

CITY OF LANCASTER
WATER POLLUTION CONTROL DEPARTMENT

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LANCASTER, OHIO 43130

March 31, 1998

Jan A. Rice
Division of Surface Water
Ohio EPA
Central District Office
3232 Alum Creek Drive
Columbus, OH 43207-3417

Re: City of Lancaster
Combined Sewer System Operational Plan
Wastewater Collection System Monitoring Plan

Dear Mr. Rice:

We are pleased to submit 2 copies of our Combined Sewer System Operational Plan. Each copy consists of one volume with text and one volume of Appendices. This plan was developed to satisfy the requirements of Part I, C.- Schedule of Compliance, Paragraph 4.B. of our current NPDES Permit. Included as Appendix H of the Operational Plan, is our Wastewater Collection System Monitoring Plan.

The Monitoring Plan is included to satisfy the requirements of Paragraph 5.A. of the NPDES Permit Schedule of Compliance. It is included in the Operational Plan because Lancaster has already completed the work outlined in the plan and has developed a sewer system model from the data collected. The data collected and the model will be used to develop the Characterization Report required by Paragraph 5.B. of the NPDES Permit Schedule of Compliance.

Should you have any questions regarding the attached reports, please feel free to contact me or Tom Bulcher at Malcolm Pirnie (888-4953).

Very truly yours,

MALCOLM PIRNIE, INC.

Michael B. Nixon /TJB

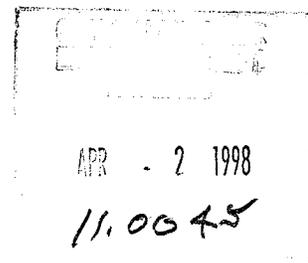
Michael B. Nixon

oepa.l3/tjb

Enclosures

c: L. Kent Huston, City Engineer
Tom Bulcher, Malcolm Pirnie

"Insuring Your Right to Clean Water . . . Now and in the Future"



March 31, 1998

Michael B. Nixon
WPCD Superintendent
City of Lancaster
800 Lawrence Street
Lancaster, OH 43130

Re: Wastewater Collection System
Combined Sewer System Operational Plan

Dear Mr. Nixon:

Enclosed are five copies of the above referenced report. Each report consists of one volume with text and one volume of Appendices. Two copies of the report have been delivered to Ohio EPA under a separate transmittal.

If you have any questions regarding this matter, please let us know.

Very truly yours,

MALCOLM PIRNIE, INC.

Thomas J. Bulcher

Thomas J. Bulcher, P.E.
Associate

omlot.11/tjb

Enclosures

c: L. Kent Huston, City Engineer

0491-028

**CITY OF
LANCASTER, OHIO**

**WATER POLLUTION CONTROL
DEPARTMENT**

**COMBINED SEWER SYSTEM
OPERATIONAL PLAN**

MARCH 1998



ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

Lancaster, Ohio
Water Pollution Control Department
Combined Sewer System Operational Plan

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1.1 Background

The City of Lancaster owns and operates a wastewater treatment facility, the Lancaster Water Pollution Control Facilities (WPCF) located at 800 Lawrence Street in Lancaster, Ohio. The WPCF discharges to the Hocking River under authority of a National Pollution Discharge Elimination System (NPDES) permit issued by the Ohio EPA.

The wastewater collection system is also operated under the regulatory authority of the NPDES permit. Lancaster's wastewater collection system consists of sanitary sewers, pump stations and combined sewers. The combined sewers were designed in the early 1900s to collect both sanitary and storm water together. The key feature of combined sewers are overflow structures known as combined sewer overflows or CSOs. These structures were designed to relieve excess flow (both sanitary and storm flow) into adjacent receiving streams when the flow exceeded the capacity of the system. In 1994 the United States Environmental Protection Agency issued its National CSO Policy to address pollution concerns related to combined sewer overflows. This policy is implemented in Ohio by requirements placed in NPDES permits by the Ohio EPA.

In order to reduce basement flooding, plan for future growth and anticipate NPDES CSO requirements, the City of Lancaster prepared the following:

- An updated city wide map of all sewers in an electronic format (see Figure 3-1 at the end of the plan).
- A Wastewater Collection System Monitoring Plan. This plan monitored sewer flows during dry weather periods (i.e. periods without rain) as well as during wet weather periods (i.e. periods with rain). This information was used to develop the sewer system computer model, characterization report and operational plan listed below. In addition to flow monitoring, the plan included sampling of CSOs and documentation of CSO activation. The Wastewater Collection System Monitoring Plan is provided in Appendix H for reference.
- A fecal coliform sampling plan to determine the extent of fecal coliforms in local streams.
- A CSO solids and floatable study to determine the extent solids and floatables are present in CSO discharges.
- A computer model of the City of Lancaster's sewer system based on XP-Software's Stormwater Management Model (XP-SWMM).
- Identification of basement flooding areas.
- A Combined Sewer System Characterization Report. The report describes collection system components such as siphons, pump stations, combined sewer overflows and collection areas. This report also evaluates the current sewer collection system capacity during dry weather and wet weather. Storm sewer alternatives to reduce basement flooding were developed and discussed as part of this report.

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- A Combined Sewer System Operational Plan (this document) implementing the National CSO Policy's Nine Minimum Controls which are required by the City's NPDES permit.

1.2 Combined Sewer System Operational Plan

This document is the City of Lancaster's Combined Sewer System Operational Plan. This document summarizes the implementation of the National CSO Policy's Nine Minimum Controls. This includes the operation and maintenance procedures of the City of Lancaster pertaining to its combined sewer system as well as sampling, flow monitoring and other information collected by the City that may be relevant.

The Nine Minimum Controls, as defined by the United States Environmental Protection Agency (USEPA), are simple, low-tech, low cost, controls intended to reduce CSOs and their impact on receiving streams. The nine minimum controls are technology-based measures that are easily implemented in a short period of time. The nine minimum controls as defined by the EPA are:

- | | | |
|----|--|------------|
| 1. | Proper operation and maintenance of the sewer system and CSO outfalls. | Chapter 4 |
| 2. | Maximize use of the collection system for storage. | Chapter 5 |
| 3. | Review and modification of pretreatment requirements. | Chapter 6 |
| 4. | Maximize flow to the POTW for treatment. | Chapter 7 |
| 5. | Prevent dry weather overflows. | Chapter 8 |
| 6. | Control of solid and floatable materials. | Chapter 9 |
| 7. | Pollution prevention. | Chapter 10 |
| 8. | Public notification. | Chapter 11 |
| 9. | Monitor CSOs to characterize impacts and efficiency of controls. | Chapter 12 |

The implementation of each minimum control by the City of Lancaster is discussed in a separate chapter of this plan, beginning with Chapter 4, and is summarized below. Chapters 2 and 3 provide introductory and background information on Lancaster's combined sewer system.

Chapter 4 - Operation and Maintenance Program

This minimum control has been implemented. This chapter describes the City of Lancaster's operation and maintenance program including personnel, training, budget, equipment, sewer inspection/cleaning, record keeping, etc. Highlights of the chapter are provided below:

- **Personnel & Training:** The Water Pollution Control Department (WPCD) consists of 23 full-time positions. Training is provided for safety purposes (e.g. confined space entry) and whenever necessary for proper operation and maintenance.
- **Budget:** The 1998 Water Pollution Control Department's Budget was \$5,502,000 with \$551,000 dedicated to wastewater collection.
- **Customer complaints:** The WPCD typically responds to complaint calls within 24 hours.

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- Inspections: A video camera truck is used to inspect sewers when necessary. Pump stations are inspected daily. Combined sewer overflows are inspected on a biweekly basis at a minimum.
- Maintenance and Cleaning: Problem sewers are cleaned weekly. Maintenance and cleaning of sewers and siphons is provided when necessary. A list of known maintenance problem areas is provided in Chapter 4. Many of these problems were found during flow monitoring and sampling efforts in 1995 and 1996. This includes areas of known deposition problems. The most critical deposition problem, the 27-inch sewer from CSO 1027 to South Broad Street, is presently being cleaned.
- Infiltration/Inflow Reduction Projects:
 - CSO 1010: A temporary plug has been installed in this CSO which is suspected of allowing stormwater to backflow into the system. If the plug does not cause flooding problems, the plug will be made permanent and the CSO will be abandoned. Similar investigations are planned for CSO 1022 and 1024.
 - Flow Metering: The city will use its flowmeters to search for sources of I/I. The City is presently investigating the area around Zimmer and Ohio streets which was identified as potentially having a significant amount of I/I during the 1995 Sewer System Evaluation.
 - Floodgates: The WPCD has been installing floodgates in recent years on CSO overflows prone to river intrusion or backflow from the stormwater system.
- Future CSO Improvement projects include:
 - Temporary overflow plugging and flow monitoring at CSO 1005 to see if it can be eliminated or if its weir elevation can be raised.
 - New sewer construction to eliminate CSO 1007.
 - Improving access to CSO 1005 (if not eliminated).
 - Improving access to siphons CSO 1006 and 1036.
- Street Sweeping/Catch Basins: The City of Lancaster Street Department performs street sweeping and catch basin cleaning.
- Sewer Map and Atlas: The WPCD has developed an electronic sewer map and atlas to be used as an updatable reference for all city storm and sanitary sewers.
- Computer Model: The WPCD has developed a computer model of its sanitary sewer system which can be used to analyze the system's response to new loads and developments.
- Records: Records are maintained of all maintenance work orders through a computerized process managed by the WPCD. Records of sewer drawings are stored and available for use in the City Engineer's Office in City Hall.

Chapter 5 - Maximize Use of Collection System for Storage

This control has been implemented. Over the past 15 years the City of Lancaster has performed numerous sewer system studies and implemented their recommendations for reducing infiltration and inflow (I/I) in its sewer system. These efforts are summarized in this chapter and demonstrate one method of maximizing storage by reducing I/I.

The city has also installed numerous floodgates (or flapgates) on the discharge of CSOs prone to reverse flow from receiving streams or storm sewers during high stream levels. By

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keeping this source of inflow out, the city has increased the storage available in the system.

This chapter also uses the XP-SWMM computer model of the Lancaster Sewer System to estimate the amount of storage available in the sewer system. After considering the necessity of protecting homes from flooded basements, it was concluded that only a small amount of storage was available in the sewer system.

Chapter 6 - Review Pretreatment Requirements

This control has been implemented. In Chapter 6, the existing Industrial Pretreatment Program (IPP) is summarized, including the number of significant industrial users in the combined sewer area and the flow they contribute. As a percentage of dry weather flow to the plant, the industrial user contribution has decreased from over 35% to only 20% in the past twenty years. The historical trend of the reduction of metals in the Lancaster Water Pollution Control Facility (WPCF) sludge since the beginning of the IPP is also provided to show the effectiveness of the IPP and to demonstrate the reduced impact of industrial flows in CSOs. No changes in the existing IPP are necessary.

Chapter 7 - Maximize Flow to the Treatment Plant

This control has been implemented. The WPCF's influent pumping capacity was increased from 6 MGD to 12.5 MGD (18 MGD through primary treatment) during a 1989 upgrade of the plant. In a subsequent project completed in 1997, the plant was further modified to treat 18 MGD. Hydraulic tests performed in 1997 confirm the plant can treat at least 18 MGD on a hydraulic basis for a short period of time.

The calibrated XP-SWMM computer model of the sanitary sewer system was used to confirm that the sewer system can and does convey the peak capacity of 18 MGD to the plant.

Chapter 8 - Prevent Dry Weather Overflows

This control has been implemented. This chapter identifies current procedures used for identifying and reporting dry weather overflows and summarizes the results of the dry weather overflow monitoring conducted in 1995 and 1996 in conjunction with the CSO flow monitoring. (Chapter 4 discusses the biweekly (minimum) monitoring of all CSO headwalls for dry weather overflows.)

This chapter concludes that dry weather overflows are rare in the Lancaster system. However, it also identifies several CSO structures that are vulnerable to dry weather overflows (CSO structures 1005 and 1007) and describes future CSO projects that will increase the resistance of the system to dry weather overflows.

Chapter 9 - Control of Solid and Floatable Materials

This control has been implemented. This chapter describes the sampling performed on CSO outfalls and storm sewer outfalls in 1996. This sampling confirmed that Lancaster's CSOs do not discharge a significant amount of objectionable material. It was concluded that no modifications to the Lancaster combined sewer system was necessary to control solid and floatable material.

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Chapter 10 - Pollution Prevention

This control has been implemented. This chapter describes the current pollution prevention and public education efforts of the City's Water Pollution Control Department (WPCD). It also summarizes county and state programs that impact the Lancaster area. A new part of this public education effort is a brochure to be developed by the WPCD devoted to CSO issues. This brochure will be distributed with sewer bills to the residents of Lancaster.

Chapter 11 - Public Notification

This control has been implemented. This chapter summarizes the fecal coliform sampling performed on streams in the Lancaster area during the summer of 1996.

It was concluded that water quality standards were met during dry weather in areas impacted by Lancaster's CSOs, however these CSOs did discharge fecal coliforms during wet weather. It was also noted that there exist sources of fecal coliforms upstream of the City of Lancaster that were sufficient to violate water quality standards during dry and wet weather.

Due to the presence of fecal coliforms in CSO discharges, it was decided to install notification signs at each CSO structure. An example of the sign is provided in this chapter for reference.

Chapter 12 - Monitor CSOs to Characterize Impacts and Efficacy of Controls

This control has been implemented. This chapter describes the CSO sampling that was performed in 1995 and 1996. Each CSO was monitored to determine its frequency of activation. Representative samples were taken at selected CSOs to estimate the pollutant concentration contained in CSO discharges. The results of this sampling are provided in this chapter. The concentration of pollutants in Lancaster's CSOs appeared to be typical of urban area combined sewers exhibiting a first-flush effect.

The most important part of this chapter is the discussion of receiving stream impacts. The Ohio EPA's stream sampling program is in the process of completing a report on the aquatic health of the Hocking River and its tributaries. The report will be based on the Ohio EPA's most recent sampling effort which was performed in 1995. The report has not been finalized yet, however preliminary conclusions document continued improvement in the Hocking River. Specifically, it no longer found aquatic life impacts from Lancaster's CSOs in the Hocking River through Lancaster. In fact, the Hocking River is making great progress in attaining its designated water quality standard. It is anticipated that the Ohio EPA will find that the Hocking River is in full or partial attainment over 100% of its length for the first time since their stream monitoring program began.

The Ohio EPA did identify high fecal coliforms and some sanitary floatable debris attributable to CSO activity in the Hocking River. The City of Lancaster investigated these impacts as part of the 1995 Sewer System Evaluation. The conclusions of these investigations are discussed in Chapters 8 and 9, respectively.

The only CSO impact area identified by the Ohio EPA from their 1995 sampling is in the lower portion of the Baldwin Run, near the Lawrence Street bridge. A total of five CSOs

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discharge to the Baldwin Run and one to an upstream tributary. Two of these CSOs (CSO 1019 and 1026) activate frequently and discharge in the lower portion of Baldwin Run, just upstream of the Lawrence Street bridge. Although the 1995 sampling found only a "partial" attainment of water quality standards in this stretch, it is still an improvement from the 1990 and 1982 sampling which found this segment in "non" attainment. The only "non" attainment status found in the 1995 sampling is likely due to a discharge related to construction activity which is no longer active.

Due to the improvement of all streams impacted by Lancaster CSOs, no further action is planned by the City to further implement this minimum control.

1.3 Conclusion

The City of Lancaster is committed to complying with the combined sewer provisions of its NPDES permit. The City of Lancaster has successfully implemented the applicable portions of the Nine Minimum Controls as described in its Combined Sewer System Operational Plan.

+ + END OF CHAPTER 1 + +

2

Chapter 2 - Permits and Ordinances

2.1 NPDES Permit

The City of Lancaster owns and operates a wastewater treatment plant, the Lancaster Water Pollution Control Facility (WPCF), located at 800 Lawrence Street in Lancaster, Ohio. The City is authorized to discharge from the WPCF to the Hocking River by the Ohio EPA. The requirements of this discharge are contained in a National Pollution Discharge Elimination System (NPDES) permit issued by the Ohio EPA. Lancaster's NPDES Permit (#4PD00001*HD) establishes effluent limits for the WPCF's discharge and lists known combined sewer overflow (CSOs) locations where discharge is permitted during wet weather. A copy of the NPDES permit can be found in Appendix B.

2.2 Sewer Use Ordinance

The City of Lancaster has adopted several ordinances to regulate the use of its sewer collection system. Sewer use ordinances define, among other things, the procedures for making connections to the sewer system, the material specifications for new sewer construction, fees and other charges and what can be discharged to the sewer system. The existing ordinances appear as chapters in the City of Lancaster Codified Ordinance. The following chapters are included in Appendix C for reference:

City of Lancaster - Streets and Public Services Code

- Chapter 912 - Use of Public and Private Sewers
- Chapter 913 - Sewerage and Drainage Generally
- Chapter 915 - Sewer Rates

2.3 Industrial Pretreatment Ordinance

The City of Lancaster has adopted an industrial pretreatment ordinance to control industrial discharges to its sewer system. This ordinance outlines the procedures required for industrial users to use the City sewer system including allowable pollutant discharge concentrations. The City's current industrial pretreatment ordinance is listed below and included in Appendix D for reference.

City of Lancaster - Streets and Public Services Code

- Chapter 916 - Wastewater Pretreatment

+ + END OF CHAPTER 2 + +

3

Chapter 3 - Combined Sewer System Description

3.1 Introduction

The City of Lancaster, Ohio has a service area of approximately 17 square miles and a population of approximately 36,600. The sewer system serves residential, commercial and industrial customers and conveys wastewater from these customers to the Water Pollution Control Facility (WPCF) through interceptor sewers, sanitary sewers and combined sewers. The sanitary sewers convey only wastewater to the interceptors which transport the wastewater to the WPCF. The combined sewers collect stormwater and wastewater and convey the combined flow to the interceptors. The combined sewers are designed to overflow to adjacent streams through combined sewer overflows (CSOs) when the volume of combined sewage and stormwater becomes greater than the carrying capacity of the sewer. The service area, sewer types, and sewer collection areas are shown on Figure 3-1 at the end of this Plan. Each type of sewer, along with other components of the sewer system such as pump stations, siphons, and CSO structures, will be discussed in Sections 3.2 through 3.9.

Sewers in the City's system are constructed of many different types of materials, some of which have been in existence since the early 1900s. The materials of construction include brick, clay, cement and cast iron. Modifications have been made over the years to improve the City's sewer system. These modifications include the addition of interceptor sewers and the separation of storm flow from sanitary flow in some combined sewer areas.

The sanitary and combined sewers within the system range in size from 6 to 60 inches in diameter. The total length and age of each type of sewer is presented in Table 3-1.

A more detailed summary of interceptors and large diameter sewers is provided in Table 3-2. Table 3-2 summarizes sewer length, overall pipe slope, roughness coefficient, and the maximum pipe capacity of each sewer.

3.2 Interceptor Sewers

For purposes of this plan, interceptor sewers are defined as large diameter sewers that collect and transport wastewater and stormwater from several collection areas throughout the City of Lancaster to the WPCF. Flows from the east and west sides of the city are conveyed to the WPCF through three main interceptors. The three main interceptors are the 36" East, 27" West and 36" West. The interceptors connect to two 48" sewers entering the treatment facility as shown on Figure 3-1.

The 36" East side interceptor (also known as the Baldwin Run Sewer) collects flow from six areas. This interceptor collects flow from areas 2, 3, 5A, 5B, 6 and 7 in the eastern portion of the City. Prior to entering the WPCF, the 36" East interceptor connects with a 30" sanitary sewer and a 60" combined sewer to form a 48" sewer. This convergence is near the southeast corner of Mary Burnham Park and the Indiana-Central Ohio Railroad. The 48" sewer transports both wastewater and stormwater to the WPCF and has a CSO located at the northeast corner of the WPCF. The invert elevation of the 48" sewer at CSO 1034 is 800.00 and the overflow elevation is 805.00.

**Table 3-1
City of Lancaster, Ohio
Wastewater Collection System Summary**

Age / Size	Separate Sanitary Sewers (feet)										Total
	6 inch	8 inch	10 inch	12 inch	15 inch	18 inch	21 inch	24 inch	> 24 in		
< 10 yrs	0	69,958	2,043	8,928	1,511	8,098	0	208	5,921		96,667
< 20 yrs	219	107,753	6,476	3,444	4,792	8,816	11,904	3,064	2,891		149,359
< 40 yrs	1,634	145,658	13,349	2,326	5,430	6,653	10,032	2,545	26,933		214,560
> 40 yrs	7,172	215,167	26,627	9,775	7,052	14,897	4,264	1,086	42,801		328,841
Subtotal	9,025	538,536	48,495	24,473	18,785	38,464	26,200	6,903	78,546		789,427
	Combined Sanitary Sewers (feet)										
< 10 yrs	0	0	0	0	0	23	0	0	0	0	23
< 20 yrs	0	0	0	0	0	0	0	0	0	0	0
< 40 yrs	0	722	0	623	0	0	0	0	0	0	1,345
> 40 yrs	0	8,993	3,675	8,007	17,805	10,440	6,245	15,075	16,455		86,695
Subtotal	0	9,715	3,675	8,630	17,805	10,463	6,245	15,075	16,455		88,063
Total	9,025	548,251	52,170	33,103	36,590	48,927	32,445	21,978	95,001		877,490
inch-diameter miles	10.3	830.7	98.8	75.2	103.9	166.8	129.0	99.9	539.8		2,054.4

- NOTE:
1. The average sewer size for those lines greater than 24 inches in diameter is assumed to be 30 inches.
 2. Table information obtained from Water Pollution Control Department and is current through 10/03/97.

Chapter 3 - Combined Sewer System Description

**Table 3-2
City of Lancaster
Interceptor and Large Diameter Sewer Summary**

<u>Description</u>	<u>Location</u>	<u>Length (feet)</u>	<u>Overall Slope (ft./ft.)</u>	<u>Roughness Coefficient (n)*</u>	<u>Full Pipe Capacity (cfs/mgd)</u>
East and North East Area of City					
<u>Baldwin Run Interceptor Sewer (Dwg. 65-3)</u>					
48" East	Mary Burnham Park to WPCF	240	0.000292	0.02	15.95/10.31
<u>Sanitary Sewer East to Industrial Park (Dwg. 65-1, 65-2)</u>					
30" East	Along IN& OH R.R. to Mary Burnham Park	530	0.00151	0.014	14.85/9.58
<u>Baldwin Run Interceptor Sewer (Dwg. 65-3)</u>					
36" East	From beginning of Baldwin River to SE corner Mary Burnham Park	290	0.00031	0.018	8.50/5.49
<u>Baldwin Run Interceptor, Ewing Run Trunk Sewer, Ewing Trunk (Dwgs. 65-3, 69-3, 1976)</u>					
24" Ewing	Valley Forge and Ewing Run to the beginning of Baldwin Run	5600	0.00357	0.014	12.60/8.15
<u>Baldwin Run Interceptor, Feters Run Interceptor (Dwgs. 65-3, 66-2)</u>					
24" Feters	N. of Stone Run Ct. and Feters Run to the beginning of Baldwin Run	1800	0.00363	0.014	12.70/8.22
60" East	From Wheeling & Maple to SE Corner Mary Burnham Park	200	0.00219	0.02	79.10/57.13
South and Southwest Area of City					
<u>Utica Reese Trunk Sewer (Dwgs. 69-1, 69-2)</u>					
24" West	From Hamburg Rd. and S.R. 793 to Broad St. Pump Station	540	0.00417	0.014	13.63/8.81

* - Roughness coefficient taken from XP-SWMM Model of the City of Lancaster Sewer System.
+ - All "Dwg." references refer to City of Lancaster as-built drawing records.

Chapter 3 - Combined Sewer System Description

**Table 3-2
City of Lancaster
Interceptor and Large Diameter Sewer Summary**

<u>Description</u>	<u>Location</u>	<u>Length (feet)</u>	<u>Overall Slope (ft./ft.)</u>	<u>Roughness Coefficient (n)*</u>	<u>Full Pipe Capacity (cfs/mgd)</u>
<u>Utica Reese Trunk Sewer and Hunters Run (Dwgs 69-1, 70-1)</u>					
30" West	From IN & OH R.R. and Hunter Ave. to Broad St. Pump Station	2350	0.0026	0.014	19.48/12.59
Central and Northwest Area of the City					
<u>Hunters Run Trunk Sewer (Dwg 70-1)</u>					
24" West	From Lincoln Ave. and Hunters Run to 30" sewer	510	0.00165	0.014	8.57/5.54
<u>Hocking River Trunk Sewer (Dwg. 67-1)</u>					
48" West	From Indiana-Central Ohio R.R. to WPCF	340	0.000235	0.018	15.90/10.28
<u>Hocking River Trunk Sewer (Dwg. 67-1)</u>					
42" West	From IN & OH RR to Park St. and Hocking River	670	0.000328	0.018	13.17/8.51
<u>Pre 1940's Trunk Sewers (Dwg. A-4)</u>					
27" West	From Wheat and Hocking River to 48" West	220	0.000409	0.018	4.54/2.93
<u>Hocking River Trunk Sewer (Dwg. 67-1)</u>					
36" West	From Park St. and Hocking River 42" West	730	0.000164	0.016	6.95/4.49
<u>Hocking River Trunk Sewer (Dwg. 68-2)</u>					
24" West	From W. Fair and Shasta Dr. to 30" sewer	470	0.000575	0.014	5.06/3.27
<u>1992 NW Annexation Sanitary Sewer Extension (Ety Road and River Valley Complex)</u>					
30" West	From Columbus Rd. to 36" interceptor	770	0.000481	0.014	8.38/5.42

Chapter 3 - Combined Sewer System Description

The 27" West side interceptor follows the Hocking River west and collects both wastewater and stormwater from thirteen subsystems located in the south-central area of the city. Flow from areas 10, 11, 14, 15, 16, 17, 18, 19, 20, 21A, 21B, 22 and 23 discharges to the 27" West side interceptor. Flow enters into the 27" interceptor through sanitary and combined sewers ranging in size from 8 to 15 inches in diameter. The Wheeling St. Pump Station discharges into this interceptor.

The 36" West interceptor also follows the Hocking River west and then north from the WPCF. The 36" West interceptor collects both sanitary and combined flows from twelve areas located in the southwestern, west, north and north west areas of the City. Areas 12A, 12B, 13, 24, 25, 26, 27, 28, 29, 30, 31 and 32. The YMCA and South Broad Street Pump Stations discharge flow into the 36" West interceptor. The pump stations are discussed in Section 3.5.

The 27" and 36" West interceptors parallel each other and are interconnected at five locations in the southwestern area of the City. These locations are west of the Hocking River and the Indiana-Central Ohio Railroad, east of High St. and Lawrence St., alley south of Lincoln Ave. and Whiley Ave., northwest of Walnut St. and Whiley Ave., and east of Wheeling St. Pump Station. As the interceptors get closer to the WPCF they increase in size. The 36" changes to a 42" sewer near the Indiana-Central Ohio Railroad and the Hocking River. The 27" and 42" join at the WPCF perimeter to form a 48" sewer influent to the WPCF.

3.3 Pump Stations

The City of Lancaster's sewer collection system utilizes pumps stations where necessary to transport wastewater to the WPCF. The City currently operates and maintains seven pump stations. Each pump station is summarized in Table 3-3 and described below.

YMCA Pump Station

The YMCA Pump Station is located west of the intersection of Allen St. and Memorial Dr. behind the YMCA. This station pumps sanitary flows from the northwest and combined flows from the north and north-central areas through an 18" force main to the 36" West interceptor. With the largest of the four pumps out of service, the pump station has a firm pumping capacity of 7,000 gpm (10.0 mgd).

South Broad Street Pump Station

The South Broad St. Pump Station is located east of Memorial Dr. and Lewis Ave. This station pumps sanitary flows from the southern and the southwestern areas of the city through a 10" force main to the 36" West interceptor sewer. This pump station has a firm pumping capacity of 2,000 gpm (2.9 mgd) with one pump out of service.

Whittier Street Pump Station

The Whittier St. Pump Station is located in the northwest area of the city at the intersection of Schorrway Dr. and Whittier St. This station pumps sanitary flows from the northwestern area of the city through a 3" force main to a 10" sanitary sewer which conveys the flow to the 18" West sewer. This station has a firm pumping capacity of 125 gpm (0.18 mgd) with one unit out of service.

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**Table 3-3
Pump Station Characteristics**

Pump Station	Pump Number	Ground Elevation (Feet)	Wet Well Elevation (Feet)	Discharge Elevation (Feet)	Pump Capacity (gpm)	TDH (Feet)	Pump On (Feet)	Pump Off Falling (Feet)	Pump Off Rising (Feet)
YMCA	1	816.5	790.17	804.5	1,300	52	794.67	793.17	796.17
	2	816.5	790.17	804.5	2,200	53	796.17	794.17	NA
	3	816.5	790.17	804.5	3,500	70	797.17	795.67	NA
	4	816.5	790.17	804.5	3,500	70	797.17	795.67	NA
S. Broad Street	1	815.0	787.33	800.17	1,000	40	791.83	791.33	NA
	2	815.0	787.33	800.17	1,000	40	793.33	790.33	NA
	3	815.0	787.33	800.17	1,000	40	793.33	790.33	NA
Whittier Street	1	844.5	828.00	840.00	125	40	831.00	829.00	NA
	2	844.5	828.00	840.00	125	40	834.00	829.00	NA
Wheeling Street	1	818.0	798.49	806.82	900	21	802.99	801.49	NA
	2	818.0	798.49	806.82	900	21	804.99	800.49	NA
	3	818.0	798.49	806.82	900	21	804.99	800.49	NA
East Main Street	1	826.5	802.00	815.00	800	33	807.00	806.00	NA
	2	826.5	802.00	815.00	800	33	809.00	805.00	NA
	3	826.5	802.00	815.00	800	33	809.00	805.00	NA
Fogg Drive (Stonegate)	1	909.5	887.00	905.00	135	73	889.80	888.00	NA
	2	909.5	887.00	905.00	135	73	891.00	888.00	NA
Commerce Street	1	826.2	815.00	823.50	410	15	817.50	815.50	NA
	2	826.2	815.00	823.50	410	15	819.00	815.50	NA

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Wheeling Street Pump Station

The Wheeling St. Pump Station is located in the alley south of Wheeling St. and east of George St. next to the Hocking River. This station pumps combined flows from the west and southwest and sanitary flows from the west areas through an 8" force main to the 27" West interceptor. With one pump out of service, the pump station has a firm pumping capacity of 1,800 gpm (2.6 mgd).

East Main Street Pump Station

The East Main St. Pump Station is located south of the Indiana-Central Ohio Railroad near Homestead Ct. This station pumps sanitary flows from the eastern area of the city to the 30" East sewer through a 10" force main. The East Main Pump Station has a firm capacity of 1,600 gpm (2.3 mgd) with one unit out of service.

Fogg Drive (Stonegate Meadows) Pump Station

The Fogg Dr. (Stonegate Meadows) Pump Station is located at Fogg Dr. and Ashwood Ct. This station pumps residential flow from the northeastern area of the City through a 4" force main. The force main connects to an 8" sewer which flow into the 24" Ewing Run sewer and then to the Baldwin Run interceptor. The Fogg Dr. (Stonegate Meadows) Pump Station has a firm pumping capacity of 135 gpm (0.19 mgd) with one unit out of service.

Commerce Street Pump Station

The Commerce St. Pump Station is located on Commerce St. west of Quarry Rd. This station pumps flow from the southeastern area of the city to the 24" sanitary sewer through an 8" force main which connects to the 30" East sewer. The Commerce St. Pump Station has a firm capacity of 410 gpm (0.59 mgd) with one unit out of service.

3.4 Siphons

The City of Lancaster utilizes three siphons to transport wastewater under streams and rivers. The location and plan and section drawings for each siphon can be found in Appendix E. Each siphon location and configuration is described below.

Southeast of Mary Burnham Park

The siphon located southeast of Mary Burnham Park transports flow in the 30" East sewer under Baldwin Run. This siphon has three barrels (8", 12" and 18") that cross under the river.

West of WPCF

This siphon is located west of the Indiana-Ohio Central Railroad and the Hocking River. Flows through this siphon are collected from the southern portion of the City through a 12" sanitary line. The siphon has two 8" barrels below the Hocking River. This siphon was constructed with a Facility/Property Protection Device (FPD). A FPD was used because the hydraulics of a siphon create low velocities which can lead to plugging. The FPD is a pipe that

Chapter 3 - Combined Sewer System Description

relieves flow to the river if the siphon becomes plugged until the line can be serviced. This is discussed in more detail in Chapter 4 - Operation and Maintenance. The FPD also acts as a combined sewer overflow which diverts flow to the This overflow (FPD) is located on the south bank of the Hocking River and numbered 1006.

Lincoln Avenue

This siphon is located at the intersection of Lincoln Ave. and Hunter Ave. and transports flow from the northeast side of Hunters Run to the west side. The wastewater then flows to the 24" west sewer. The siphon consists of two 8" barrels under Hunters Run. This siphon also has a facility protection device which diverts flow to the river if the siphon becomes obstructed. This structure has been assigned number 1036.

3.5 Combined Sewer Overflows

Combined sewer overflows are located throughout the City of Lancaster to prevent property damage during wet weather periods. The City has identified thirty-one CSOs within their sewer system that actuate from varying amounts of rainfall. Drawings for each of the CSOs are presented in Appendix E. Table 3-4 on the following page provides a list of all known CSOs, indicates whether the CSO was included in the City's 1997 NPDES permit and provides any relevant remarks regarding the CSO's status.

3.6 Water Pollution Control Facility (WPCF)

The sewer system in Lancaster was first constructed in early 1900s to serve as a stormwater system. By 1933, parts of the central portion of the City had been provided with combined sewers that discharged directly to the Hocking River. In 1939, the first wastewater treatment plant was built on the same site as the current plant, which is located at the confluence of the Hocking River and Baldwin Run in the southeastern area of the City at 800 S. Lawrence St.

The original wastewater treatment facility was built to serve an area of about 2,000 acres. This area was serviced by storm water collection system as well as a combined storm/sanitary sewer system. The 1939 WPCF was originally a secondary treatment trickling filter plant. It consisted of raw sewage pumping, a grit chamber, primary settling tanks, two trickling filters, secondary settling tanks, two anaerobic digesters, and sludge beds.

In 1964, the treatment plant was upgraded to a secondary treatment trickling filter/activated sludge plant. The plant was designed for a 5.0 MGD capacity. Upgrades completed in 1989 and 1997 increased the plant capacity to an average flow of 10 MGD and a peak flow of 18 MGD.

The sizing criteria for major equipment at the WPCF is provided in Appendix A. In Appendix A, "existing" refers to equipment prior to plant improvements under the 1997 upgrade project. "CPI" refers to equipment and facilities that were installed as part of the first phase and "CPII" refers to equipment and facilities that were installed as part of the second phase.

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**Table 3-4
Combined Sewer Overflows**

<u>CSO</u>	<u>Location</u>	<u>Permitted (#4PD00001*HD)</u>	<u>Remarks</u>
1004	West Perimeter of WPCF	Yes	
1005	IN & OH RR and Hocking River-North Bank	Yes	Possible abandonment
1006	IN & OH RR and Hocking River-North Bank	Yes	Also a Facility/Property Protection Device
1007	South Broad St. Chestnut - S. Columbus	Yes	To be abandoned
1008	Lincoln Ave. and Hocking River	Yes	
1009	Mulberry St. and Memorial Dr.	Yes	
1010	Mulberry St. and Hocking St.	Yes	Possible abandonment
1011	Union St. and Memorial Dr.	Yes	
1012	Fifth Ave. and Memorial Dr.	Yes	
1013	Sixth Ave. and Memorial Dr.	Yes	
1014	Allen St. and Memorial Dr.	Yes	
1015	North Broad St. and Fair Ave.	Yes	
1016	Sixth Ave. and North Broad St.	Yes	
1017	Fifth Ave. and North Broad St.	Yes	
1018	North Broad St. and Mulberry St.	Yes	
1019	SE Corner of Mary Burnham Park	Yes	
1020	Chestnut St. and Brooks Ave.	Yes	
1021	Union St. and Garfield Ave.	Yes	
1022	Columbus St. and Wilson Ave.	Yes	Possible abandonment
1023	High St. North of Fair Ave.	Yes	
1024	Wheeling St. and Livingston Ave.	Yes	Possible abandonment
1025	Fetters Run North of Frederick	---	Abandoned
1026	NE Corner of Mary Burnham Park	Yes	
1027	Walnut St. and Whiley Ave.	Yes	
1028	Sixth Ave. and Pierce Ave.	Yes	
1029	Sixth Ave. and Boyd St.	Yes	
1030	Walnut St. and Maple St.	Yes	
1031	Wheeling St. and Maple St.	Yes	
1032	Alley North of Main St. and Maple St.	Yes	
1033	Park St. and Memorial Dr.	Yes	
1034	Baldwin Run and Lawrence St.	Yes	
1035	E. of Park and Columbus	Yes	
1036	Lincoln Ave. and Hunters Run	No	Not a CSO (Facility/Property Protection Device)

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3.7 Combined Sewer Service Areas

The combined sewer areas are located predominately in the central portion of the city. However, some combined sewers are also located in the east and north areas of the city. There are seventeen entry points for the combined sewer into the sewer system. The combined sewer areas are 3, 4, 5A, 8A, 8B, 8C, 8D, 8E, 9, 11, 14, 15, 16, 17, 19, 20, 21A, 22, 23, 24 and 26.

Flow from the combined sewer areas enter the 24" Feters Run Sewer, the 36" East interceptor (Baldwin Run Sewer), the 27" West interceptor, and the 36" West interceptor. During wet weather periods, the combined sewer system is designed to relieve flow in excess of the sewer capacity to the Hocking River, Baldwin Run, Hunters Run, or Ewing Run because of the stormwater present in the system. The location of all of the CSOs within the system can be seen on Figure 3-1. Plan and section drawings of each CSO can be found in Appendix E.

3.8 Separate Sewer Service Areas

The City of Lancaster also has many areas serviced by separate sewers systems. There are areas where the sanitary flow is conveyed in sewers designed only to carry sanitary wastewater from residences, commercial areas and industry. All stormwater from these areas should be handled in either storm sewers, drainage ditches or by some means other than the sanitary sewers.

These sanitary sewers surround the central area of the city, which is predominantly combined sewers, on the north, south, east and west side. The areas with sanitary flow are 1, 2, 5B, 6, 7, 10, 12A, 12B, 13, 18, 25 and 27 to 32. The approximate boundary area for each of these areas is described in Section 3.9. The wastewater from these areas flows to one of the interceptor sewers described in Section 3.2 and then flows to the WPCF.

3.9 Sewer Collection Areas

The City of Lancaster is served by over 166 miles of sanitary and combined sewer. These sewers provide service to thirty-nine (39) distinct areas of the City. Figure 3-1 shows the boundaries of these sewer collection areas. A brief description of each area is provided below:

Area 1

Area 1 is located in the southeastern portion of the City. Flow from this area is collected and transported to a 30" sewer. This sewer extends to the east parallel to the Indian-Ohio Railroad tracks and serves industrial and residential users. The 30" sewer connects to the 36" East interceptor southeast of Mary Burnham Park, and the Indiana-Central Ohio Railroad. The facilities in this area includes two pump stations and one siphon. The individual characteristics of the pump stations and the siphon are described in Sections 3.3 and 3.4 respectively.

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Area 2

Area 2 is located in the southeastern area of the City north of Area 1. This area is composed primarily of residential customers and separated sewers. Flow from this area connects to the 36" East interceptor. The approximate boundary of this area is the Indiana-Central Ohio Railroad, Chestnut St., Marietta Rd., and Baldwin Ave.

Area 3

The combined sewer serving this area collects flow from the eastern portion of the city and discharges to the 36" East interceptor at the NE corner of Mary Burnham Park. This residential and commercial area is approximately bounded by Chestnut St., Brooks Alley, Main St., Fulkerson Ave., Livingston Ave., Mulberry St., and Baldwin Ave. The combined flow from this area passes through the structure at CSO 1020 prior to entering the interceptor. This CSO is located at the intersection of Brooks Alley and Chestnut St. Any flow in excess of the 15" sanitary sewer capacity overflows to Baldwin Run. CSO 1024 is also located in this area near Wheeling St. and Livingston Ave.

Area 4

The combined sewer entering the northeast corner of Mary Burnham Park collects flow from a residential area bounded by Cherry St., King St., Main St., and Eastwood Ave. The structure at CSO 1026 located at the northeast corner of Mary Burnham Park diverts flow in excess of downstream pipe capacity to Baldwin Run.

Areas 5A/B

The 24" Feters Run sewer extends from the 36" Baldwin Run Sewer to the north, collecting sanitary and combined flows from this residential area. The combined flows originate in the vicinity of Sixth Ave. and Mt. Pleasant Ave. and enter the 24" Feters Run sewer system at the intersection of Sixth Ave. and Boyd St. through the structure at CSO 1029.

Area 5A is bounded by Feters Run, Mt. Pleasant Ave., King St., Eastwood Ave., Sixth St. and Fair Ave. and is served by a 48" combined sewer. Prior to entering the 24" Feters Run sewer, the flow passes through the structure at CSO 1029 which is located at Sixth Ave. and Boyd St. Flow in excess of the 8" pipe capacity that connects the CSO structure to the interceptor, overflows to Feters Run via a leaping weir overflow configuration.

The sewers in area 5B collect flow from the an area located in the northern part of the City. The approximate boundary for this area is Feters Run, Granville Pike and Fair Ave., and the City corporation line.

Area 6

Collection Area 6 is located in the north central part of the City. The approximate service area boundary is Fair Ave, Feters Run, and Sheridan Dr. The collection area also receives flow from a section of Allen St. east of Sheridan Dr. The flow is transported in a 12" sewer to a 15" sewer along the east bank of Baldwin Run. The collector sewers then connect to the 36" East (Baldwin Run) interceptor at the northeast corner of Mary Burnham Park.

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Area 7

Collection Area 7 is located along Ewing Run. Flows in this area are transported to the 36" East (Baldwin Run) interceptor through the 24" Ewing Run sanitary sewer. The Ewing Run sewer extends to the northeast collecting sanitary flows from this residential area.

Areas 8A-E

The combined sewer entering the northwest corner of Mary Burnham Park collects flow from the central area of the city which is composed of residential and commercial users. The 60" combined sewer has a service area that is bounded by High St., Chestnut St., Eastwood Ave., Sixth Ave., Mt. Pleasant Ave., and Rising Park. The structure at CSO 1019, which is located at the southeastern corner of Mary Burnham Park, diverts excess wet weather flow to Baldwin Run. Dry weather flow is normally transported through a 10" opening in the structure at CSO 1019 which connects to an 18" sewer before entering the 48" East sewer. This combined sewer area also has three additional CSOs (1023, 1031 and 1032) that relieve the system upstream from CSO 1019.

The combined flow area for Area 8A is approximately bounded by Chestnut St., Wyandot St. and the alley north of Main St. This service area is composed of residential and commercial users.

Area 8B collects and transports combined flow to a 60" combined sewer through a 24" combined sewer. The collection area is composed of residential and commercial users. The approximate service area boundary is Chestnut St., Mt. Pleasant Ave., Sixth Ave., Wyandot St., and two blocks east and west of Madison Ave.

The approximate collection area for Area 8C is bounded by Wheeling St., Maple St., Frederick St., Mt. Pleasant Ave., Sixth Ave. and two blocks east of Mt. Pleasant Ave. This area collects stormwater and wastewater from residential and commercial users:

Area 8D is located in the central portion of the City. The approximate area boundary is High St., Allen St., Maple St., Wheeling St., Chestnut St., and Mt. Pleasant Ave. The flow in this area is composed of residential and commercial users. CSOs 1031 and 1032 are located within this collection area.

Area 8E is the northern most collection area for Area 8. Flows in this area are mainly residential. The approximate area boundary is Allen St., the City corporation line and Rising Park. CSO 1023 is located in this area at the third manhole north of Fair Ave. on High St.

Area 9

Flow is collected from this south-central area of the city and discharges to a 24" combined sewer, at the intersection of Wyandot St. and Lawrence St., which discharges to one of the 48" sewers at the WPCF. This residential service area is approximately bounded by Lawrence St., Mt. Pleasant Ave., Chestnut St., and Cherry St.

Area 10

Area 10 is located in the south-central part of the City. This area is composed of residential users and its approximate service area is bounded by the Hocking River, the City corporation line and Tarhe Run. The flow from this area is transported to the 27" West interceptor through a 12" sanitary line and a two barrel siphon. CSO 1006 is part of the siphon structure.

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Area 11

Flow from this south-central area of the city is collected in an 18" combined sewer which discharges to the 27" West interceptor. The area is composed of residential, commercial and industrial customers. This service area is bounded by Lawrence St., Mt. Pleasant Ave., Main St. and Pearl Ave. Prior to entering the 27" interceptor, the combined sewer passes through the structure at CSO 1005 which is located east of the Indiana-Central Ohio Railroad along the north bank of the Hocking River. CSO 1030, which also relieves this combined system, is located at Walnut St. and Maple St.

Areas 12A/B

The 24" sewer in Area 12 collects sanitary flow from the southern portion of the city. This sewer extends south from the Broad St. Pump Station to the intersection of Hamburg Rd. and BIS Rd. (S.R. 793). Sanitary flows are collected from residential and industrial areas through sewers which range in size from 6 to 12 inches in diameter and are pumped to the 36" West interceptor through the Broad St. Pump Station. The approximate service area boundary for Area 12A is Memorial Dr., Lewis Ave., Lane St., the City corporation line, and Hunter Ave., minus Area 12B. The approximate service area boundary for area 12 B is the alley south of Reese Ave., South Broad St., Mt. Ida. St., Hunter Ave., and the City corporation line.

Area 13

A 30" sewer collects residential sanitary flow from the southwestern portion of the city. This sewer extends westward from the Broad Street Pump Station along the Indiana-Central Ohio Railroad until it reduces in size to a 24" sewer (Area 32) at Hunter Avenue. The approximate collection area boundary is the Hocking River, Indiana-Central Ohio Railroad, the City corporation line, Hunter Ave., and Lewis Ave. Flows from this area are pumped to the 36" West interceptor through the South Broad Street Pump Station.

Area 14

Flow collected from this south-central area of the city is discharged to the 27" West interceptor. This residential and commercial area is bounded by South Columbus St., High St., Walnut St., and South Broad St. CSO 1007 (structures CSO 7A through 7D) is located in this area.

Area 15

Flow from this southern portion of the downtown area is discharged to a 27" combined sewer which in turn discharges to the 27" West interceptor. This commercial and industrial service area is bounded by Memorial Dr., Main St., Front St., High St. and South Broad St. Flow entering the interceptor passes through the structure at CSO 1027 which is located at the intersection of Walnut St., and Whiley Ave. CSO 1027 overflows to the Hocking River when the capacity of the sanitary sewer is exceeded.

Chapter 3 - Combined Sewer System Description

Area 16

Flow from this southern portion of the downtown area is discharged to a 24" combined sewer which in turn discharges to the 27" West interceptor. This commercial area is bounded by Main St., High St., Wheeling St., and Hocking River. The combined sewer from this area passes through the structure at CSO 1008, located at Lincoln Ave. and the Hocking River, prior to entering the interceptor. Flows in excess of the capacity of the 12" sewer connecting the combined sewer to the interceptor overflow into the Hocking River.

Area 17

Collection Area 17 is located in the southwestern area of the City west of the Hocking River. Combined flow from this area flows to the Wheeling St. Pump Station through a 36" combined sewer and then is pumped to the 27" West interceptor. The approximate boundary for Area 17 is the Indiana-Central Ohio Railroad, Lincoln Ave., Hocking River, and Wheeling St.

Area 18

Area 18 is located in the southwestern area of the City. Sanitary flows from this area are transported to the 27" West interceptor through 8 inch collector sewers. The approximate boundary of this area is Memorial Dr., Hocking River, Lincoln Ave., and South Broad St.

Area 19

The combined sewer serving this area collects flow from a portion of the downtown area and discharges to the 27" West interceptor. This commercial and residential area is bounded by the Hocking River, Wheeling St., High St., and the alley north of Mulberry St. The flow passes through the structure at CSO 1009, which is located at Memorial Dr. and Mulberry St., prior to entering the interceptor. CSO 1018 is also located in this area at North Broad St. and Mulberry St.

Area 20

The combined sewer serving this area collects flow from a portion of the downtown area and discharges to the 27" West interceptor. This commercial area is bounded by the Hocking River, High St., and the alley north and south of Union St. The flow from this area passes through the structure at CSO 1011 which is located at Memorial Dr. and Union St. prior to entering the interceptor.

Areas 21 A/B

Area 21 is located in the west-central area of the City. Areas 21A and 21B collect stormwater in addition to sanitary flows from residential, industrial and commercial users.

The approximate boundary for Area 21A is the Indiana-Central Ohio Railroad, Wheeling St., Hocking River, Union St., Washington Ave., Eighth Ave., and Pierce Ave. Flows from Area 21A are transported through a 24" combined sewer to the Wheeling St. Pump Station. CSOs 1010, 1018, and 1021 relieve combined sewage to the Hocking River from this area during storm events.

The approximate boundary for Area 21B is the Hocking River, Union St., Eighth Ave., Slocum St., and Harrison Ave. Flows from Area 21B are transported through an 18" combined sewer to the Wheeling St. Pump Station.

Chapter 3 - Combined Sewer System Description

Area 22

The combined sewer serving this area collects flow from the northern portion of the downtown area and discharges to the 27" West interceptor. This commercial area is bounded by the Hocking River, High St., and the alley north and south of Fifth Ave. The flow from this area passes through the structure at CSO 1012, which is located at Memorial Dr. and Fifth Ave., prior to entering the interceptor. CSO 1017, which is located at North Broad St. and Fifth Ave., also relieves this area.

Area 23

The combined sewer serving this area collects flow from a portion of the downtown area and discharges to the 27" West interceptor. This commercial area is bounded by the Hocking River, High St., and the alley north and south of Sixth Ave. The flow from this area passes through the structure at CSO 1013, which is located at Memorial Dr. and Sixth Ave., prior to entering the interceptor. CSO 1016, which is located at North Broad St. and Sixth Ave., also relieves this area.

Area 24

This residential and commercial area is bounded by North Broad St., Sixth Ave., Arnold Ave., Fair Ave., and Hocking River in the north-central area of the City. Flow from the combined sewer passes through the structure at CSO 1014 which is located west of Allen St. and Memorial Dr. At CSO 1014, a 12" sewer connects the combined sewer area to the YMCA Pump Station.

Area 25

Area 25 is located in the western portion of the City and is bounded by the Indiana-Central Ohio Railroad, Graylock St., Meda Ave., Pierce Ave., Eighth Ave., Harrison Ave., Union St., Washington Ave., Seventh Ave., and Slocum St. The flow from this area is pumped to the 36" West interceptor by the YMCA Pump Station.

Area 26

A 30" combined sewer collects flow from Area 26, which is in the northern part of the city. This residential, commercial, and industrial area is approximately bounded by the Hocking River, the City corporation line, High St., Allen St., and Fair Ave. Combined flow from this area passes through the structure at CSO 1033 and eventually reaches the YMCA Pump Station. CSO 1033 is located on Park St. west of Memorial Dr. Three additional CSOs are located in this combined sewer area. CSO 1015 is located east of North Broad St. on Fair Ave., CSO 1022 is located at the intersection of Wilson Ave. and Columbus St., and CSO 1035 is located east of Park St. and Columbus St.

Area 27

Sanitary flow in Area 27 is transported to the YMCA Pump Station through a 36" interceptor. The approximate collection area boundary is the Hocking River, Ohio Ave., Beacon St., and Meda Ave. Flows in this area are generated from residential and commercial users.

Chapter 3 - Combined Sewer System Description

Area 28

An 18" sewer collects sanitary flows from this northwestern area of the city and discharges to the 30" NW Annexation Sewer described below for Area 29. This sewer transports residential sanitary flows from collector sewers ranging in size from 8 to 15 inches in diameter. The approximate collection area boundary for Area 28 is the City corporation line, Memorial Dr., Arlington Ave., and Graf St. The Whittier St. Pump Station is located within Area 28.

Area 29

A 30" sewer (the 1992 NW Annexation Sewer) extends north and then west collecting sanitary flows from the northwest area of the city in the vicinity of the River Valley Mall. This collection area is composed of residential, commercial and industrial users. The 30" sewer receives flows from 18" and 24" sewers (Areas 28, 30 and 31). The 18" sewer joins the 30" sewer near Hocking St. and Harrison Ave. The 24" sewer joins the 30" sewer northwest of the Hocking River and Pierce Ave. These flows are eventually pumped to the 36" West interceptor by the YMCA Pump Station.

Area 30

The sanitary flow from Area 30 is collected from residential and industrial users. The approximate collection area boundary for Area 30 is the City corporation line, Indiana-Central Ohio Railroad, and West Fair Ave. Flow from this area is conveyed by an 18" sewer to the 30" sewer described in Area 29 near Zimmer Ave. and the Hocking River.

Area 31

The primary sewer in Area 31 is a 24" sewer that connects to the 30" sewer (Area 29) near the Hocking River and Pierce Ave. This sewer drains the western area of the city and collects flow from residential, commercial, and industrial users. The approximate collection area boundary for Area 31 is the City corporation line, Indiana-Central Ohio Railroad, West Main St., Mulberry St., and Ohio Ave.

Area 32

A 24" sewer extends north from Hunter Ave. and the Indiana-Central Ohio Railroad to Hunters Run where the sewer changes direction and proceeds southwest. This sewer collects residential, commercial and industrial sanitary flows from the southwestern area of the city. This sewer is bounded by the Indiana-Central Ohio Railroad on two sides, the City corporation line, West Main St., Mulberry St., and Busby Ave. These flows are eventually pumped to the 36" West interceptor by the Broad St. Pump Station.

++ END OF CHAPTER 3 ++

4

Chapter 4 - Operation and Maintenance Program

4.1 Introduction

The first minimum control of the USEPA's National CSO Control Policy is the implementation of an Operation and Maintenance (O&M) Program for the combined sewer system. Implementation of an O&M Program can reduce the number of CSOs and maximize use of existing sewer system facilities.

The operation and maintenance procedures for the City of Lancaster are discussed in this chapter. This section describes the maintenance personnel, cleaning schedules, and maintenance schedules for the different components of the combined sewer system, including sewers, CSOs, pump stations and siphons.

4.2 Personnel

The City of Lancaster's Water Pollution Control Department (WPCD) operates and maintains the Water Pollution Control Facility (WPCF) and the sanitary sewer system. The Plant Superintendent oversees the operation of the WPCD. The Plant Superintendent reports to the City's Service and Safety Director who reports to the mayor. The duties of the Assistant Plant Superintendent include the day-to-day operation and maintenance of the sanitary and combined sewers.

The City employs 23 full-time personnel in various positions in the WPCD. The Plant Superintendent exercises general supervision of the entire staff through other administrative and supervisory support personnel. The plant staff is summarized in Table 4-1.

The operations staff duties are primarily related to the operation of the plant. The maintenance staff has responsibility for plant maintenance as well as maintenance of the sewer system. Maintenance staff duties are summarized below:

- Performing general plant equipment maintenance.
- Performing general maintenance at lift stations.
- Performing minor vehicle maintenance.
- Completing small repairs on plant equipment.
- Completing small repairs on sewer system.
- Television inspection of sewer system.
- Locating sanitary and combined sewer mains.
- Cleaning sewers with a jet/vactor truck.
- Informing plant assistant superintendent or plant superintendent of problems.
- Other duties as assigned.

These duties as related to the sewer system are discussed in more detail later in this chapter.

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**Table 4-1
Water Pollution Control Department Staffing**

Position	Number of Personnel
ADMINISTRATIVE	
Plant Superintendent	1
Assistant Plant Superintendent	1
Industrial Pretreatment Coordinator	1
Chemist	1
Confidential Staff Secretary	1
OPERATIONS	
Chief Operator	1
Shift Operators	8
Relief Operators	2
LABORATORY	
Laboratory Technician II	2
MAINTENANCE	
Maintenance Mechanic II	5
TOTAL STAFF	23

Key personnel and their phone numbers can be found in Table 4-2. Emergency phone numbers are listed in Table 4-3.

**Table 4-2
Key Personnel and Phone Numbers**

<u>Position</u>	<u>Name</u>	<u>Work Number</u>
City Engineer	Kent Huston	614-687-6614
Asst. City Engineer	Rick Mark	614-687-6614
Plant Superintendent	Mike Nixon	614-687-6664
Asst. Plant Superintendent	Richard Tipple	614-687-6664
Industrial Pretreatment Coordinator	Paul Menz	614-687-6664

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**Table 4-3
Emergency Phone Numbers**

<u>Organization</u>	<u>Phone Number</u>
Fire	911 (also 687-6680)
Police	911 (also 653-4511)
Fairfield County Sheriff	911 (also 653-5223)
Ohio Utilities Protection Service	800-362-2764
Ohio EPA-Central District Office	728-3778 or 800-686-2330
Ohio EPA-Emergency Spill Hotline	800-282-9378
WPCF	614-687-6664

4.3 Training

Training for maintenance mechanics, when determined to be required by the Plant Superintendent or Assistant Plant Superintendent, is typically performed by existing WPCD staff. In this manner, all maintenance staff receive training in the following areas at a minimum:

- I. Lift Station Operation and Troubleshooting:
 - Basic centrifugal pump maintenance.
 - Pump tear down and reassembly.
 - Bearing replacement and greasing.
 - Motor troubleshooting and replacement.
 - Coupling installation and alignment.
 - Check valve repair/replacement.
 - Float-control troubleshooting.
- II. Gravity Sewer maintenance Techniques
 - Vacuum/Jet Truck Operation.
 - TV Truck Operation.
- III. Periodic Training (Refresher Videos)
 - Confined Space Entry
 - Traffic Control
 - Lock-out/Tag-out Procedures

The City of Lancaster WPCD further enhances its training efforts by sending its maintenance personnel to the annual Collection System Maintenance Workshop sponsored by the Operator Training Committee of Ohio (OTCO). When new equipment is purchased, training is provided by equipment manufacturers.

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4.4 Equipment

A list of major equipment used by the WPCD to maintain the sewer system is provided in Table 4-4. Equipment used for health and safety of personnel is provided in Table 4-5.

**Table 4-4
Sewer Maintenance-Major Equipment**

<u>Qty.</u>	<u>Item Description</u>
1	High Pressure Jet/Vac Truck Nozzle Pressure: 2,000 psi at 0-60/80 gpm Water Supply: 1,000 gallons Hose Length: 650 feet Vacuum: 220 inches water column at 0-8,000 cfm Tank (debris hauling capacity): 10 yd ³
1	Industrial Surveillance Vehicle: 1996 Ford Van
1	Utility Vehicle: 1993 Ford F800 Truck with 8-Ton Boom
1	Blower: Gasoline powered, used to ventilate and test sewers
5	Flow Monitoring Units: Marsh-McBirney Flo-Totes
1	Video Camera Vehicle with monitor camera and cable
1	Portable Air Compressor
4	Gas-Powered Portable Pumps

**Table 4-5
Health and Safety Equipment**

<u>Qty.</u>	<u>Item</u>	<u>Description</u>
1	First Aid Kits	One per Vehicle
1	Fire Extinguisher	One per Vehicle
2	Tripod	Used for Confined Space Entry
2	Winch with Fall Protection	Used for Confined Space Entry
2	Gas Monitor	Used for Confined Space Entry
	Personnel Protection	Hard hat, gloves, boots, eye, ear

4.5 Budget

The City of Lancaster Water Pollution Control Department's (WPCD) sewer use fees are approved by the Ohio EPA and are sufficient to cover the operation and maintenance costs, debt service and replacement costs associated with the wastewater plant and the sanitary sewer system. The WPCD manages its expenditures to match annual revenues received and to

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maintain a positive fund balance. Presently, the Water Pollution Control Fund carries a \$1.5M to \$2.0M positive balance.

A 1998 breakdown of the Water Pollution Control Department's budget is provided in Table 4-6 as a typical example of how the City allocates the revenue it collects for sewer service. This allocation will vary from year to year to reflect system needs as they develop.

Table 4-6
1998 Operating Budget - Wastewater Collection System

<u>Item</u>	<u>Budget</u>
Salaries, Overtime and Benefits	\$188,768
Operations/Maintenance	\$ 45,000
Materials and Supplies	\$ 13,300
Training and Standards	\$ 4,000
Utilities	\$ 30,251
Collection Department Services	\$ 76,543
Electric Department Services	\$ 17,967
Sewer Rehabilitation Fund	\$ 100,000
Equipment Replacement Fund	\$ 48,601
<u>Misc. Transfers</u>	<u>\$ 26,460</u>
Wastewater Collection System Budget	\$ 550,890
Total WPCD Annual Budget	\$5,502,000

As can be seen from Table 4-6, the City of Lancaster devotes approximately 10% of its budget to its sewer system. In addition to the Sewer Rehabilitation and Equipment Replacement Fund, the City maintains the following accounts for sewer system improvements:

- Sewer Capacity Fund: This fund is used for funding sewer system improvements and extensions.
- Improvement Account: This fund is used for major wastewater system improvements such as pump station rehabilitation.

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4.6 Sewer Maintenance

The City of Lancaster's sewer system can be divided into two areas (East and West) depending on the interceptor that enters the WPCF. Each of these areas is further subdivided into major collection areas (as described in Chapter 3). The thirty-two major collection areas are shown on Figure 3-1.

4.6.1 Sewer Inspection

The City of Lancaster Water Pollution Control Department (WPCD) owns a Video Camera Vehicle (VCV) for sewer inspection. The truck is equipped with a monitor for immediate review of the condition of the sewer being inspected. This vehicle is used to investigate suspected blockages, confirm line taps and inspect the overall condition of the sewer system. The VCV is also used to confirm the effectiveness of root control methods.

Sewers are investigated on an as-needed basis as determined by the Assistant Plant Superintendent. In 1996, the WPCD inspected and televised over 3,900 feet of sanitary and storm sewer.

4.6.2 Sewer Cleaning and Other Services

Sewer maintenance activities of the WPCD include sewer cleaning, grit and grease removal, manhole sealing, sewer locating for pre-construction and excavation, sewer inspections and cleaning, and assisting the city street department with cleaning the storm sewers. All of these duties are in addition to preventive maintenance tasks and complaint calls discussed below.

4.6.3 Preventive Maintenance and Problem Areas

As part of its preventative maintenance program, the WPCD has identified problem sanitary sewers to be cleaned on a weekly basis. The list is modified as needed to reflect results of the cleaning effort and customer comments. Below is the 1996 list of problem sewers targeted for weekly cleaning:

- 231 Hubert Avenue
- 300 E. Allen Street
- Eagle Avenue
- 1653 Mulberry Street
- 805 8th Avenue
- 158 Berwick
- Chestnut Street - St. Mary's
- 1326 Beacon Street
- 1260 Wheeling Street
- 700 King Street
- 900 King Street
- 293 Scott Drive

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During the City's recent sewer evaluation study, sewer lines with high amounts of sediment due to flat slopes and/or low flow rates were found. Known areas of deposition are:

- 12" Upstream and downstream of CSO 1024
- 18" Union and Hocking Street downstream to CSO 1010
- 18" Downstream of CSO 1010 to Wheeling Street Pump Station
- 10" Vicinity of Beacon and Hocking Street
- 15" Miller Park along Memorial Drive
- 15" Upstream and downstream of CSO 1015
- 12" From CSO 1014 to YMCA Pump Station
- 12" Upstream of CSO 1014 (Value City Parking Lot)
- 24" Upstream and downstream of CSO 1021
- 27" CSO 1027 to South Broad Street (Full of Sediment)

The City intends to flush clean these lines in order of importance. Presently, the 27" sewer from CSO 27 to South Broad Street has the highest priority for sewer cleaning due to its clogged condition. The remaining trouble areas will be cleaned as other maintenance duties allow. The WPCD will evaluate whether any of these sewers should be added to the weekly preventive maintenance programs.

A discussion of dry weather overflow events from combined sewer structures is provided in Chapter 8 - Prevent Dry Weather Overflows.

4.6.4 Customer Complaints

The WPCD places its highest priority on responding to user problems. The department is committed to responding to customer complaints within 24 hours. In 1996, the sewer maintenance crew responded to 90 customer complaint calls. Of the 90 calls, 58 calls were found to be due to problems on the customer's own property and not associated with the city sewer. The remaining 32 complaint calls required cleaning or other maintenance services on the city sewer. In 1996, the WPCD cleaned approximately 10,700 feet of the sewer line.

4.6.5 Sewer Repairs

Sewers in need of repair are discovered during television inspections, CSO inspections, sewer cleaning, catch basin cleaning or by citizen complaints. Once a sewer is scheduled for repair, the problem is corrected as soon as possible. Repairs to the city sewers are classified according to importance of the repair (e.g. plugged sewer vs. broken ladder rung).

The WPCD performs most of its own sewer repairs using its own crews. As an example of the type of repairs the WPCD performs, a list of some of the more significant repairs made in 1996 is provided below:

- A new concrete head-wall was constructed and a 64" cast iron flap valve was installed on CSO 1019 (Mary Burnham Park overflow to Baldwin Run) to help prevent backflow to the sewer system and flooding in the area.
- Emergency repairs were made to trunk line in the creek bed at the bridge

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replacement site on Pleasantville Road.

- Sanitary sewer line repairs were made to the main sewer line on Medill Avenue between Sixth Avenue and Fair Avenue.
- An 8" sanitary sewer was repaired at Reese and Talmadge Avenue.
- An 8" sanitary sewer was repaired in the area of Oak Street.

4.6.6 Sewer System Investigations and Improvements

Below is a list of sewer system investigations and improvements planned by the WPCD. Most of these projects are the result of problems uncovered during the 1995 Sewer System Evaluation.

Infiltration/Inflow Reduction

- CSO 1010: Backflow from the storm sewer is suspected to be occurring at this CSO structure. The City has installed a temporary plug in the CSO overflow and flow meters upstream. If no flooding problems occur in a one-year period, the CSO will be abandoned.
- CSOs 1022 and 1024: As with CSO 1010, it is suspected that stormwater may be backflowing into these CSOs. These CSOs will be investigated in a similar fashion to CSO 1010 after the CSO 1010 investigation is complete.
- Zimmer/Ohio Streets: Large increases in flow following rain events in this separate sewer area were observed during recent flow monitoring. The City is using its flow meters to track down potential sources of I/I in this area.

CSO Improvements

- CSO 1005: During the 1995 Sewer System Evaluation, it was observed that the overflow elevation of CSO 1005 was lower than nearby overflows. It was also lower than the crown of the connected 27" West Trunk. This caused the overflow to relieve frequently and prevents the 27" West Trunk from storing its full capacity. The City will install a temporary plug in this overflow. If no flooding problems occur during the following year, this CSO will be abandoned. Access to CSO 1005 is also very poor. If CSO 1005 is not abandoned, improved vehicle access to the structure as well as improvements for entering the structure safely are planned by the WPCD. In addition, raising the overflow weir elevation will be investigated.
- CSO 1007: During the 1995 Sewer System Evaluation, this CSO was found to be poorly constructed. The City is planning to install a new sewer and abandon this CSO.

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Miscellaneous Improvements

- **Floodgates:** One gate is known to not operate freely. Sediment build-up around the floodgate on CSO 1010 has prevented the gate from opening as well as closing freely. If this CSO is not abandoned, the WPCD will consider adding this gate to its preventive maintenance program. Floodgates are discussed in Section 4.9.
- **Siphon Access:** Two siphons in the sanitary sewer system do not have complete access. The siphon at CSO 1006 cannot be accessed by City vehicles or cleaning equipment, although it can be accessed for inspection. The siphon at CSO 1036 is in a very congested location making vehicle access difficult. No modifications are planned at this time since both structures can be accessed for visual inspections and routine maintenance.
- **Stagnant Pools:** The two CSOs that discharge to Baldwin Run at Mary Burnham Park have created stagnant pools. If these pools create odor or other nuisance problems, the WPCD plans to fill the pools with large stone riprap or use some other method to restore the free flow from the CSO outfall discharge to the main stream flow.

4.6.7 Street Sweeping and Catch Basin Cleaning

Although the Water Pollution Control Department is responsible for complying with the City's NPDES permit, the Street Department's duties indirectly support the WPCD.

Street Sweeping

The Street Department typically operates two street sweeping machines. No fixed schedule for street sweeping is maintained due to the impact of weather conditions on street sweeping operations. Also, street sweeping activities are impacted from year to year by the availability of funds that run the Street Department and by the availability of department crews that have many other street maintenance-related duties as well. When weather and funding permit, the Street Department sweeps downtown streets about once every two weeks. Main Street and other state routes are swept about once a month. All other streets are swept two to three times during a typical year. These streets are usually swept after the last snow fall in order to pick up grit and other material remaining from the winter street de-icing operations and before and after the leaf season.

Catch Basin Cleaning

The Street Department is responsible for maintaining the storm sewer system as well as all catch basin inlets on both the storm sewer and combined sewer systems. The Street Department has one jet/vacuum-type sewer maintenance vehicle that is used to clean catch basins of accumulated debris. The goal of the department is to clean each basin once a year. However catch basin cleaning is subject to the same weather, funding and personnel limitations as street sweeping discussed above. The department was successful in achieving this goal in

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1996.

The Street Department also provides leaf pick-up in the fall as a service to the community. This activity also prevents leaves from clogging catch basins and sewers.

4.7 Pump Station Inspection

A description of each pump station in the City's sewer system is provided in Chapter 3, Section 3.5. The WPCD places a high priority on pump station inspections. The pump stations within the City's sewer collection system are currently inspected once per day, seven days per week. Twenty-four hour per day emergency service is provided by telemetering equipment that monitors each station and automatically notifies the on-call WPCD personnel of pump station alarms. Pump station conditions that are monitored include:

- Pump status - ON/OFF/ALARM
- Wet well level
- Flow
- Flooding (station)
- Loss of power
- Security (doors)
- Emergency generator (if applicable)

Since the pumps are critical to the proper operation of the Lancaster Wastewater Collection System, pump station inspections are necessary to properly maintain equipment and minimize failures. A pump station inspection check list for the pump stations can be found in Appendix F. The checklist is used to monitor equipment performance and maintenance. Information recorded on the checklist includes the date, pump condition, flow meter condition, pump station condition, and maintenance performed.

4.8 Combined Sewer Overflow Inspection

4.8.1. Background

As part of the 1995 Sewer System Evaluation, the City began inspecting its CSOs for dry weather overflows in August, 1995. The results of this 1995 monitoring are included in Appendix G and conclusions from this effort are discussed in Chapter 8 - Prevent Dry Weather Overflows.

In 1996, during the City's Sewer Evaluation Study, flow meters were installed throughout the system to measure wet and dry weather flow. As part of this effort, each CSO was fitted with a block of wood tied to a string that was secured to the CSO itself. By carefully locating the block of wood in the overflow pipe, the block served as a simple device to determine if an overflow had occurred. After each rain event, the position of the block was noted and recorded. The data from this effort is summarized in Appendix R.

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operates. This effort provided information such as which overflows were most active, which overflows allowed river and stormwater intrusion and what size rain event activated CSOs. As a result of these efforts, the WPCD has developed the overflow inspection programs discussed below.

4.8.2 Dry Weather

The WPCD performs a bi-weekly check of CSO headwalls during dry weather. By visually inspecting the CSO headwalls, the WPCD can verify that no overflows are occurring. The form used to record the results of the inspection is provided in Appendix G. If a dry weather overflow is suspected, further investigation is made. The dry weather overflow inspection procedure is discussed in more detail in Chapter 8 - Prevent Dry Weather Overflows.

4.9 Floodgates

Floodgates are a critical component of the combined sewer system since they prevent river water and stormwater from entering the sewer system.

The floodgates used on the Lancaster sewer system are typically cast iron flap valves installed on the end of the combined sewer overflow pipe. The WPCD has been installing floodgates in recent years on CSO overflows prone to river intrusion or backflow from storm sewers. Recently, the City of Lancaster completed the installation of numerous floodgates, including a 60-inch diameter gate at CSO 1019. These gates were installed in order to reduce inflow to the combined sewer system.

The list of CSO headwall locations in Table 4-7 provides a summary of floodgates currently installed in the Lancaster sewer system.

4.10 Siphon Inspection

The City of Lancaster's sewer system contains three siphons. Each of the three siphons are discussed in Chapter 3, Section 3.6. Two of the siphons (Mary Burnham Park and Behind WPCF) have limited or no access. Due to the configuration of siphons, they are subject to sedimentation and blockage. Currently, the City maintenance of the siphons occurs on an "as-needed" basis.

4.11 Record Keeping

All records associated with the operation and maintenance of the plant and wastewater collection system are stored in the Water Pollution Control Facility's Office and laboratory Building in accordance with the Ohio Historical Society's approved record retention program. Other important record information that is stored in the Office Laboratory Building includes

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**Table 4-7
Headwall Locations and Floodgate Status**

CSO #	STRUCTURE LOCATION	HEAD WALL LOCATION	FLOOD GATE (Y/N)	RIVER ELEV. (Ft.)	RISE TO CSO (FT.)
1004	West of Final Clarifier	H.R., N. Bank, Behind Plant	Y	NA	NA
1005	East of RR Bridge and H.R. (1)	H.R., N. Bank, W. RR Bridge	Y	NA	NA
1006	West of RR Bridge and H.R.	H.R., S. Bank, W. RR Bridge	Y	797.5	NA
1007	Broad & Chestnut/Walnut Winding/Columbus (2)	H.R., N. Bank, E. of S. Broad & 33	N	800.6	NA
1008	Lincoln and Hocking River	H.R., E. Bank, S. of Lincoln Bridge	N	804.5	4.2
1009	N. of Water Works Dr. at Rt. 33	H.R., E. Bank, N. of Wheeling(24")	N	805.4	12.2
1010	Mulberry and Hocking (1)	H.R., W. Bank, E. of Structure	Y	NA	NA
1011	Rt. 33 and Union	H.R., E. Bank, In line with Union	Y	NA	NA
1012	Rt. 33 and Fifth	H.R., E. Bank, Between 5th and Union	Y	NA	NA
1013	Rt. 33 and Sixth	H.R., E. Bank, S. of 6th Bridge	N	806.8	10.8
1014	Aldi Parking Lot	H.R., E. Bank, S. of YMCA lift station	N	NA	NA
1015	Fair Ave and Alley E of Broad	H.R., E. Bank, N. of Fair (84")	N	808.3	NA
1016	Broad and Sixth	See 1015	N	NA	20
1017	Broad and Fifth	See 1015	N	NA	22.7
1018	Broad and Mulberry	See 1015	N	NA	29.6
1019	Mary Burnham Park N of RR	B.R., W. Bank, N. of RR	Y	800	4
1020	Brooks and Chestnut	B.R., E. Bank, W. of Structure	Y	800	10
1021	Garfield and Union	H.R., W. Bank, in line with Union	Y	NA	NA
1022	Wilson and Columbus	See 1015	N	NA	36.5
1023	High north of Fair	See 1015	N	NA	NA
1024	Wheeling, east of Livingston	B.R., E. Bank, N. of Main	N	801	29
1025	Abandoned				
1026	Mary Burnham Park NE corner	B.R., W. Bank, At Structure	N	NA	NA
1027	Whiley and Walnut	H.R., E. Bank, End of Walnut	N	802.9	7.4
1028	Sixth and Pierce	See 1021	N	NA	NA

Chapter 4 - Operation/Maintenance Program

**Table 4-7
Headwall Locations and Floodgate Status**

CSO #	STRUCTURE LOCATION	HEAD WALL LOCATION	FLOOD GATE (Y/N)	RIVER ELEV. (Ft.)	RISE TO CSO (FT.)
1029	Sixth W of Fetters Bridge	F.R., W. Bank, N. of 6th Bridge	Y	NA	NA
1030	Maple and Walnut	H.R., N. Bank, W. of old Maple Bridge	N	798.4	17.3
1031	Maple and Wheeling	See 1030	N	NA	20.4
1032	Maple Alley S. Wheeling	See 1030	N	NA	23.9
1033	Park St	H.R., E. Bank, N. of Fair (30")	N	NA	NA
1034	Plant Front	B.R., W. Bank, S. of Lawrence	Y	NA	NA
1035	E. Park and Columbus	See 1015	N	NA	NA
<u>Facility/Property Protection Device</u>					
1036	Lincoln and Hunters Run	Lincoln and Hunters Run, NE Bank	Y	NA	NA

H.R. - Hocking River
 B.R. - Baldwin Run
 F.R. - Fetters Run
 NA - Not Available

Notes:

- (1) Possible abandonment
- (2) To be abandoned

Chapter 4 - Operation/Maintenance Program

manufacturers' operation and maintenance manuals, shop drawings, and Material Safety Data Sheets (MSDS).

Each week maintenance work orders are generated by the Confidential Staff Secretary and distributed to the maintenance staff. The work orders detail the specific maintenance tasks that must be performed. Once the maintenance task is completed, the work order is returned to the Confidential Staff Secretary so that the completed work can be logged into the computer. A sample work order form is provided in Appendix T.

4.12 Sewer Map and Sewer Atlas

An important part of sewer maintenance is reliable and accessible sewer maps. All records of sewer construction (construction drawings, as-builts, etc.) are stored and available for use in the City Engineer's Office located in City Hall. As part of the City's 1995 Sewer System Evaluation, a new City sewer map was created. This sewer map consists of two parts:

- An overall City Sewer Map showing both the sanitary and storm sewer systems for the entire City of Lancaster including all components of the sewer systems from manholes to pump stations. The Sewer Map is in an electronic format (Auto CADD version 12) to allow the City to easily update it. Any update to the sewer map is automatically incorporated in the Sewer Atlas discussed below. The Sewer Map was used to create Figure 3-1 at the end of this Plan.
- A Sewer Atlas that breaks down the City of Lancaster into thirty-one areas. Each area is represented on an 11"x17" sheet. This Atlas contains the same information as the Sewer Map, however it is at a much larger scale for use by management and maintenance personnel. All maintenance personnel are provided with a copy of this atlas for their use. An example of an atlas sheet is provided in Appendix T.

The new Sewer Map and Sewer Atlas replace a previous cloth and ink Sewer Map that had become difficult to update. Information included on the Sewer Map and Atlas includes:

- Street Right-of-Ways and Names
- Streams and Rivers
- Sanitary and Combined Sewer Alignments
- Storm Sewer Alignments
- Curb Inlet and Catch Basin Locations
- Pump Station and Manhole Locations
- CSO Structure locations, CSO number, and headwall locations
- Floodgate locations
- Sewer Diameters
- Sewer Type (Sanitary, Combined or Storm)
- Drainage Areas and Designations
- Siphon Locations and Sizes

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4.13 Operation and Maintenance Manuals

The WPCD is presently completing a two volume comprehensive operations manual for the Waste Pollution Control Facilities. This manual will provide technical guidance for operation and management of treatment processes and equipment including all facilities that were part of the latest upgrade as well as all facilities that were in existence prior to the last upgrade.

The manual is intended to be used by the plant operations and maintenance staff as the primary reference for the control, standard operation, emergency operation, start-up, shutdown and alarm troubleshooting of the treatment processes and their related equipment. The manual is also intended for the use of administrative personnel both as a reference and as an instructional document in staff training.

No manual for the sanitary sewer system has been developed. However, this Plan will serve as a good reference of useful data for maintenance personnel including inspection forms, CSO structure information, known trouble spots, dry weather overflow procedures, etc.

Operation and maintenance manuals supplied by the equipment manufacturers are used for information and details on the specific pieces of equipment.

4.14 Sanitary Sewer System Computer Model

A very useful tool that the City intends to develop for operating its sewer system is the sewer system computer model developed as part of the City's 1995 Sewer System Evaluation. This model included sanitary and combined sewers 12-inches in diameter and larger, and other sewers of a smaller diameter if necessary for modeling purposes.

The model used was XP-Software's Stormwater Management Model (XP-SWMM). XP-SWMM is an enhanced version of the United States Environmental Protection Agency's Stormwater Management Model (SWMM). The model was calibrated using data from flow meters installed at key locations throughout the sanitary system from late 1995 through 1996.

The City's model can be used to estimate the volume of overflow from CSOs for a given storm. The model can also be used to determine the capacity of existing sewers and estimate the impact of new sewer flows or sewer extensions on the system.

++ END OF CHAPTER 4 ++

5

Chapter 5 - Maximize Use of the Collection System for Storage

5.1 Introduction

The second minimum control of the USEPA National CSO Control Policy emphasizes maximizing flow storage within the sewer system. This control suggests that excess sewer capacity could be used to store flows generated during wet weather conditions provided that it does not cause flooding. In addition to storing flows within the system, inflow/infiltration reduction and control measures such as floodgates, sewer cleaning, sewer system monitoring can be used to maximize storage in the sewer system.

5.2 Inflow/Infiltration Reduction

Over the past 15 years, the City has invested significant resources to remove inflow/infiltration (I/I) from the sewer system. Below is a list of Lancaster's I/I reduction activities.

- A Sanitary Sewer Evaluation Survey (SSES) was performed in 1980 to determine possible sources of I/I throughout the City. The SSES identified 2.3 MGD of inflow and 0.85 MGD of infiltration that could be cost-effectively removed. The Sewerage Collection System Rehabilitation Project implemented the SSES recommendations. This project removed infiltration by chemically sealing manholes, installation of watertight manhole covers, joint grouting of sewers, mechanical sewer cleaning, hydrocleaning of sewers, hydraulic sewer cleaning, root removal and replacement of collapsed or failed sewer sections. Final inflow reduction was estimated to be 2.3 MGD while infiltration removal was estimated at approximately 0.65 MGD.
- A pipe joint sealing project was completed as part of the 1986 Water Pollution Control Facility Upgrade Grant from the Ohio EPA. This project applied sealing compound to joints in large diameter combined sewers in the central portion of the City.
- A Community Development Block Grant was used to install a storm sewer in the West Mulberry St. combined sewer area. The project was divided into three phases. The first phase widened Union St. and installed storm sewers in Garfield Ave. and Washington Ave. Phase Two widened West Fifth Ave., installed additional storm sewers and replaced a combined sewer in Mulberry St. with a new sanitary and storm sewer. The third phase installed storm sewers in George St., Main St., Slocum Ave. and Welsh Ave.
- A study was performed in the South Broad Street area beginning in 1994 to identify I/I. This study suggested that this area is not adversely impacted by I/I.
- As part of the City's 1995 Sewer System Evaluation, which included flow monitoring and CSO inspection, several I/I sources were found. Examples of I/I reduction due to the City's 1995 Sewer System Evaluation are listed below:
 - In 1996, an 18" inflow source in the South Broad Street area was identified and sealed with a mechanical plug. This source had allowed river water into the system through a rusted steel plug on an unused connection (stub for future connection) to a system manhole. The amount of dry weather inflow is estimated

Chapter 5 - Maximize Use of the Collection System for Storage

to be 0.35 MGD.

- In 1997, CSO 1010 was temporarily plugged. The Sewer System Evaluation suspected this CSO as a source of inflow. Flow monitoring is presently being used to monitor the overall impacts of plugging this CSO.
- In 1997, an overflow at Wildwood and Pershing was plugged. At the same time, an unknown overflow downstream of this site was also discovered and plugged.
- In 1997, an overflow to an abandoned siphon was plugged. This overflow was located at the end of Locust Street on the east side of Baldwin Run and was suspected as a source of inflow. It is estimated this will reduce peak flows by 0.035 MGD during high river stages.
- CSO 1005 is planned to be temporarily plugged. The overflow in this invert was found to be lower than the crown of the connected 27" West Interceptor. If this overflow can be plugged, the full storage capacity of the 27" West Interceptor can be used.

In addition to defined sewer improvement projects, the City of Lancaster's Water Pollution Control Department continually removes I/I sources when they are found. The I/I reduction efforts of the WPCD maximize the use of the collection system for storage by removing sources of inflow in the system, thus reducing peak flows in the system.

5.3 Existing Control Measures

5.3.1 Floodgates

The City of Lancaster is maximizing flow within their collection system by eliminating external sources of water. This is being done with the installation of floodgates at the outfall of CSOs that are found to be prone to inflow from adjacent streams or rivers. Floodgates in the Lancaster sewer system are round, cast-iron, hinged flap valves. The floodgates prevent receiving streams from back-flowing into the sewer system when the stream level becomes higher than the CSO overflow elevation. A list of CSO locations and associated floodgates is provided in Chapter 4, Table 4-7. In 1996, floodgates were added at CSOs 1006, 1019 and 1020.

Although difficult to quantify, the installation of floodgates is believed to have significantly reduced inflow to the sewer system during periods of high river stages.

5.3.2 Sewer Maintenance

The City currently inspects and cleans sewers within the system prone to sedimentation and/or backups. Sewer maintenance by the City of Lancaster is discussed in Chapter 4, Section 4.6 of this Plan.

Chapter 5 - Maximize Use of the Collection System for Storage

5.3.3 Sewer Use Ordinance

Chapter 913 of the Lancaster City Code prohibits the discharge of surface water, rain water or other "unobjectionable" water to the City's sanitary sewers. A copy of the City's sewer use ordinance is included in Appendix C for reference.

This provision of the City Code prevents new connections from adding any unobjectionable water to the sanitary system and also requires any sources of unobjectionable water be disconnected. By preventing and removing illegal sources of flow, the sewer use ordinance preserves the system's carrying capacity and maximizes any available storage.

5.4 Sewer System Storage

As part of the 1995 Sewer System Evaluation, a computer model of the main sewers (both combined and sanitary) greater than 12-inches in diameter was created. This model, which utilized XP-Software's Stormwater Management Model (XP-SWMM), is an enhanced version of the USEPA's Storm Water Management Model (SWMM). It was calibrated using actual flows measured in the Lancaster sewer system. The model can be used to predict the system's response to rainfall as well as plan for future system extensions.

The sewer system capacity and ability to store wastewater during rain events was also evaluated using XP-SWMM. Only the trunk sewers discussed in Chapter 3 were evaluated for the ability to store flow since their diameters are greater than or equal to 18 inches and thus have the best chance of providing storage.

Using XP-SWMM, the total volume of the trunk sewer system was estimated to be 3,676,533 gallons as shown in Table 5-1. XP-SWMM was also used to determine the volume of flow within the trunk sewer during dry weather conditions. The peak DWF volume in the trunk sewer was estimated to be 385,265 gallons.

XP-SWMM was then used to evaluate the trunk sewer capacity during three different rain events. These storms correlate to design frequency storms of 1, 4 and 10 years. The Rain Event Volume shown in Table 5-1 is the wastewater stored in the system during a rain event. The Available Storage Remaining is the Trunk Volume minus the Rain Event Volume. The CSO Discharge Volume is the volume of flow discharged to the receiving streams through CSOs.

As seen in Table 5-1, the Available Storage Remaining for each simulation is much less than the CSO Discharge Volume. This is due to the relationship of the CSO weirs, ground surface and areas of available storage to the hydraulic grade line of the sewer system.

Chapter 5 - Maximize Use of the Collection System for Storage

**Table 5-1
Sewer System Storage Volume
XP-SWMM**

Storm Frequency (year)	Trunk Volume (gallons)	DWF Volume (gallons)	Rain Event Volume (gallons)	Avail. Storage Remaining (gallons)	CSO Discharge Volume (gallons)
1	3,676,533	385,265	1,519,970	2,156,563	14,174,719
4	3,676,533	385,265	1,575,569	2,100,964	29,983,258
10	3,676,533	385,265	2,199,414	1,477,199	50,892,409

Furthermore, for the reasons listed below, not all of the Available Storage Remaining volume could be used for storage. After analyzing the XP-SWMM output data, a storage volume of approximately 170,000 gallons was found available for storage. This volume was located in the upper reaches of the sewer system. The data used to determine the areas and volume of available storage can be seen in Appendix I.

The assumptions used to analyze the XP-SWMM output data are listed below:

- Use trunk sewers 18" and greater (as identified in Chapter 3). Storing flows in sewers less than 18" is not practical due to the increased potential for basement flooding or other unacceptable consequences.
- Do not use trunk sewers that exhibit surcharging during a 1 year frequency storm since these lines are already operating at full capacity.
- Do not use trunk sewers with a pipe crown elevation less than 10 feet below ground level to reduce the potential for basement flooding. Ten feet was based on a house with an 8-foot basement, a 1 foot foundation and 1 foot of fall between the foundation and the trunk sewer.
- Do not use trunk sewers in areas of reported basement flooding since these areas obviously have no storage available.
- Use a maximum storage time of 6 hours to back up flow using inflatable weirs or some other method. Six hours was selected as the maximum time sewage could be stored since any greater time period would increase the potential for sedimentation of suspended particles and anaerobic decomposition of the wastewater.

As can be seen, these assumptions were necessary in order to avoid using storage in areas where the existing hydraulics do not allow a reasonable safety factor against basement flooding.

Chapter 5 - Maximize Use of the Collection System for Storage

Due to the low volume of storage available compared to the volume of CSO discharge from each evaluated storm (see Table 5-1), storage of flow within the sewer system was concluded to be negligible. In addition, the cost and time associated with storing this small amount of wastewater within the sewer system would not be cost effective nor result in any significant benefit to the Hocking River. The minimal estimate of available storage agrees with the WPCD's knowledge of the sewer system and its response to rainfall.

++ END OF CHAPTER 5 ++

6

Chapter 6 - Review and Modification of Pretreatment Requirements

6.1 Introduction

Water quality impacts from CSOs due to industrial discharges upstream (or up-pipe) of CSO discharge points are discussed in this Chapter. In 1996, there were thirteen (13) Significant Industrial Users (SIUs) and eight (8) Minor Industrial Users participating in the Industrial Pretreatment Program.

Industrial discharges to the Lancaster sanitary sewer system are regulated under the Lancaster Industrial Pretreatment Program (IPP) approved by the Ohio EPA in 1985. The IPP enforces the City's Wastewater Pretreatment Ordinance which was passed on October 22, 1984 and subsequently amended. A copy of the current ordinance is provided in Appendix D.

6.2 Existing Program Description

The City of Lancaster's IPP is staffed by one full-time employee of the Lancaster Water Pollution Control Department. Presently the program is operated from the offices in the Office and Laboratory Building and from the Pollution Prevention Building at the Water Pollution Control Facilities. The Pollution Prevention Building is used to provide secure storage for samples, sampling equipment and the IPP's sampling vehicle.

Equipment dedicated to the Industrial Pretreatment Program includes:

- (1) Sampling Vehicle (1996 Ford E150 Van Equipped w/shelving)
- (4) ISCO Automatic Samplers
- (2) Computers: 486/66 Desktop Computer; 486/25 Laptop Computer
- (1) Portable 2-way Radio
- (1) Ice Machine
- (5) Marsh-McBirney Flow Meters and associated equipment
- (1) Qualimetrics Rain Gauge
- (1) Portable pH Meters
- (1) Dissolved Oxygen Meter
- Spill Control Absorbent Material

The IPP monitors and samples local industrial discharges to the sewer system. The IPP also inspects industrial dischargers' facilities, evaluates compliance performance, issues discharge permits, reviews spill control programs and issues violation notices.

One of the responsibilities of the IPP is to monitor industrial users and issue notices of violation. The IPP publishes a list, at least once a year, of users that have been in "significant" non-compliance as defined in the Wastewater Pretreatment Ordinance. A summary of the Industrial Pretreatment Program enforcement activities over the past five years is provided in Table 6-1.

Chapter 6 - Review and Modification of Pretreatment Requirements

**Table 6-1
Summary of Industrial Pretreatment
Program Activity**

Year	Total Significant Industrial Users (SIUs)	No. of SIUs in Significant Non-Compliance	No. of Significant Violators (Published)
1995	13	7	2
1994	13	2	3
1993	13	3	3
1992	14	1	1
1991	14	2	1

6.3 Ordinances and Administrative Controls

The City of Lancaster has a Sewer Use Ordinance (Chapter 912 of the City Code) and an Industrial Pretreatment Program (Chapter 916 of the City Code). These ordinances control all aspects of the city's sanitary sewer system including what can be discharged to the system. The City's Sewer Use Ordinance and Industrial Pretreatment Program are included in Appendices C and D respectively for reference. Both of these ordinances have been approved by the Ohio EPA.

6.4 Industrial Users

The Industrial Pretreatment Program ordinance defines the requirements for industrial users to connect and discharge to the City's sanitary sewer system. Twenty-one industrial users participate in Lancaster's IPP. These firms are inspected annually. Additionally, the IPP monitors the flows and loads from sixteen (16) of the industrial users. Of these sixteen, thirteen are classified as "significant industrial users".

A list of the sixteen monitored industrial users is provided in Table 6-2. As shown in Table 6-2, these industrial users have a combined average daily flow of 1.1 MGD. The average dry weather flow monitored at the Lancaster Water Pollution Control Facility (WPCF) in 1995 was approximately 5.6 MGD. (Flow data from the WPCF is summarized in Appendix J). This indicates that 19.9% of the dry weather flow can be attributed to industrial users. A 1977 study estimated the percent industrial contribution at 35.5%. This indicates that the percent industrial flow has decreased substantially. This decrease is likely due to the closing of some industrial discharges and the implementation of the Industrial Pretreatment Program in 1985 which encourages conservation and reduced discharges.

Chapter 6 - Review and Modification of Pretreatment Requirements

**Table 6-2
Monitored Industrial Users
(January 1995 through June 1996)**

<u>Industry</u>	<u>Flow (MGD)</u>	<u>Service Lateral Location</u>
Significant Industrial Users		
Anchor Hocking Plant 1	0.2716	10" Line - Pierce and Fifth 24" Line - Pierce and Union
Sonoco Products	0.1400	8" Line - South of Tarhe Run and Fourth
Lancaster Electro Plating 2	0.1491	15" Line - W. Main St. East of Pierce
Premier Auto Glass	0.1231	24" Line - IN-OH RR, 2nd Manhole West of Quarry Rd.
Fairfield Medical Center	0.1002	10" Line - North of Harmon Ave.
Ralston Foods Rd.	0.1000	24" Line - IN-OH RR, W. of Schwik
Lancaster Electro Plating 1	0.0779	8" Line - Mulberry St. and Sherman St.
Rental Uniform Service	0.0412	8" Line - Commerce St. Lift Station
Lancaster Glass	0.0336	12" Line - Chestnut St. and Memorial Dr.
Akrosil	0.0268	12" Line - Wilson Rd. and Mill Park
Baily Corporation	0.0177	8" Line - Commerce St. (Private)
Conn's Potato Chips	0.0146	8" Line - Locust St. and Mt. Pleasant
Diamond Power	0.0075	24" Line - IN-OH RR W. of Schwik Rd.
Minor Industrial Users		
Anchor Hocking Packaging	0.0018	12" Line - Mill Park
Anchor Hocking Plant 31	0.0070	8" Line - McKinley
National Meter, Inc.	<u>0.0032</u>	8" Line - Alley North of Wheeling
Total	1.1153	

Chapter 6 - Review and Modification of Pretreatment Requirements

6.5 Industrial Users and Combined Sewer Discharges

A review of Industrial Pretreatment Program users found five users discharge to the combined sewer system. Of these five, only four flow through a combined sewer overflow structure prior to entering an interceptor sewer. These users are listed in Table 6-3.

**Table 6-3
Industrial Users in Combined Sewer Areas**

<u>Industrial User</u>	<u>Drainage Basin</u>	<u>CSO Structure</u>	<u>Remarks</u>
Anchor Hocking Plant 1	30	1010 & 1021	Infrequent discharge, oil and grease violations
Conn's Potato Chips	9	1005	
Lancaster Glass	15	1027	Effluent discharge of good quality, protected by sediment traps
National Meter Inc.	3	1020 & 1024	Very small discharger

The location of these dischargers is shown schematically in Figure 6-1. Note that any discharge to the Lancaster sewer system has the potential to exit the system prior to treatment. All flows except for a small area just north of the WPCF pass through one of two CSO structures near the WPCF. All flows must pass through CSO Structure #1034 on the east side of the WPCF or CSO Structure #1004 on the west side of the WPCF.

Significant dischargers not in combined sewer areas are summarized below:

East Side: Two of the IPP's largest users discharge to separate sanitary sewers on the east side of the drainage area (Baldwin Run drainage basin). The two large users are Rental Uniform Service and Ralston Foods.

West Side: Only two industrial users discharge to trunks west of the Water Pollution Control Facility. These discharge into sanitary sewers that are eventually pumped by the Broad St. Pump Station. One significant user is Sonoco Products which is surcharged for its BOD and SS loads. The other is Lancaster Electroplating 1.

Chapter 6 - Review and Modification of Pretreatment Requirements

6.6 Industrial Users and Water Quality Impacts

Since the industrial users are distributed across the City's sewer system, the impact of these users on combined sewer system discharges is difficult to predict. However, by looking at historical discharge trends of industrial users, conclusions regarding the impact of industrial flows exiting the system can be made

As discussed in Section 6.4, the industrial component of dry weather (non-storm related) flow treated at the WPCF has decreased dramatically since 1977. This fact alone indicates that the impact of industrial users (if any) has decreased substantially. Another measure of industrial discharge activity is the concentration of metals in the sludge produced by the Water Pollution Control Facilities. Figures 6-2 and 6-3 show the annual average sludge metals concentrations since 1986 have decreased significantly. From these trends it can be concluded that the amount of metals exiting the system at CSOs has decreased significantly over the past ten years.

The final measure of the impact of industrial flows in CSO discharges is the aquatic life of the receiving streams. Heavy metals and chemicals in industrial discharges can have serious negative impacts on aquatic life. However, the aquatic life in Lancaster streams is steadily improving as documented in the Ohio EPA's study of the Hocking River and its tributaries in 1982, 1990 and 1995. This success indicates that the efforts over the past twenty years to upgrade wastewater treatment and implement a pretreatment program have been very effective. It also follows that existing CSO discharges, including the industrial flow component from the combined system, do not appear to have an impact on local streams. The impact of CSOs on stream water quality is discussed in more detail in Chapter 12.

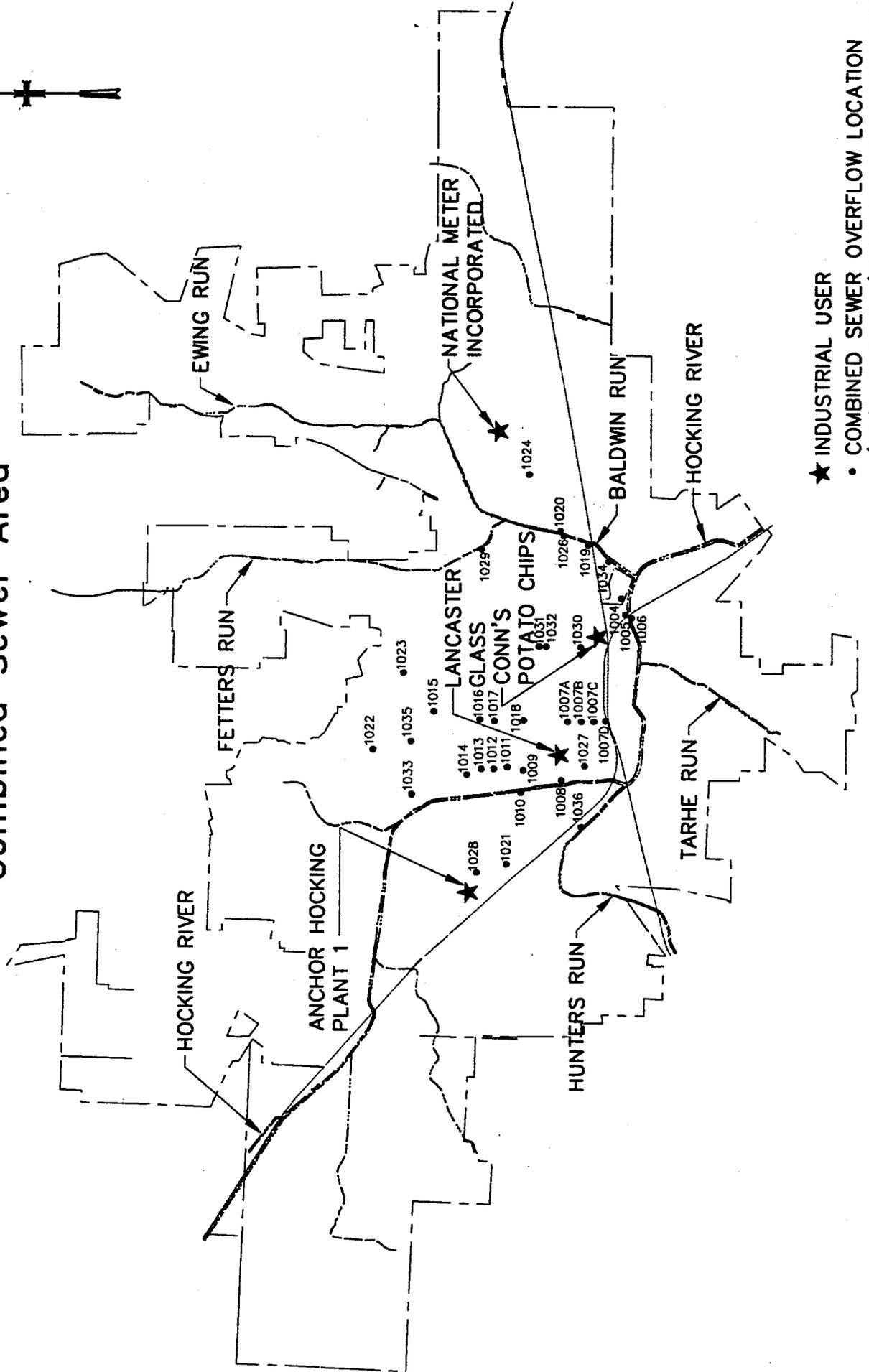
6.7 Pretreatment Program Modifications

Due to the success of the city's pretreatment program and the improved biologic life in the local streams, no additional controls or modifications to the pretreatment program are necessary.

++ END OF CHAPTER 6 ++

++ FIGURES FOLLOW ++

Figure 6-1
 Location of Industrial Users—
 Combined Sewer Area



- ★ INDUSTRIAL USER
- COMBINED SEWER OVERFLOW LOCATION
 (1036—FACILITY/PROPERTY PROTECTION DEVICE)

Figure 6-2
Lancaster OH Water Pollution Control Facilities
Annual Sludge Metals Concentrations

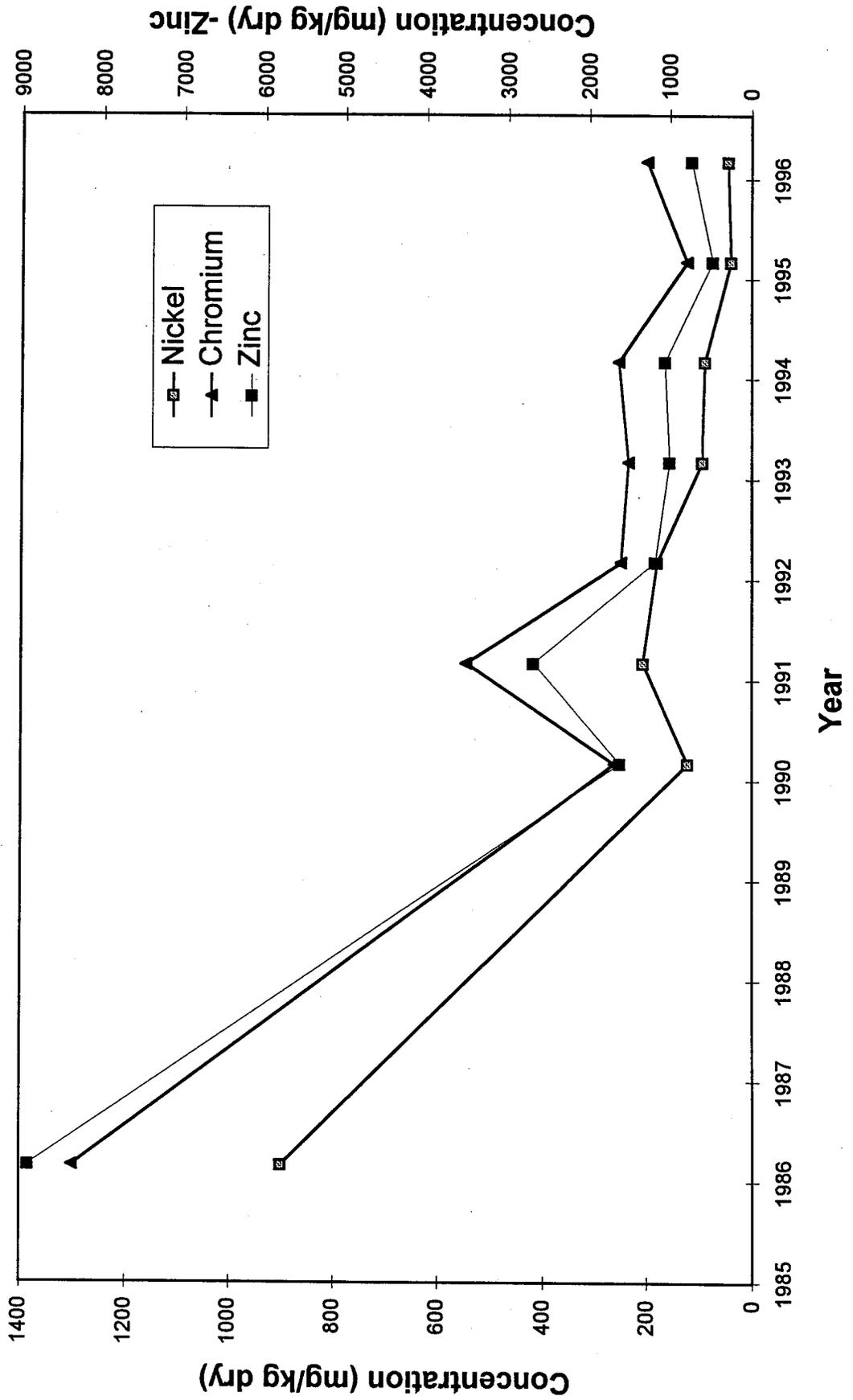
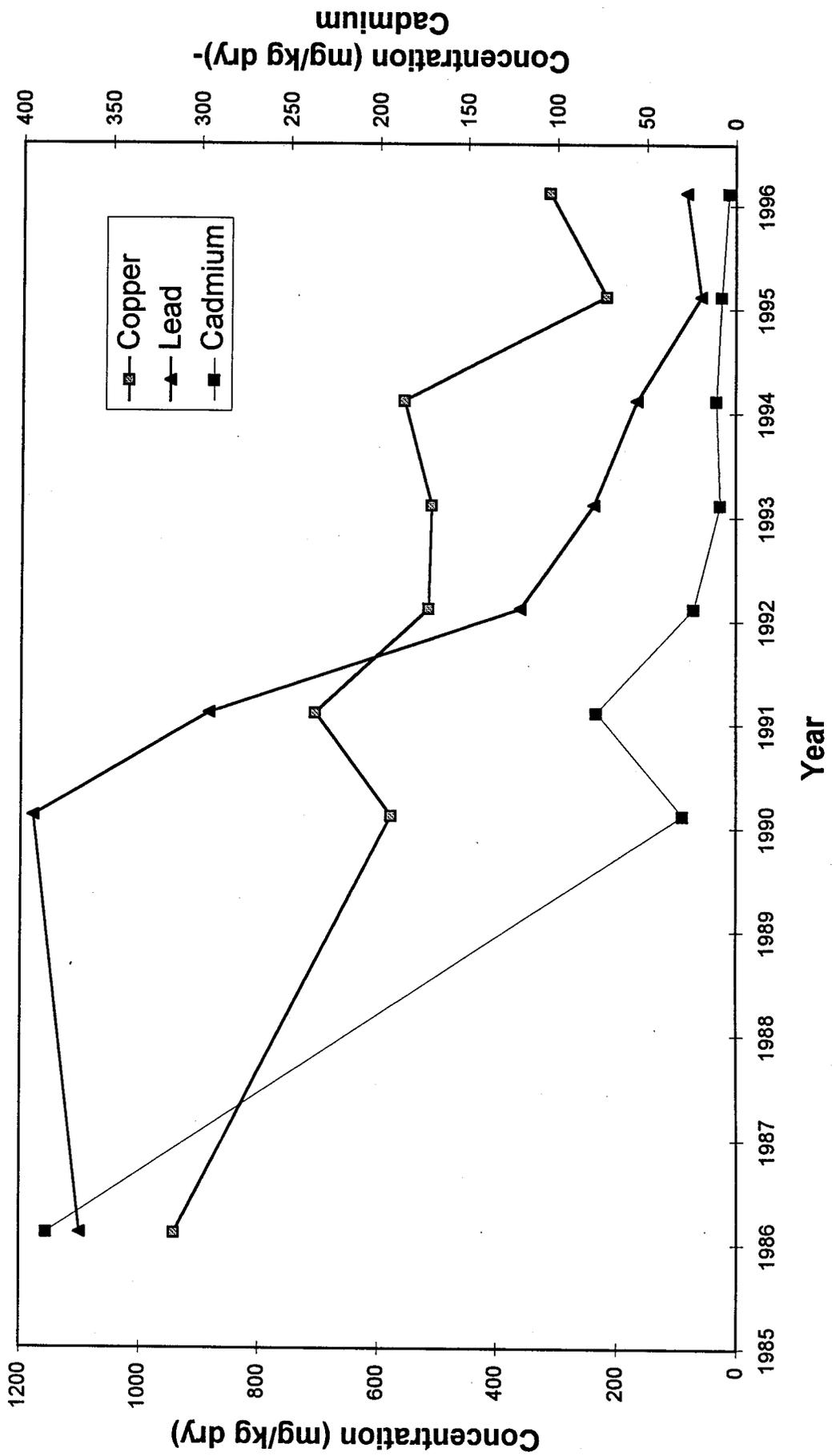


Figure 6-3
Lancaster OH Water Pollution Control Facilities
Annual Sludge Metals Concentrations



7

7.1 Introduction

Maximizing flows to and through the Lancaster Water Pollution Control Facility (WPCF) is the fourth of the nine minimum controls required by the USEPA's National CSO Control Policy. This control involves minimizing CSOs by utilizing the full carrying capacity of the sewage collection system as well as the full treatment capacity of the WPCF. Since this control maximizes wastewater flows to the WPCF, considerations of the negative impacts of increased flows on solids removal and NPDES discharge requirements need to be considered.

The City of Lancaster upgraded its treatment plant's capacity in 1989 in order to treat more of the wet weather flow its sewer system conveys to the wastewater plant. Since this expansion was prompted by repeated NPDES violations and negative receiving stream impacts, it essentially completes one part of a Long Term CSO Control Plan. Additional improvements were completed in 1997 which further improved the plant's wet weather flow treatment capacity.

7.2 Wastewater Treatment Capacity

The capacity of a wastewater treatment plant can be discussed in terms of "hydraulic" capacity as well as treatment or "process" capacity. The hydraulic capacity is often stated in terms of the peak amount of flow that can be moved through the plant, with the only limitation being either a mechanical limitation (such as a pump station's capacity) or hydraulic limitation such as overflowing tanks or submerged weirs. The process capacity is often defined in terms of accepted loading rate standards (such as the amount of pollutant load and/or flow) that can be applied to a unit process, above which performance of the unit process will deteriorate. The process capacity must be reviewed carefully when attempting to maximize the hydraulic capacity of the plant since the plant's NPDES discharge requirements must be maintained.

7.2.1 Peak Hydraulic Capacity

The facility plan for the 1989 Expansion (revised 1983) of the Lancaster WPCF identified the peak hydraulic capacity of the pre-1989 WPCF as 8 MGD, although the influent pump station could pump a peak flow of 12 MGD (6.5 MGD firm). Above 8 MGD, the primary clarifier splitting chamber overflowed and the rectangular primary clarifier scum trough flooded.

Plant deficiencies such as limited hydraulic capacity, combined with NPDES permit violations and negative water quality impacts from plant effluent and CSOs, led the City to expand the WPCF in 1989. The 1989 Expansion brought the WPCF up to an average treatment capacity of 8.33 MGD and a peak treatment capacity of 12.5 MGD. It also provided a peak primary treatment capacity of 18 MGD with bypassing of secondary treatment.

Included in the 1989 Expansion were several improvements that increased the ability of the WPCF to treat wet weather flows. One significant improvement was the construction of a new influent pump station. This station consists of three enclosed-screw lift pumps. This station

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has a firm capacity of 18 MGD. A one million gallon equalization tank was also constructed to further store and treat peak wet weather flows.

The 1989 Expansion was successful in increasing the plant's ability to treat peak flows. The 1989 Expansion resulted in an increase in the average flow treated by the plant and a reduction in the CSO volume discharged to the Hocking River. Although this reduction was not quantified at the time, the August 1990 Performance Evaluation found that in the eleven month period following the 1989 Expansion, the plant treated an average flow of 7.65 MGD with daily maximum's ranging from 8.98 MGD to 13.8 MGD. In 1982, prior to the expansion, the plant treated an average daily flow of 5.8 MGD with a hydraulic limit of 8 MGD peak flow.

The impact of this project on the water quality in the Hocking River has been dramatic. The increase in pumping capacity, and its associated reduction in combined sewer overflow volumes, is thought to be one of the reasons for the remarkable improvement in water quality reported by the Ohio EPA in the Hocking River. A 1991 Ohio EPA study of the Hocking River noted that biological improvements in the Hocking River rivaled any seen throughout the entire state ("Biological and Water Quality Study of the Hocking River Mainstem and Selected Tributaries", Ohio EPA Division of Water Quality, Ecological Assessment Section, 1991, page 3). The impact of Lancaster CSOs on the Hocking River is discussed in more detail in Chapter 12-Monitor CSOs to Characterize Impacts and Efficiency of Controls.

As discussed below, the City of Lancaster has invested in an additional expansion of the WPCF. The 1997 Improvements increased the average daily flow capacity from 8.33 MGD to 10.0 MGD and the peak plant flow from 12.5 MGD to 18.0 MGD. It is anticipated this additional capacity will provide full treatment for flow that previously had to be bypassed after Primary Treatment.

7.2.2 Peak Process Capacity

Although substantial improvements in both plant performance and water quality of the Hocking River resulted from the 1989 Expansion, there remained several nagging problems with the operation of the WPCF:

- Violations of suspended solids and ammonia and
- Inability to consistently and adequately treat peak flows.

An engineering and operations study was performed in 1992 to review the plant's overall process capacity and to make recommendations. The study determined the capacities for the Lancaster WPCF's unit processes. The conclusions of this study regarding the existing unit process capacities are shown in Table 7-1. Based on an analysis of existing plant loads and existing capacities, the study recommended improvements to bring all unit processes up to 18 MGD peak process capacity. These recommended capacities are also shown in Table 7-1.

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In 1994, the City of Lancaster began a two-phased implementation of this study's recommendations. Major additions included in the Phase I and Phase II Improvements which have had a significant impact on the hydraulic capacity of the plant include the following:

- Construction of a third final settling tank.
- Modifications to chlorination equipment and to the chlorine contact tank.
- Retrofitting of one of the two existing final settling tanks with a new center feed collector mechanism.
- Conversion of former centrifugal return sludge pumps and centrifugal trickling filter effluent pumps to secondary centrifugal pumps. This modification allows a part of primary effluent to be pumped directly to the aeration tanks. The remaining portion of the primary effluent flow can be processed through one or two of the trickling filters prior to being pumped via the secondary screw pumps to aeration. A portion of or all of the primary effluent that is conveyed to the trickling filters can actually bypass the trickling filters prior to being pumped to the aeration tanks via the secondary screw pumps. The firm pumping capacity of the secondary centrifugal pumps is 9 mgd and the firm pumping capacity of the secondary screw pumps is 9 mgd for a total firm pumping capacity of 18 mgd. Previously, the total firm pumping capacity was only 9 mgd. Figure 7-1 provides a general flow schematic of the Lancaster WPCF.

Prior to implementation of the 1997 Phase I and Phase II Improvements, there was a major hydraulic restriction between the primary settling tanks and the trickling filters. This restriction would allow only approximately 12 mgd to flow to the trickling filters without surcharging the primary effluent boxes. Flow in excess of 12 mgd would have to be diverted to equalization. In addition, prior to the chlorine contact tank modifications and addition of the third secondary clarifier, the secondary clarifier weirs would flood at approximately 12 mgd.

At the time of this writing, the construction of the Phase I and Phase II Improvements are completed and the facilities are operating. A summary of the major equipment sizing criteria for all existing and proposed equipment at the Lancaster WPCF is provided in Appendix A.

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Table 7-1
WET STREAM UNIT PROCESS CAPACITY (MGD)

Unit Process	1992 Process Capacity⁽¹⁾	Recommended Phase I/II Improvements
Raw Sewage Screening	18	18
Grit Removal and Handling	16	18
Raw Sewage Pump Station	18	18
Primary Settling	10	18
Trickling Filters	10	10
Aeration	10	18
Final Settling (One tank out of service)	5	18
Chlorination/Dechlorination	18	18
Effluent Pump Station	18	18

(1) Based on Influent Pollutant Loads Measured (1989-1990)

7.2.3 Peak Flow Test

In order to verify the peak capacity of the WPCF after the 1989 Expansion and the 1997 Phase I Improvements, a peak flow test was performed in March of 1997. The purpose of this test was to verify the maximum capacity of the WPCF. The test concluded the WPCF was capable of processing a peak flow of 18 MGD for up to four hours without degrading the plant's treatment capability. A summary of the test is provided below.

On March 10, 1997, influent flows to the WPCF were high, between 13 to 14 MGD. (Average daily flow in 1995 was 5.9 MGD. Plant daily flow data from 1995 is provided in Appendix J for reference). Prior to the test, influent flow was diverted to the plant's one million gallon equalization tank in order to be able to increase the total flow to the plant during the test.

Influent flow was stored in the equalization tank during the morning hours. To begin the test, the stored wastewater was released from the equalization tank to mix with the incoming sewage. In order to maximize the plant flow during the test, all three raw sewage pumps were placed into service along with all primary tanks (four) and all final settling tanks (3).

Over the next four hours, water surface elevations were measured at approximately fifty locations throughout the plant, from the influent channel to the effluent pump station. Flow

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measurements were taken along with water surface measurements. A total of seven sets of measurements were taken throughout the afternoon. The water surface elevations and flow measurements were reviewed together to develop conclusions regarding primary treatment and secondary treatment capacities of the WPCF. When tank weirs became submerged, it was concluded that the unit's capacity had been reached.

Primary Treatment

Measurements were made at the effluent weirs of all primary tanks. Flows were measured using the secondary pump meters located in the Blower Building and Flow Metering Manhole No. 1. During the test, the plant was using one of its first stage trickling filters, thus some primary effluent was pumped directly to the aeration tanks and the remainder of the flow was processed through a trickling filter prior to being pumped to the aeration tanks. A flow schematic of the WPCF during the peak test is shown in Figure 7-1.

Figure 7-2 shows flow pumped to the aeration tanks by the secondary centrifugal pumps. Figure 7-3 shows the flow to the first stage trickling filters. All flows were measured by doppler-type flow meters installed recently as part of the WPCF's instrumentation and control system. Together, Figure 7-2 and Figure 7-3 represent the total flow exiting primary treatment. At approximately 12:30 in the afternoon, the weir of Primary Tank No. 2 became submerged. As estimated from Figures 7-2 and 7-3, the peak flow at this time was:

Figure 7-2: Secondary Centrifugal Pump Flow - Pumps 1-3	5.8 MGD
Figure 7-2: Secondary Centrifugal Pump Flow - Pumps 4, 5	5.6 MGD
Figure 7-3: Secondary Pump Station Influent Flow (Trickling Filters)	<u>8.9 MGD</u>
	20.3 MGD

Secondary Treatment

Water surface elevations were also recorded throughout the secondary treatment units. However, unlike primary treatment, there was no calibrated flow meter to use to measure flows to correspond to the water surface measurements. The plant does have a 36-inch parshall flume to measure effluent flow. However, the ultrasonic meter intended to measure depth was not considered reliable at the time of the test and was not used. (It has since been replaced). Instead, the flume's staff gauge was used to measure the depth of flow in the flume. These depth readings were converted to flow using the appropriate parshall flume equations.

During the test, it was noted that the interior weir of Secondary Clarifier No. 1 became submerged around 2:00 p.m. Approximately 15 minutes earlier, a flume depth of 26.5-inches had been recorded. This converts to a flow of 17.7 MGD. Allowing that flow was increasing at that time and the plant could accommodate additional weir submergence, a peak rating of 18 MGD through secondary treatment was concluded.

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Conclusions

As a result of the measurements taken on March 10, 1997, the following conclusions were made regarding the Lancaster WPCF:

- The peak primary treatment capacity is approximately 18 MGD.
- The peak secondary treatment capacity is approximately 18 MGD.
- Plant maximum capacity is approximately 18 MGD.
- Peak flows can be sustained for at least four hours.

Although 20 mgd passed through the primary settling tanks before weirs became submerged, the plant capacity is limited to the firm pumping capacity of the influent pumps. The firm pumping capacity is 18 mgd. In addition, the overall plant maximum capacity is also limited by secondary treatment to 18 MGD. Note that these capacities were achieved with all facilities and tanks available and operating as intended. These capacities represent the peak capacities of the WPCF under ideal conditions.

No process upsets or permit violations were noted or recorded on March 10, 1997 thus it can be concluded that these peak flows can be sustained for at least four hours, which was the approximate length of the test.

As a further check, the measured water surface elevations were compared to an existing calibrated hydraulic model of the plant. The model was run using the measured flows. Water surfaces predicted by the model were then compared with those measured in the field. The water surfaces measured compared well to those predicted by the model. This effort confirmed the flow measurements taken in the field and the conclusions of the test regarding the peak hydraulic capacities of primary and secondary treatment of the Lancaster WPCF.

7.2.4 Minimum Wet Weather Flow

The peak capacities discussed above were based on all facilities operating at their intended capacities. However, during the design life of these facilities there will occur periods when equipment and tanks must be taken off-line. Examples of these occurrences include clarifier mechanism repair, pump bearing replacement and routine tank cleaning. At these times, the plant's maximum wet weather capacity will be reduced. From the operating experience of the plant prior to the 1997 Phase I and II Improvements, it can be determined that the plant's minimum wet weather capacity is approximately 10 mgd. The plant should be able to treat this flow even if a critical piece of equipment or tank is out of service.

7.3 Maximize Use of Existing Facilities

The 1989 Expansion determined that flow equalization was necessary at the Lancaster WPCF. The design of this expansion did not use any existing facilities for flow equalization, rather it constructed a new one million gallon flow equalization tank.

Chapter 7 - Maximize Flow to the POTW for Treatment

As confirmed in the peak flow test, the existing facilities, including the 1997 Phase I and Phase II Improvements, are currently used to their maximum potential of 18 MGD. Since completion of the Phase II facilities, there have been no plant bypasses.

There are no unused facilities that could be used for the storage or treatment of peak flows. The plant currently does not make full use of its trickling filters, however with stringent ammonia permit requirements, these must remain on standby for treatment purposes.

7.4 Sewer System Peak Flows

A verification of the flows reaching the plant can be found in the sewer flow metering performed during the City's 1995-1996 Sewer System Evaluation.

During the fall of 1995 and throughout 1996, flow meters were installed at key locations in the Lancaster sanitary sewer system. These flow meters measured flow in the sewer system as well as flow overflowing through CSO structures during rain events. Rainfall was also measured. The rain data and flow data was used to calibrate a computer model of the sanitary sewer system. The model is based on XP-Software's Stormwater Management Model (XP-SWMM). The model of the Lancaster sanitary sewer system was calibrated to predict sewer system's flows resulting from rain events based on the data collected in 1995-1996. Due to model size limitations, only sanitary and combined sewers 12-inches in diameter and larger were modeled, although all significant sewers were included regardless of size where necessary.

The model can be used to estimate flow within the sewer system for different storm events. The model can also be used to determine if flow can be stored in the sewer system without causing flooding problems upstream (see Chapter 5-Maximize Use of the Collection System for Storage) and the impact of new sewer system extensions/flows. For purposes of this chapter, the model was used to determine if the sewer system conveys the maximum plant capacity to the treatment plant.

Lancaster area precipitation data from approximately 5 years of data was evaluated. The precipitation data was divided into four precipitation categories: 0 to 0.5 inches, 0.5 to 1.0 inches, 1.0 to 1.5 inches and 1.5 to 2.0 inches. An average precipitation event was developed for each category and a model simulation performed. Table 7-2 shows the model results for plant influent flow and CSO bypass volume from the two CSOs upstream of the plant for each precipitation event.

Table 7-2 demonstrates that at storm events greater than 1.0-inch, the sewer system does convey the maximum plant flow of 18 MGD to the plant.

Chapter 7 - Maximize Flow to the POTW for Treatment

**Table 7-2
Influent Sewer Flows for Typical Storms**

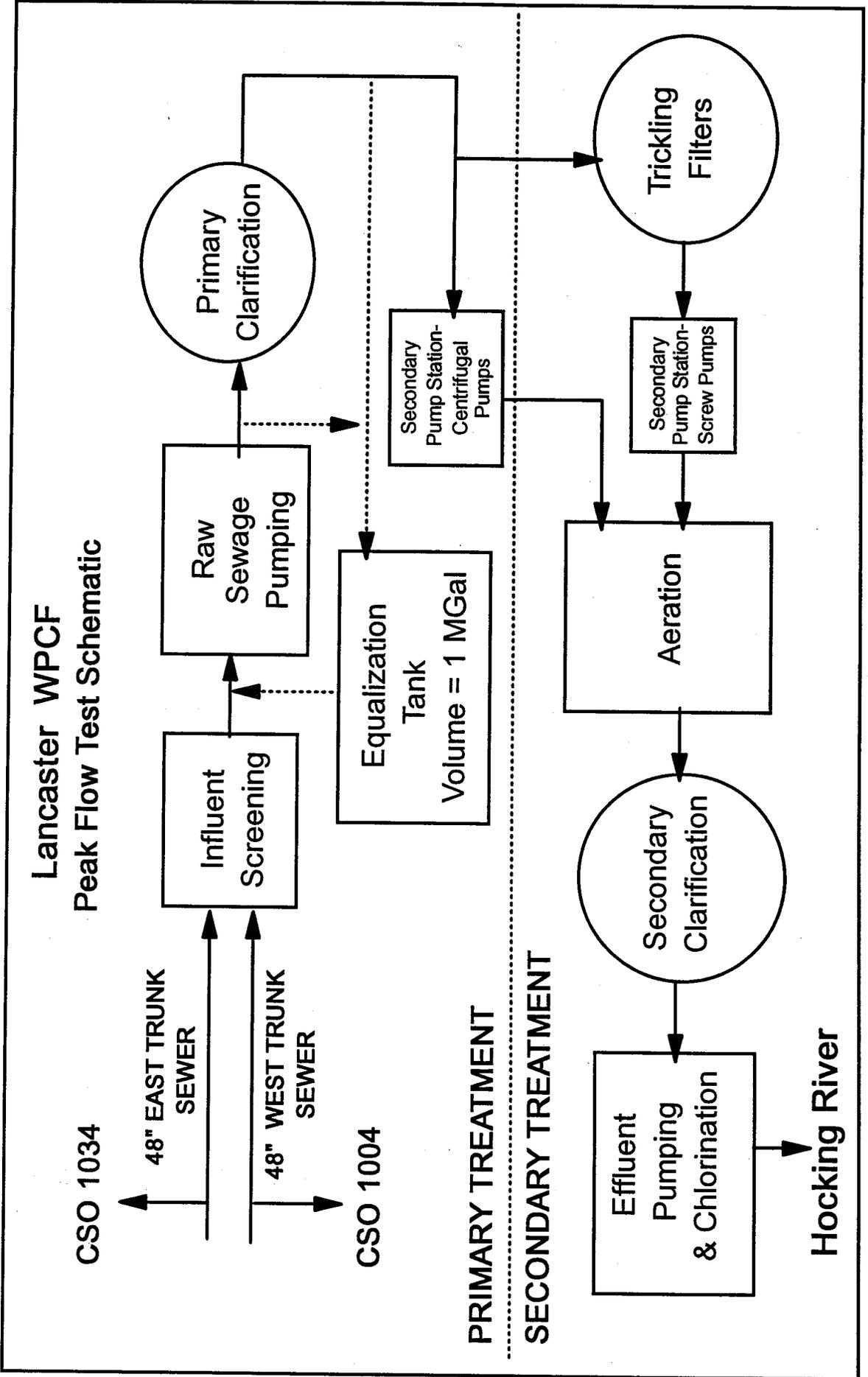
Rain Event	0.21 inches in 2.3 hours	0.74 inches in 7 hours	1.21 inches in 8.4 hours	1.81 inches in 8 hours
Plant Influent Flow (MGD)	9.66	15.68	17.44	18.00
Volume of CSO 1004 (gal.)	0	0	526,764	1,933,954
Volume of CSO 1034 (gal.)	0	0	18,513	237,954

++ END OF CHAPTER 7 ++

++ FIGURES FOLLOW ++

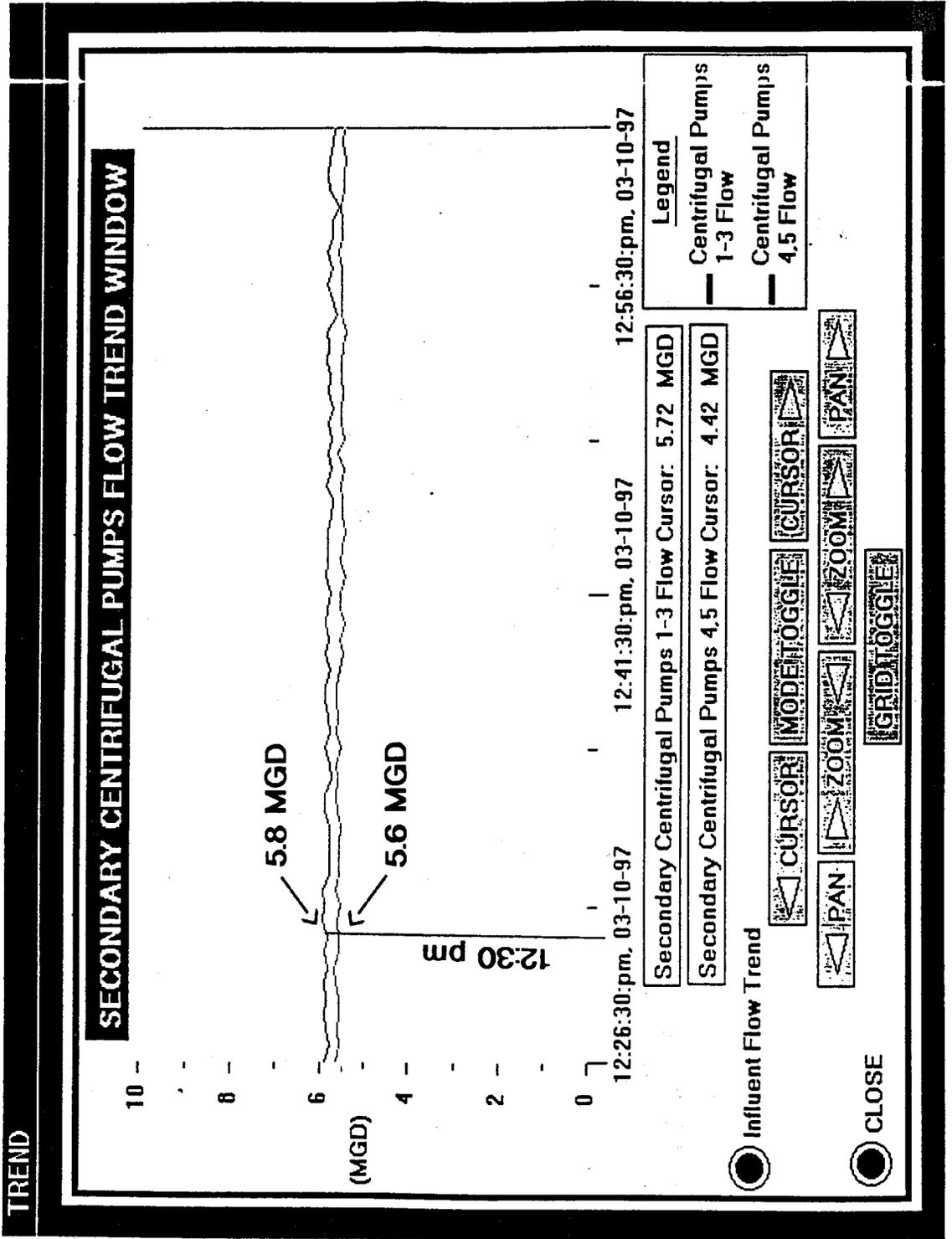
Combined Sewer System Operational Plan

Figure 7-1



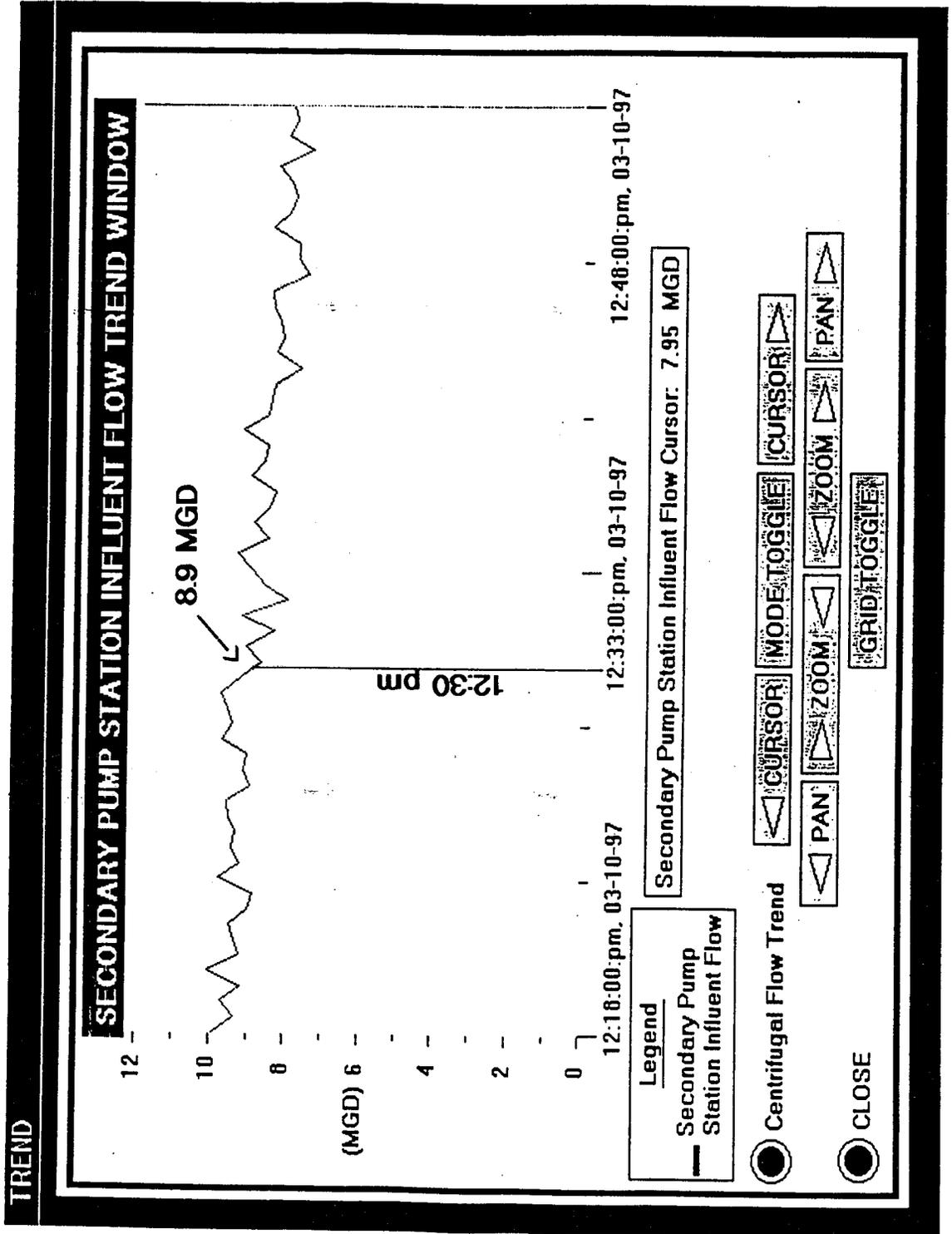
LANCASTER OH
COMBINED SEWER SYSTEM OPERATIONAL PLAN

FIGURE 7-2



LANCASTER OH
COMBINED SEWER SYSTEM OPERATIONAL PLAN

FIGURE 7-3



8

Chapter 8 - Prevent Dry Weather Overflows

8.1 Introduction

Prohibition of CSOs during dry weather is the fifth control measure of the USEPA's National CSO Control Policy. The objectives of this control are to determine if dry weather overflows (DWOs) are occurring, find the cause of the DWO, eliminate it and document the correction.

8.2 Current Practice

The WPCD is informed of dry weather overflows by routine inspections performed by WPCD maintenance crews or by citizen complaints. Sewers that are found to be overflowing during dry weather conditions are reported to the WPCD for correction. DWOs are typically caused by a blockage in the pipe and are corrected with sewer cleaning as soon as possible. The WPCD's sewer cleaning activities are discussed in Chapter 4 - Operation and Maintenance Program.

Since 1995, the WPCD has been specifically inspecting its combined sewer overflow structures for dry weather overflows. As discussed later in this Chapter, this effort resulted in the following conclusions:

- Dry weather overflows are infrequent in the Lancaster sewer system. Those that have been discovered have been eliminated by proper maintenance techniques or will be evaluated for modifications.
- For proper surveillance it is necessary to inspect CSO headwalls every two weeks to verify dry weather overflows have not developed.

CSO structure inspections are discussed in more detail in Chapter 4-Operation and Maintenance Program. The form used by the WPCD staff for the bi-weekly inspections is provided in Appendix G.

8.2.1 Reporting Procedure

If a dry weather overflow has been identified, it is required to be documented. The overflow is reported immediately to a supervisor so that the cause can be eliminated. City personnel are available 24 hours a day, 7 days a week to correct reported DWOs as soon as possible. The current reporting procedure used by the WPCD is as follows:

1. The investigating crew from the WPCD will notify the Plant Superintendent or Assistant Superintendent that an overflow has been identified.
2. The Superintendent or Assistant Superintendent will dispatch maintenance personnel to correct the DWO.
3. City personnel will verify that the DWO has been corrected.

8.3 Dry Weather Overflow Observations

8.3.1 Background

As part of the 1995 Sewer System Evaluation project, the WPCD began inspecting its CSOs for dry weather overflows in August, 1995. This effort consisted of a visual inspection of each overflow on a periodic basis, as allowed by "dry weather". The results of this effort for August through December 1995 is included in Appendix G for reference. During the 1996 flow monitoring effort, CSOs were checked frequently for activation during wet weather. This inspection effort turned up dry weather overflows also.

8.3.2 Results/Discussion

A summary of dry weather overflow events noted between August 1995 and December 1996 is included provided in Table 8-1.

**Table 8-1
Dry Weather Overflow Summary**

<u>Overflow</u>	<u>Date</u>	<u>Remarks</u>
CSO 1014	10/6/95	Clogged Pipe
CSO 1007	11/14/95	Slight; Clog Removed
CSO 1014	11/14/95	Clogged Pipe
CSO 1007	11/15/95	Slight
CSO 1005	11/20/95	
CSO 1007	11/24/95	Slight
CSO 1005	11/25/95	
CSO 1014	NA	Clogged Pipe
CSO 1029	5/3/96	Clogged Pipe
CSO 1013	5/3/96	
CSO 1005	5/7/96	
CSO 1029	7/96	Clogged Pipe

As can be seen from Table 8-1, only five of Lancaster's thirty-one known CSOs were found to overflow during dry weather and none routinely overflowed to local receiving streams.

The current status of these overflows is as follows:

CSO 1014 & 1029

The overflow occurrences at these two structures were concluded to have been caused by downstream debris in the sewers and were eliminated by cleaning the sewers at the overflow structure.

Chapter 8 - Prevent Dry Weather Overflows

CSO 1005, 1007, 1011, 1012 & 1013

It was concluded that these CSOs need to be evaluated for modifications to reduce their tendency to overflow during dry weather. The existing construction of these overflows may allow dry weather overflows under certain conditions.

Due to its poor accessibility and its low CSO weir elevation, CSO 1005 is currently being investigated for elimination. Temporary plugs will be installed in CSO 1005's overflow and flow meters will be installed upstream. This monitoring effort is intended to determine if the CSO can be safely eliminated without creating flooding problems in the system. If it cannot be eliminated, the possibility of raising the weir elevation will be investigated. If the CSO must remain, then access will be improved for personnel safety and maintenance purposes.

Due to its poor CSO design, CSO 1007 has a high priority for elimination by the WPCD. This will prevent dry weather overflows from this structure.

CSOs 1011, 1012 and 1013 were constructed with a "leaping weir" configuration. Sketches of these devices are provided in Appendix E. Normal dry weather flow is intended to drop below the weir and stay in the combined system. However during periods of increased dry weather flow (normal diurnal variations), the flow may have enough velocity to "jump" the gap and overflow to the stream. As shown in Table 8-1, only CSO 1013 was observed overflowing during the dry weather monitoring period. However, due to the infrequency of overflows from this structure it was concluded that this was an isolated event. Although CSO 1011 and 1012 were not found to overflow during dry weather, their construction is similar to CSO 1013 which makes them vulnerable to dry weather overflows. Since these overflows are currently not causing problems, no adjustments are presently planned. However if dry weather overflows are detected during the City's inspections, they will be evaluated for modifications. Dry weather overflow monitoring is discussed in Chapter 4-Operation/Maintenance Program.

CSO 1006 and 1036

A Facility/Property Protection Device (FPPD) is another location within the sewer system where dry weather overflows can occur. Facility/Property Protection Devices are constructed at siphons to prevent basement or area flooding when a blockage of the siphon barrels occurs. When overflows have occurred at FPPDs, the WPCD has eliminated the overflow by cleaning the siphon barrels.

The Lancaster System has two FPPDs. Sewer System Structure 1036 and CSO 1006. Sketches of both are provided in Appendix E. Sewer System Structure CSO 1006 acts as both a CSO and a FPPD for a siphon.

Chapter 8 - Prevent Dry Weather Overflows

8.3.3 Conclusions

The following conclusions resulted from this monitoring effort:

1. Dry weather overflows do not frequently occur in Lancaster's sewer system.
2. The WPCD will inspect CSOs on a bi-weekly basis to monitor for dry weather overflows.
3. The WPCD will remove any debris found to be causing a dry weather overflow.
4. CSOs prone to dry weather overflows will be evaluated for modifications to reduce the possibility of overflows during dry weather. This includes CSOs 1005 and 1007 (immediately) and CSOs 1011, 1012 and 1013 (if required).

The results of these conclusions have been incorporated into Chapter 4-Operation and Maintenance Program. Chapter 4 includes CSO structure dry weather overflow inspection schedules and CSO improvement project descriptions.

++END OF CHAPTER 8 ++

9

Chapter 9 - Control of Solid and Floatable Materials

9.1 Introduction

The intention of the sixth minimum control is to control the objectionable floatable material discharged to receiving waters from CSOs. Floatable material can be controlled by a variety of measures including screens, nets and baffles.

Minimum controls discussed in other Chapters of this plan can reduce the amount of floatable material entering a receiving stream. Sewer cleaning discussed in Chapter 4 and floodgates discussed in Chapter 5 can both reduce the amount of floatable material entering a stream by maximizing the available sewer system storage thus retaining the material in the sewer system.

Solid and floatable material in the sewer system can also be reduced through public awareness. Educating the public regarding the effects of litter and other types of garbage dumping may reduce floatables in the sewer system. Public education is discussed in Chapter 10- Pollution Prevention.

9.2 Existing Conditions

The City of Lancaster Water Pollution Control Department receives few complaints of floatables in the Hocking River from the public or other concerned parties. This condition was confirmed during the CSO floatables study discussed in Section 9.3.

Floatables and solids enter the storm and combined sewers primarily through catch basins. Storm sewers and catch basins in the City of Lancaster are maintained by the Street Department. The Street Department, a separate city department from the Water Pollution Control Department, also provides street sweeping and catch basin cleaning services. Street sweeping and catch basin cleaning are discussed in more detail in Chapter 4-Operation and Maintenance Program.

The Street Department typically schedules sweeping and catch basin cleaning activities to remove grit and debris that accumulate over time, especially from winter de-icing operations. The Street Department also provides leaf removal and composting in the fall. However all Street Department activities are subject to weather, funding and personnel limitations thus schedules are constantly subject to change. These activities are provided as a community service primarily to maintain driveability of city streets, thus they are not intended to directly benefit the combined sewer system. The impact of these activities on solids and floatables reaching the receiving streams through CSOs is not known. However, from the results of the study discussed below, a significant problem does not exist and current efforts are satisfactory.

9.3 Floatable Collection Study

In order to determine if the amount of floatables discharged from the combined sewer system was objectionable, a sampling program was performed from May 27 thru June 15, 1996.

Chapter 9 - Control of Solid and Floatable Materials

The study collected floatable material from various CSO outfall locations and stormwater outfall locations to determine the type and volume of material entering local streams.

Copatrawl® nets with a ½-inch opening were used to collect floatable material from two separate rainfall events. The Copatrawl® nets were attached to three combined sewer outfalls and two storm sewer outfalls to evaluate the material entering the stream from each type of sewer. A typical installation of a Copatrawl® net can be seen in Figure 9-1. After a rain event, the Copatrawl® nets were removed from each of the head wall locations and taken to the WPCF for inspection. The inspection consisted of photographing, identifying and quantifying the collected material. A summary of the collected material is presented in Table 9-1

9.4 Results of Floatable Collection Study

As seen in Table 9-1, the collected material from the 0.13 inch rain event on June 6, 1996 consists primarily of yard waste (i.e. grass clippings and leaves). The material collected from the 1.48 inch rain event on June 14, 1996 consisted of primarily gravel. A picture of the material collected in both the combined and storm sewers can be seen in Figures 9-2 and 9-3 for the June 6th and 14th rainfalls respectively. For both events, the material collected from the combined sewers did not differ significantly from that collected from the storm sewers.

Conclusions

The results of this study and the fact that the City does not receive many complaints from residents regarding the aesthetic appearance of the Hocking River indicates that a problem does not exist from floatable material entering the Hocking River from the Lancaster combined sewer system. Comments from the public regarding debris in the streams will be encouraged by the installation of notification signs installed at CSO outfalls along Lancaster streams. The notification signs are discussed in more detail in Chapter 11-Public Notification. An example of the notification signs is shown in Figure 11-12 at the end of Chapter 11.

This study also did not find a significant amount of paper products in CSO or stormwater outfalls. This indicates that litter is not a significant problem. Litter control programs in the Lancaster area are discussed in Chapter 10 - Pollution Prevention.

The study did find grass clippings in one storm event. The City does provide yard waste disposal services. This discussed in more detail in Chapter 10, Section 10.6.

The results of this study indicate that the existing operation and maintenance practices of the City of Lancaster are satisfactory to limit solids and floatables in Lancaster streams to acceptable levels.

++ END OF CHAPTER 9 ++

++ TABLE & FIGURES FOLLOW ++

**Table 9-1
Lancaster CSO
Summary of Collected Floatable Material**

Location	Date	Rainfall		Volume Collected Gallons	Material Description	Remarks
		Inches	Hours			
CSO 1027 Walnut and Hocking River 27" Combined Sewer	5/27	1.09	30	0	None	Collection bag was split open but attached to headwall and laying in river when retrieved.
	5/29	1.27	10			
Canal at the End of High 18" Storm Sewer	6/6/96	0.13	0.25	4	98% Yard Waste - leaves, grass clippings	Collection bag was in water when retrieved.
					1% Plastic - straws, cup lids	
					1% Paper - Cigarette Butts	
Wheeling and Hocking River 24" Storm Sewer	6/6/96	0.13	0.25	1	35% Yard Waste - leaves, grass clippings	Collection bag was not in water when retrieved.
					65% Plastic - straws, cup lids	
					Paper - Cigarette Butts	
CSO 1013 6th and Hocking River 24" Combined Sewer	6/6/96	0.13	0.25	5.5	85% Yard Waste - leaves, grass clippings	Collection bag was in water when retrieved.
					15% Plastic - straws, cup lids	
					Paper - Cigarette Butts	
					1 rag	
CSO 1026 NE Corner of Mary Burnham Park 27" Combined Sewer	6/6/96	0.13	0.25	10	95% Yard Waste - leaves, grass clippings	Collection bag was in water when retrieved.
					5% Human Waste	
					Plastic - straws, cup lids, comb	
					Paper - Cigarette Butts	

**Table 9-1
Lancaster CSO
Summary of Collected Floatable Material**

Location	Date	Rainfall		Volume Collected Gallons	Material Description	Remarks
		Inches	Hours			
Canal at the End of High 18" Storm Sewer	6/14	1.48	1.5	~12	90% Gravel, stone, asphalt 10% Aluminum and plastic cans Plastic - straws, cup lids Paper - Cigarette Butts	Collection bag was setting in mud on headwall floor when retrieved.
Wheeling and Hocking River 24" Storm Sewer	6/14	1.48	1.5	~7	70% Gravel, stone, asphalt 30% Aluminum and plastic cans, grass Plastic - straws, cup lids Paper - Cigarette Butts	Collection bag was not in water when retrieved.
CSO 1013 6th and Hocking River 24" Combined Sewer	6/14	1.48	1.5	~10	95% Gravel, stone, asphalt 5% Grass, cigarette butts	Collection bag was split open but attached to headwall and laying in river when retrieved.
CSO 1026 NE Corner of Mary Burnham Park 27" Combined Sewer	6/14	1.48	1.5	0	Some cigarette butts and Styrofoam	Collection bag was split open but attached to headwall and laying in river when retrieved.

Figure 9-1

Lancaster CSO
Typical Installation of Floatable Collection System

Installation of a Copatrawl® Net at CSO 1013 on June 13, 1996



Figure 9-2

Lancaster CSO
Floatable Material Collected on June 6, 1996

Floatable material collected from a storm line located on the north bank of the Hocking River at Canal St. and High St. on June 6, 1996.



Floatable material collected from the discharge CSO 1026 located on the west bank of Baldwin Run at the north end of Mary Burnham Park on June 6, 1996.



Figure 9-3

**Lancaster CSO
Floatable Material Collected on June 14, 1996**

Floatable material collected from a storm line located on the east bank of the Hocking River at Wheeling St. on June 14, 1996.



Floatable material collected from the discharge from CSO 1013 located on the east bank of the Hocking River at 6th St. on June 14, 1996. (Only gravel was visible due to the net failure.)



10

10.1 Introduction

The seventh minimum control emphasizes pollution "prevention" instead of pollution "treatment". This control encourages behavioral changes by the residents of the community primarily through education. As discussed below, many of the activities contributing to this minimum control are presently being performed by government agencies other than the City of Lancaster Water Pollution Control Department.

10.2 Public Education

10.2.1 Previous Efforts

In the past, the Water Pollution Control Department has distributed pollution prevention information to residents, schools, the Fairfield County Chamber of Commerce and at community events such as Earth Day and local fairs. Many of the brochures distributed were professionally prepared. They were developed in cooperation with other city departments or purchased from professional organizations such as the Water Environment Federation.

Public education to date has focused on water conservation, home hazardous waste disposal and solid waste reduction (reduce, reuse and recycle).

Water Conservation

Water conservation information has been distributed by both the City's Water Pollution Control Department (WPCD) and the City's Water Department. The Departments have made presentations to local schools, at the County Fair and local Earth Day events. Below are some examples of water conservation information that have been distributed (examples of each are provided in the Appendix K to this Plan):

- "25 Things You Can Do to Prevent Water Waste"
- A 6-inch Ruler With Water Waste Examples to Encourage Conservation

The Water Pollution Control Department has also distributed the Water Environment Federation (WEF) publication titled:

- "Clean Water: A Bargain At Any Cost"

In 1996, the WPCD began annual funding of water conservation programs. In 1997, \$8,400 of the annual WPCD budget was used for promoting water conservation. The City intends to annually fund water conservation as long as budget constraints allow.

Household Hazardous Waste

Recognizing the potential impact of hazardous waste on local streams as well as drinking water, the Water Pollution Control Department and the Water Department collaborated on an educational brochure titled:

- "Home*A*Syst- An Environmental Guide for the Home"

The table of contents for this publication is provided in Appendix L to this Plan for reference.

The Water Pollution Control Department has also distributed the Water Environment Federation (WEF) publication titled:

- "Household Hazardous Wastes-What You Should & Shouldn't Do"

A copy of this brochure is also included in Appendix L for reference.

Solid Waste

The Water Pollution Control Department distributed a children's activity book promoting things they could do to "reduce, reuse and recycle". This brochure's title is shown below and a copy is included in Appendix M to this Plan.

- "Color City of Lancaster GREEN-An Environmental Awareness Activity Book"

Miscellaneous

The Water Pollution Control Department has also distributed general educational information regarding wastewater treatment. These brochures were intended primarily for school-age children. The titles of these brochures are listed below and copies are included in Appendix N to this Plan.

- "Let's Learn About Wastewater Treatment-An Information & Activities Book"
- "Test the Waters! Careers in Water Quality"

10.2.2. Current Efforts:

As part of this Combined Sewer System Operational Plan (CSSOP), the City of Lancaster is developing an educational brochure that will be distributed along with water/sewer bills to all residential and commercial/industrial customers. One purpose of this brochure is to educate the public on the impact of their behavior on the local sewer system, streams and rivers. An example of what the brochure may look like is shown in Figure 10-1.

Chapter 10 - Pollution Prevention

Some possible ideas for the content of the Water Pollution Control Department's brochure are listed below:

- Discuss the results of the Department's basement flooding survey
- Provide an introduction to combined sewers and explain how they work and how they impact local streams.
- Discuss the Department's Combined Sewer Overflow sign project and provide an example of the signs to be posted at each headwall.
- Advertise and sponsor a "stream appreciation day" to allow school groups and community organizations to help clean debris from local streams.
- In cooperation with the Fairfield County Soil and Water Conservation District, advertise and sponsor additional storm drain stenciling opportunities in selected areas of the City.
- Direct attention to the pollution prevention activities already on-going in Lancaster by other agencies and provide contact people and phone numbers.
- Coordinate with the Department of Water's public education efforts including sprinkling information and other water conservation efforts.

Depending on their analysis of the success of this brochure, the Water Pollution Control Department will decide whether to produce additional brochures.

10.2.3 Other Sources

Public education regarding pollution prevention is also provided throughout Fairfield County and the City of Lancaster by government agencies other than the City of Lancaster's Water Pollution Control Department. Below is a list of some of the pollution prevention education activities on-going in the Lancaster area:

State

- The Ohio Environmental Protection Agency (OEPA) is very active in promoting pollution prevention education. In addition to emphasizing pollution prevention throughout all of its regulatory programs, the OEPA also provides information to the general public through the distribution of brochures, public presentations and other forms of information through its Public Information Center. The OEPA also operates several toll-free emergency numbers for reporting spills and other pollution-related problems.
- The Ohio Department of Natural Resources (ODNR) provides funding and technical assistance to many local groups that provide litter awareness education. ODNR has developed curriculum to assist in educating elementary and high school students. ODNR provides funding to many local groups and programs. An example of a program in the Lancaster area funded by ODNR is Lancaster/Fairfield County Community Action Recycling and Litter Prevention.

County

- The Fairfield Soil and Water Conservation Service is very involved in pollution prevention education. This service is operated in tandem with the United States Department of Agriculture's Natural Resources Conservation Service.

The Fairfield Soil and Water Conservation Service has focused its public education efforts on non-point pollution sources. The Service provides information to anyone interested regarding the proper disposal of hazardous waste and other pollutants, both on the farm and in the home.

The Service also visits local schools and sponsors a summer "Earth Camp". These efforts emphasize the impact of pesticides, herbicides and household hazardous wastes on the water cycle, trees and drinking water.

- Public education regarding pollution prevention is also provided on the County level through the Fairfield County Cooperative Extension. The Cooperative Extension provides training and application certification to farmers and other non-commercial parties on the proper use of herbicides and pesticides. It also provides instruction on "pasture management" including manure distribution and nitrogen application. All of the efforts are directed toward protecting water quality in the local streams.
- In the Lancaster area, solid waste falls under the authority of the Four County Solid Waste District (Fairfield, Licking, Perry and Coshocton Counties). The Solid Waste District does not itself provide extensive public education, however it provides funding for other agencies, such as Community Action, to provide education.

The Lancaster/Fairfield County Community Action is a grant-funded agency that coordinates many community services. The Ohio Department of Natural Resources and the Four County Solid Waste District both provide grants to Community Action Recycling & Litter Prevention. Recycling and Litter Prevention provides extensive public education opportunities such as:

- Sponsoring Earth Day Events for the Lancaster area and coordinating the participation of many different public and private agencies.
- Sponsoring presentations to schools and community groups regarding recycling and litter prevention. In 1997, the education specialist for Recycling and Litter Prevention presented information to over 10,000 people.

10.3 Water Conservation/Protection Program

Water conservation is a primary goal of the City of Lancaster and an important pollution prevention technique. Protection of groundwater resources is also important and the City of Lancaster is only one of five public water supplies to have an Ohio EPA-approved wellhead protection program.

The City of Lancaster's water conservation program has allowed the City to receive a discount from the Water Pollution Control Loan Fund on the interest rate charged on funds borrowed to finance improvements at the City's wastewater treatment plant. This discount was established to encourage communities to pursue water conservation projects in their systems.

Below is a list of some of the ways that the City of Lancaster Water Department is implementing the water conservation/protection goals:

- Annual Budget: Every year the Water Department allocates funds to pursue water conservation and water protection education measures.
- Wellhead Protection Committee: This committee consists of the City Engineer, the City Service Director, Water Department employees, representatives from Fairfield County Regional Planning, Fairfield County Engineers Office, the Soil and Water Conservation District, a teacher from the Lancaster Public Schools, various township trustees, a Fire Department representative and a private citizen. This committee provides a means to focus the attention of concerned parties on protecting the City's water supply from chemical spills, overuse of fertilizers and pesticides, illegal dumping, etc.
- Wellhead Protection Area Signs: The City Water Department recently began installing signs along State routes through the City identifying the area as part of a wellhead protection area.
- Water Conservation Kits: In the past, the Water Department has distributed free water conservation kits to the public.
- Public Education: In addition to the brochures discussed in Section 10.2 above, the Department of Water provides the following:
 - Speakers: Speakers from the Water Department will talk to local community organizations to discuss water conservation and water protection.
 - Tours: The Water Department provides tours of the Water Plant to local schools to better explain the role of water treatment and the importance of protecting water supplies.
 - Displays: The Water Department provides booths and displays at local events such as Earth Day observances, Chamber of Commerce events and the County Fair. All these events are opportunities to promote water conservation and protection.

10.4 Street Sweeping

The benefit of street sweeping as a method of pollution prevention is not clear. A study of solid and floatable debris in the Lancaster storm and combined sewer discharges is discussed in Chapter 9-Control of Solid and Floatable Materials. This study did not find a significant problem of litter in storm or combined sewer discharges.

Street sweeping in the City of Lancaster is the responsibility of the Street Department. The Street Department typically schedules sweeping and catch basin cleaning activities to remove grit and debris that accumulate over time, especially from winter de-icing operations. The Street Department also provides leaf removal in the fall as discussed in Section 10.6. Street sweeping is discussed in more detail in Chapter 4-Operation and Maintenance.

10.5 Anti-Litter Efforts

The anti-litter effort in the City of Lancaster is sponsored primarily by the Lancaster/Fairfield County Community Action Recycling and Litter Prevention. A summary of their programs, along with other state-wide programs, is provided below:

10.5.1 State Efforts

The Ohio Department of Natural Resources' (ODNR) Recycling & Litter Prevention Division provides technical assistance to government agencies, hospitals, etc. in addition to providing funding to local community groups for litter-awareness programs. In the Lancaster area, ODNR provides funding and technical assistance to the Lancaster/Fairfield County Community Action Recycling and Litter Prevention program.

10.5.2 County Efforts

The primary County program for preventing litter is the Lancaster/Fairfield County Community Action Recycling and Litter Prevention program. This program supports the anti-litter work of many private groups, communities and schools.

Community Action coordinates and supports "Adopt-a-Road" projects for interested groups. This consists of a commitment by a community group to clean a specific section of a local roadway two to four times a year for two years. The office also supports cub scouts and other organizations looking for single event opportunities to pick-up litter.

10.6 Solid Waste and Recycling

10.6.1 Municipal Solid Waste

The task of collecting trash from the residents of Lancaster is performed by the Lancaster

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Sanitation Department. The Department hauls municipal trash to a transfer station where the trash is placed into packer trucks. The trash is then hauled by a private contractor to any landfill in the Four County Solid Waste District. The Four County Solid Waste District was set up by the counties of Fairfield, Licking, Perry and Coshocton to provide for solid waste management for their residents.

In addition to curbside trash pick up, the Sanitation Department also offers the following trash-related services:

- **Spring Cleanup:** Each spring, residents place bulk material and other trash not picked up by the weekly collection service on the curb for City personnel to pick up and transport to the transfer station. This material is then hauled away by a private contractor in the same manner as the other solid waste collected by the Sanitation Department.
- **Fall Cleanup:** This is the same as the Spring Cleanup, however the residents must bring the material to the transfer station themselves.

The purpose of the "cleanups" is to provide residents with an opportunity to dispose of bulk items or other material that is not picked up by the weekly curbside service. This includes bulk items that can't easily fit on the collection trucks such as large furniture as well as items that have disposal restrictions such as refrigerators and tires.

These cleanup programs prevent bulk items and other hard-to-dispose-of material from being dumped illegally in streams, ravines or abandoned lots. Most materials are accepted for disposal free of charge. A nominal fee is charged for tires and items containing Freon.

The cleanup programs are planned to continue as long as funding is available to operate them.

10.6.2 Recycling

The Lancaster Sanitation Department also offers voluntary curbside recycling for City residents. Green bins are provided for residents to separate out recyclables such as plastics, aluminum cans, paper, cardboard, etc.

For those outside the City, the Licking/Fairfield County Community Action Recycling Station also accepts many recyclable items. These include, among other items, all forms of plastic and paper as well as auto batteries, motor oil and car radiators.

A complete list of recycling opportunities in the Lancaster area is provided in Appendix O to this Plan.

10.6.3 Yard Waste Composting

As with all other Ohio communities, the City of Lancaster requires its residents to separate yard waste from their other trash. Presently, the City's Sanitation Department collects yard waste and hauls it to a private firm where it is composted. Currently, free disposal is provided on Saturdays at the compost facility for those located outside of the City.

The City of Lancaster Street Department also offers curbside pickup of leaves during the

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fall. Residents are encouraged to rake the leaves to the curb where they are picked up by the City and composted with other yard waste. Although this is provided primarily as a community service, it has the added benefit of keeping leaves out of combined or separate storm sewer systems where they can contribute to clogging of pipes and catch basins. Leaves that are collected are composted with other yard waste.

10.7 Household Hazardous Wastes

In the Lancaster area, the Four County Solid Waste District provides a hazardous waste collection program. This provides local residents an opportunity to drop off common household hazardous wastes such as used oil, antifreeze, herbicides, paints, etc. for proper disposal.

The District typically provides a collection day every two years, however this schedule is dependent on their Master Plan which is updated every five years. One day is provided for each county, using consecutive Saturdays.

Another effort that encourages the proper disposal of hazardous waste is storm drain stenciling. The Fairfield Soil and Water Conservation Service has encouraged local groups to stencil storm drains as a method of pollution prevention. In October 1997, the Fairfield Soil and Water Conservation District joined with the Lancaster Water Pollution Control Department to sponsor a storm drain stenciling project. The project was initiated when the Medill Cub Scout Pack 188 contacted the Conservation District looking for ideas for community service projects. The cub scouts stenciled storm drains near their school. The stencils warned residents not to dump waste in the storm drains. A similar effort was also sponsored by the Conservancy District in 1996 in a Fairfield County neighborhood of 138 homes. An example of a storm drain stencil similar to the one used in these projects is shown in Figure 10-2. An example of the informational flyer distributed to area homes during the stenciling effort is included in Appendix P along with a newspaper photograph of the Cub Scouts' project.

Public education regarding the proper disposal of hazardous waste is discussed in Section 10.2 above.

10.8 Product Bans

Although the Water Pollution Control Department has adopted language in its sewer use ordinance that prohibits universally banned products such as PCBs as well as dangerous products such as gasoline from discharge into its sewer system, it has not found it necessary to unilaterally prohibit or ban any one particular product.

Related to product bans however, is the minimization of the use of hazardous or potentially harmful products. Currently, efforts being made in this area are primarily educational and are discussed in Section 10.2.

+ + END OF CHAPTER 10 + +

+ + FIGURES FOLLOW + +

Lancaster, OH
Combined Sewer System Operational Plan
Figure 10-1 (Page 1)

Lancaster, Ohio
Department of Water Pollution Control
Volume No. 1 Issues No. 1 February 1997

PREVENTION NEWS

What is Pollution Prevention?

Our job at the Water Pollution Control Department is to remove pollution that is generated by the City of Lancaster. This pollution is carried by sewers to our Water Pollution Control Facility on Lawrence Street where it is cleaned up before it is discharged to the Hocking River. In Lancaster, some of the sewers carry only pollution from homes and businesses. This is referred to as "sanitary sewage" and is carried in "sanitary sewers". Other sewers carry water from rain events (often called "stormwater") and sanitary sewage together. These are called "combined sewers". It is important to understand that during rain storms, the combined sewers are designed to overflow to our local streams and rivers. This means some pollution can get to the streams and rivers without going to our treatment facility. Sometimes this pollution will not hurt the river, but sometimes it can. We have made a lot of progress in reducing the pollution from our combined sewers. The improvement in the Hocking River is known throughout Ohio. However, more can be done and this is where you can help by practicing "pollution prevention".

Pollution Prevention means removing pollution before it has a chance to enter the sewer system. Since we maintain Lancaster's sewer system, we see many things that people throw away that wind up as pollution. In this newsletter, we hope to give you some ideas how you can help prevent pollution.

What can you do?

Many items used everyday eventually wind up in our sewer system. This is especially true for our combined sewers that carry rainwater. Everything that is washed away by a rainfall will wind up in our combined sewers and possibly our local streams and rivers. Everything from paper sacks and cups from fast food restaurants to cigarette butts can wind up in our streams and rivers if not properly disposed. When we sampled the river we found paper cups and lids that people had thrown away or not carefully disposed.

Another thing we found when we looked at the river was grass clippings. You may not think of grass clippings as pollution, however these clippings can matt together and clog the sewers which can cause pollution to get into the river. Also, grass clippings floating on the river decay which robs oxygen from the river. They also look terrible and decrease the enjoyment of our streams. Both of those consequences are "pollution".

We will provide other ideas in future issues of this newsletter. In the meantime please feel free to call us with your own ideas or questions at the phone numbers on the next page.

**Combined Sewer System Operational Plan
Figure 10-1 (Page 2)**



Lancaster, Ohio
Department of Water Pollution Control
Volume No. 1 Issues No. 1 July 1997

Pollution Prevention Contact List

Ohio EPA:	645-3020
Emergency Spill Hotline:	1-800-282-9378
Ohio Department of Natural Resources:	265-6565
Civilian Conservation Corps:	265-6423
Recycling & Litter Prevention:	265-6333
Soil & Water Conservation:	265-6610
Fairfield County	
Fairfield Soil & Water Conservation District/ Natural Resources Conservation Service :	653-5320
Lancaster/Fairfield County Community Action- Recycling and Litter Prevention	681-4423
Four County Solid Waste District (Fairfield, Licking, Perry & Coshocton):	349-6308
Fairfield County Cooperative Extension:	653-5419
Fairfield County Engineer:	687-7050
City of Lancaster	
Water Works:	687-6634
Department of Water Pollution Control:	687-6664
Sanitation Department:	687-6660
Street Department:	687-6668
Fire Department (For Hazardous Spills):	911
Health Department:	687-6678

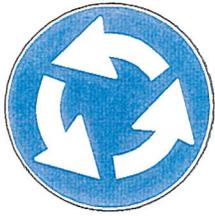
Future Issues:

Lancaster's Wet Basement Survey

Storm Drain Stenciling

Hocking River Clean-up

PREVENTION NEWS

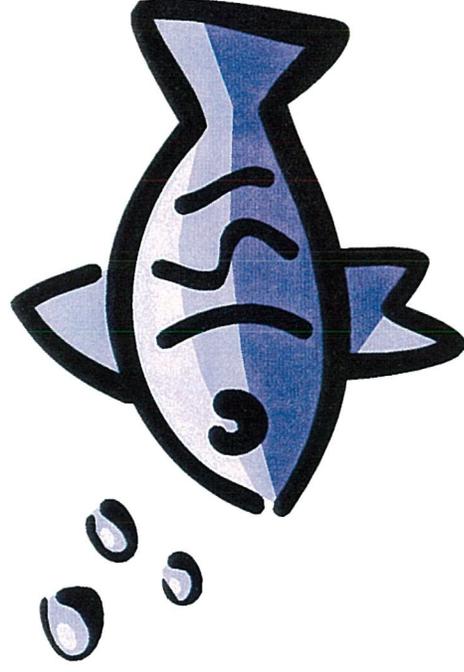




Combined Sewer System Operational Plan

Figure 10-2

DUMP NO WASTE



DRAINS TO STREAM

1

1

11.1 Introduction

Public notification is the eighth minimum control of the National CSO Policy. The primary concern of this control is determining the appropriate level of public notification required due to the presence of fecal coliform bacteria in local streams from combined sewer discharges. It is beyond the scope of this plan to address the relative health threat of the presence of fecal coliforms in Lancaster area streams. The Ohio EPA has established a maximum concentration of fecal coliform bacteria for waters where human contact may occur. This is the standard used in this plan for measuring the impact of fecal coliforms. It is also beyond the scope of this plan to address public notification of fecal coliforms in Lancaster area streams that are not the result of overflows from the City of Lancaster's combined sewers.

11.2 Combined Sewer Discharges and Receiving Waters

As shown in Figure 11-1, the Hocking River flows from the northwest to the southeast through the City of Lancaster. The Hocking is fed by several tributaries that also flow through the city. These tributaries are:

- Ewing Run
- Fetters Run
- Baldwin Run
- Hunters Run
- Tarhe Run

The majority of the City's combined sewers discharge to the Hocking River. On the east side of the city, Baldwin Run receives discharge from five known CSOs. Baldwin Run is formed by the confluence of Fetters Run and Ewing Run. Fetters Run has one known CSO.

Tarhe Run enters the Hocking River upstream of the treatment plant, however it does not receive discharges from any known CSOs. Hunters Run joins the Hocking River near the Indiana-Ohio Railroad Bridge. There is no known CSO on Hunters Run, however there is a facility/property protection device for a siphon near Lincoln Avenue. This will discharge if the siphon becomes blocked.

Further upstream, three unnamed tributaries enter the Hocking River, all outside the combined sewer area.

The locations of all known combined sewer discharge points, known as combined sewer overflows (CSOs) are shown on Figure 11-1.

11.3 Water Quality Use Designations and Standards

Stream uses in the State of Ohio are defined by the Ohio Environmental Protection Agency (EPA). The Ohio EPA has categorized the Hocking River (from its headwaters to the Rockbridge Nature Preserve) and its tributaries (Ewing Run, Baldwin Run, Feters Run and Hunters Run) with the "use designations" listed below. No designation was provided for Tarhe Run.

<u>Use Designation</u>	<u>Lancaster Streams</u>
State Resource Water:	No
Aquatic Life Habitat:	Warmwater
Water Supply:	Agricultural and Industrial
Recreation:	Primary Contact

(Source: September 1993 State of Ohio Water Quality Standards Chapter 3745-1 of the Administrative Code)

The numeric water quality standard for the Recreational Use of "Primary Contact", as established by the Ohio EPA, is:

The Geometric Mean, based on not less than five samples within a 30 day period, shall not exceed 1000 per 100 ml and shall not exceed 2000 per 100 ml in more than 10% of samples taken during any 30 day period.

Note that this standard is a **recreational standard** and only exists during the EPA-defined recreational season, May 1st through October 15th of each year.

The existing water quality standard for fecal coliforms does not acknowledge the impact of wet weather on stream fecal concentrations. This deficiency has been the source of much discussion between the Ohio EPA and interested parties. It has been proposed that a "wet weather" standard should be adopted that recognizes fecal coliform concentrations will increase in streams for a period of time following rain events. Although no consensus has been reached, the discussion points to the reality that stream fecal coliform concentrations increase during rain events from a variety of sources, including urban activity (sanitary sewer systems and on-site treatment systems), agricultural activity and wildlife.

Recognizing the fact that some level of fecal coliforms will always exist in streams due to rain events, regardless of the presence of human activity, the standard as it now exists is most useful when looking at dry weather data. This plan adopts the concept that rain-related exceedances of water quality fecal coliform standards will occur and are not by themselves a cause of action for the city. Dry weather violations of fecal coliform standard should be investigated immediately. This is addressed in Chapter 8 - "Prevent Dry Weather Overflows."

11.4 Fecal Monitoring Plan

In order to assess the impact of Lancaster's CSOs on the recreational use of streams in the City, Lancaster developed and implemented a fecal coliform monitoring plan during the summer of 1996. A copy of the plan is included in Appendix Q.

The goal of the plan was to identify fecal coliform impacts of Lancaster's CSOs on local streams. Accordingly, the plan identified eight locations for fecal coliform sampling. These locations are shown on Figure 11-1 and listed in Table 11-1. These sites were selected in order to sample upstream and downstream of known CSOs and draw conclusions from the data about the relative impact of the known CSOs. It was beyond the scope of the plan to estimate the impact of non-CSO sources of fecal coliforms in local streams.

**Table 11-1
Fecal Coliform Stream Sampling Locations**

<u>Sample Location</u>	<u>Description</u>	<u>Remarks</u>
1	Hocking River at Ety Road	Hocking River upstream of Lancaster and known CSOs
2	Fetters Run at Rainbow Dr.	Fetters Run upstream of Lancaster and known CSOs.
3	Ewing Run at Rainbow Dr.	Ewing Run upstream of Lancaster and known CSOs
4	Hunters Run at Lincoln Ave.	Hunters Run upstream of confluence with Hocking River
5	Tarhe Run at So. Broad St.	Tarhe Run upstream of confluence with Hocking River
6	Baldwin Run at Lawrence St.	Baldwin Run downstream of CSOs
7	Hocking River at So. Broad St.	Hocking River upstream of WWTP and downstream of Lancaster CSOs
8	Hocking River at Sugar Grove Rd.	Hocking River downstream of WWTP and downstream of confluence with Baldwin Run

Samples were collected during "dry" weather days of August and September 1996. Dry days were defined as days when less than 0.1-inches of rain had fallen in the past three days. The dry weather data was intended to establish the background or baseline level of fecal coliforms present in the streams.

Samples were also collected for four "wet" weather events during the sampling period. Wet weather events were defined as days when 0.1-inches or more of rain fell. Samples were collected as soon as possible following the rain event and for three days following.

11.5 Fecal Monitoring Plan - Results and Conclusions

Water Quality Standard Analysis

The samples were taken over a forty-five day period during August and September 1996, with a ten day gap between August 27th and September 7th. The Plan succeeded in collecting a good data set. The total data set consisted of samples from approximately ten days of dry weather which was sufficient to establish a good baseline of fecal coliform concentrations. Four wet weather events of varying intensities (between 0.2 to 1.15 inches of rain) were also sampled to provide a good representation of the impact of rainfall and CSOs on fecal coliform levels.

Since the water quality standard is based on thirty-day periods, the data was divided between August and September. Splitting the data between August and September also has the advantage of allowing the comparison of a "dry" period (only one rain event) to a "wet" period (multiple rain events).

The August data consists of about seventeen days of data and is shown in Figure 11-2. This period was relatively dry, with one isolated rain event of 0.2-inches occurring on August 24th. (For the purposes of this plan, rainfalls less than or equal to 0.1-inches were considered insignificant).

The September data consists of about twelve days of data and is shown in Figure 11-3. This was a relatively wet period that saw three significant rain events, one of which was greater than one-inch (1.15-inches on September 16th).

The analysis of the data in terms of the Ohio EPA's water quality standard is shown in Figure 11-4. As discussed previously, the water quality standard established for fecal coliforms is based on a geometric mean of 1000 (minimum of five samples) in a thirty day period, with 10% of those samples not exceeding 2000. The geometric mean of the samples collected for each location was calculated separately for August and September and is shown in Figure 11-4 along with a count of the number of values exceeding 2000. Those values exceeding the "Primary Contact" water quality standard are noted. Conclusions based on the Ohio EPA's water quality standard are listed below:

- The Hocking River at Ety Road (#1) and the Ewing Run at Rainbow Drive (#3) sample values indicate that sources of fecal coliforms exist upstream of the City of Lancaster. These sources are sufficient to exceed water quality standards. Both of these sample locations exceeded water quality standards during the relatively dry month of August.
- The Fetters Run (#2) sample values indicate that it does not exceed water quality standards.
- The Hunters Run (#4) values exceeded water quality standards in the relatively wet month of September.

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- The Tarhe Run (#5) sample values did not exceed water quality standards.
- The Baldwin Run samples (#6), taken near the confluence with the Hocking River, indicate that there are sufficient sources of fecal coliforms to exceed water quality standards. This sample location is downstream of active CSOs thus it can be concluded that the CSOs are a source of fecal coliforms. The sample values from the upstream tributaries of Fetters Run (#2) and Ewing Run (#3) indicate that they are also sources of fecal coliforms in Baldwin Run, however the concentrations do not imply that they significantly contribute to the Baldwin Run values.
- The Hocking River, both upstream (#7) and downstream (#8) of the Lancaster Water Pollution Control Facility, contains sources of fecal coliforms sufficient to exceed water quality standards. A possible significant source of these concentrations may be upstream of the City of Lancaster, as indicated by the Ety Road (#1) sample values. However, both these locations (#7 and #8) are downstream of active CSOs which obviously impacted the values.

Rainfall Impacts Analysis:

As noted previously, the Ohio EPA's water quality standard for fecal coliforms does not address the impact of rainfall on stream fecal coliform values. However, since CSOs are distinctly rain-related events, it is necessary to analyze the data for a relationship between rainfall and fecal coliform concentrations in order to understand the impact of CSOs on water quality.

The values from Figures 11-2, 11-3 and 11-4 were plotted chronologically with rainfall. Figures 11-5, 11-7 and 11-9 show the daily values along with the corresponding daily rainfall data. Note that the vertical axis in these figures is plotted on a logarithmic scale due to the wide range in the order of magnitude of the sample values. Figures 11-6, 11-8 and 11-10 show the geometric mean of the sample values in relation to the water quality standard of 1,000 per 100 ml. Each value plotted is the geometric mean of the preceding sample values (minimum of five samples).

Figure 11-5 shows a relationship exists between wet weather and fecal coliform concentrations in Baldwin Run. Figure 11-5 also shows that Fetters Run and Ewing Run do not typically experience a large increase in fecal coliform concentrations for rainfalls less than 0.77-inches. Note that neither stream experienced a significant increase after the 0.77-inches on September 7, 1996, however both increased after the 1.15-inch storm on September 16th. The increase due to the storm on September 16th may also reflect a delayed impact of smaller storms on September 12th and 13th (0.06-inches and 0.13-inches respectively).

In regards to water quality standards, Figure 11-6 confirms that Fetters Run does not have a significant source of fecal coliforms. When the data for Ewing Run is plotted it also does not violate the 1000 / 100 ml standard. Although Figure 11-4 shows that more than 10% of the Ewing Run samples exceeded 2000 / 100 ml, Figure 11-6 indicates that fecal coliforms are not a significant issue in Ewing Run. Figure 11-6 also confirms that the Baldwin Run is impacted by fecal coliforms during wet weather. Due to the minor sources of fecal coliforms upstream, Lancaster CSOs are the likely cause of these fecal coliforms.

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Figure 11-7 shows a relationship exists between wet weather and fecal coliform concentrations in the Hocking River, both upstream and downstream of the combined sewer area. The Hocking River, upstream and downstream of the Lancaster Water Pollution Control Facilities (WPCF), sees an almost immediate increase in fecal coliform concentrations followed by a quick drop back to pre-rain event levels (or lower). Surprisingly, the Hocking River at Ety Road, which is upstream of the city, shows the same reaction, although perhaps slightly delayed.

Figure 11-8 shows that the Hocking River contains sources of fecal coliforms sufficient to exceed water quality standards upstream of Lancaster (Ety Road). This is significant in that this occurred during dry weather (August data). The Hocking River upstream of the WPCF also exceeded water quality standards during dry weather. This may have been due to the upstream sources indicated by the Ety Road samples, however a clear relationship was not detected. The Hocking River downstream of the WPCF during August dry weather had fecal coliform concentrations below water quality standards, perhaps reflecting the impact of the WPCF discharge. The Hocking River sample point downstream of the WPCF also includes impacts from Baldwin Run, which did not exceed water quality standards during dry weather in this time period either (see Figure 11-6).

Figures 11-7 and 11-8 show that all sites on the Hocking River show a significant increase in fecal coliforms in response to wet weather. The Ety Road site is upstream of the City and all CSOs. The Hocking River site upstream of the WPCF appears to be impacted by Lancaster's CSOs. The Hocking River site downstream of the WPCF is also impacted by the Baldwin Run and its associated CSOs (see Figure 11-6).

Figures 11-9 and 11-10 show the fecal concentrations for the Tarhe Run and Hunters Run, both tributaries to the Hocking River. Neither of these tributaries are known to receive discharges from the Lancaster combined sewer system, however, a facility/property protection device for a siphon under Hunters Run has been known to discharge if the siphon barrels are blocked. No known overflows occurred from the siphon during the sampling period.

A review of the Hunters Run values in Figure 11-9 is inconclusive for the August data (dry weather, small rain events). However, the rain events in September show a sharp increase in fecal concentrations followed by a quick decline. The Tarhe Run results are similar, except the September increase in fecal coliform values from the August values is small, indicating a lesser relationship to rain events. Since these samples are upstream of the combined sewer area, they are non-CSO sources of fecal coliforms in the Hocking River.

Figure 11-10 shows that the Tarhe Run and Hunters Run samples do not exceed water quality standards during dry weather. However, during wet weather, the Hunters Run values increase significantly enough to violate water quality standards.

Conclusions:

- **Dry Weather:** There did not appear to be any dry weather overflows from the Lancaster combined sewer system during the sampling period. However, Figure 11-8 does indicate sources of fecal coliforms in the Hocking River sufficient to exceed water quality standards during dry weather upstream of Lancaster as Ety Road and upstream of the WPCF. The Ety Road dry weather exceedance may explain the dry weather exceedances

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upstream of the WPCF. These exceedances were not due to Lancaster's CSOs since these were checked for dry weather overflows throughout the sampling period.

- **Wet Weather:** All streams showed an increase in fecal coliform concentrations during certain wet weather events.
 - Fethers Run, Ewing Run and Tarhe Run did not show a significant increase in fecal coliform concentrations due to rain events.
 - Baldwin Run, Hunter's Run and all locations on the Hocking River exhibited increases in fecal coliform concentrations due to rain events, though the concentrations dropped immediately in the days following the event. Hunter's Run appeared to respond to larger storms (0.77-inches and larger).
- **Combined Sewer Overflow Impacts:** During wet weather, discharges from Lancaster's combined sewer system impact the Baldwin Run and the Hocking River upstream and downstream of the treatment plant. These impacts are sufficient to exceed water quality standards. However, these streams also receive fecal coliforms from upstream (non-CSO) sources.
 - Fethers Run and Ewing Run contribute fecal coliforms to the Baldwin Run, although the CSOs appear to be the most significant source of fecal coliforms.
 - The increase observed at the Hocking River Ety Road sample location appears to lag the rain event by one to two days, which is another indicator of upstream fecal coliform sources.
 - Hunters Run can be a significant source of fecal coliforms to the Hocking River during wet weather. Tarhe Run is also a source, however it does not appear significant.

The significance of these conclusions is discussed in Section 11.7 "Public Notification".

11.6 Public Uses

The Hocking River through the City of Lancaster is not heavily used by the public or by business or industry. Use of the Hocking River and its tributaries within the city is limited to fishing, primarily at bridges. Boating, canoeing, wind surfing are also not common on the Hocking River or its tributaries near the combined sewer area. The public is known to wade in the local streams at random times near public parks, although access to the streams is not intentionally provided or convenient.

There are no facilities in the City of Lancaster specifically for public use of local streams for recreational purposes. There are two canoe liveries located downstream in Logan, Ohio. Both Liveries enter the Hocking River at the town of Rockbridge, approximately twelve miles downstream from Lancaster on the Hocking River.

11.7 Public Notification

In Section 11.5, the impact of fecal coliforms on streams in the City of Lancaster was analyzed. It was concluded that fecal coliforms due to Lancaster CSOs are related to wet weather events. In Section 11.6, it was noted that the Hocking River and its tributaries are not used extensively by the public for recreational purposes. Since fecal coliforms from combined sewer discharges are associated with rain events and the Hocking River and its tributaries are not heavily used by the public (when compared to a bathing beach for example), the City of Lancaster does not believe that public announcements or media presentations (radio, newspapers, etc.) regarding fecal coliform concentrations are warranted.

However, the city does believe that posting signs identifying the presence of a CSO outfall is warranted in the unlikely event that the public would be in the vicinity of an overflow during a wet weather event. The purpose of the signs will be to notify anyone to avoid contact with discharges from the outfall should they be in the vicinity of the outfall during a CSO discharge.

The sign locations are listed in Figure 11-11. Twenty-two (22) signs have been posted. Each sign is approximately 9-inches high by 30-inches wide and is mounted directly on the CSO structure headwall when possible. Each sign is numbered to assist the public and the City in identifying problem locations.

The City of Lancaster is also planning public education efforts regarding combined sewer overflows in its local streams. This is discussed in more detail in Chapter 10 - Pollution Prevention.

An example of the signs to be posted is provided in Figure 11-12.

11.8 Public Information Program of CSO Issues, Solutions and Costs

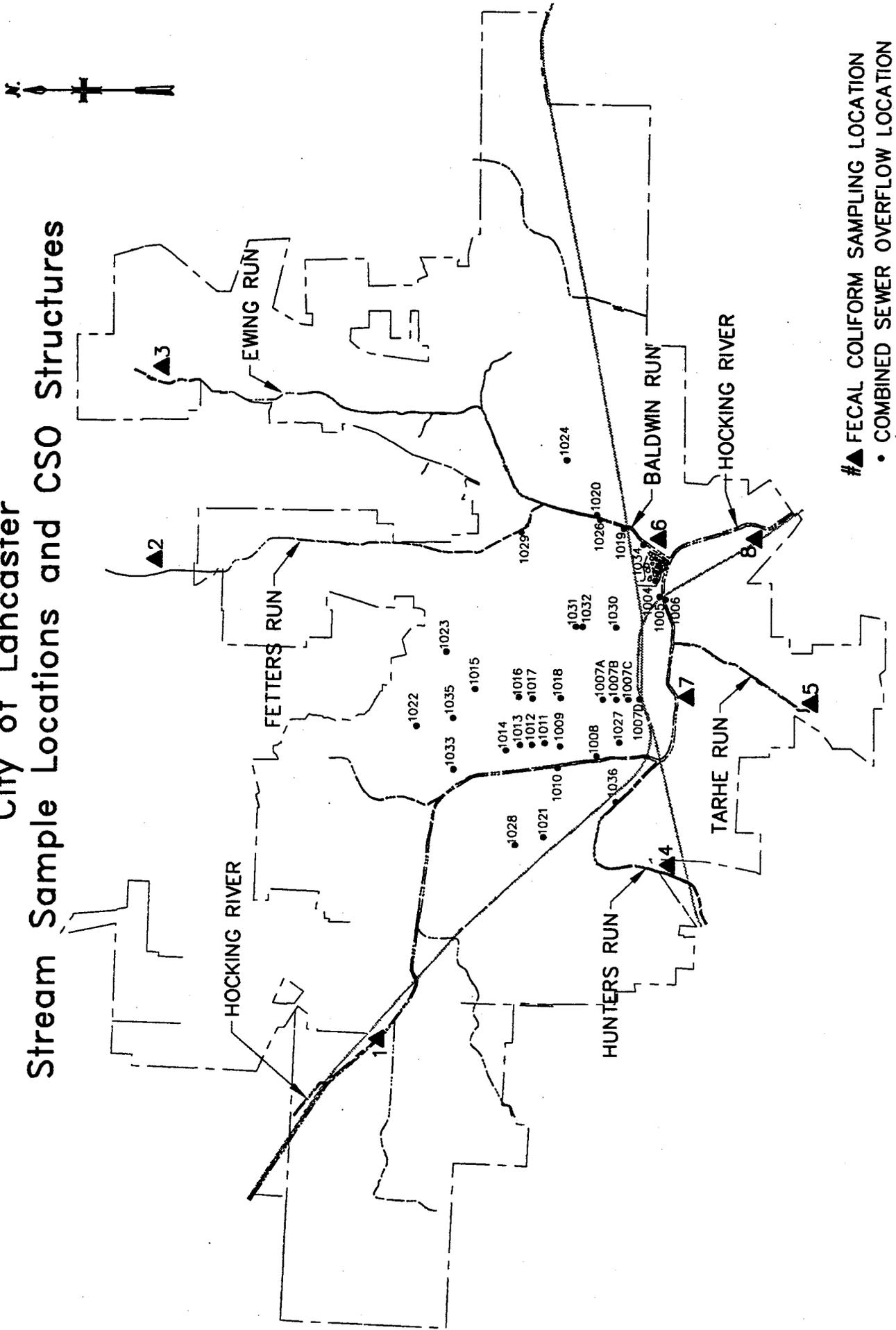
Since no significant CSO-specific projects are planned by the City of Lancaster, no public information program is necessary nor has the city found it necessary to develop a separate combined sewer program funding mechanism.

If significant capital facilities are found to be necessary to control the impact of combined sewers on the Hocking River or its tributaries, then this process of public notification will be performed, including an explanation of the specific CSO problem, various solutions and their costs during the implementation of a Long Term Control Plan.

++ END OF CHAPTER 11 ++

++ FIGURES FOLLOW ++

Figure 11-1
 City of Lancaster
 Stream Sample Locations and CSO Structures



#▲ FECAL COLIFORM SAMPLING LOCATION
 • COMBINED SEWER OVERFLOW LOCATION
 (1036—FACILITY/PROPERTY PROTECTION DEVICE)

**Figure 11-2
Fecal Coliform Stream Sample Data and Rainfall
August 1996**

Date	8/5/96	8/6/96	8/7/96	8/8/96	8/12/96	8/13/96	8/14/96	8/15/96	8/16/96	8/19/96	8/21/96	8/22/96	8/23/96	8/24/96	8/25/96	8/26/96	8/27/96
Rain Events (Total)				0.10										0.20			
Location																	
Ety Rd. and Hocking River	1,300	1,400			1,200		1,000	1,100	1,500	600	730	900		900	900	5,000	4,600
Rainbow Drive and Fetters Run				800	1,100	480	250	430	510	2,200	360	625		1,200	1,200	2,000	700
Rainbow and Ewing Run				430	2,400	270	330	80	2,100	480	590	1,900		1,600	330	600	480
Lincoln Ave., RR and Hunters Run		220	410		320		280	330	340	260	300	380		1,600	640	400	400
So. Broad St. and Tarhe Run	830	560	120				160	210	1,500	130	310	200		870	200	310	1,200
Lawrence St. and Baldwin Run				3,900	720	620	420		830	390	550	900	340	69,000	7,000	14,000	800
Upstream (So. Broad St.) Location #801			1,400	1,000		720	670		2,100	1,500	700	270	1,000	140,000	1,800	670	400
Downstream (Sugar Grove Rd.) Location #901			520	970		600	730		560	800	520	750	500	140,000	1,500	1,300	150

(1) Actual Value > 140,000 - Too numerous to count; 140,000 Used in Calculations; 60,000 Reported Value

**Figure 11-3
Fecal Coliform Stream Sample Data and Rainfall
September 1996**

Date	9/6/96	9/7/96	9/8/96	9/9/96	9/10/96	9/11/96	9/12/96	9/13/96	9/14/96	9/15/96	9/16/96	9/17/96	9/18/96	9/19/96
Rain Events (Total)	0.77						0.06	0.13			1.15			
Location														
Ely Rd. and Hocking River		8,000	630	6,700	6,800	1,100		1,000	140	200	14,000	78,000	1,500	1,000
Rainbow Drive and Fetters Run		1,800	930	1,400	230			600	420	210	4,400	420	290	250
Rainbow and Ewing Run		1,200	120	220	300			370	150	130	3,500	580	200	230
Lincoln Ave., RR and Hunters Run		75,000	330	470	300			1,380	200	170	1,000	21,000	550	320
So. Broad St. and Tarhe Run		1,800	360	2,000	240			600	120	350	4,600	1,900	280	150
Lawrence St. and Baldwin Run		80,000	47,000	2,000	700			77,000	33,000	1,200	4,000	12,000	900	1,500
Upstream (So. Broad St.)		22,000	8,000	800	410	420		87,000	2,700	500	120,000	9,300	500	900
Location #801		20,000	15,000	1,600	410	240		120,000	2,300	2,000	130,000	14,000	180	770
Downstream (Sugar Grove Rd.)														
Location #901														

**Figure 11-4
Fecal Coliform Stream Sample Data
Geometric Mean**

Location / Sample Site	AUGUST VALUES			SEPTEMBER VALUES		
	GEOMETRIC MEAN	SAMPLES >2000	PERCENT >2000	GEOMETRIC MEAN	SAMPLES >2000	PERCENT >2000
Ety Rd. and Hocking River (#1)	1,287	2	15.4%	2,181	5	41.7%
Rainbow Drive and Fetters Run (#2)	748	1	7.7%	603	1	9.1%
Rainbow and Ewing Run (#3)	598	2	15.4%	337	1	9.1%
Lincoln Ave., RR and Hunters Run (#4)	387	0	0.0%	955	2	18.2%
So. Broad St. and Tarhe Run (#5)	356	0	0.0%	587	1	9.1%
Lawrence St. and Baldwin Run (#6)	1,512	4	30.8%	6,603	6	54.5%
Upstream (So. Broad St.) Location #801 (#7)	1,289	2	15.4%	3,258	6	50.0%
Downstream (Sugar Grove Rd.) Location #901 (#8)	982	1	7.7%	3,700	6	50.0%
Water Quality Standard	1000		10%	1000		10%

= EXCEEDS WATER QUALITY STANDARDS

Figure 11-5
Lancaster, Ohio - Fecal Coliform Stream Samples

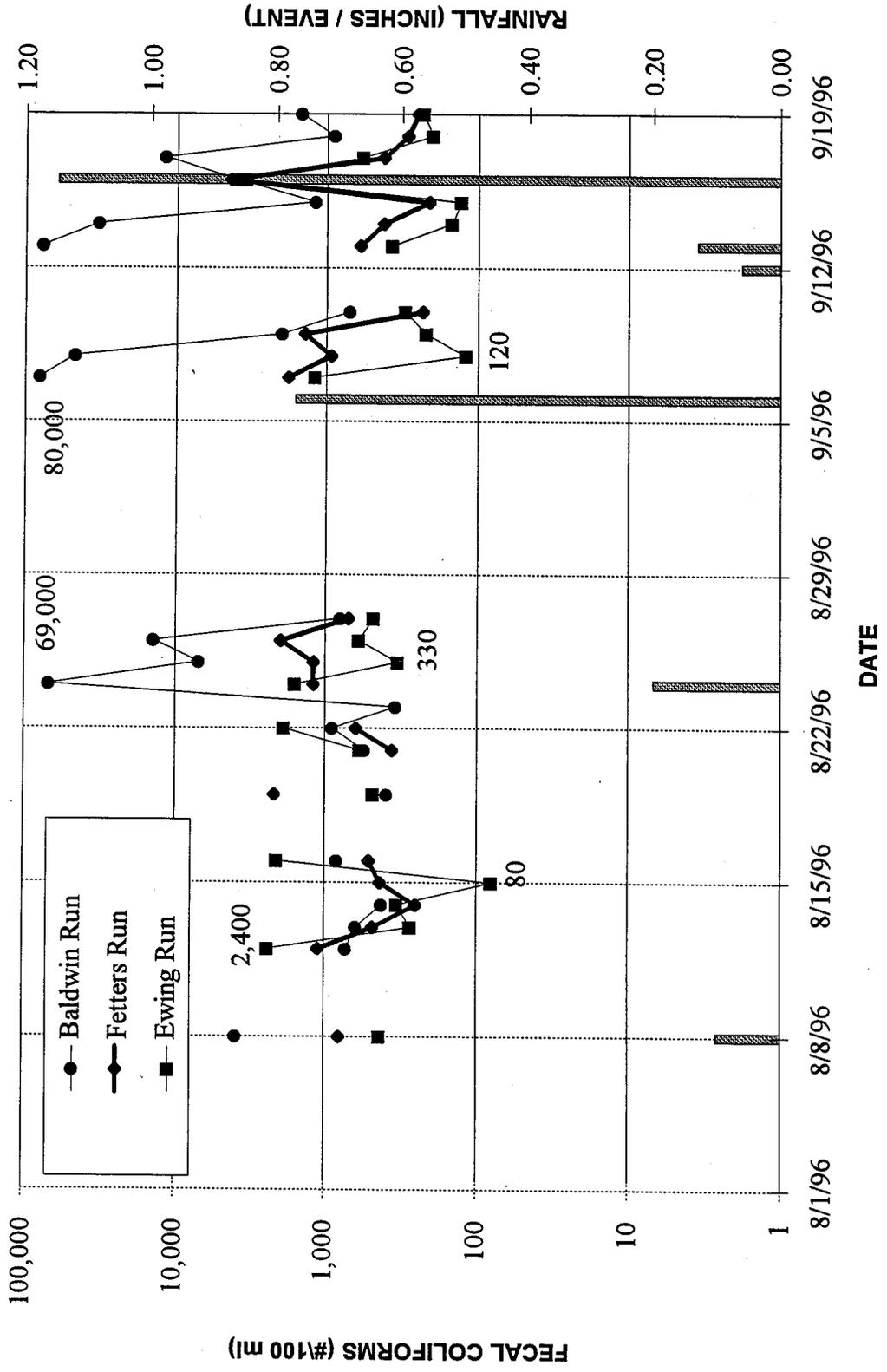


Figure 11-6
Lancaster, Ohio - Running Geometric
Mean of Fecal Coliform Stream Samples

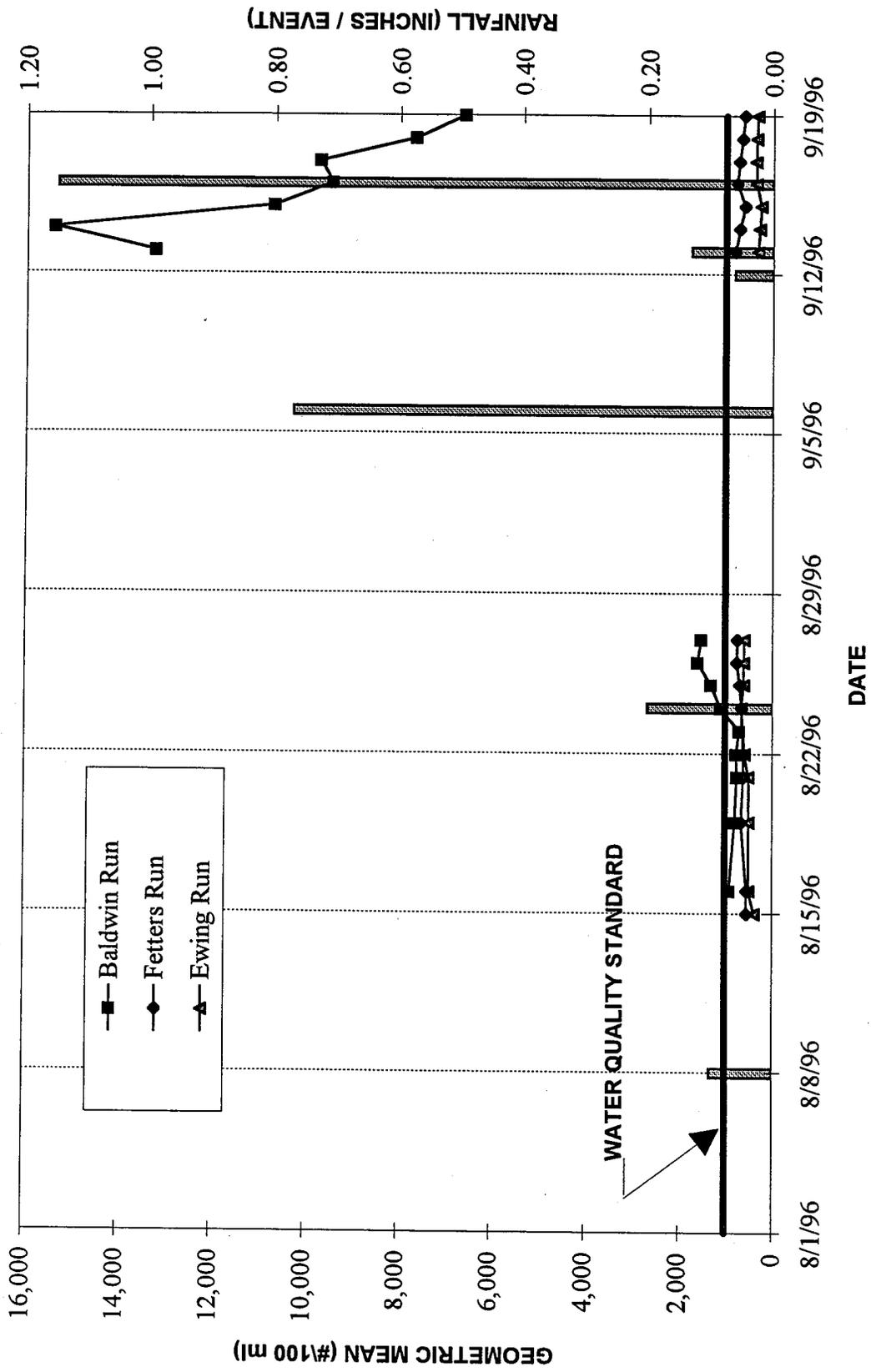


Figure 11-7
Lancaster, Ohio - Fecal Coliform Stream Samples

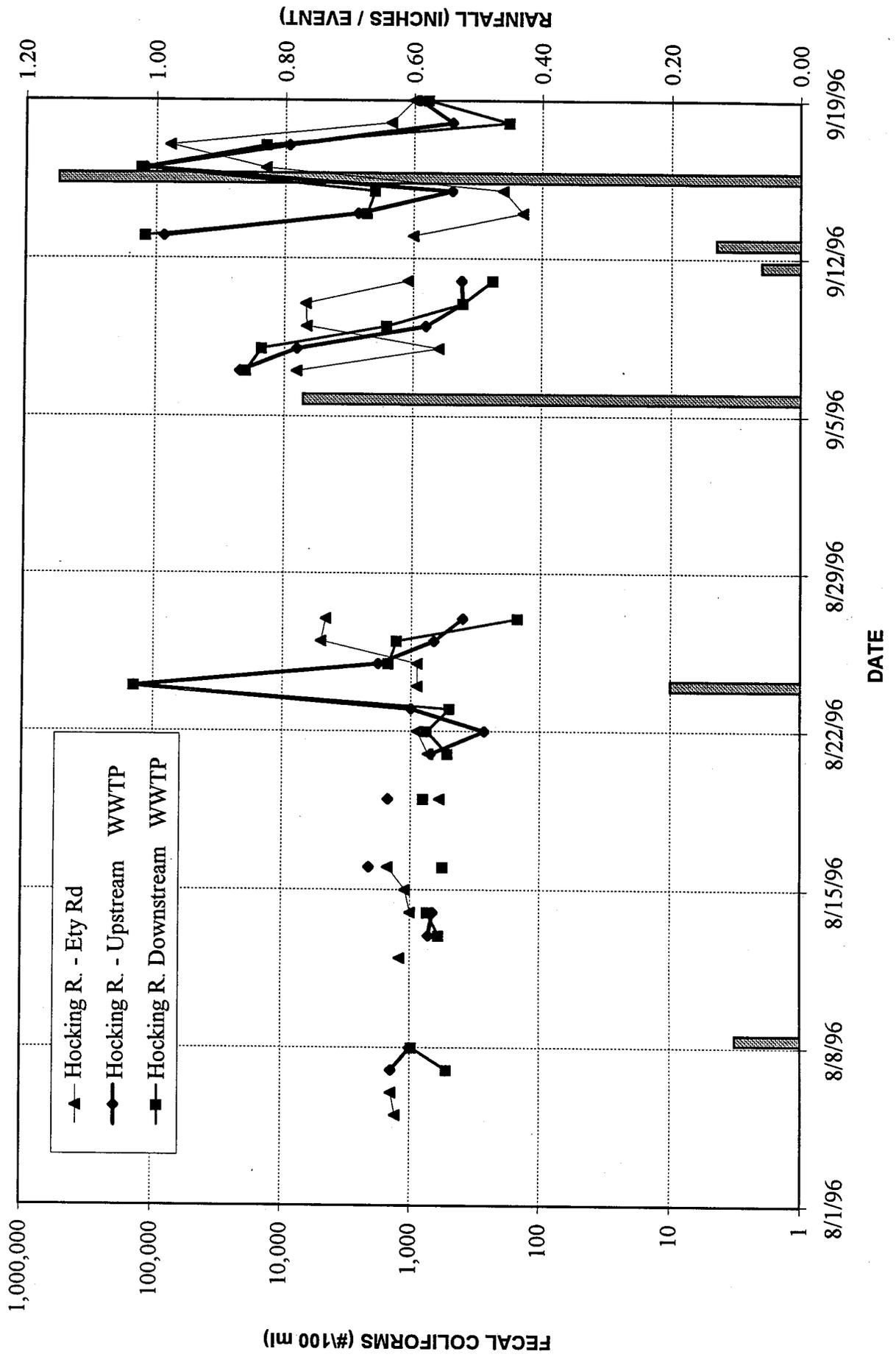


Figure 11-8
Lancaster, Ohio - Running Geometric Mean
of Fecal Coliform Stream Samples

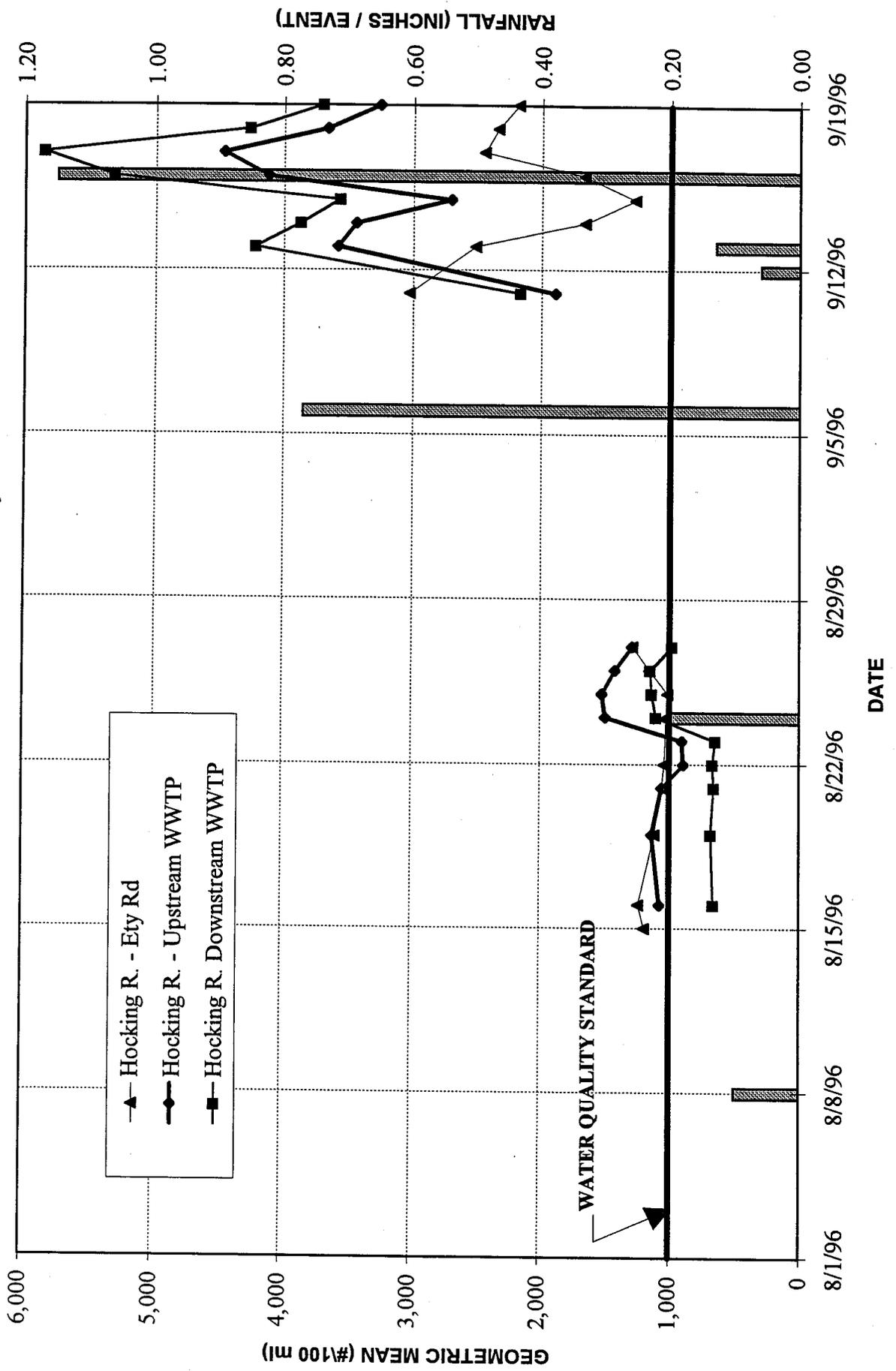


Figure 11-9
Lancaster, Ohio - Fecal Coliform Stream Samples

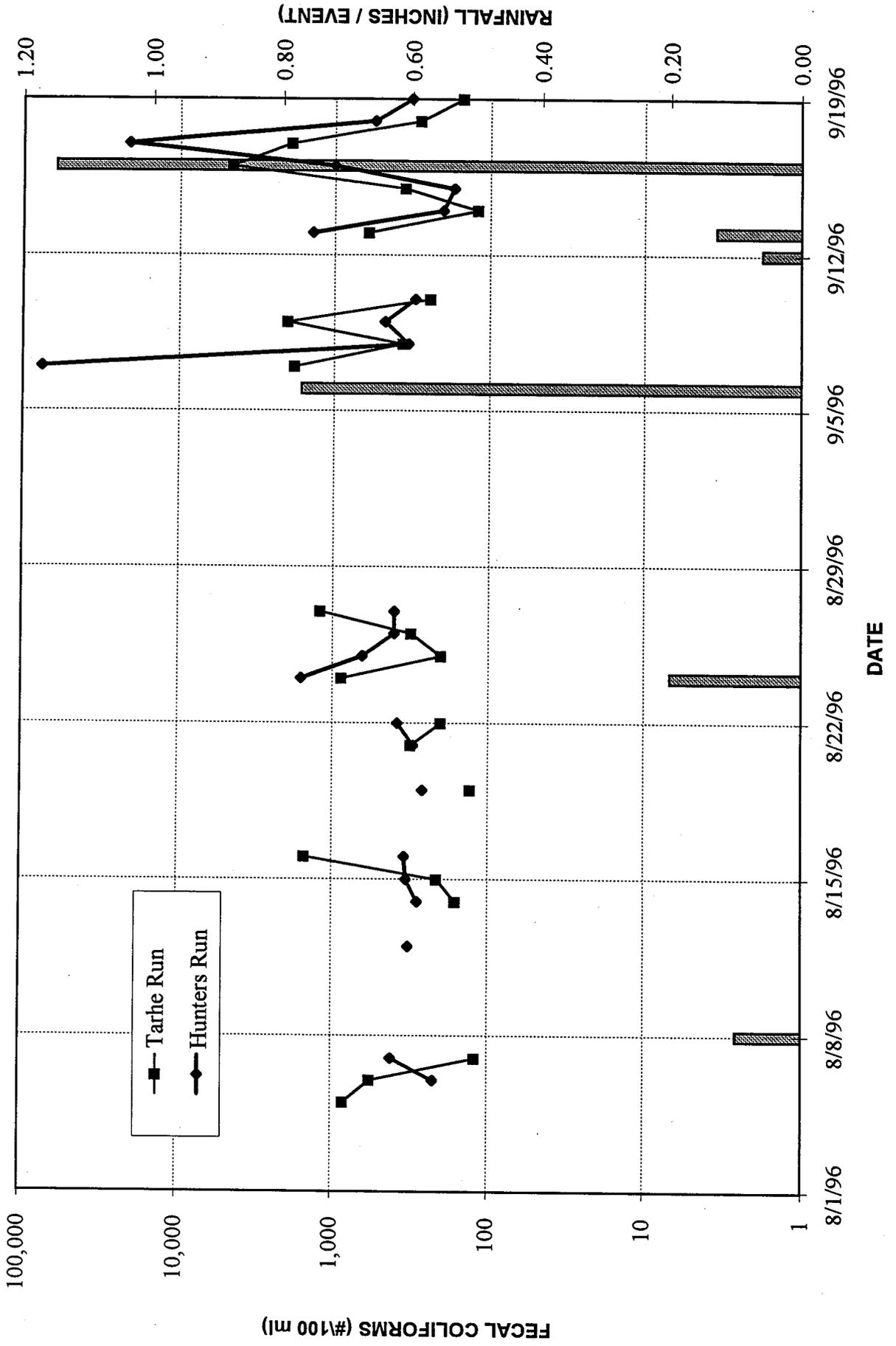
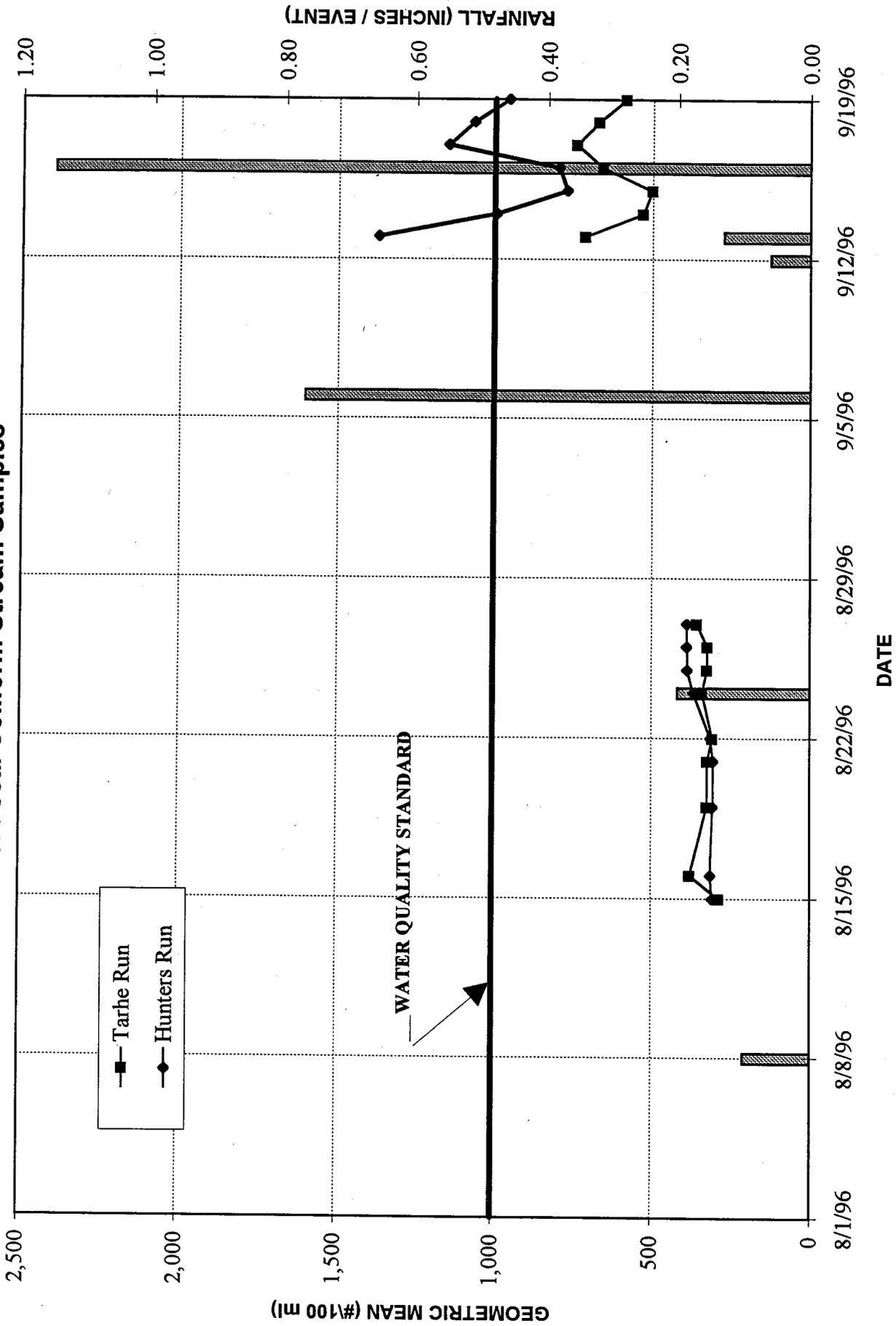


Figure 11-10
Lancaster, Ohio - Running Geometric Mean
of Fecal Coliform Stream Samples



**Figure 11-11
CSO Notification Sign Locations**

<u>CSO NO.</u>	<u>STRUCTURE LOCATION</u>	<u>HEAD WALL LOCATION</u>	<u>SIGN NO.</u>	<u>NOTES</u>
1004	West of Final Clarifier, WPCF	H.R., N. Bank, Behind Plant	#21	
1005	East of RR Bridge and H.R.	H.R., N. Bank, W. RR Bridge	#1	(5)
1006	West of RR Bridge and H.R.	H.R., S. Bank, W. RR Bridge	#2	(3)
1007	Broad & Chestnut/Walnut/ Winding/Columbus	H.R., N. Bank, E. of S. Broad at 33	None	(4)
1008	Lincoln and Hocking River	H.R., E. Bank, S. of Lincoln Bridge	#5	
1009	N. of Water Works Dr. at Rt.33	H.R., E. Bank, N. of Wheeling(24")	#6	
1010	Mulberry and Hocking	H.R., W. Bank, E. of Structure	#7	(5)
1011	Rt. 33 and Union	H.R., E. Bank, In line with Union	#8	
1012	Rt. 33 and Fifth	H.R., E. Bank, Between 5th and Union	#10	
1013	Rt. 33 and Sixth	H.R., E. Bank, S. of 6th Bridge	#11	
1014	Aldi Parking Lot	H.R., E. Bank, S. of YMCA lift station	#12	
1015	Fair Ave and Alley E of Broad	H.R., E. Bank, N. of Fair (84")	#14	
1016	Broad and Sixth	See 1015	#14	
1017	Broad and Fifth	See 1015	#14	
1018	Broad and Mulberry	See 1015	#14	
1019	Mary Burnham Park N of RR	B.R., W. Bank, N. of RR	#15	(1)
1020	Brooks and Chestnut	B.R., E. Bank, W. of Structure	#17	
1021	Garfield and Union	H.R., W. Bank, in line with Union	#9	
1022	Wilson and Columbus	See 1015	#14	
1023	High, North of Fair	See 1015	#14	
1024	Wheeling, East of Livingston	B.R., E. Bank, N. of Main	#18	
1025	Abandoned		None	
1026	Mary Burnham Park NE corner	B.R., W. Bank, At Structure	#16	
1027	Whiley and Walnut	H.R., E. Bank, End of Walnut	#4	
1028	Sixth and Pierce	See 1021	#9	
1029	Sixth W of Fetters Bridge	F.R., W. Bank, N. of 6th Bridge	#19	
1030	Maple and Walnut	H.R., N. Bank, W. of old Maple Bridge	#3	
1031	Maple and Wheeling	See 1030	#3	
1032	Maple Alley S. Wheeling	See 1030	#3	
1033	Park St	H.R., E. Bank, N. of Fair (30")	#13	
1034	Plant Front	B.R., W. Bank, S. of Lawrence	#22	
1035	E. Park and Columbus	See 1015	#14	
1036	Lincoln and Hunters Run	Hunters Run (NE Bank) at Lincoln	#20	(2)

H.R. - Hocking River

F.R. - Fetters Run

B.R.- Baldwin Run

(1) Double Sign

(2) Non-CSO; Facility/Property Protection Device

(3) CSO and Facility/Property Protection Device

(4) To be abandoned

(5) Possible abandonment

Combined Sewer System Operational Plan
CSO Discharge Notification Sign (Sample)

Figure 11-12

NOTICE-HEALTH ADVISORY

AVOID CONTACT WITH ANY WATER FLOWING FROM THIS PIPE. THIS IS THE SITE OF A
COMBINED SEWER OVERFLOW CONSISTING OF STORMWATER AND SEWAGE. WATER FROM
THIS PIPE MAY CONTAIN MATERIAL HARMFUL TO YOUR HEALTH. FOR FURTHER INFORMATION
OR TO REPORT DEBRIS AT THIS SITE, CALL THE CITY OF LANCASTER,
WATER POLLUTION CONTROL DEPARTMENT AT 687-6664
REFER TO SIGN # 1

12

Chapter 12 - Monitor CSOs to Characterize Impacts and Efficiency of Controls

12.1 Introduction

The ninth minimum control of the National CSO Policy requires simple or "low-tech" approaches to monitor CSO occurrences, CSO characteristics and receiving water impacts (if any). Although only simple methods are required for this minimum control, Lancaster has already completed a comprehensive study of its combined sewer system which included sewer and CSO flow monitoring, sophisticated modeling and CSO sampling. The Ohio EPA has performed significant stream sampling and documented a reduction in the impact of Lancaster's CSOs on the Hocking River.

12.2 Background

In anticipation of the implementation of the National CSO Policy in its upcoming permit renewal, the City of Lancaster initiated a sewer system study in 1995. Among other goals, this sewer study included combined sewer system flow monitoring, overflow sampling and sewer system modeling. The study's efforts related to CSOs are summarized below:

- A Wastewater Collection System Monitoring Plan was developed and is included in this report as Appendix H.
- Flow was monitored in the fall of 1995 and again in the spring, summer and fall of 1996.
- Flow monitoring data was used to calibrate a computer model of the Lancaster combined sewer system. This model is based on XP-Software's Stormwater Management Model (XP-SWMM). This model was calibrated using two to three storms of varying intensities.
- Samples from combined sewer overflows were taken in order to estimate the concentration of pollution in the overflows. The results of the CSO sampling is discussed below.
- The activation of all Lancaster CSOs was documented. Documentation of CSO activation for the period of March 1996 through November 1996 can be found in Appendix R and is discussed in more detail below.

12.3 Combined Sewer Overflow Characterization

12.3.1 CSO Activation

In the spring, summer and fall of 1996, CSOs were monitored to determine their frequency of activation during rain events. CSOs were monitored by observing the movement of a wooden block tied to a string and placed in the overflow line. Table 12-1 summarizes the activation of individual CSOs during the monitoring period. The complete data set of overflow activation observations and the corresponding rainfall is provided in Appendix R.

**Table 12-1
Lancaster CSO
Overflow Activation Summary**

Overflows Verified Between March through November 1996

CSO Number	CSO Location	Overflow Events
1004	West Perimeter of WWTP	13
1005	N. Bank IN & OH RR and Hocking River	17
1006	S. Bank IN & OH RR and Hocking River	10
1007	S. Broad (Chestnut thru S. Columbus-Series of Four Manholes)	23
1008	Lincoln and Hocking River	23
1009	Mulberry and Memorial	24
1010	Mulberry and Hocking	4
1011	Union and Memorial	24
1012	Fifth and Memorial	28
1013	Sixth and Memorial	27
1014	Allen and Memorial	24
1015	N. Broad and Fair	21
1016	Sixth and N. Broad	27
1017	Fifth and N. Broad	3
1018	N. Broad and Mulberry	13
1019	SE Corner Mary Burnham Park	30
1020	Chestnut and Brooks	6
1021	Union and Garfield	9
1022	Columbus and Wilson	9
1023	High N. of Fair	4
1024	Wheeling and Livingston	3
1026	NE Corner Mary Burnham Park	23
1027	Walnut and Whiley	21
1028	Sixth and Pierce	10
1029	Sixth and Boyd	27
1030	Walnut and Maple	7
1031	Wheeling and Maple	25
1032	Maple and Alley N. of Main	9
1033	Park and Memorial	27
1034	Baldwin Run and Lawrence	8
1035	E. of Park and Columbus	0
1036	Lincoln and Hunters Run (Facility/Property Protection Device)	2
1037	Wildwood and Pershing (Closed)	1

Total Rain Event Days (Rain > 0.1-inches) During Observation Period	47
Total Rain Events Days when CSO Activation Verified	33
Total Rain During Observation Period (inches)	33.3

Chapter 12 - Monitor CSOs to Characterize Impacts and Efficiency of Controls

As seen in Table 12-1, some of the overflows have a relatively high frequency of activation while others do not:

<u>Active CSOs</u>	<u>Inactive CSOs</u>
• 1012	• 1010
• 1013	• 1017
• 1016	• 1020
• 1019	• 1023
• 1029	• 1024
• 1033	• 1035

The program to collect this data required frequent inspection of CSO structures. During this inspection effort, it appeared that stormwater entered the combined sewer system from the storm system through CSOs 1010, 1022, and 1024. Additional flow monitoring will be required at these locations to determine if inflow is occurring and to what extent. This is discussed in more detail in Chapter 4 - Operation and Maintenance Program.

12.3.2 CSO Characteristics

In addition to monitoring flows in the combined sewer system, the 1995 Sewer System Evaluation project collected samples from CSOs during wet weather events to measure the concentration of pollution. CSOs were selected for sampling that were known to have a relatively high frequency of activation. Samples were collected using automatic samplers located in CSO structures or adjacent to the CSO outfalls. Samples were collected at 15 minute intervals up to a maximum of twenty-four samples, or six hours, whichever came first, for each event. Samplers were activated by a flow switch mounted in the outfall pipe. Samples from a total of twenty events were collected from ten CSO locations. Samples were taken at CSO Structures:

- | | |
|--------|------|
| • 1004 | 1026 |
| • 1012 | 1027 |
| • 1013 | 1029 |
| • 1014 | 1031 |
| • 1019 | 1033 |

Each sample was tested for the following parameters:

- CBOD₅
- Total Suspended Solids
- TKN
- Cadmium
- Lead
- Copper
- Zinc

Chapter 12 - Monitor CSOs to Characterize Impacts and Efficiency of Controls

It is interesting to compare the pollution concentration measured in the combined sewer overflows to those typically received at the plant. (The analytical data for each sample is summarized in Appendix S.) The average concentrations of CBOD, TKN and suspended solids during the first and third hour of overflow are shown in Table 12-2 along with average values for their parameters measured in the plant influent. Note that during the first hour of overflow pollutant concentrations from the CSOs were higher than during the third hour of overflow. However the first hour of overflow CBOD values were still well below the pollutant concentrations typically received at the treatment plant. Conversely, the suspended solids (SS) values were much higher in the CSO overflow than at the plant. The elevated SS values are indicative of the resuspension of solids that occurs in some sewers during the "first flush". This is discussed in more detail below. Note that by the third hour of the overflow, all pollutant concentrations had decreased significantly.

Table 12-2
CSO POLLUTANT CONCENTRATIONS

Pollutant Parameter	Average of First Hour of CSO Discharge	Average of Third Hour of CSO Discharge	Average of Plant Influent Data (Nov 89-Oct 91)
CBOD₅ (mg/l)	60.5	31.25	110
Suspend Solids (mg/l)	500	125	128
TKN (mg/l)	23	8	15.1

This same pattern of decreasing CSO pollution concentration with time is shown in Figures 12-1 and 12-2. Figures 12-1 and 12-2 plot the average concentration of each parameter by bottle number. Since each bottle was filled sequentially, this provides a plot of the variance of concentration over time.

As can be seen in Figures 12-1 and 12-2, pollutant concentrations tended to decrease during the time of overflow. The initial high concentrations can be attributed to the flushing action of the system during the initial portion of the storm. This occurrence is commonly referred to as the "first flush". Solids and other relatively heavy material may drop out if the sewer's daily flows are not fast enough to keep them in suspension. However, during the peak flows created by stormwater in combined systems, these materials are resuspended creating a concentrated pollutant load. As seen in the sample data, the pollution concentrations of the first flush can be very high initially, however, they decrease rapidly due to dilution by stormwater. The concentrations noted in Lancaster CSOs were typical for urban CSOs and, as discussed in Section 12.4, are not causing negative impacts to the receiving streams.

Another CSO sampling effort involved the sampling of CSO discharges for solids and floatables. This is discussed in detail in Chapter 9-Control of Solid and Floatable Materials.

Chapter 12 - Monitor CSOs to Characterize Impacts and Efficiency of Controls

12.4 Receiving Stream Impacts

The Ohio EPA performed water quality studies of the Hocking River in 1985, 1991 and 1995. The purpose of these studies was to determine if the Hocking River was attaining its water quality standards, identify causes for lack of attainment and make recommendations that would restore water quality. The Hocking River is designated by the Ohio EPA as a warmwater habitat. (Please note that the section of the Hocking River between Ety Road on the northwest boundary of Lancaster and the discharge of the Water Pollution Control Facility is being considered for redesignation as modified warmwater habitat. This may result in additional sections of the river meeting full attainment as opposed to partial attainment.)

The 1985 study found "gross pollution" in the segment of the Hocking River that flows through Lancaster. This study concluded these impacts were due to combined sewer overflows and the effluent from the Lancaster wastewater treatment plant.

In 1991, the Ohio EPA noted significant improvement in the Hocking River. In 1985, 77% of the Hocking River between Lancaster and Enterprise exhibited "poor to very poor" conditions. However, by 1990 almost 67% of the river was in full or partial attainment of warmwater habitat standards. The 1991 Ohio EPA study attributed much of this improvement to upgrades at the Lancaster Water Pollution Control Facility that were completed in 1989. The 1989 upgrade of the plant not only improved the plant effluent, but it also significantly reduced the volume of CSO discharges. This is discussed in more detail in Chapter 7-Maximize Flows to the Treatment Plant. The reduction in CSOs upstream of the plant has apparently been sufficient to allow the restoration of aquatic life in the Hocking River.

At the time of this writing, the Ohio EPA's 1995 study has not been released. However, preliminary conclusions from the Ohio EPA indicate continued improvement. In fact, it appears the Hocking River through Lancaster will be in either full or partial attainment for the first time since the Ohio EPA began assessing this data in 1982.

Figure 12-3 demonstrates the improvements in the fish population in the river by plotting the Index of Biotic Integrity (IBI) scores for the past three studies. The IBI scores represent twelve criteria used to measure the "integrity" or health of the river's fish population as a whole. The IBI scores consider the number of species present, the type of species present, the mix of species and the apparent health of individual fish samples. As can be seen from Figure 12-3, the fish populations have shown dramatic improvement since 1982.

Although the Hocking River through Lancaster has improved greatly, it is still not in "Full Attainment" of water quality standards. This can be seen in part by the IBI scores in Figure 12-3. However, the Ohio EPA does not associate this lack of full attainment with Lancaster's CSOs. In the 1995 sampling, the Ohio EPA found excellent ICI (Invertebrate Community Index) scores upstream of the wastewater plant where CSOs discharge. The ICI scores are similar to the IBI scores but the ICI scores reflect the health of the insect population in the river. A healthy insect population combined with a lagging fish population often points to problems in the habitat itself. One possibility is that the extensive channelization of the Hocking River through Lancaster for flood control and development has reduced the capability of the river to support a wide variety and abundance of fish species. As noted above, the Ohio EPA is presently considering changing

Chapter 12 - Monitor CSOs to Characterize Impacts and Efficiency of Controls

the habitat designation of the Hocking River through Lancaster from "warmwater habitat" to "modified warmwater" habitat to reflect the modified structure of the river.

One tributary to the Hocking River may be impacted by CSOs. In the 1995 study, the Ohio EPA noted apparent CSO impacts in the lower portion of the Baldwin Run, near the Lawrence Street bridge. Though the data is not final at this time, it is likely these impacts were observed downstream of CSOs 1019 and 1026 which are known to activate frequently. The Baldwin Run was classified as only being in "partial" attainment in this section, however this is an improvement from the results of previous surveys in 1982 and 1990 which found this section to be in "non" attainment.

In their 1995 study, the Ohio EPA also noted other CSO impacts not associated with aquatic life. High fecal coliform levels above water quality standards were measured during rain events. This is discussed in more depth in Chapter 11 - Public Notification which summarizes Lancaster's own fecal coliform sampling program. The Ohio EPA also observed floatable debris associated with sanitary sewage. In 1996, the City of Lancaster sampled the solid and floatable debris discharged from its storm and combined sewer systems. The results of this study are summarized in Chapter 9 - Control of Solid and Floatable Material.

In conclusion, improvements by the City of Lancaster over the past eight years have eliminated the impact of the Lancaster combined sewer system on the aquatic life in the Hocking River and reduced the impact on the Baldwin Run, although floatable debris and high fecal coliforms occur during wet weather. Due to the improvements in water quality, no significant CSO projects are planned by the City of Lancaster other than those described in this plan.

+ + END OF CHAPTER 12 + +

+ + FIGURES FOLLOW + +

Figure 12-1
Lancaster CSO Pollutant Concentrations
Average of CSO Samples Collected April 1996 - October 1996

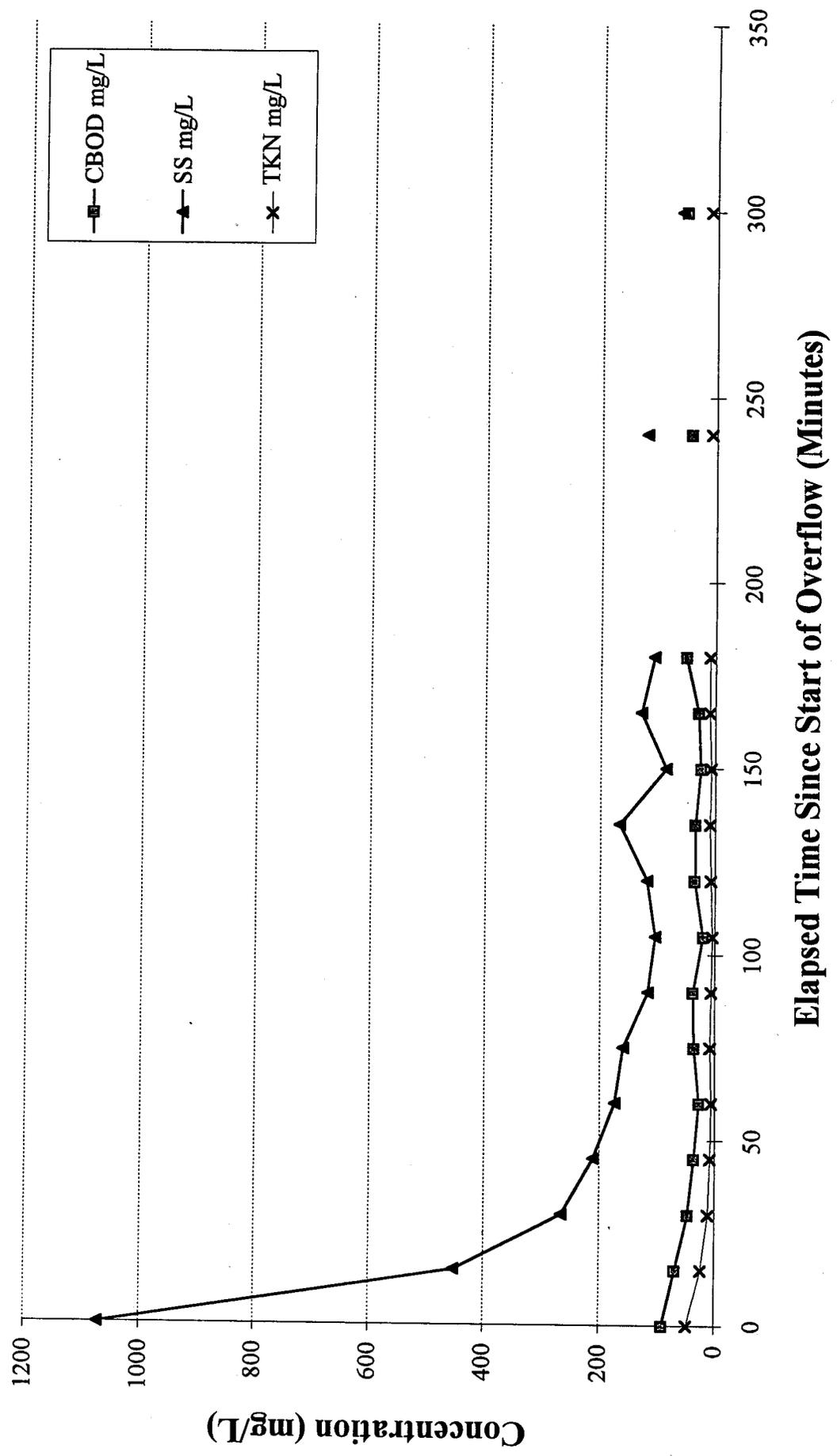
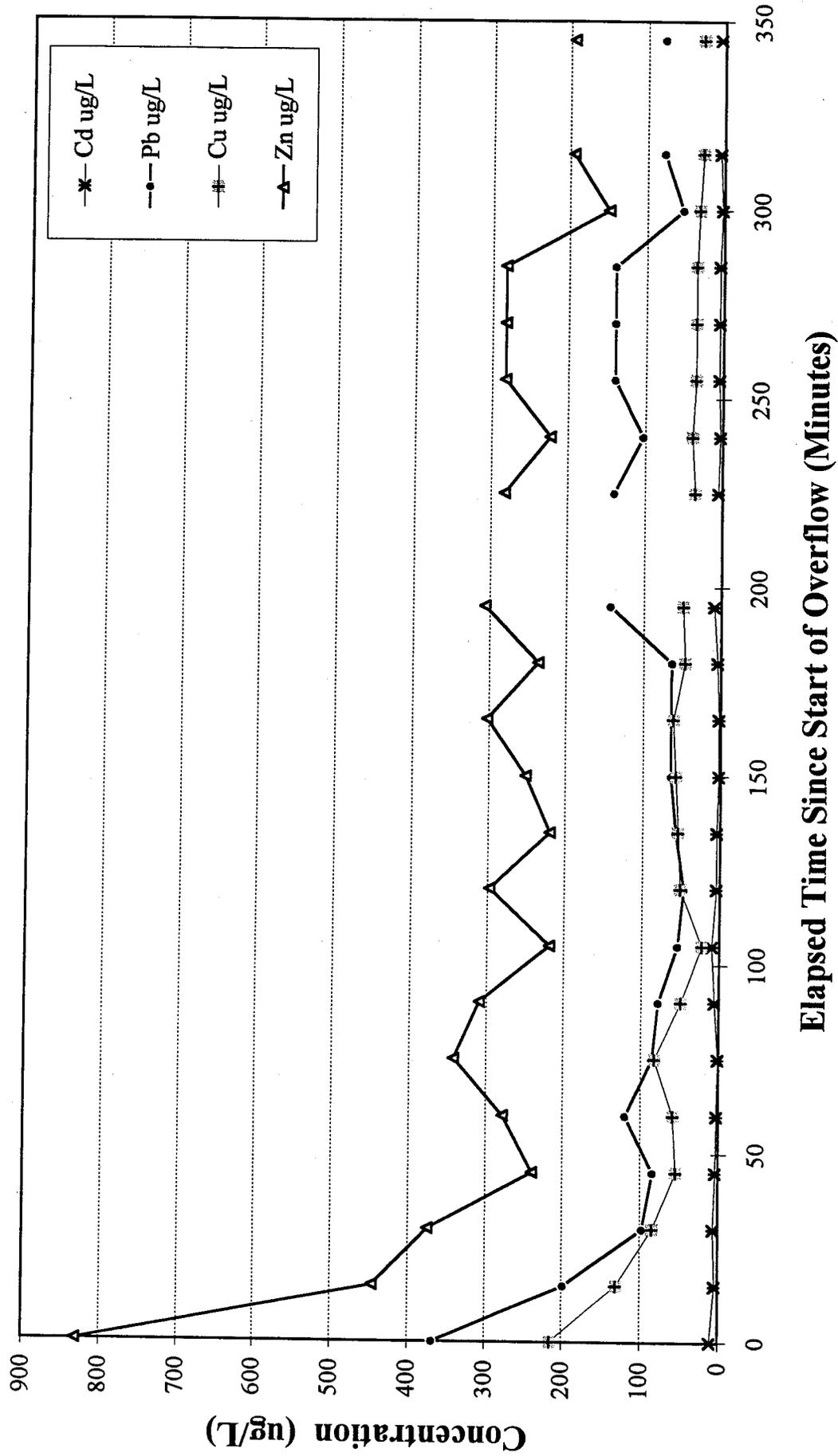


Figure 12-2
Lancaster CSO - Pollutant Concentrations
Average of CSO Samples Collected April 1996 - October 1996



**Figure 12-3
Lancaster, OH
Combined Sewer System Operational Plan**

Hocking River IBI Scores

