Department of Health
Alan Mills, Cuyahoga Mayors and Managers Association
John Perera, Great Lakes United
Frank Samsel, Samsel Supply Company
Norm Schultze, Lake Erie Marine Trade Association
Joe Smerglia*, Goodyear Tire and Rubber Company
Jim Storer, Soil Conservation Service, USDA
Lester Stumpe*, Northeast Ohio Regional Sewer District
Rolf Tinge, Greater Cleveland Boating Association
Bob Wysenski*, Ohio Environmental Protection Agency
Steve Yaksich, U.S. Army Corps of Engineers

Members Prior to November, 1991

David Allen, U.S. Environmental Protection Agency
Alison Kaczmarek, Flats Oxbow Association
Alan Kuper, Sierra Club
Roger Mintz, Great Lakes United
Donald Morris, Urban League of Greater Cleveland
Richard Sahli, Ohio Environmental Council
Jeff Stickle, Sierra Club
Paul Svedersky, Great Lakes United
Carolyn Watkins, Ohio Environmental Council
Len Wisniewski, Englehard Corp.

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*Members, Cuyahoga Coordinating Committee Steering Committee.
**CCC Secretary

10.2 Plan Drafting Committee

The Plan Drafting Committee was established by the Coordinating Committee to develop and draft the Remedial Action Plan Stage One Report. The PDC was given the overall responsibility for coordination of the plan drafting process and insuring that a plan was completed as required. Six subcommittees of th PDC were establish to address specific elements of the report. The subcommittees and their membership are reported on the seven pages that follow.

Greg Studen, Chair

Kenneth Alvey (Recreation Impairments Co-Chair)
Ohio Department of Natural Resources

Virginia Aveni (Community Involvement Chair)
Cuyahoga County Planning Commission

John Beeker (Secretary)
Northeast Ohio Areawide Coordinating Agency

Edith Chase (Socio-Economic Chair)
League of Women Voters

Dave Crandell (Point Source Co-Chair)
Akron Public Utilities Bureau

John Debo (Recreation Impairments Co-Chair)
Cuyahoga Valley National
Recreation Area

Frank Greenland (Point Source Co-Chair)
Northeast Ohio Regional Sewer District

Jeff Lintern (Toxics Consumption Co-Chair)
Summit County Sanitary Engineer's Office

Don Miles (Toxics Consumption Co-Chair)
Ohio Department of Health

Joe Smerglia (Biota Impairments Co-Chair)
Goodyear Tire and Rubber Company

Jim Storer (Nonpoint Source Chair)
Soil Conservation Service, USDA

Lester Stumpe (Technical Chair)
Northeast Ohio Regional Sewer District

Garree Williamson (Alternate for Mr. Debo)
Cuyahoga Valley National
Recreation Area, USDI

Bob Wysenski (Biota Impairments Co-Chair)
Ohio Environmental Protection Agency

BIOTA IMPAIRMENTS SUBCOMMITTEE

The Biota Impairments Subcommittee was established to respond to the sections of the GLWQA Annex 2.1(c), "Beneficial Use Impairments," that demand biological data and analysis. The Subcommittee researched and reported on available information on the biological uses that are impaired, the degree of impairment, the geographic extent of impairment, possible sources and causes of the impairment, and its degree of confidence in the available data and analysis. The subcommittee also developed suggestions for additional research. This information is presented is a series of reports which can be found in Appendix A and summarized in Chapter 4, under Impairments (III) fish and wildlife populations; (IV) fish tumors; (V) birds and animal deformities; (VI) benthos; (VIII) eutrophication; (XVIII) planktons; and (XIV) habitat loss.

Joe Smerglia, Goodyear Tire and Rubber Co., Chair
Bob Wysenski, Ohio Environmental Protection Agency, Co-Chair*

Ruth Ann Buzzi*, Summit County Department of Environmental Services
Bob Carlson*, Kent State University
Diane Conyers-Rizzo*, under contract with Ohio Environmental Protection Agency
Bill Kurey*, U.S. Fish and Wildlife Service, USDI
Marc Smith*, Ohio Environmental Protection Agency

Resource and Review Members

Paul Bauman, U.S. Fish and Wildlife Service, USDI
John Beeker, Northeast Ohio Areawide Coordinating Agency
Meg Benke, Cuyahoga Valley National Recreation Area, USDI
Charles Boucher*, Ohio Environmental Protection Agency
Jeff DeShon*, Ohio Environmental Protection Agency
Al Garlausus, Samsel Marine Services
John Goltz, Ohio Department of Natural Resources
Phil Hillman, Ohio Department of Natural Resources
David Kelch, Ohio Sea Grant, Lorain County Extension Office
Bob Kleinhenz, Independent
Ken Krieger, Heidelberg College
Vince LeConte, Ohio Department of Natural Resources
Tim Matson, Cleveland Museum of Natural History
Donna Myers, U.S. Geological Survey
John Olive*, University of Akron
Mike Rawson, Ohio Department of Natural Resources
David Ross, Ohio Department of Natural Resources
Jim Schuler, Ohio Department of Natural Resources
Jerry Sgro*, Independent
Probot Sharma, Northeast Ohio Regional Sewer District
Clyde Simmerer, Ohio Department of Natural Resources
Andrew White, John Carroll University
Chris Yoder, Ohio Environmental Protection Agency

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* Authors of Subcommittee Reports; See Appendix A.

NONPOINT SOURCE SUBCOMMITTEE

The Nonpoint Source Subcommittee was established to locate and describe nonpoint sources contributing to use impairments in the Area of Concern. The Subcommittee researched and reported on available information on 19 nonpoint source categories, including descriptions of sources, the location of the sources in the basin, how they contribute to the impairment of uses, and suggestions for future inventory or research. Their work is reported in Part II of Chapter 5 and in Appendix H.

Jim Storer*, Soil Conservation Service, USDA, Chair

Virginia Aveni, Cuyahoga County Planning Commission
Mary Beth Binns, CRCPO
Al Bonnis, Soil Conservation Service, USDA
Darnell Brown, Cleveland Department of Public Utilities
Joe Hadley, Northeast Ohio Four County Regional Planning Agency
Pete Henderson, Cuyahoga Valley Community Council
Don Killinger*, Cuyahoga County Board of Health
Dave Kopack, Cuyahoga Valley National Recreation Area
Craig Lass, Independent
Dan Ross, Soil Conservation Service, USDA
Andy Vidra*, Northeast Ohio Areawide Coordinating Agency
Carolyn Watkins*, Ohio Environmental Council
Barbara Woldridge, Ohio Environmental Protection Agency
Betsy Yingling*, Northeast Ohio Regional Sewer District

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* Drafters of significant portions of text in Chapter 5 and authors of Subcommittee Reports; See Appendix H.

POINT SOURCE SUBCOMMITTEE

The Point Source Subcommittee was established to locate and describe point sources contributing to use impairments in the Area of Concern. The Subcommittee researched and reported on available information on the following sources: municipal and industrial permitted dischargers, combined and sanitary sewer overflows, plant bypasses and stormwater outfalls.

Frank Greenland, Northeast Ohio Regional Sewer District, Co-Chair*
Dave Crandell, Akron Public Utilities Bureau, Co-Chair

John Beeker*, Northeast Ohio Areawide Coordinating Agency
Darnell Brown, Cleveland Department of Public Utilities
James Brueggeman, Cuyahoga County Sanitary Engineer's Office
John Etchison, LTV Steel
Alan Kuper, Sierra Club
Jeff Lintern, Summit County Sanitary Engineer's Office
Mark Moloney, U.S. Environmental Protection Agency
Keith Riley*, Ohio Environmental Protection Agency
Joe Smerglia, Goodyear Tire and Rubber Company
Greg Studen, Donray Company
Lester Stumpe, Northeast Ohio Regional Sewer District
Andy Vidra, Northeast Ohio Areawide Coordinating Agency
Bob Wysenski, Ohio Environmental Protection Agency

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* Drafters of significant portions of text in Chapter 5 and Appendix G.

RECREATION IMPAIRMENTS SUBCOMMITTEE

The Recreation Impairments Subcommittee was established to respond to the sections of the GLWQA Annex 2.1(c), "Beneficial Use Impairments," that demand recreational data and analysis. The Subcommittee researched and reported on available information on the recreation uses that are impaired, the degree of impairment, the geographic extent of impairment, possible sources and causes of impairment, and its degree of confidence in the available data and analysis. The subcommittee also developed suggestions for additional research. This information is presented in a report which can be found in Appendix D and summarized in Chapter 4, under Impairments (V) Recreation and (XI) Aesthetics.

Kenneth Alvey, Ohio Department of Natural Resources, Co-Chair
John Debo, Cuyahoga Valley National Recreation Area, USDI, Co-Chair

John Beeker, Northeast Ohio Areawide Coordinating Agency
John Graves, Northeast Ohio Regional Sewer District
Jeff Lenartz, North Cuyahoga Valley Corridor, Inc.
Brian McHugh, Cuyahoga Valley National Recreation Area
Don Miles, Ohio Department of Health
Tom Stanley, Cleveland Metroparks System
Paul Svedersky, Great Lakes United
Garree Williamson*, Cuyahoga Valley National Recreation Area, USDI
Bob Wysenski, Ohio Environmental Protection Agency

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* Author of Subcommittee Report; See Appendix D.

SOCIO-ECONOMIC SUBCOMMITTEE

The Socio-economic Impairments Subcommittee was established to respond to the sections of the GLWQA Annex 2.1(c) "Beneficial Use Impairment, that demand a definition and detailed description of socio-economic aspects of the environmental problem in the Area of Concern, including a definition of the beneficial uses that are impaired, the degree of impairment, the geographic extent of the impairment, possible sources and causes of the impairment, and its degree of confidence in the data and information. The Subcommittee also developed suggestions for additional research. This information is presented in a series of reports which can be found in Appendix E and summarized in Chapter 4, under Impairments (VII) Dredging; (VIII) Eutrophication; (IX) Drinking Water; (XI) Aesthetics; and (XII) Added costs to Agriculture or Industry.

Edith Chase, League of Women Voters, Chair*

Tom Baclawski, Ohio Environmental Protection Agency
John Beeker*, Northeast Ohio Areawide Coordinating Agency
John Etchison, LTV Steel
Don Heuer, Cleveland Department of Public Utilities
Alan Kuper*, Sierra Club
Ann Laubach*, Ohio Environmental Protection Agency
Mary Maciejowski*, Northeast Ohio Regional Sewer District
Frank Samsel*, Samsel Supply Company
Greg Studen, Donray Company
Lester Stumpe, Northeast Ohio Regional Sewer District
Dan Underwood, Ohio Environmental Protection Agency
Carolyn Watkins*, Ohio Environmental Council
Bob Wysenski, Ohio Environmental Protection Agency

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* Authors of Subcommittee Reports; See Appendix E.

TOXICS CONSUMPTION SUBCOMMITTEE

The Toxics Consumption Subcommittee was established to respond to the sections of the GLWQA Annex 2.1(c) "Beneficial Use Impairments" that addressed human consumption of toxics. The Subcommittee researched and reported on available information regarding toxics and pathways of human ingestion, including the degree and geographic extent of impairment, contaminants of concern, and its confidence in the data and information. The Subcommittee also developed suggestions for additional research. This information is presented in Appendix C and summarized in Chapter 4, under Impairment (I) Fish/Wildlife Consumption. Members of this subcommittee also led the fish tissue task group.

Jeff Lintern, Summit County Sanitary Engineer's Office, Co-Chair
Don Miles, Ohio Department of Health, Co-Chair

Paul Bauman, U.S. Fish and Wildlife Service, USDI
David Beach, Sierra Club
Alan Kuper, Sierra Club
Keith Linn*, Northeast Ohio Regional Sewer District
Jack Mosser, Akron Water Pollution Control Division
Mike Rawson, Ohio Department of Natural Resources
Mary Rouse*, Ohio Department of Health
Tracy Shelley, Ohio Department of Health
Steve Tuckerman*, Ohio Environmental Protection Agency
Garree Williamson, Cuyahoga Valley National Recreation Area, USDI

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* Authors of Subcommittee Reports, See Appendix C.

SOURCE-IMPAIRMENT LINKAGES TASK GROUP OF THE PLAN DRAFTING COMMITTEE

This Task Group was established in July 1991 to assist the PDC by:

a) presenting point source and nonpoint source loading information in an integrated fashion;
b) evaluating approaches for establishing links between sources and impairments;
c) identifying future possible research efforts to establish source/impairment linkages; and
d) recommending how to address this issue in the Stage One Report.

Lester Stumpe, Northeast Ohio Regional Sewer District, Chair

Richard Connelly, Northeast Ohio Regional Sewer District
Jim Storer, Soil Conservation Service, USDA
Andy Vidra, Northeast Ohio Areawide Coordinating Agency
Garree Williamson, Cuyahoga Valley National Recreation Area, USDI
Bob Wysenski, Ohio Environmental Protection Agency
Betsy Yingling, Northeast Ohio Regional Sewer District

TASK GROUP TO REVIEW SAIC TEXT

The following individuals were asked to review and comment specifically on the Background Chapter of the SAIC report for possible incorporation in the Environmental Setting Chapter:

Natural Features

John Beeker, Northeast Ohio Areawide Coordinating Agency
Michael Colvin, Ohio Department of Natural Resources
Dave Crandell, Akron Public Utilities Bureau
John Graves, Northeast Ohio Regional Sewer District
Steve Hindall, U.S. Geological Survey
Larry Milliron, Soil Conservation Service, USDA
Rebecca Petty, Ohio Department of Natural Resources
Jim Storer, Soil Conservation Service, USDA
Andy Vidra, Northeast Ohio Areawide Coordinating Agency
Andrew White, John Carroll University
Bob Wysenski, Ohio Environmental Protection Agency

Land Uses

Virginia Aveni, Cuyahoga County Planning Commission
Jim Cowden, Great Lakes Tomorrow
Dave Crandell, Akron Public Utilities Bureau
John Graves, Northeast Ohio Regional Sewer District
Joe Hadley, Northeast Ohio Four County Regional Planning Agency
Dan Keller, Summit County Department of Planning & Economic Development
Andy Vidra, Northeast Ohio Areawide Coordinating Agency
Garree Williamson, Cuyahoga Valley National Recreation Area, USDI
Bob Wysenski, Ohio Environmental Protection Agency

Water Uses

Michael Colvin, Ohio Department of Natural Resources
Dave Crandell, Akron Public Utilities Bureau
John Graves, Northeast Ohio Regional Sewer District
Mike Rawson, Ohio Department of Natural Resources
Andrew White, John Carroll University
Garree Williamson, Cuyahoga Valley National Recreation Area, USDI
Bob Wysenski, Ohio Environmental Protection Agency

10.3 Community Involvement Committee

The Community Involvement Committee was established to carryout community involvement goals developed in the CCC Work Program. Subcommittees of the Community Involvement Committee include a Public Workshops Subcommittee, a Publications Subcommittee, and a Media/Events Planning Subcommittee.

Virginia Aveni, Chair

Janet Abdullah, Northeast Ohio Regional Sewer District
David Beach, Sierra Club
John Beeker, Secretary, Northeast Ohio Areawide Coordinating Agency
Mary Beth Binns, CRCPO
Peg Bobel, Friends of the Crooked River
Joseph Chadbourne, Institute for Environmental Education
Edith Chase, League of Women Voters
Emeline Clawson, Cleveland Waterfront Coalition
Jim Cowden, Great Lakes Tomorrow
Claude Custer, Northeast Ohio Four County Regional Planning Agency
Bill Davis, Northeast Ohio Areawide Coordinating Agency
John Debo, Cuyahoga Valley National Recreation Area, USDA
Carlene Groeger, City of Akron Recycling
Pete Henderson, Cuyahoga Valley Communities Council
Sandra Humphrey, Akron Public Utilities
Alison Kaczmarek, Flats Oxbow Association
Ellen Kowall, Cleveland Waterfront Coalition
Elaine Marsh, Friends of the Crooked River
Linda Proffitt, Proffitt and Associates
Janine Rybka, CRCPO
Bill Skowronski, Ohio Environmental Protection Agency
Greg Studen, Donray Company
Rolf Tinge, Greater Cleveland Boating Association
Carolyn Watkins, Ohio Environmental Council
Bob Wysenski, Ohio EPA

10.4 Technical Committee

The Technical Committee was established to carryout technical activities in support of the CCC Work Program. It currently consists of the following Task Groups: the Lower Cuyahoga Bacterial Investigation Task Group, the Middle Cuyahoga Bacterial Investigation Task Group, the Modelling Task Group, the Fish Tissue Task Group, the Bibliography Task Group, and the Debris Committee.

Lester Stumpe, Northeast Ohio Regional Sewer District, Chair

1. Lower Cuyahoga Bacterial Investigation Task Group

   The principal objective of the Lower Cuyahoga Bacterial Investigation Task Group is to coordinate ongoing Water Quality Studies in the Cuyahoga River below Independence Road and the nearshore area of Lake Erie. 1990 objectives included coliform study and data gathering to support modelling.

   Meg Benke, Cuyahoga Valley National Recreation Area
   Don Killinger, Cuyahoga County Board of Health
   Keith Linn, Northeast Ohio Regional Sewer District
   Dave Stroud, Ohio Environmental Protection Agency
   Lester Stumpe, Northeast Ohio Regional Sewer District
   Steve Tuckerman, Ohio Environmental Protection Agency
   Andy Vidra, Northeast Ohio Areawide Coordinating Agency
   Garree Williamson, Cuyahoga Valley National Recreation Area, USDI
   Bob Wysenski, Ohio Environmental Protection Agency
   Betsy Yingling, Northeast Ohio Regional Sewer District

2. Modelling Task Group

   The principal objective of the Modelling Task Group is to develop a mathematical model of transport and fate of pollutants in the Lower Cuyahoga River. The first step is a screening model to define detailed data needs.

   Dave Allen, U.S.Environmental Protection Agency
   Seif Amragy, Ohio Environmental Protection Agency
   Randy Bournique, Ohio Environmental Protection Agency
   Dan Dudley, Ohio Environmental Protection Agency
   John Etchison, LTV Steel
   Mike Gray, Ohio Environmental Protection Agency
   Mark Moloney, U.S. Environmental Protection Agency
   Gary Martin, Ohio Environmental Protection Agency
   Dave Stroud, Ohio Environmental Protection Agency
   Lester Stumpe, Northeast Ohio Regional Sewer District
   Steve Tuckerman, Ohio Environmental Protection Agency
   Andrew Turner, Ohio Environmental Protection Agency
   Andy Vidra, Northeast Ohio Areawide Coordinating Agency
   Bob Wysenski, Ohio Environmental Protection Agency
   Betsy Yingling, Northeast Ohio Regional Sewer District
   Rich Zavoda, LTV Steel

3. <u>Fish Tissue Task Group</u>

The principal objective of the Fish Tissue Task Group was to gather data on toxics in area fish and evaluate and report the results. They are to assess the need for a fish consumption advisory in the Area of Concern.

Keith Linn, Northeast Ohio Regional Sewer District, Co-Chair
Steve Tuckerman, Ohio Environmental Protection Agency, Co-Chair
Paul Bauman, U.S. Fish and Wildlife Service
David Beach, Sierra Club
Phil Hillman, Division of Wildlife, ODNR
Alan Kuper, Sierra Club
Bill Kurey, U.S. Fish and Wildlife Service
Don Miles, Ohio Department of Health
Jack Mosser, Akron Water Pollution Control Division
Mike Rawson, Ohio Department of Natural Resources
Mary Rouse, Ohio Department of Health
Tracy Shelley, Ohio Department of Health
Marc Smith, Ohio Environmental Protection Agency
Garree Williamson, Cuyahoga Valley National Recreation Area, USDI
Bob Wysenski, Ohio Environmental Protection Agency

4. <u>Middle Cuyahoga Bacterial Investigation Task Group</u>

The principal objective of the Middle Cuyahoga Bacterial Investigation Task Group was to coordinate ongoing Water Quality Studies in the river between Ohio Edison Dam and Independence Road. The focus was on bacterial data collection.

Dave Stroud, Ohio Environmental Protection Agency, Coordinator
Meg Benke, Cuyahoga Valley National Recreation Area
Dave Crandell, Akron Public Utilities Bureau
Bob Davic, Ohio Environmental Protection Agency
John Debo, Cuyahoga Valley National Recreation Area Superintendent
Jim Jackson, University of Akron
Don Miles, Ohio Department of Health
Jack Mosser, Akron Water Pollution Control Division
Garree Williamson, Cuyahoga Valley National Recreation Area, USDI
Bob Wysenski, Ohio Environmental Protection Agency

5. <u>Bibliography Task Group</u>

Pete Henderson, Cuyahoga Valley Community Council, Chair
John Beeker, Secretary, Northeast Ohio Areawide Coordinating Agency
Jim Cowden, Great Lakes Tomorrow
Dave Crandell, Akron Public Utilities Bureau
John Etchison, LTV Steel
Joe Hadley, Northeast Ohio Four County Regional Planning Agency
Mark Moloney, U.S. Environmental Protection Agency
Jim Storer, Soil Conservation Service, USDA
Lester Stumpe, Northeast Ohio Regional Sewer District
Len Wisniewski, Englehard Corp.
Bob Wysenski, Ohio Environmental Protection Agency

6. Debris Committee

Richard Connelly, Northeast Ohio Regional Sewer District
Frank Samsel, Samsel Supply Company
Lester Stumpe, Northeast Ohio Regional Sewer District
Steve Tuckerman, Ohio Environmental Protection Agency
Betsy Yingling, Northeast Ohio Regional Sewer District
Bob Wysenski, Ohio Environmental Protection Agency