Appendix C
Combined Sewer Characterization Report - Executive Summary

CITY OF
LANCASTER, OHIO

WATER POLLUTION CONTROL DEPARTMENT

COMBINED SEWER SYSTEM CHARACTERIZATION REPORT

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1.0 EXECUTIVE SUMMARY

1.1 PURPOSE

As part of the Schedule of Compliance in the City of Lancaster's 1997 National Pollution Discharge Elimination System (NPDES) permit, a *Combined Sewer System Characterization Report* must be completed and submitted to the Ohio EPA by December 1, 1999. This report will characterize the Lancaster wastewater collection system and the combined sewer overflows (CSOs) to the Hocking River and its tributaries. A copy of the City's NPDES permit is included in Appendix I for reference.

1.2 SCOPE

The scope of this report is to characterize the City of Lancaster's wastewater collection system and combined sewer overflows. System characterization is required by the NPDES Permit Schedule of Compliance for the Lancaster Water Pollution Control Facility (WPCF). The objectives of the characterization report are as follows:

- Develop an understanding of the collection system and how it responds to a variety of rain events.
- Identify separate sewered areas tributary to combined sewer overflows and determine their impacts on CSOs.
- Identify sources of toxic and hazardous pollutants within the combined sewer system and estimate loads entering the system.
- Quantify and characterize the combined sewer overflow (CSO) discharged to the Hocking River and its tributaries during rain events.
- Support development of the Long Term Control Plan.

This process is based on the Ohio EPA's March 1995 Combined Sewer Overflow Strategy.

1.3 DATA COLLECTION

In order to characterize and understand the wastewater collection system and the combined sewer overflows (CSOs), various data collection activities were completed. Data was collected from multiple sources that are summarized below. A complete discussion of these activities is provided in Chapter 3.

1.3.1 Sewer Map and Atlas

An electronic version of the City Sewer Map and Atlas was developed. This provided a current, updatable, and readily available map for City personnel to use for operation and maintenance of the entire collection system. To develop the Sewer Map and Atlas, sewer system information such as sewer diameters, slopes, elevations, and collection areas were researched from drawings in the City Engineer's office. Locations of sewers, connections and questionable or incomplete records were field verified where possible.

A copy of the City Sewer Map, Figure 1-1, is provided at the end of the report for reference. Figure 1-1 shows collection system drainage areas, interceptor sewers, sanitary sewers, storm sewers, combined sewers, siphons, pump stations, combined sewer overflow structures and the Hocking River and its tributaries.

1.3.2 Monitoring Plan

A requirement of Lancaster's NPDES permit, which has previously been fulfilled, is the development of a monitoring plan. The purpose of the monitoring plan is to provide sufficient data to support the various CSO activities required by the NPDES permit Schedule of Compliance, including this characterization report. The *Wastewater Collection System Monitoring Plan* was prepared and submitted to the Ohio EPA as part of the *Combined Sewer System Operational Plan* dated March 1998. A copy of the monitoring plan is included in Appendix B for reference.

The monitoring plan outlined the following data collection activities:

- Measurement of baseline flow, wet weather flow, and combined sewer overflows.
- Collection and analysis of samples from selected CSO locations.
- Measurement of rainfall in the study area.

A schematic of the collection system showing CSO monitoring points is shown on Figure 3-3.

1.3.3 CSO Activation

All CSOs within the City were monitored to determine the frequency of activation. To measure CSO activity, a wooden block was strategically located in each CSO structure, tethered with a string for retrieval. After rain events, each CSO was monitored by observing and recording the position of the wooden block. If the block moved, the CSO had activated. This data documented the size and type of rain event that causes overflows and in general how the combined sewer system responds to rainfall. This data is summarized in Chapter 3.

1.3.4 Basement Flooding Questionnaire

A questionnaire was distributed to City residents to identify areas where basement flooding occurs, how often basement flooding occurs, and probable causes of the basement flooding. The surveys were distributed to residents with their monthly utility bill. The responses from the surveys that were returned were compiled in a database for evaluation. This data is summarized in Chapter 3.

1.3.5 Floatable Materials Survey

A survey of floatable materials discharged from the combined sewer system to receiving streams during wet weather was performed. The survey evaluated and characterized material discharged from both CSOs and storm sewers. Conclusions from the survey are discussed in Chapter 3.

1.3.6 Collection System Model

To better understand the existing operation of the combined sewer system and the impacts of future projects, the City of Lancaster developed a computer model of their wastewater collection system. Sewer information collected to develop the sewer map and atlas was also used to develop the sewer network in the model. The sewer flow data and rainfall information were collected in accordance with the monitoring plan and were used to develop and calibrate the model. The model is discussed in more detail in Chapter 4.

1.4 CONCLUSIONS

Data collection, field sampling and computer modeling were used to characterize flow in the Lancaster combined sewer wastewater collection system and combined sewer overflows to the Hocking River and its tributaries. The conclusions from the characterization effort are summarized below according to the four criteria included in the Ohio EPA's Combined Sewer Overflow Strategy:

Collection System Understanding

- From field investigations, it was found that a rainfall of 0.10-inches will typically activate at least one CSO in the system. CSO 1019 is the most active while CSO 1035 appears inactive.

- The most active CSOs in the Lancaster system (as determined by frequency of activation predicted by the Lancaster collection system model) are:

Stream	CSO
• Baldwin Run	1019
• Fetters Run	1029
• Hocking River	1005, 1011, 1013, 1016, 1027, 1031 and 1033

Note: CSO 1005 has recently been permanently closed.

- Deposition occurs in several areas in the combined sewer system. The most significant location is a 1,400-foot length of a 27-inch interceptor. This section has been cleaned recently.

- Flow metering and computer model development defined complex hydraulic conditions which occur within the collection system, such as surcharging and backwater.

- Through flow metering and computer model development, it was found that the response of the collection system to rainfall, including frequency of activation and volume of overflow, is dependent on the precipitation volume, the rainfall duration, and pre-existing conditions. These conditions were successfully included in the Lancaster collection system model.

- CSOs 1010, 1022 and 1024 are prone to inflow from either the receiving stream or the receiving storm sewer. Inflow was identified at an abandoned siphon near Locust Street and the Baldwin Run and from a leaking bulkhead in a manhole near S.R. 793 and Tarhe Run. CSO 1010 has subsequently been permanently closed and the abandoned siphon and leaking bulkhead have been repaired.

- Areas of flooded basements exist. These are summarized in Section 3.5. Residents report that flooded basements occur for a variety of reasons including clean water (storm water) sources and sanitary/combined sewage sources.

Impact of Separate Sewered Areas

- Separate Sewers have minimal impact on CSO discharge as evidenced by the following:
    - Sanitary sewer service areas discharge to the Lancaster interceptor sewers and do not discharge into other combined service areas.
    - Many sanitary service areas discharge to pump stations which regulate flow to the interceptors. This causes storage in the sanitary areas and minimizes the impact on CSOs.
    - Computer modeling demonstrates that an increase in sanitary sewer flow causes a disproportionately small increase in CSO volume.
    - CSOs that could be impacted by separate sewer flows (CSOs 1004, 1006 and 1034) do not overflow for 90% of storms during a typical year. Thus, sanitary sewers have no impact on CSO volumes for 90% of annual storm events.

Toxic and Hazardous Material Sources and Loads

- Lancaster combined sewer overflows are not toxic and hazardous based on the results of annual Priority Pollutant scans of Lancaster wastewater and sampling of aquatic life in Lancaster receiving streams.

- Lancaster combined sewer overflows contain low concentrations of heavy metals. The amount of heavy metals in the combined sewer system has been decreasing over the past fifteen years. This is due primarily to the successful Lancaster Industrial Pretreatment Program. Evidence to support this conclusion includes:

  - Industrial discharge flows to the collection system have decreased approximately 43% since 1977.

  - There are only four industries directly upstream of combined sewer overflow structures which are capable of discharging industrial pollutants. Those industries are listed in Figure 5-9.

  - The sludge produced by the WPCF contains low enough concentrations of heavy metals that it could qualify as a Class A high quality sludge.

Quantity and Characteristics of Combined Sewer Overflows

- Field sampling showed that the floatable material discharged from the CSOs is similar to the material discharged from storm sewers.

- Lancaster CSOs exhibit a typical "first flush" pollutant concentration pattern. The concentrations of pollutants at the beginning of the overflow event are generally higher than the concentrations of pollutants near the end of the overflow event. Pollutant concentrations decrease significantly after the first 30 minutes of overflow and are not significant enough to cause water quality violations in the receiving stream during wet weather conditions.

- The Lancaster CSO system discharges approximately 111 million gallons of combined sewage during wet weather in a typical year and conveys for treatment approximately 588 million gallons of combined sewage during wet weather. Thus, the Lancaster wastewater system treats more than 80% of the combined sewage collected during wet weather.

- Approximately 45% of the total annual CSO volume is discharged from CSO 1019.

++ END OF EXECUTIVE SUMMARY ++