

This is the WATERS of Jefferson County - Year Zero Report. This document combines three annual reports that MSD submits to the Kentucky Division of Water (KDOW): the Municipal Separate Storm Sewer System (MS4) Report, the Combined Sewer Operational Plan (CSOP) - 1999 Update, and the Sanitary Sewer Overflow Abatement and Elimination Plan (SSOAEP). This document is watershed based and has been organized into three sections and twelve appendices as shown below:

Section 1	Executive Summary
Section 2	Programs
Section 3	Watersheds
Appendix I	MS4 Matrix of Elements
Appendix II	Storm Water Outfall Data 1993 - 1999
Appendix III	Outfall Program Protocol for Contaminated Outfalls
Appendix IV	Erosion Prevention and Sediment Control Draft Ordinance
Appendix V	Water Quality Statistics
Appendix VI	ArcView GIS Application
Appendix VII	CSO Tables
Appendix VIII	I/I Program 5 - Year and 15 - Year Lookahead
Appendix IX	SSO Locations and Fact Sheets
Appendix X	List of Current and Future Projects and Project Maps
Appendix XI	SSOs and Associated Projects
Appendix XII	CSO Monthly Monitoring Report

The Executive Summary, Section 1, is a summary of the annual report. Section 2 provides an overview of the MS4, CSO, and SSO programs. Section 3 provides detailed information on each program by watershed.

**TABLE OF CONTENTS**

1 EXECUTIVE SUMMARY ..... 1

    1.1 Introduction..... 1

    1.2 The Programs ..... 2

        1.2.1 MS4 Program..... 2

            1.2.1.1 MS4 Program Elements ..... 3

            1.2.1.2 Projects and Programs (Water, Quality, Drainage, and Sanitary) by Watershed..... 5

            1.2.1.3 MS4 Education ..... 7

        1.2.2 CSO Program..... 7

            1.2.2.1 CSO Program Elements ..... 8

            1.2.2.2 CSO Projects and Programs by Watershed..... 9

            1.2.2.3 CSO Education..... 10

        1.2.3 SSO (I/I) Program ..... 11

            1.2.3.1 SSO Program Elements..... 12

            1.2.3.2 SSO Project and Programs by Watershed..... 13

            1.2.3.3 SSO Education ..... 14

    1.3 The Watersheds..... 14

        1.3.1 General Information..... 14

        1.3.2 Hydrology and Flooding ..... 15

        1.3.3 Status of Water Quality..... 16

        1.3.4 Water Quality Impacts ..... 17

            1.3.4.1 Point Source ..... 22

            1.3.4.2 Non-Point Source..... 23

            1.3.4.3 Habitat and Biological Quality ..... 24

        1.3.5 Monitoring Activities..... 24

            1.3.5.1 Adequacy of Monitoring Program ..... 24

            1.3.5.2 Ohio River Valley Sanitation Commission ..... 25

    1.4 Conclusions..... 26

2 PROGRAMS..... 27

    2.1 The Municipal Separate Storm Sewer System Program..... 27

2.1.1	Objectives .....	27
2.1.2	History (MSD and Regulatory).....	27
2.1.3	Program Elements.....	28
2.1.3.1	Illicit Discharge Program (ID).....	28
2.1.3.2	Construction Site Runoff Controls (CS).....	30
2.1.3.3	Post Construction Controls (PC).....	31
2.1.3.4	Good Housekeeping/Pollution Prevention (GH) .....	32
2.1.3.5	Public Education/Outreach Programs (PE).....	33
2.1.3.6	Monitoring (M).....	35
2.1.3.7	Reporting (R) .....	39
2.1.3.8	External Agencies .....	45
2.1.3.9	Focus for Year One.....	50
2.1.4	Matrix of Elements .....	50
2.1.5	Program Costs.....	50
2.2	The Combined Sewer Overflow Program.....	51
2.2.1	Objectives .....	51
2.2.2	History (MSD and Regulatory).....	52
2.2.3	CSO Program Elements .....	53
2.2.3.1	Flow Monitoring .....	53
2.2.3.2	Backflow Prevention Device Installation Program .....	54
2.2.3.3	Status of Long-Term Control Plans .....	55
2.2.3.4	System Improvements and Enhancements.....	61
2.2.4	Compliance with the Nine Minimum Controls.....	61
2.2.5	CSO Performance Summary .....	63
2.2.5.1	Introduction.....	63
2.2.5.2	Background .....	63
2.2.5.3	System Improvements.....	64
2.2.6	Program Costs.....	66
2.3	The Sanitary Sewer Overflow Program.....	67
2.3.1	Objectives of the I/I and SSO Program .....	67
2.3.2	History .....	67
2.3.3	Program Elements.....	68

2.3.3.1	Flow Monitoring .....	69
2.3.3.2	Computer Modeling .....	69
2.3.3.3	Investigation (SSES).....	70
2.3.3.4	Rehabilitation.....	70
2.3.3.5	Post-Rehabilitation Flow Monitoring .....	70
2.3.3.6	Other Programs .....	71
2.3.3.7	Sanitary Sewer Overflow Abatement and Elimination Plan .	71
2.3.4	Program Costs.....	72
3	WATERSHEDS.....	73
3.1	Harrods Creek .....	75
3.1.1	History, Demographic and Community Information.....	75
3.1.2	Hydrology and Flooding.....	76
3.1.2.1	.. Flood Prevention Measures .....	76
3.1.3	Status of Water Quality.....	76
3.1.4	Water Quality Impacts .....	77
3.1.4.1	.. Point Source .....	78
3.1.4.2	.. Non-Point Source.....	79
3.1.4.3	.. Habitat and Biological Quality .....	80
3.1.5	Tracking Changes in Water Quality .....	80
3.1.5.1	.. Monitoring Activities.....	81
3.1.6	Program Activities .....	81
3.1.6.1	.. Planning .....	81
3.1.6.2	.. Projects.....	82
3.1.6.3	.. Education .....	83
3.2	Goose Creek.....	85
3.2.1	History, Demographic and Community Information.....	85
3.2.2	Hydrology and Flooding.....	86
3.2.2.1	.. Flood Prevention Measures .....	86
3.2.3	Status of Water Quality.....	86
3.2.4	Water Quality Impacts .....	87
3.2.4.1	Point Source .....	88
3.2.4.2	.. Non-Point Source.....	90

3.2.4.3 .. Habitat and Biological Quality .....	90
3.2.5 Tracking Changes in Water Quality .....	91
3.2.5.1 .. Monitoring Activities.....	92
3.2.6 Program Activities .....	93
3.2.6.1 .. Planning .....	93
3.2.6.2 .. Projects.....	94
3.2.6.3 .. Education .....	96
3.3 Beargrass Creek - Muddy Fork.....	98
3.3.1 History, Demographic and Community Information.....	98
3.3.2 Hydrology and Flooding .....	98
3.3.2.1 .. Flood Prevention Measures .....	99
3.3.3 Status of Water Quality.....	99
3.3.4 Water Quality Impacts .....	100
3.3.4.1 .. Point Source.....	100
3.3.4.2 .. Non-Point Source.....	101
3.3.4.3 .. Habitat and Biological Quality .....	102
3.3.5 Tracking Changes in Water Quality .....	103
3.3.5.1 .. Monitoring Activities.....	103
3.3.6 Program Activities .....	104
3.3.6.1 .. Planning .....	104
3.3.6.2 .. Projects.....	105
3.3.6.3 .. Education .....	107
3.4 Beargrass Creek - Middle Fork.....	112
3.4.1 History, Demographic and Community Information.....	112
3.4.2 Hydrology and Flooding .....	113
3.4.2.1 .. Flood Prevention Measures .....	113
3.4.3 Status of Water Quality.....	113
3.4.4 Water Quality Impacts .....	114
3.4.4.1 .. Point Source.....	116
3.4.4.2 .. Non-Point Source.....	117
3.4.4.3 .. Habitat and Biological Quality .....	118
3.4.5 Tracking Changes in Water Quality .....	118

3.4.5.1 .. Monitoring Activities.....	119
3.4.6 Program Activities .....	119
3.4.6.1 .. Planning .....	119
3.4.6.2 .. Projects.....	120
3.4.6.3 .. Education .....	124
3.5 Beargrass Creek - South Fork.....	130
3.5.1 History, Demographic and Community Information.....	130
3.5.2 Hydrology and Flooding.....	131
3.5.2.1 .. Flood Prevention Measures .....	131
3.5.3 Status of Water Quality.....	132
3.5.4 Water Quality Impacts .....	133
3.5.4.1 .. Point Source .....	135
3.5.4.2 .. Non-Point Source.....	136
3.5.4.3 .. Habitat and Biological Quality .....	137
3.5.5 Tracking Changes in Water Quality .....	138
3.5.5.1 .. Monitoring Activities.....	138
3.5.6 Program Activities .....	139
3.5.6.1 .. Planning .....	139
3.5.6.2 .. Projects.....	140
3.5.6.3 .. Education .....	148
3.6 Ohio River.....	154
3.6.1 History, Demographic and Community Information.....	154
3.6.2 Hydrology and Flooding.....	154
3.6.2.1 .. Flood Prevention Measures .....	155
3.6.3 Status of Water Quality.....	155
3.6.4 Water Quality Impacts .....	156
3.6.4.1 .. Point Source .....	160
3.6.4.2 .. Non-Point Source.....	162
3.6.4.3 .. Habitat and Biological Quality .....	162
3.6.5 Tracking Changes in Water Quality .....	163
3.6.5.1 .. Monitoring Activities.....	163
3.6.6 Program Activities .....	164

3.6.6.1 .. Planning .....	164
3.6.6.2 .. Projects.....	165
3.6.6.3 .. Education .....	175
3.7 Mill Creek .....	179
3.7.1 History, Demographic and Community Information.....	179
3.7.2 Hydrology and Flooding.....	179
3.7.2.1 .. Flood Prevention Measures .....	179
3.7.3 Status of Water Quality.....	180
3.7.4 Water Quality Impacts .....	181
3.7.4.1 .. Point Source .....	182
3.7.4.2 .. Non-Point Source.....	184
3.7.4.3 .. Habitat and Biological Quality .....	185
3.7.5 Tracking Changes in Water Quality .....	185
3.7.5.1 .. Monitoring Activities.....	186
3.7.6 Program Activities .....	186
3.7.6.1 .. Planning .....	186
3.7.6.2 .. Projects.....	188
3.7.6.3 .. Education .....	196
3.8 Pond Creek.....	199
3.8.1 History, Demographic and Community Information.....	199
3.8.2 Hydrology and Flooding.....	199
3.8.2.1 .. Flood Prevention Measures .....	200
3.8.3 Status of Water Quality.....	201
3.8.4 Water Quality Impacts .....	202
3.8.4.1 .. Point Source .....	205
3.8.4.2 .. Non-Point Source.....	206
3.8.4.3 .. Habitat and Biological Quality .....	207
3.8.5 Tracking Changes in Water Quality .....	208
3.8.5.1 .. Monitoring Activities.....	209
3.8.6 Program Activities .....	209
3.8.6.1 .. Planning .....	209
3.8.6.2 .. Projects.....	211

3.8.6.3 .. Education .....	215
3.9 Pennsylvania Run .....	219
3.9.1 History, Demographic and Community Information.....	219
3.9.2 Hydrology and Flooding .....	219
3.9.2.1 .. Flood Prevention Measures .....	220
3.9.3 Status of Water Quality.....	220
3.9.4 Water Quality Impacts .....	221
3.9.4.1 .. Point Source.....	221
3.9.4.2 .. Non-Point Source.....	222
3.9.4.3 .. Habitat and Biological Quality .....	223
3.9.5 Tracking Changes in Water Quality .....	223
3.9.5.1 .. Monitoring Activities.....	224
3.9.6 Program Activities .....	224
3.9.6.1 .. Planning .....	224
3.9.6.2 .. Projects.....	225
3.9.6.3 .. Education .....	226
3.10 Cedar Creek .....	228
3.10.1 History, Demographic and Community Information.....	228
3.10.2 Hydrology and Flooding .....	228
3.10.2.1 Flood Prevention Measures .....	229
3.10.3 Status of Water Quality.....	229
3.10.4 Water Quality Impacts .....	230
3.10.4.1 Point Source.....	231
3.10.4.2 Non-Point Source.....	232
3.10.4.3 Habitat and Biological Quality .....	233
3.10.5 Tracking Changes in Water Quality .....	233
3.10.5.1 Monitoring Activities.....	233
3.10.6 Program Activities .....	233
3.10.6.1 Planning .....	234
3.10.6.2 Projects.....	235
3.10.6.3 Education .....	236
3.11 Floyds Fork .....	239

---

3.11.1 History, Demographic and Community Information.....	239
3.11.2 Hydrology and Flooding.....	239
3.11.2.1 Flood Prevention Measures .....	240
3.11.3 Status of Water Quality.....	240
3.11.4 Water Quality Impacts .....	241
3.11.4.1 Point Source .....	243
3.11.4.2 Non-Point Source.....	244
3.11.4.3 Habitat and Biological Quality .....	245
3.11.5 Tracking Changes in Water Quality .....	246
3.11.5.1 Monitoring Activities.....	246
3.11.6 Program Activities .....	247
3.11.6.1 Planning .....	247
3.11.6.2 Projects.....	248
3.11.6.3 Education .....	252

## LIST OF TABLES

Table 1.	MSD MS4 Program Elements - Year Zero.....	4
Table 2.	Co-Permittee MS4 Program Elements - Year Zero .....	5
Table 3.	1999 MS4 Projects and Programs.....	6
Table 4.	CSO Abatement Program .....	8
Table 5.	1999 CSO Projects and Programs.....	9
Table 6.	SSO Program .....	12
Table 7.	1999 SSO Projects and Programs .....	13
Table 8.	General Watershed Information - Jefferson County .....	15
Table 9.	Status of Water Quality.....	16
Table 10.	Water Quality Statistics .....	20
Table 11.	Point Sources .....	23
Table 12.	Stream Sampling Sites, 1988 - 1998 and 1999 - Present.....	36
Table 13.	Watershed Specific External Agencies.....	49
Table 14.	1999 and 2000 Overflow Monitoring Sites .....	53
Table 15.	Backflow Prevention Device Program Totals .....	54
Table 16.	South Fork of Beargrass Creek Basin Summary .....	57
Table 17.	Land Use Percentages (1992) - Harrods Creek (Jefferson County Only) .....	75
Table 18.	303(d) List of Waters for TMDL Development - Harrods Creek (Jefferson County Only) .....	76
Table 19.	Basic Statistics for Water Quality Constituents - Harrods Creek (Jefferson County Only) .....	78
Table 20.	Potential Exceedances of State Water Quality Standards - Harrods Creek (Jefferson County Only).....	78
Table 21.	Summary of MSD's Regulatory Obligations plus Private Treatment Plants - Harrods Creek (Jefferson County Only).....	78
Table 22.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants) - Harrods Creek (Jefferson County Only) .....	79
Table 23.	Land Use Percentages (1992) - Goose Creek .....	85
Table 24.	Other Communities within the Goose Creek Watershed.....	85
Table 25.	303(d) List of Waters for TMDL Development - Goose Creek .....	86
Table 26.	Basic Statistics for Water Quality Constituents - Goose Creek.....	87
Table 27.	Potential Exceedances of State Water Quality Standards - Goose Creek.....	88
Table 28.	Summary of MSD's Regulatory Obligations plus Private Treatment Plants - Goose Creek.....	89
Table 29.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants) - Goose Creek.....	89
Table 30.	Sources of Loads for Point Sources (P) and Wet Weather (W) - Goose Creek.....	90
Table 31.	Land Use Percentages (1992) - Muddy Fork.....	98
Table 32.	Other Communities within the Muddy Fork Watershed.....	98
Table 33.	303(d) List of Waters for TMDL Development - Muddy Fork.....	99

Table 34.	Basic Statistics for Water Quality Constituents - Muddy Fork .....	100
Table 35.	Potential Exceedances of State Water Quality Standards - Muddy Fork .....	100
Table 36.	Summary of MSD's Regulatory Obligations Plus Private Treatment Plants - Muddy Fork .....	100
Table 37.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants) - Muddy Fork .....	101
Table 38.	Sources of Loads for Point Sources (P) and Wet Weather (W) - Muddy Fork .....	102
Table 39.	Land Use Percentages (1992) - Middle Fork .....	112
Table 40.	Other Communities within the Middle Fork Watershed .....	112
Table 41.	303(d) List of Waters for TMDL Development - Middle Fork .....	113
Table 42.	Basic Statistics for Water Quality Constituents - Middle Fork .....	114
Table 43.	Potential Exceedances of State Water Quality Standards - Middle Fork .....	115
Table 44.	Potential Exceedance of State Water Quality Standards - Middle Fork - Use of Minimonitors .....	115
Table 45.	Summary of MSD's Regulatory Obligations plus Private Treatment Plants - Middle Fork .....	116
Table 46.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants) - Middle Fork .....	117
Table 47.	Sources of Loads for Point Sources (P) and Wet Weather (W) - Middle Fork .....	117
Table 48.	Land Use Percentages (1992) - South Fork .....	130
Table 49.	Other Communities within the South Fork Watershed.....	130
Table 50.	303(d) List of Waters for TMDL Development - South Fork .....	133
Table 51.	Basic Statistics for Water Quality Constituents - South Fork .....	134
Table 52.	Potential Exceedances of State Water Quality Standards - South Fork .....	134
Table 53.	Potential Exceedance of Sate Water Quality Standards - South Fork - Use of Minimonitors .....	135
Table 54.	Summary of MSD's Regulatory Obligations plus Private Treatment Plants - South Fork .....	135
Table 55.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants) - South Fork.....	136
Table 56.	Sources of Loads for Point Sources (P) and Wet Weather (W) - South Fork.....	137
Table 57.	Land Use Percentages (1992) - Ohio River .....	154
Table 58.	Other Communities within the Ohio River Watershed.....	154
Table 59.	303(d) List of Waters for TMDL Development - Ohio River .....	156
Table 60.	Sampling Results from Kentucky Streams - Ohio River .....	160
Table 61.	Summary of MSD's Regulatory Obligations plus Private Treatment Plants - Ohio River .....	161

Table 62.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants) - Ohio River.....	161
Table 63.	UV Dose Response CSO 50 Effluent - Ohio River.....	168
Table 64.	Surface Flooding Volumes - Wheeler Basin.....	169
Table 65.	11 <sup>th</sup> and Rowan Sanitary Connections - Ohio River.....	174
Table 66.	Land Use Percentages (1992) - Mill Creek.....	179
Table 67.	303(d) List of Waters for TMDL Development - Mill Creek.....	180
Table 68.	Basic Statistics for Water Quality Constituents - Mill Creek.....	181
Table 69.	Potential Exceedances of State Water Quality Standards - Mill Creek	182
Table 70.	Summary of MSD's Regulatory Obligations plus Private Treatment Plants - Mill Creek.....	182
Table 71.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants).....	183
Table 72.	Sources of Loads for Point Sources (P) and Wet Weather (W) - Mill Creek.....	184
Table 73.	Surface Flooding Volumes - Wheeler Basin.....	194
Table 74.	Land Use Percentages (1992) - Pond Creek, (Jefferson County Only)	199
Table 75.	Other Communities within the Pond Creek Watershed (Jefferson County Only).....	199
Table 76.	303(d) List of Waters for TMDL Development - Pond Creek (Jefferson County Only).....	201
Table 77.	Basic Statistics for Water Quality Constituents - Pond Creek (Jefferson County Only).....	202
Table 78.	Potential Exceedances of State Water Quality Standards - Pond Creek (Jefferson County Only).....	204
Table 79.	Summary of MSD's Regulatory Obligations plus Private Treatment Plants - Pond Creek (Jefferson County Only).....	205
Table 80.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants) - Pond Creek (Jefferson County Only).....	206
Table 81.	Sources of Loads for Point Sources (P) and Wet Weather (W) - Pond Creek (Jefferson County Only).....	207
Table 82.	Land Use Percentages (1992) - Pennsylvania Run.....	219
Table 83.	303(d) List of Waters for TMDL Development - Pennsylvania Run ...	220
Table 84.	Basic Statistics for Water Quality Constituents - Pennsylvania Run ...	221
Table 85.	Potential Exceedances of State Water Quality Standards - Pennsylvania Run.....	221
Table 86.	Summary of MSD's Regulatory Obligations plus Private Treatment Plants - Pennsylvania Run.....	221
Table 87.	Sources of Loads for Point Sources (P) and Wet Weather (W) - Pennsylvania Run.....	223
Table 88.	Land Use Percentages (1992) - Cedar Creek.....	228
Table 89.	303(d) List of Waters for TMDL Development - Cedar Creek.....	229
Table 90.	Basic Statistics for Water Quality Constituents - Cedar Creek.....	230
Table 91.	Potential Exceedances of State Water Quality Standards - Cedar Creek.....	230
Table 92.	Summary of MSD's Regulatory Obligations plus Private Treatment	

	Plants - Cedar Creek .....	231	
Table 93.	Sources of Loads for Point Sources (P) and Wet Weather (W) - Cedar Creek .....	232	
Table 94.	Land Use Percentages (1992) - Floyds Fork, (Jefferson County Only)		239
Table 95.	303(d) List of Waters for TMDL Development - Floyds Fork (Jefferson County Only) .....	240	
Table 96.	Basic Statistics for Water Quality Constituents - Floyds Fork (Jefferson County Only) .....	241	
Table 97.	Potential Exceedances of State Water Quality Standards - Floyds Fork (Jefferson County Only).....	243	
Table 98.	Summary of MSD’s Regulatory Obligations plus Private Treatment Plants - Floyds Fork (Jefferson County Only) .....	243	
Table 99.	KPDES Discharge Permit Holders (Other than MSD and Private Treatment Plants) - Floyds Fork (Jefferson County Only).....	244	
Table 100.	Sources of Loads for Point Sources (P) and Wet Weather (W) - Floyds Fork (Jefferson County Only).....	245	

**LIST OF FIGURES**

Figure 1. Waters of Jefferson County - Year Zero..... 1

Figure 2. Jefferson County Watersheds ..... 1

Figure 3. Student Outfall Program ..... 3

Figure 4. Water Quality Monitoring ..... 3

Figure 5. Typical CSO Structure..... 7

Figure 6. Continuous Deflection Separation Unit..... 9

Figure 7. Typical SSO Location..... 11

Figure 8. Sewer Line Rehabilitation ..... 12

Figure 9. Percent Exceedance Dissolved Oxygen (DO) ..... 17

Figure 10. Percent Exceedance Fecal Coliform (FC) ..... 17

Figure 11. Percent Exceedance Cadmium (Cd) ..... 17

Figure 12. Percent Exceedance Copper (Cu) ..... 17

Figure 13. Percent Exceedance Chromium (Cr) ..... 18

Figure 14. Percent Exceedance Iron (Fe)..... 18

Figure 15. Percent Exceedance Lead (Pb) ..... 18

Figure 16. Percent Exceedance Mercury (Hg)..... 18

Figure 17. Percent Exceedance Zinc (Zn)..... 19

Figure 18. Average Percent Exceedance..... 19

Figure 19. Filamentous Algae ..... 19

Figure 20. Channelization in Beargrass Creek..... 24

Figure 21. Good In-stream and Riparian Habitat..... 24

Figure 22. Stream Sampling Sites, 1988 - 1998 and 1999 - Present..... 25

Figure 23. Television Inspection..... 29

Figure 24. Monitoring of Macroinvertebrates..... 35

Figure 25. Stream Sampling Sites, 1988 - 1998 and 1999 - Present..... 36

Figure 26. Percent Exceedance DO, 1991 - 1998 System..... 37

Figure 27. Percent Exceedance of DO with the Minimonitors ..... 38

Figure 28. Minimonitor ..... 38

Figure 29. Installation of the Minimonitor..... 38

Figure 30. Trends, by Watershed, for Total Volatile Solids (low flow data) for 1991 - 1998..... 41

Figure 31. Trends, by Watershed, for Total Volatile Solids (high flow data) for 1991 - 1998..... 41

Figure 32. Trends, by Watershed, for Total Phosphorous (low flow data) for 1991 - 1998..... 42

Figure 33. Trends, by Watershed, for Total Phosphorous (high flow data) for 1991 - 1998..... 42

Figure 34. Trends, by Watershed, for Soluble Reactive Phosphorous (low flow data) for 1991 - 1998..... 43

Figure 35. Trends, by Watershed, for Soluble Reactive Phosphorous (high flow data) for 1991 - 1998..... 43

Figure 36.	Trends, by Watershed, for Fecal Coliform Bacteria (low flow data) for 1991 - 1998.....	44
Figure 37.	Trends, by Watershed, for Fecal Coliform Bacteria (high flow data) for 1991 - 1998.....	44
Figure 38.	MSD I/I Investigation/Rehabilitation Process .....	68
Figure 39.	Installing a Flow Monitor .....	69
Figure 40.	Typical Modeling Output Data .....	69
Figure 41.	Smoke Testing Defects .....	70
Figure 42.	Installing Cured-In-Place Pipe (CIPP) in Old Cannons Lane.....	70
Figure 43.	Sump Pump Connected to the Sanitary Sewer .....	71
Figure 44.	Harrods Creek Watershed (Jefferson County Only).....	75
Figure 45.	Heavily Wooded Area - Harrods Creek (Jefferson County Only).....	75
Figure 46.	Water Quality Priority Rankings - Harrods Creek (Jefferson County Only) .....	77
Figure 47.	Goose Creek Watershed.....	85
Figure 48.	Water Quality Priority Rankings - Goose Creek .....	87
Figure 49.	Steep Slopes - Goose Creek.....	91
Figure 50.	Trends, by Watershed, for Total Volatile Solids (low flow data) for 1991 - 1998 - Goose Creek .....	91
Figure 51.	Trends, by Watershed, for Total Phosphorus (low flow data) for 1991 - 1998 - Goose Creek .....	92
Figure 52.	Trends, by Watershed, for Soluable Reactive Phosphorus (low flow data) for 1991 - 1998 - Goose Creek .....	92
Figure 53.	Muddy Fork Watershed .....	98
Figure 54.	Water Quality Priority Rankings - Muddy Fork Watershed.....	99
Figure 55.	Eroded Stream Banks Through Residential Areas - Muddy Fork .....	102
Figure 56.	Middle Fork Watershed .....	112
Figure 57.	Water Quality Priority Rankings - Middle Fork Watershed.....	114
Figure 58.	Heavily Silted Stream - Middle Fork.....	118
Figure 59.	Good Habitat - Middle Fork .....	118
Figure 60.	Cherokee Lake - Middle Fork.....	122
Figure 61.	Cherokee Lake - Middle Fork.....	122
Figure 62.	South Fork Watershed.....	130
Figure 63.	Impervious Area - South Fork .....	131
Figure 64.	Channelized Section of the South Fork of Beargrass Creek.....	131
Figure 65.	Water Quality Priority Rankings - South Fork Watershed .....	133
Figure 66.	Filamentous Algae - South Fork .....	137
Figure 67.	NSTS Cleaning and Isolation Project - South Fork.....	143
Figure 68.	CSO 108 - South Fork.....	143
Figure 69.	Typical CDS Unit - South Fork .....	144
Figure 70.	CSO 108 CDS Flow Schematic .....	144
Figure 71.	Net Bags - South Fork .....	145
Figure 72.	Net Bags - South Fork .....	145
Figure 73.	Ohio River Watershed.....	154
Figure 74.	ORSANCO Sampling - Day 1 .....	158
Figure 75.	ORSANCO Sampling - Day 2 .....	158

Figure 76.	ORSANCO Sampling - Day 3 .....	159
Figure 77.	ORSANCO Sampling - Day 4 .....	159
Figure 78.	Upper Dry Run Regional Storage Facility - Ohio River .....	167
Figure 79.	CDS Unit at CSO 50 - Ohio River.....	167
Figure 80.	Typical CDS Unit - Ohio River .....	168
Figure 81.	Wheeler Avenue CSO/Flood Control Basin - Ohio River.....	169
Figure 82.	Wheeler Avenue CSO/Flood Control Project Hydraulic Profile.....	170
Figure 83.	Garvin Brown Preserve.....	178
Figure 84.	Mill Creek Watershed.....	179
Figure 85.	Channelization - Mill Creek .....	180
Figure 86.	Water Quality Priority Rankings - Mill Creek.....	181
Figure 87.	Algae - Mill Creek .....	185
Figure 88.	Wetland - Mill Creek .....	185
Figure 89.	Wheeler Avenue CSO/Flood Control Basin - Ohio River.....	193
Figure 90.	Wheeler Avenue CSO/Flood Control Project Hydraulic Profile.....	194
Figure 91.	Pond Creek Watershed (Jefferson County Only).....	199
Figure 92.	Water Quality Priority Rankings - Pond Creek (Jefferson County Only) .....	202
Figure 93.	Good Stream Quality - Pond Creek (Jefferson County Only) .....	206
Figure 94.	Wetland - Pond Creek (Jefferson County Only).....	207
Figure 95.	Channelization - Pond Creek (Jefferson County Only).....	208
Figure 96.	Trends by Watershed, for Total Phosphorous (low flow data) for 1991 - 1998 - Pond Creek (Jefferson County Only).....	208
Figure 97.	Trends by Watershed, for Soluble Reactive Phosphorous (low flow data) for 1991 - 1998 - Pond Creek (Jefferson County Only) .....	208
Figure 98.	Pennsylvania Run Watershed .....	219
Figure 99.	Typical Stream - Pennsylvania Run.....	219
Figure 100.	Water Quality Priority Rankings - Pennsylvania Run Watershed.....	220
Figure 101.	Cedar Creek Watershed .....	228
Figure 102.	Typical Stream - Cedar Creek .....	228
Figure 103.	Water Quality Priority Rankings - Cedar Creek Watershed.....	229
Figure 104.	Floyds Fork Watershed (Jefferson County Only).....	239
Figure 105.	Water Quality Priority Rankings - Floyds Fork Watershed (Jefferson County Only) .....	240
Figure 106.	Good Stream - Floyds Fork (Jefferson County Only) .....	245
Figure 107.	Mussel Relocation - Floyds Fork (Jefferson County Only).....	246

**LIST OF EXHIBITS**

The page numbers listed are the first reference to the exhibits. The exhibits are located following this reference.

Exhibit 1.	1999 CSO, SSO, & MS4 Projects.....	6	
Exhibit 2.	Watershed Information and Water Quality Summary .....	14	
Exhibit 3.	1999 Overflow Monitoring Sites .....	53	
Exhibit 4.	2000 Overflow Monitoring Sites .....	54	
Exhibit 5.	Backflow Program .....	55	
Exhibit 6.	Region 1 LTCP Elements .....	55	
Exhibit 7.	Regions 2 & 3 LTCP Elements.....	58	
Exhibit 8.	MSD Combined Sewer System Location Map.....	62	
Exhibit 9.	Hydrology & Flooding - Harrods Creek Watershed.....	76	
Exhibit 10.	SSOs by Type - Harrods Creek Watershed.....	79	
Exhibit 11.	Monitoring Activities - Harrods Creek Watershed.....	79	
Exhibit 12.	Point Sources - Harrods Creek Watershed .....	79	
Exhibit 13.	Harrods Creek Watershed.....	79	
Exhibit 14.	Fiscal Year 2000 - 2004 Projects - Harrods Creek Watershed.....	81	
Exhibit 15.	Fiscal Year 1999 Projects - Harrods Creek Watershed .....	82	
Exhibit 16.	Hydrology & Flooding - Goose Creek Watershed .....	86	
Exhibit 17.	Monitoring Activities - Goose Creek Watershed .....	89	
Exhibit 18.	Point Sources - Goose Creek Watershed .....	89	
Exhibit 19.	Goose Creek Watershed.....	89	
Exhibit 20.	Fiscal Year 2000 - 2004 Projects - Goose Creek Watershed.....	93	
Exhibit 21.	Fiscal Year 1999 Projects - Goose Creek Watershed .....	94	
Exhibit 22.	Hydrology & Flooding - Muddy Fork of Beargrass Creek Watershed .....	99	
Exhibit 23.	CSO Locations - Muddy Fork of Beargrass Creek Watershed.....	101	
Exhibit 24.	SSOs by Type - Muddy Fork of Beargrass Creek Watershed .....	101	
Exhibit 25.	Monitoring Activities - Muddy Fork of Beargrass Creek Watershed .....		101
Exhibit 26.	Point Sources - Muddy Fork of Beargrass Creek Watershed .....	101	
Exhibit 27.	Muddy Fork Beargrass Creek Watershed.....	101	
Exhibit 28.	Fiscal Year 2000 - 2004 Projects - Muddy Fork of Beargrass Creek Watershed .....	104	
Exhibit 29.	Fiscal Year 1999 Projects - Muddy Fork of Beargrass Creek Watershed .....	105	
Exhibit 30.	Hydrology & Flooding - Middle Fork of Beargrass Creek Watershed .....	113	
Exhibit 31.	CSO Locations - Middle Fork of Beargrass Creek Watershed.....	116	
Exhibit 32.	SSOs by Type - Middle Fork of Beargrass Creek Watershed .....	116	
Exhibit 33.	Monitoring Activities - Middle Fork of Beargrass Creek Watershed .....		116
Exhibit 34.	Point Sources - Middle Fork of Beargrass Creek Watershed .....	116	
Exhibit 35.	Middle Fork Beargrass Creek Watershed.....	116	
Exhibit 36.	Fiscal Year 2000 - 2004 Projects - Middle Fork of Beargrass Creek		

	Watershed .....	119
Exhibit 37.	Fiscal Year 1999 Projects - Middle Fork of Beargrass Creek Watershed .....	120
Exhibit 38.	Cherokee Lake .....	122
Exhibit 39.	Hydrology & Flooding - South Fork of Beargrass Creek Watershed .....	131
Exhibit 40.	CSO Locations - South Fork of Beargrass Creek Watershed .....	135
Exhibit 41.	SSOs by Type - South Fork of Beargrass Creek Watershed .....	135
Exhibit 42.	Monitoring Activities - South Fork of Beargrass Creek Watershed..	135
Exhibit 43.	Point Sources - South Fork of Beargrass Creek Watershed .....	135
Exhibit 44.	South Fork Beargrass Creek Watershed .....	135
Exhibit 45.	Fiscal Year 2000 - 2004 Projects - South Fork of Beargrass Creek Watershed .....	139
Exhibit 46.	Fiscal Year 1999 Projects - South Fork of Beargrass Creek Watershed .....	140
Exhibit 47.	CSO 108 CDS Demo Project - South Fork of Beargrass Creek Watershed .....	144
Exhibit 48.	Letterle Pump Station Improvements - South Fork of Beargrass Creek Watershed.....	147
Exhibit 49.	Bishop Lane Relief - South Fork of Beargrass Creek Watershed .....	147
Exhibit 50.	Breckenridge & Rubel Flooding - South Fork of Beargrass Creek Watershed .....	148
Exhibit 51.	Hydrology & Flooding - Ohio River Watershed .....	155
Exhibit 52.	CSO Locations - Ohio River Watershed.....	161
Exhibit 53.	SSOs by Type - Ohio River Watershed .....	161
Exhibit 54.	Monitoring Activities - Ohio River Watershed .....	161
Exhibit 55.	Point Sources - Ohio River Watershed .....	161
Exhibit 56.	City/Ohio River Watershed .....	161
Exhibit 57.	Fiscal Year 2000 - 2004 Projects - Ohio River Watershed.....	164
Exhibit 58.	Fiscal Year 1999 Projects - Ohio River Watershed.....	165
Exhibit 59.	CSO 50 CDS Demo Project - Ohio River Watershed.....	168
Exhibit 60.	Wheeler Avenue CSO/Flood Control Basin - Ohio River and Mill Creek Watersheds .....	169
Exhibit 61.	Southwest Louisville Study Area - Ohio River, Mill Creek, and Pond Creek Watersheds .....	172
Exhibit 62.	MDS Improvements - Ohio River Watershed .....	174
Exhibit 63.	11 <sup>th</sup> & Rowan Connections - Ohio River Watershed.....	174
Exhibit 64.	Hydrology & Flooding - Mill Creek Watershed.....	179
Exhibit 65.	SSOs by Type - Mill Creek Watershed .....	183
Exhibit 66.	Monitoring Activities - Mill Creek Watershed.....	183
Exhibit 67.	Point Sources - Mill Creek Watershed .....	183
Exhibit 68.	Mill Creek Watershed.....	183
Exhibit 69.	Fiscal Year 2000 - 2004 Projects - Mill Creek Watershed.....	186
Exhibit 70.	Fiscal Year 1999 Projects - Mill Creek Watershed .....	188
Exhibit 71.	Hydrology & Flooding - Pond Creek Watershed .....	200
Exhibit 72.	SSOs by Type - Pond Creek Watershed .....	205
Exhibit 73.	Monitoring Activities - Pond Creek Watershed .....	205

---

Exhibit 74.	Point Sources - Pond Creek Watershed .....	205
Exhibit 75.	Pond Creek Watershed.....	205
Exhibit 76.	Fiscal Year 2000 - 2004 Projects - Pond Creek Watershed.....	209
Exhibit 77.	Fiscal Year 1999 Projects - Pond Creek Watershed .....	211
Exhibit 78.	Hydrology & Flooding - Pennsylvania Run Watershed .....	220
Exhibit 79.	SSOs by Type - Pennsylvania Run Watershed .....	222
Exhibit 80.	Monitoring Activities - Pennsylvania Run Watershed .....	222
Exhibit 81.	Point Sources - Pennsylvania Run Watershed.....	222
Exhibit 82.	Pennsylvania Run Watershed .....	222
Exhibit 83.	Fiscal Year 2000 - 2004 Projects - Pennsylvania Run Watershed ....	224
Exhibit 84.	Fiscal Year 1999 Projects - Pennsylvania Run Watershed.....	225
Exhibit 85.	Hydrology & Flooding - Cedar Creek Watershed .....	228
Exhibit 86.	SSOs by Type - Cedar Creek Watershed.....	231
Exhibit 87.	Monitoring Activities - Cedar Creek Watershed .....	231
Exhibit 88.	Point Sources - Cedar Creek Watershed.....	231
Exhibit 89.	Cedar Creek Watershed .....	231
Exhibit 90.	Year 2000 - 2004 Projects - Cedar Creek Watershed .....	234
Exhibit 91.	Fiscal Year 1999 Projects - Cedar Creek Watershed.....	235
Exhibit 92.	Hydrology & Flooding - Floyds Fork Watershed.....	239
Exhibit 93.	SSOs by Type - Floyds Fork Watershed.....	243
Exhibit 94.	Monitoring Activities - Floyds Fork Watershed.....	243
Exhibit 95.	Point Sources - Floyds Fork Watershed .....	244
Exhibit 96.	Floyds Fork Watershed .....	244
Exhibit 97.	Fiscal Year 2000 - 2004 Projects - Floyds Fork Watershed .....	247
Exhibit 98.	Fiscal Year 1999 Projects - Floyds Fork Watershed .....	248

**LIST OF APPENDICIES**

Appendix I	MS4 Matrix of Elements
Appendix II	Storm Water Outfall Data 1993 - 1999
Appendix III	Outfall Program Protocol for Contaminated Outfalls
Appendix IV	Erosion Prevention and Sediment Control Draft Ordinance
Appendix V	Water Quality Statistics
Appendix VI	ArcView GIS Application
Appendix VII	CSO Tables
Appendix VIII	I/I Program 5 - Year and 15 - Year Lookahead
Appendix IX	SSO Locations and Fact Sheets
Appendix X	List of Current and Future Projects and Project Maps
Appendix XI	SSOs and Associated Projects
Appendix XII	CSO Monthly Monitoring Report

## GLOSSARY OF ACRONYMS AND UNITS

### Acronyms

ACRE	Association of Chenoweth Run Environmentalists
ARC/INFO™	Geographic Information System Software from Environmental Systems Research, Inc.
ArcView™	Geographic Information System Software from Environmental Systems Research, Inc.
BCTF	Beargrass Creek Task Force
BGI	Beargrass Creek Interceptor
BGIR	Beargrass Creek Interceptor Relief
BMP	Best Management Practice
BOD	Biological Oxygen Demand
Cd	Cadmium
CDS	Continuous Deflection Separation
CIPP	Cured In Place Pipe
Cr	Chromium
CRD	Central Relief Drain
CRS	Community Rating System
CS	Construction Site Erosion Control
CSO	Combined Sewer Overflow
CSOP	Combined Sewer Operational Plan
Cu	Copper
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
FC	Fecal Coliform
Fe	Iron
FEMA	Federal Emergency Management Administration
FFEA	Floyds Fork Environmental Association
FOBC	Friends of Beargrass Creek
GH	Good Housekeeping/Pollution Prevention
GIS	Geographic Information System
HAZMAT	Hazardous Materials
HBAL	Home Builders Association of Louisville
Hg	Mercury
HTML	Hypertext Markup Language
ICAM	Industrial Compliance and Monitoring Program
IC	Illicit Connection and Improper Disposal
ID	Industrial Discharge Program
I/I	Infiltration and Inflow
IMS	Infrastructure Management System
JCPS	Jefferson County Public Schools
KAR 5:005	Title 401 of the Kentucky Administrative Regulation, Chapter 5, Section 5
KDOW	Kentucky Division of Water

KIPDA	Kentuckiana Regional Planning and Development Agency
KPDES	Kentucky Pollutant Discharge Elimination System
KTC	Kentucky Transportation Cabinet
KWA	Kentucky Waterways Alliance
LEEP	Louisville Education Employment Partnership
LOJIC	Louisville and Jefferson County Information Consortium
LTCP	Long-Term Control Plan
M	Monitoring
MDS	Main Diversion Structure
MFWTP	Morris Forman Wastewater Treatment Plant
MMR	Monthly Monitoring Reports
MS4	Municipal Separate Storm Sewer System
MSD	Louisville and Jefferson County Metropolitan Sewer District
NCAP	North County Action Plan
NFIP	National Flood Insurance Program
NH <sub>3</sub>	Ammonia
NH <sub>4</sub>	Ammonia Nitrogen
NMC	Nine Minimum Controls
NO <sub>3</sub>	Nitrate
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Services
NSTS	Northeastern Sanitary Trunk Sewer
ORFM	Ohio River Force Main
ORI	Ohio River Interceptor
ORMP	Ohio River Mile Point
ORSANCO	Ohio River Valley Sanitation Commission
P	Point Source
Pb	Lead
PC	Post Construction Program
PE	Public Education/Outreach Program
PS	Pump Station
PSC	Property Service Connection
R	Reporting
SBRD	Snead's Branch Relief Drain
SMMP	Strategic Manhole Monitoring Program
SRP	Soluble Reactive Phosphorus
SSES	Sanitary Sewer Evaluation Study
SSO	Sanitary Sewer Overflow
SSOAEP	Sanitary Sewer Overflow Abatement and Elimination Plan
SWMM	Storm Water Management Model
TDS	Total Dissolved Solids
TKN	Organic Nitrogen
TMDL	Total Maximum Daily Loads
TP	Total Phosphorus
TSS	Total Suspended Solids
TVI	Television Inspection

USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
USI	Underground Sewer Inspection
UV	Ultraviolet
W	Wet Weather
WATERS	Watershed Approach to Environmentally Responsible Stewardship
WCWTP	West County Wastewater Treatment Plant
WTP	Wastewater Treatment Plant
Zn	Zinc

### Units

gpd	gallons per day
lf	linear feet
MGD	million gallons per day
sq. mi.	square mile