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**STREAM REACH CHARACTERIZATION
AND EVALUATION REPORT**

**Wabash River
West Lafayette, Indiana**

**Submitted as Required by
NPDES Permit Number IN0024821**

May 2000

Stream Reach Characterization and Evaluation Report West Lafayette, Indiana

INTRODUCTION

The City of West Lafayette has an NPDES permit (IN0024821) which specifies conditions under which the city may discharge wastewater to the Wabash River in Tippecanoe County, Indiana. One of the requirements of the permit is to submit a Stream Reach Characterization and Evaluation Report (SRCER). This report is an evaluation of how the city's combined sewer overflows (CSOs) may affect water quality of the river. A copy of the SRCER requirement is attached in Appendix A.

In fulfillment of the SRCER requirement of the city's NPDES permit, this report contains information on how the three CSO overflow points in the City of West Lafayette may affect water quality of the Wabash River. The report also contains a summary of how the CSOs are monitored and recommendations for further work to minimize their effects on water quality.

LOCAL BACKGROUND

The Wabash River near West Lafayette is a large "sixth order" river draining much of Indiana (Fig. 1). It's watershed area is approximately 7,300 square miles and its Q7,10 is about 580 cfs [1]. The City of West Lafayette (population 23,000) has a wastewater treatment plant (WWTP) designed to treat 7.8 million gallons per day, but this capacity is exceeded during heavy rainfall, causing one or more CSOs to overflow. The City of Lafayette, on the opposite bank, has 16 additional CSO discharges to the Wabash River.

There is very little industrial wastewater contribution to the WWTP influent. However, Purdue University is a major contributor of wastewater to the WWTP. The university's wastewater includes both sanitary and laboratory wastes.

Figure 1
The Wabash River in the West Lafayette Area

WABASH RIVER WATER QUALITY INFORMATION

A. Fish Consumption Advisories

Consumption advisories based on chemical contamination of fish are issued jointly by the Indiana Departments of Health, Environmental Management, and Natural Resources. They are updated annually and include five risk groups. The most serious risk group (Group 5) advises against fish being consumed by anyone. The most recent advisory was issued in 1998 [2].

There are four Group 5 fish advisories for the Wabash River in Tippecanoe County. The first, which also pertains to all other Indiana waterbodies, recommends that carp longer than 25 inches not be eaten by anyone due to relatively high PCB and mercury levels. The other two Group 5 advisories are specific to Tippecanoe County: quillback carpsuckers and river redhorse larger than 19 inches and smallmouth buffalo larger than 25 inches should not be eaten by anyone due to high PCB levels.

Lower level advisories (Groups 2,3, and 4) also exist for eleven other fish species from the Wabash River in Tippecanoe County. Again, PCBs and mercury are the contaminants of major concern.

There is little possibility that significant PCB or mercury contamination could originate from West Lafayette CSO discharges. Both contaminants are monitored regularly in WWTP biosolids samples, where pollutants often accumulate in measurable quantities. PCBs are always undetected in biosolids, while mercury concentrations never exceed 2 mg/kg. The U.S. EPA does not regulate mercury in biosolids for risk assessment purposes unless concentrations exceed 17 mg/kg [3].

B. Bacterial Contamination

IDEM monitors Wabash River water quality at sites upstream (WB-316) and downstream (WB-303) from West Lafayette on a monthly schedule. E.coli bacteria, an indicator of potential sewage pollution, are among the parameters analyzed in these samples. Based on recent analyses of the sampling data, IDEM has determined that this segment of the Wabash River does not support its recreational use due to potential adverse health effects from bacteria [4].

The West Lafayette segment is not unusual in the degree of E.coli contamination observed. None of the Wabash River, from its headwaters in Adams County to its confluence with the Ohio River, supports recreational use due to E.coli. Bacterial contamination in the river is widespread.

IDEM recently made an analysis of their water quality data collected from 1991 through 1997 [5]. A summary of the E.coli information (in colony forming units per 100 ml) for the West Lafayette area is shown below:

	Mean	Median	Maximum	Samples
Upstream (WB-316)	1148	170	23,000	76
Downstream (WB-303)	990	200	26,000	75

IDEM's data indicate that West Lafayette CSOs do not add significantly to the river's E.coli concentrations. These data confirm sampling done by the City of West Lafayette in 1992 and 1999, as shown below:

	1992 Median cfu/100 ml	1999 Median cfu/100 ml
Upstream from West Lafayette	190	30
In West Lafayette		40
Downstream from West Lafayette	200	31

C. Fish Community and Fish kills

The fish community of the Wabash River in Tippecanoe County has been studied extensively. IDEM considers the segment to be fully supporting its aquatic life use designation [4].

Dr. James Gammon of DePauw University has been studying the fish communities of the middle Wabash River for 25 years. His most recent report [6] shows that the fish community of the Wabash River has become increasingly healthy in most areas. Reach 2 of his study, which includes the West Lafayette area, has demonstrated considerable variability in its biological health (see graph below). The biotic index values for the West Lafayette reach have ranged from the “good” to “poor” categories but over time have not been much different than in Reach 1, immediately upstream.

1973 **1996**
Regression of the Biotic Index of Reach 2 divided by the Biotic Index of Reach 1

There is no indication from these results that West Lafayette CSOs are degrading aquatic life communities in the river. Because of the low volume of flow compared to the receiving stream, combined sewer overflows in West Lafayette have little potential to adversely affect the fish community of the Wabash River.

No fish kills have been reported in the Clinton segment of the Wabash River in recent years (IDEM Office of Environmental Response).

Because they are less mobile and respond more rapidly to change than fish, macroinvertebrates are often better indicators of biological health in the immediate area of CSOs. West Lafayette commissioned studies of the macroinvertebrate community upstream and downstream from CSOs in 1992, 1997, and 1999 [7]. Copies of the studies are attached in the appendix.

Several areas of impact were observed in these benthic studies. In October 1992, three sites downstream from the West Lafayette CSO's were "slightly impacted" as compared to an upstream site. During the preceding three months there had been significant discharges (10-28 million gallons) from all three CSOs at a time in which river flows were lower than average. In 1997, a zone of impact was observed in the lower reaches of the study area. WWTP bypasses from both West Lafayette and Lafayette (188 million gallons during eleven preceding months) probably contributed to this effect. In the dry year of 1999, no CSO-related impacts were observed (very few CSO events occurred during this monitoring period), but the Wabash River had much lower biotic index values than normal, both upstream and downstream from West Lafayette.

D. Spills of Hazardous Substances

If spilled and not recovered, hazardous substances may enter a city sewer system and be discharged to a local waterbody through a combined sewer overflow. Petroleum spills are by far the most common in Indiana. the potential for spills affecting West Lafayette CSOs is low. Local spills from commercial sites such as gas stations is possible, but the potential to harm the aquatic environment of the Wabash River is low. Sites in West Lafayette with U.S.EPA environmental permits were obtained from the EPA Envirofacts database [8]. They are listed individually in the Appendix.

**CITY OF WEST LAFAYETTE
COMBINED SEWER OVERFLOW INFORMATION**

Outfall	Location	Latitude	Longitude	Receiving Water
003	Dehart Street	40.25.53.1	86.53.48.3	Wabash River
004	Quincy Street	40.25.38.5	86.53.49.7	Wabash River
005	Wood Street	40.25.06.6	86.53.55.9	Wabash River

According to West Lafayette WWTP personnel, outfall 005 was eliminated as a CSO discharge point in May 1999.



**CITY OF WEST LAFAYETTE
COMBINED SEWER OVERFLOW INFORMATION**

A. Local Precipitation Data

Rainfall information is recorded daily at the WWTP, as well as at nearby Lafayette and at two sites on the Purdue campus. Rainfall data for the period 1995 through 1999 are attached in the appendix.

B. CSO Overflow Data

CSOs are monitored by flow meters and data loggers maintained by WWTP staff at each CSO point. A copy of the CSO overflow data are attached in the appendix.

C. CSO Control Strategy Effectiveness

CSO events are always associated with wet weather. The data for 1999 showed that a 24-hr rainfall total of at least 0.8 inches was required to make the West Lafayette wastewater collection system overflow.

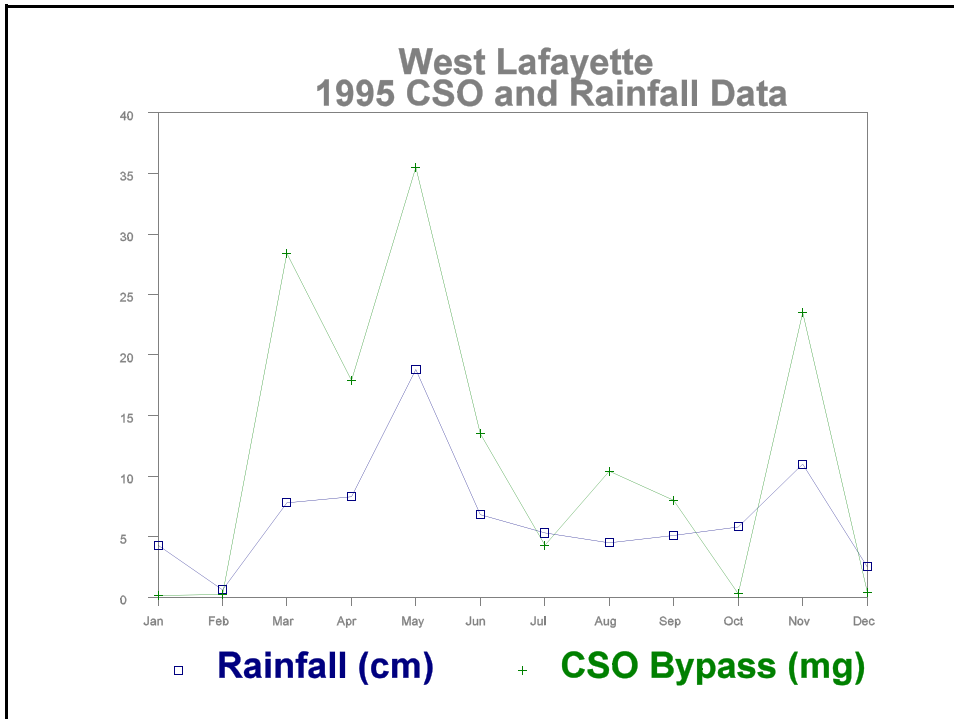
The CSO control strategy has been very effective in reducing the frequency of discharges. In 1995, the City bypassed 142 million gallons of untreated sewage through its CSOs. By 1999, this figure had been reduced to 22 million gallons, even though annual rainfall was almost identical both years. This represents a pollution reduction of 85%. In addition, one CSO overflow point (outfall 005) has been entirely eliminated. Graphs representing rainfall and CSO overflow data for these two years are shown below for comparison.

D. Implementation of Best Operation and Management Practices

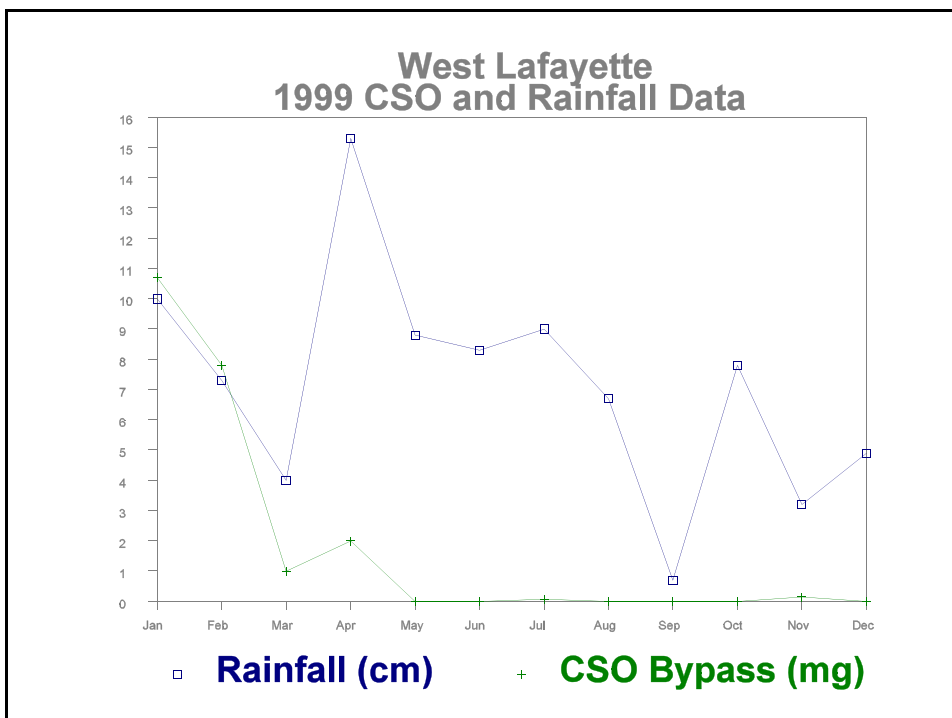
Best Operation and Management Practices have been implemented since the CSO Operations Plan was completed:

- C Procedures to reduce clear water loading have been implemented.
- C Procedures to maximize wet weather flow at the WWTP have been implemented.
- C Administrative controls have been implemented by updating and enforcing the Sewer Use Ordinance.
- C Sewer system maintenance procedures have been implemented.
- C Signs have been placed at all outfall structures
- C Each CSO is monitored constantly by datalogger

1995



1999



RECOMMENDATIONS FOR FURTHER ACTION

1. Continue monitoring bacteria and aquatic life in the Wabash River to document the ongoing improvements in water quality.

2. The Indiana CSO control strategy recommends that public participation be included in the CSO decision-making process. Find ways to advertise the program and its successes. Get public input about how the community wants to proceed with water quality issues related to CSOs.

REFERENCES

1. Stewart, J.A. 1983. Low-flow characteristics of Indiana streams. USGS Open file report 82-1007. Indianapolis, IN.
2. Indiana State Department of Health, 1998. Fish consumption advisory. Indianapolis, IN
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5. Indiana Department of Environmental Management, 1998. Indiana Fixed Station Statistical Analysis. Office of Water Management Assessment Branch. IDEM 32/02/005/1998. Indianapolis IN.
6. Gammon, J.R., 1998. The Wabash River Ecosystem. Indiana University Press, Bloomington, IN
7. Bright, G.R., 1992-1999. Bioassessments of the Wabash River using benthic macroinvertebrates. Manuscripts submitted to the City of West Lafayette.
8. U.S.EPA, 2000. Envirofacts website. www.epa.gov/enviro.