



# Combined Sewer Overflow Long Term Control Plan

**City of Lafayette, Indiana  
Water Pollution Control Department**

September 2009



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CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

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May 2005

*Updated September 2009*

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CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Chapter 1**  
**Characterization of Combined Sewer System**

Greeley and Hansen

**1.1 Introduction**

This chapter characterizes the Lafayette combined sewer system, including the lift stations, and the wastewater treatment plant (WWTP). This chapter also describes current collection system improvements that have been implemented or are being implemented to reduce combined sewer overflow (CSO) discharges.

**1.2 Description of Collection System and Wastewater Treatment Plant**

The City of Lafayette is the eleventh largest city in Indiana with a population of 56,397 (2000 Census). The total sewered area for the City consists of approximately 18,000 acres and 410 miles of sewers. The older portions of Lafayette (including the downtown area) are primarily served by combined sewers. The total combined sewer area is approximately 3,800 acres. The newer portions of the City are served by separate sanitary and storm sewers. Figure 1.2-1 shows the overall study area boundary and the individual CSO service area boundaries.

Each combined sewer area drains to one CSO diversion structure. The City's interceptor system collects and conveys flows from the CSO diversion structures to the WWTP for treatment. During dry weather all flow goes to the WWTP for treatment. During some wet weather events, the capacity of the collection system is exceeded and excess flows are discharged from the diversion structures to the river. Details of Lafayette's collection system and WWTP are included in the following sections.

### 1.2.1 Combined Sewer System

The 3,800 acres in the City that are serviced by combined sewers are divided into 12 CSO service areas, as shown on Figure 1.2-1. Details of each CSO service area, including acreage served by each area and land use, are included in Chapter 1 of the 2004 *Stream Reach Characterization and Evaluation Report (SRCER)*. The combined and separated acreage for each CSO service area is included in Table 1.2-0.

Each CSO service area has a trunk sewer that connects to interceptor lines through a CSO diversion structure. During dry weather flow in the trunk sewers is conveyed to the interceptor through throttle pipes leading to the interceptor. During wet weather flows can exceed the capacities of the throttle pipes. When this occurs the excess flows are discharged over weirs located in each CSO diversion structure to the Wabash River. A list of each permitted CSO and its location, including latitude and longitude, is included in Table 1.2-1.

Each CSO service area in Lafayette has a CSO diversion structure. Typically, dry weather flow enters the diversion structure from the trunk sewer and is conveyed to the interceptor through the throttle pipe. During wet weather events combined sewer flow enters the diversion structure from the trunk sewer. As the flow increases through the throttle pipe the water level in the diversion structure rises. When the water level exceeds the elevation of the weir, the combined sewer flow discharges over the weir to the Wabash River.

A typical CSO diversion structure, common to most of the CSO diversion structures in Lafayette, is shown on Figure 1.2-2. Information for each CSO diversion structure, including inflow, outflow, and throttle pipe diameters and invert elevations, and weir elevations, is shown in Table 1.2-2. All of the CSO diversion structures are constructed as shown on Figure 1.2-2 except for CSOs 009 and 015.

These two CSO diversion structures have atypical features. CSO 009 does not have a throttle pipe and CSO 015 does not have a weir. These structures are described as follows:

- Instead of a throttle pipe the CSO 009 diversion structure, located on the interceptor, has a 3-foot by 3-foot opening that connects to an outfall to the Wabash River through which overflows discharge into the Wabash River when the WWTP capacity is exceeded.
- In lieu of a weir the CSO 015 diversion structure relies on the outflow pipe's invert elevation being approximately a foot higher than the throttle pipe invert elevation. This height differential, therefore, acts similarly to a weir.

There are several interceptors that convey flow throughout the collection system.

- The West Interceptor begins as a 36-inch sewer at the Pearl River Lift Station and continues southwest along the Wabash River increasing to a 48-inch sewer before it enters the Headworks of the Lafayette WWTP.
- The Romney Road Interceptor begins as a 24-inch force main at the Romney Road Lift Station and then turns into a 48-inch sewer before it enters the Headworks of the WWTP.
- The Williams Street Interceptor starts as a 24-inch sewer in Highland Park, continues west along Ravine Street and Williams Street increasing in size to a 72-inch sewer, then enters the West Interceptor southwest of Smith Street and Sycamore Street.
- The Durkee's Run Interceptor begins as an 18-inch sewer near Beck Lane and Summerfield Drive. The line continues along Summerfield Drive and turns west at Teal Road and increases to a 48-inch sewer. The line then turns northwest to the Fairgrounds CSO and continues west towards the WWTP until entering the West Interceptor near Durkee's Run.
- The Ferry Street Interceptor begins as a 24-inch sewer at Ferry Street and 26<sup>th</sup> Street. The line continues along Ferry Street and increases into a 72-inch sewer before entering the Parking Lot Lift Station.

- The Cincinnati Street Interceptor begins as a 42-inch sewer south of St. Elizabeth Hospital. The line continues along south on Cincinnati Street and increases to a 72-inch sewer. The line then turns west on 3<sup>rd</sup> Street and enters the Parking Lot Lift Station.
- The Greenbush Street Interceptor begins as a 72-inch sewer near Greenbush Street and 20<sup>th</sup> Street and continues west along Greenbush until it reaches 9<sup>th</sup> Street and then turns south until it enters the Parking Lot Lift Station.

### **1.2.2 Lift Stations**

The City of Lafayette's collection system has 27 lift stations that convey wastewater to the WWTP. All lift stations have alarms for power outages and high wet well levels. Currently all lift stations are physically checked on a weekly basis to verify proper operation. Ten of the 27 lift stations are equipped with backup generators. In case of prolonged power outages the remaining lift stations are either wired for a portable generator or have pump-around capabilities consisting of permanent setups for temporary, portable pumps.

Most of the lift stations are located in the separated sewer areas of the City and do not affect any CSOs as the lift stations convey sanitary flows directly to the WWTP. Two lift stations – the Parking Lot and Pearl River Lift Stations – are located in the combined sewer areas of the City and directly affect CSOs.

As described in Section 1.2.1 of this report, three of the seven interceptors enter the Parking Lot Lift Station located in a parking lot in downtown Lafayette. The Parking Lot Lift Station has four pumps and a peak wet weather flow rate of 12 cfs. Consequently, this lift station limits the ability to deliver flow to the WWTP in wet weather. When the capacity of the lift station is reached, several CSOs upstream of the lift station overflow. To utilize the peak hydraulic capacity of the WWTP, discussed in Section 1.2.3, and to help minimize the impacts from CSOs, the Parking Lot Lift Station capacity will need to be expanded or the lift station will need to be eliminated.

The Pearl River Lift Station is located downstream of the Parking Lot Lift Station on the throttle pipe of CSO 006. Prior to 2008 this lift station had three pumps with a peak wet weather flow rate of only 3.81 cfs. When the lift station reached capacity, CSO 006 overflowed. To help minimize the impacts on the Wabash River from CSO 006, the Pearl River Lift Station capacity was expanded in 2008 and is discussed in more detail in Section 1.2.4.

The Romney Road Lift Station is located downstream of the closed CSO 017 on the main trunk sewer on the south side of the City. The Romney Road Lift Station serves a rapidly expanding area of the city. The lift station had three pumps with a peak wet weather flow rate of approximately 16.5 cfs. When the Romney Road Lift Station's capacity was reached, flow backed up into the trunk sewer and caused CSO 017 to overflow. As discussed in Section 1.2.4, the City made improvements to several sections of the collection system. Five existing lift stations were eliminated with the addition of an interceptor and larger lift station, and Romney Road Lift Station was one of the lift stations eliminated. The other four lift stations that were eliminated include:

- 43 South,
- Rolling Hills,
- Buckingham, and
- Stratford.

Pump information, average dry weather and peak wet weather flow rates, and the locations of each lift station are included in Table 1.2-3.

### **1.2.3 Wastewater Treatment Plant**

The City's WWTP has been upgraded and expanded. The plant improvements, completed in the summer of 2004, increased the plant design average annual capacity from 16 mgd to 26 mgd. The improvements increased the plant's peak capacity from 22 mgd to 52 mgd to

enable the plant to treat greater flow during wet weather events, thereby reducing the magnitude and frequency of CSO events.

The improvements to the WWTP include the following elements:

- New influent pump station
- New fine screening, grit removal, and scum concentration facilities
- Five new primary clarifiers
- Addition of two new aeration tanks
- New process air blowers
- Four new final clarifiers and rehabilitation of the six existing clarifiers
- New effluent pump station
- New disinfection facilities and modified chlorine contact tank
- Addition of waste activated sludge thickening equipment
- Two new anaerobic sludge digester tanks and rehabilitation of the two existing sludge digester tanks
- New sludge storage and dewatering facilities
- Standby power
- Expanded and upgraded office, laboratory, and personnel facilities
- New maintenance facility

A schematic showing the upgraded and expanded WWTP is shown on Figure 1.2-3.

#### **1.2.4 Description of Collection System Improvements**

The 2001 *Lafayette Wastewater Collection System Projects Preliminary Engineering Report* was prepared to help in the evaluation, scheduling, and coordination of the various collection system improvements that are needed to address a variety of deficiencies. The study included a 20-year planning period and also addressed existing problems in the collection system.

The Elliot Ditch Interceptor and the Romney Road Lift Station had reached full capacity due to growth of the south side of the City. To facilitate additional growth and larger industrial flows in the area, a new interceptor (Prairie Oaks), and new lift stations and force mains (Prairie Oaks, Ross Road, and McCarty Lane) were determined to be required. The Prairie Oaks Interceptor, Lift Station, and Force Main and the McCarty Lane Lift Station and Force Main were completed in Summer 2004, and the Ross Road Lift Station and Force Main were completed in 2008. The Prairie Oaks Lift Station has eliminated five existing lift stations, including Romney Road, 43 South, Rolling Hills, Buckingham, and Stratford. In addition to addressing the growth of the south side of the City, the ultimate benefit of all these projects is the elimination of CSO 017, which occurred in 2004.

As discussed in Section 1.2.2, the Parking Lot Lift Station and Pearl River Lift Station limit the ability to deliver flow to the WWTP. In addition to causing the existing bottleneck in the collection system, starting in 2006 the Parking Lot Lift Station will be receiving an additional 1.4 MGD of flow from Tate & Lyle, an industry located on the north side of the City. Consequently, it has been proposed to eliminate the aging Parking Lot Lift Station by installing a new gravity sewer and send its flow down to the Pearl River Lift Station. The aging Pearl River Lift Station was eliminated and a new lift station was constructed. The new Pearl River Lift Station has a dry weather peak flow rate of 18 MGD, which was an increase from the current wet weather flow rate of both lift stations of 10.22 MGD (15.81 cfs). This lift station upgrade and expansion was designed to be expanded to meet future LTCP requirements. Construction of the new Pearl River Lift Station was completed in 2008.

Also, as part of the Pearl River Lift Station construction project, backflow prevention was installed at CSOs 006 and 007. Back flow prevention was considered at all the CSOs along the Wabash River. The CSOs along Durkee's Run were not considered for back flow prevention because they are not affected by the Wabash River 100-year flood elevation. CSOs 006 and 007 were selected for back flow prevention because they are the two overflow points that are at the lowest elevation in the system and downstream of the Parking Lot Lift Station. They are also two CSOs that will not be eliminated through the LTCP, as they are large diameter CSOs. The CSOs upstream of the Parking Lot Lift Station will not

affect the flow to the plant and therefore will not be a priority until LTCP improvements have been made to address the bottleneck in the system. Additionally, it has not been determined between CSOs 001, 002, 003, and 004 which will remain after the implementation of the LTCP, as the intent is to consolidate these CSOs through the construction of storage or treatment facilities. Therefore, it is not practical to install back flow prevention devices on any of these CSOs, as an early action project, but rather as part of the LTCP implementation.

As part of the Pearl River Lift Station and backflow prevention project for CSO 006, the City constructed a CSO screening facility with equipment to control floatables from that CSO outfall. The project was completed as an early action project. All CSO's remaining after implementation of the CSO LTCP will be provided with floatable control that is determined to be the best available technology for control of floatables on that CSO.

In the fall of 2001, the City completed a storm sewer project that reduced storm water flow to the combined sewer system for the Shamrock Park CSO outfall (CSO 008) and allowed the City to permanently close this CSO.

Additional sewers are being constructed to serve some of the developing areas and to eliminate some smaller lift stations. The projects include the South 18<sup>th</sup> Street Sewer, Twyckenham Boulevard Extension and Overpass, and Rome Drive.

To utilize the plant expansion for maximizing wet weather treatment, additional improvements to the combined sewer collection system will be necessary. These improvements include CSO diversion structure modifications to allow more flow to enter the interceptor sewer. The Parking Lot Lift Station, which is located half way up the interceptor sewer, limits the ability to deliver flow to the treatment plant. To eliminate this aged lift station, a 114-inch storage and conveyance tunnel is currently being constructed from the Parking Lot Lift Station to the Pearl River Lift Station. Once this tunnel is in service, current flows entering the Parking Lot Lift Station will be diverted into the tunnel and the Parking Lot Lift Station will be demolished. This tunnel also will intercept flows

from CSO 004 (Ferry Street), allowing the City to close this CSO. The tunnel construction is projected to be completed by the middle of 2010.

A majority of the projects discussed have been completed, unless otherwise noted. When completed these improvements will further maximize flows to the wastewater treatment facility and minimize impacts from CSO discharges.

In order to evaluate the impacts the WWTP capacity increase had on the CSOs and collection system, the City conducted a short-term flow monitoring period at the end of 2004. The WWTP expansion was substantially completed in May 2004. In order to not overwhelm the new plant operations, the influent capacity to the new facility was increased in approximately 10 MGD increments until it was demonstrated that operations at the WWTP could properly handle the increased flow at each increment. Full capacity of the WWTP was on-line by August 2004, when data collection at the WWTP began.

The flow monitoring study for the CSOs was conducted from November 2004 through January 2005 and monitored the following nine locations:

- CSO 001 – Greenbush Street,
- CSO 003 – Cincinnati Street,
- CSO 006 – Pearl River,
- CSO 007 – Williams Street,
- CSO 010 – 11<sup>th</sup> Street and Potomac,
- CSO 011 – 14<sup>th</sup> Street and Warren,
- CSO 012 – Fairgrounds,
- Wabash Interceptor just downstream of Shamrock Park, and
- Durkee's Run Interceptor just downstream of CSO 015 (6<sup>th</sup> Street and Oaklawn).

The flow monitors at the CSOs listed above were located downstream of each diversion structure, on the downstream side of the weir. The intent of these monitors was to verify CSO overflow frequency, as previous monitors for model calibration were located upstream of the weirs. Flow monitors located downstream of weirs are difficult to calibrate due to

lack of flow during installation and the hydraulics downstream of the weir were very turbulent, the velocity readings fluctuated significantly, therefore producing data that can not be used to calculate volume, but can verify frequency of overflows. The flow monitoring study was conducted during the late Fall and Winter. There were seven major rain events, which occurred, ranging from 0.4-inch to 1.1-inches, and there were many conditions that created some challenges with the data. During the course of the study, there was significant flooding of the Wabash River, snowfall and snowmelt, and the ground was frozen for periods of the study. Due to these conditions and also due to the locations of some of the monitors, not all the data was reasonable for comparison to the model results.

The City compared flow data from the WWTP to flow data from the updated collection system model developed as part of the *SR CER*, which was modified to reflect the upgrades to the system. Flow data from the WWTP influent flow monitor was also collected from August 2004 through January 2005. On August 25, 2004 through August 26, 2004, a one-inch rain event occurred. Rain data collected from rain gages located throughout the City was imported into the model. Results of this model run are shown on Figure 1.2-4. As shown, there is approximately a three percent difference between the peak flow at the WWTP and the peak flow in the model. As visually depicted on the figure, the trend between the modeled and monitored flow verifies that modifications to the model are correct. For the seven major rain events during the CSO monitoring period, there was an approximate difference on average of two percent between the peak flows monitored at the WWTP and the model. The frequency of overflows for the reasonable flow data during the period matched the predicted frequency using the updated model on all but one event for all CSOs. Therefore, using the reasonable data, it was verified that the collection system model update is reasonable in predicting the results of the improvements made to the WWTP and collection system.

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Table 1.2-0  
CSO Service Areas Information**

Greeley and Hansen  
July 2009

<i>CSO Area (Number)</i>	<i>Combined Area (Acres)</i>	<i>Separated Area (Acres)</i>	<i>Total Area (Acres)</i>
001	1,052	1,212	2,264
002	75	0	75
003	366	0	366
004	269	0	269
006	406	0	406
007	318	40	358
008	0	16	16
009	225	1,736	1,961
010	69	0	69
011	73	0	73
010/007	275	671	946
012	682	0	682
015	20	0	20
017	0	10,544	10,544
Total	3,830	14,219	18,049

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Table 1.2-1  
Latitude and Longitude of Each CSO Outfall**

Greeley and Hansen  
May 2005

*Revised July 2009*

<i>CSO Number</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Location</i>	<i>Receiving Stream</i>
001	40°25'55.55591"N	86°53'25.64038"W	Greenbush Street	Unnamed Ditch to Wabash River
002	40°25'32.31394"N	86°53'38.53548"W	Salem Street	Unnamed Ditch to Wabash River
003	40°25'21.54180"N	86°53'43.44349"W	Cincinnati Street	Wabash River
004	40°25'11.90376"N	86°53'47.01695"W	Ferry Street	Wabash River
006	40°24'53.92623"N	86°53'48.41512"W	Pearl River	Unnamed Ditch to Wabash River
007	40°24'40.57949"N	86°54'04.55492"W	William Street	Unnamed Ditch to Wabash River
009	40°24'06.36"N	86°54'37.93"W	WWTP	Durkee's Run to Wabash River
010	40°24'03.81295"N	86°53'04.08464"W	11th Street	Unnamed Ditch to Durkee's Run to Wabash River
011	40°23'54.77612"N	86°52'52.39618"W	14th Street	Durkee's Run to Wabash River
012	40°23'55.26167"N	86°52'46.49546"W	Fairgrounds	Durkee's Run to Wabash River
015	40°23'49.95921"N	86°53'23.64864"W	6th and Oaklawn	Unnamed Ditch to Durkee's Run to Wabash River

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Table 1.2-2  
CSO Diversion Structure Information**

Greeley and Hansen  
May 2005

*Revised July 2009*

<i>Manhole Number</i>	<i>CSO Number</i>	<i>Inflow Diameter (in.)</i>	<i>Inflow Invert Elevation (ft.)</i>	<i>Inflow Diameter (in.)</i>	<i>Inflow Invert Elevation (ft.)</i>	<i>Outflow Diameter (in.)</i>	<i>Outflow Invert Elevation (ft.)</i>	<i>Throttle Pipe Diameter (in.)</i>	<i>Throttle Pipe Invert Elevation (ft.)</i>	<i>Weir Elevation (ft.)</i>
1700	001	84	525.66			84	508.25	48	525.13	528.07
1480	002	32	528.11			48	518.47	32	519.31	521.15
1390	003	72	518.52			72	506.88	15	516.61	520.07
1340	004	24	521.32	72	521.37	72	516.25	18	518.09	521.73
1250	006	120	516.03			120	515.05	18	514.51	519.70*
1170	007	72	516.46			72	514.12	18	511.94	517.93
1020	009	54	506.27			54	506.27	no throttle pipe		514.29
3570	010	48	619.06			48	618.73	12	613.84	619.56
3680	011	36	614.67			36	613.76	18	605.67	615.46
4040	012	72	611.53			72	611.37	36	607.95	615.20
3870	015	24	625.56	15	627.51	48	621.23	8	625.56	N/A

\* determined by surveyor

CITY OF LAFAYETTE, INDIANA

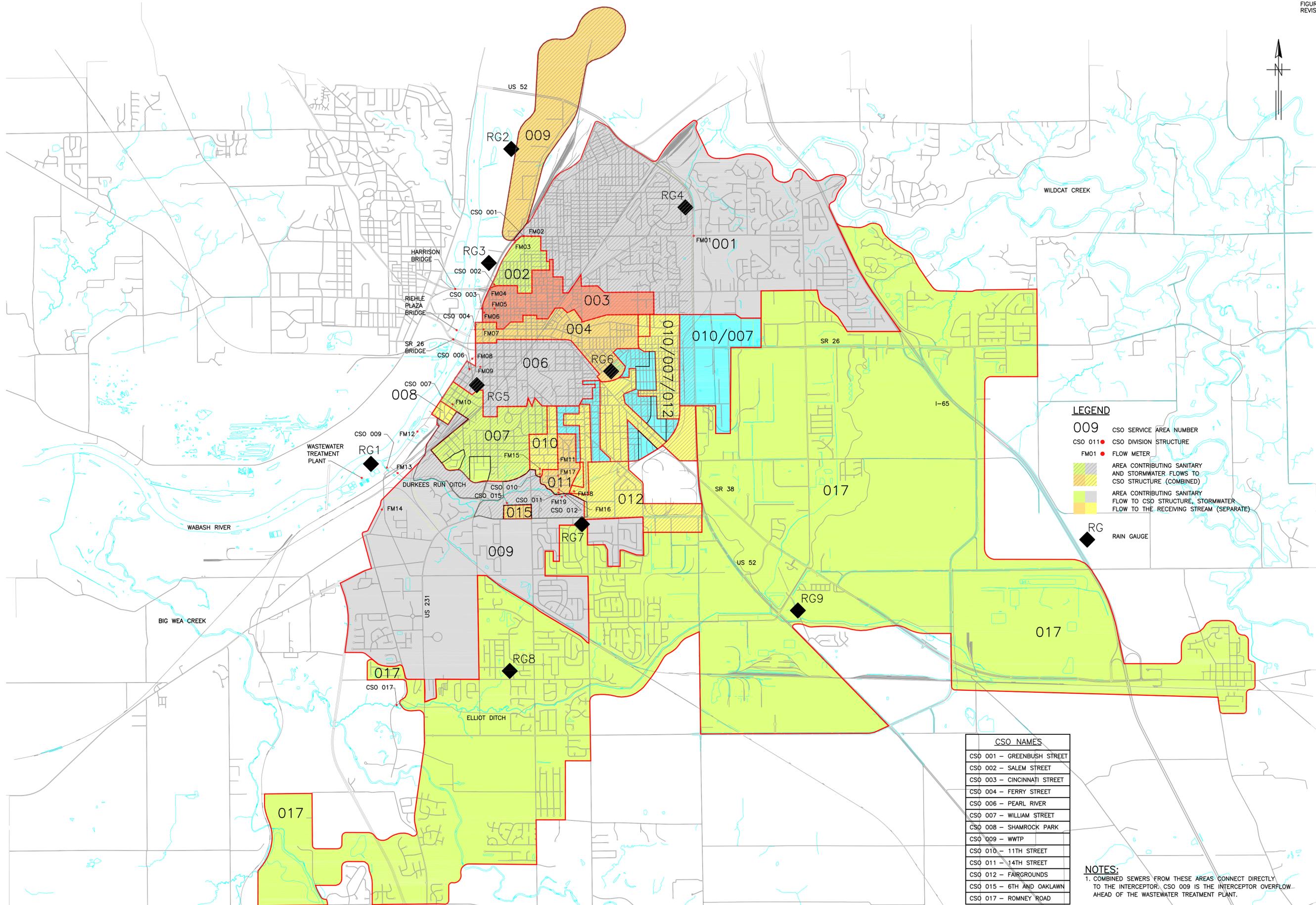
*Combined Sewer Overflow Long Term Control Plan*

**Table 1.2-3  
Lift Station Information**

Greeley and Hansen  
May 2005

*Revised July 2009*

<i>Lift Station Number</i>	<i>Name</i>	<i>Location</i>	<i>Number of Pumps</i>	<i>Type</i>
1	Parking Lot	2nd and Ferry Streets	4	Dry Well
2	Rainey Brook	500 S. and Cardinal Drives	2	Dry Well
3	Pearl River	102 Walnut St. - Use drive left of house	3	Dry Well
4	9th & Beck	905 Beck Lane	2	Dry Well
5	Creek Ridge	3581 Eisenhower Blvd.	2	Submersible
6	Crouch	Across from house at 842 Melody Lane	2	Submersible
7	40 & 8	Eisenhower Rd. - Just West of I-65	2	Dry Well
8	Prairie Oaks	670 350 S. West	4	Dry Well
9	Masons Ridge	150 East & Wea School Rd.	2	Dry Well
11	Cobble Stone	Beck Lane East of Ace Hardware	2	Dry Well
12	McCarty Lane	McCarty Lane & 500 East	3	Dry Well
13	Golf Course	North 9th Street Road by Golf Course	2	Submersible
14	Creasy Lane	North side of 3864 Kensington Drive	2	Submersible
15	Vinton III	3125 Cedar Lane	2	Submersible
16	Cracker Barrel	26E next to Meijer Gas Station	3	Submersible
17	Twyckenham	Behind 512 on 300S look close for drive	2	Submersible
18	Greenbriar	2218 Vancouver Drive	2	Submersible
19	Sanctuary	2308 Wigeon Drive	2	Submersible
20	Ross Road	3251 Ross Road	3	Dry Well
21	Wildcat Valley	501 East 50 North	2	Submersible
22	Hickory Hills	50 North 550 East	2	Submersible
23	Ashton Woods	337 Chesire Lane - in Ashton Woods	2	Submersible
24	550 East Reg	550 East to 50S then East ¼ mile	2	Submersible
25	Waterstone	3650 South 18th Street	2	Submersible
26	Rome Drive	3957 Rome Dr.	2	Submersible
98	9th Street Storm	Canal Rd. across from Sears warehouse	2	Submersible
99	Wabash Storm	2nd & Mechanic Street	2	Submersible



**LEGEND**

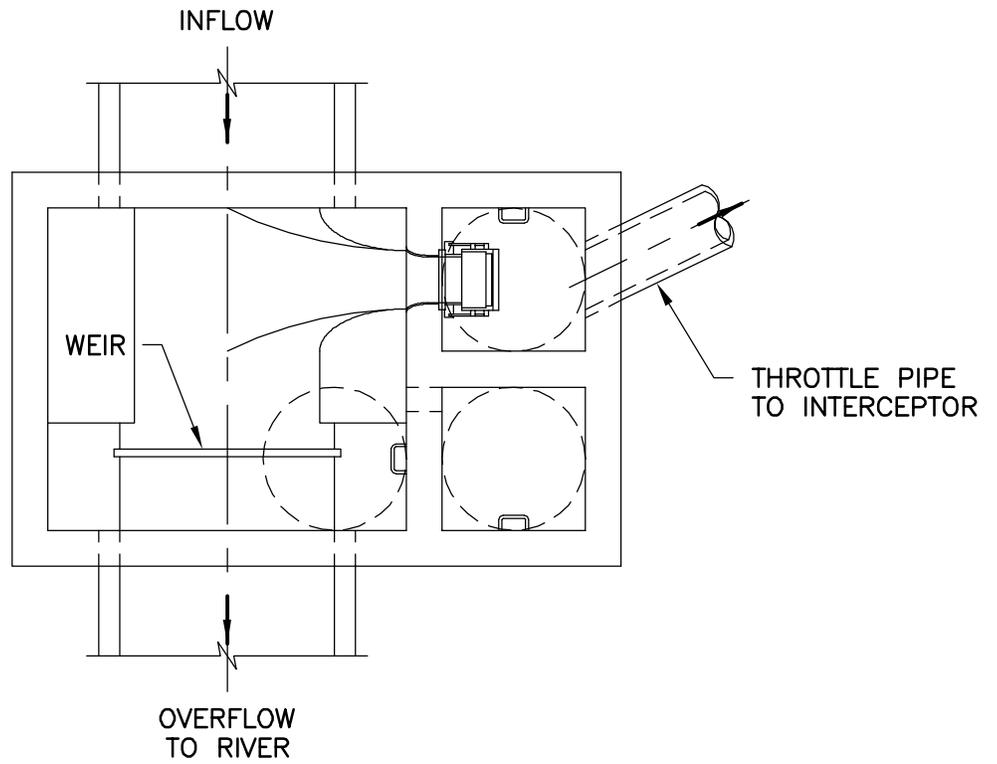
- 009 CSO SERVICE AREA NUMBER
- CSO 011 ● CSO DIVISION STRUCTURE
- FM01 ● FLOW METER
- AREA CONTRIBUTING SANITARY AND STORMWATER FLOWS TO CSO STRUCTURE (COMBINED)
- AREA CONTRIBUTING SANITARY FLOW TO CSO STRUCTURE, STORMWATER FLOW TO THE RECEIVING STREAM (SEPARATE)
- RG ● RAIN GAUGE

CSO NAMES	
CSO 001	GREENBUSH STREET
CSO 002	SALEM STREET
CSO 003	CINCINNATI STREET
CSO 004	FERRY STREET
CSO 006	PEARL RIVER
CSO 007	WILLIAM STREET
CSO 008	SHAMROCK PARK
CSO 009	WWTP
CSO 010	11TH STREET
CSO 011	14TH STREET
CSO 012	FAIRGROUNDS
CSO 015	6TH AND OAKLAWN
CSO 017	ROMNEY ROAD

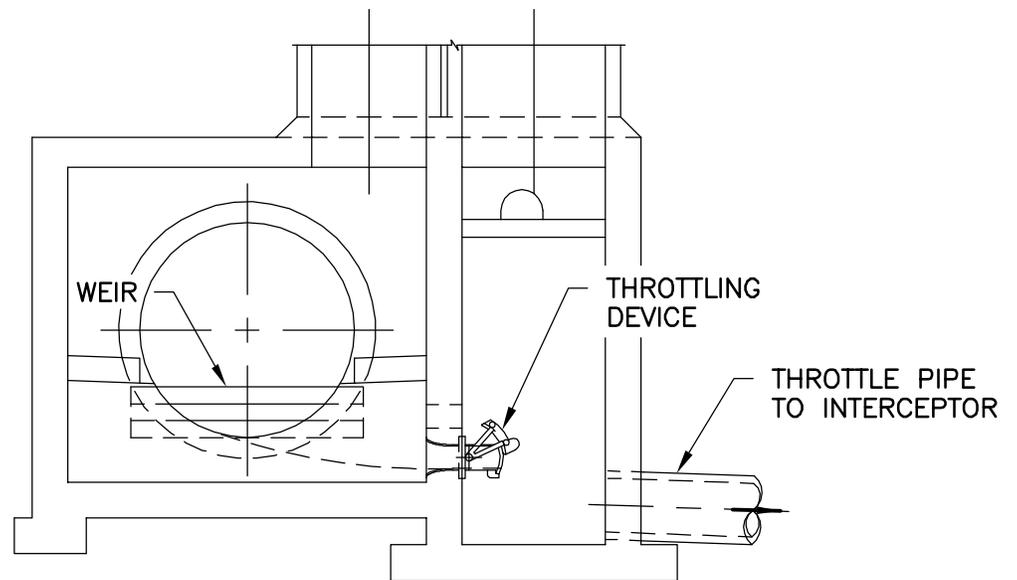
**NOTES:**  
1. COMBINED SEWERS FROM THESE AREAS CONNECT DIRECTLY TO THE INTERCEPTOR. CSO 009 IS THE INTERCEPTOR OVERFLOW AHEAD OF THE WASTEWATER TREATMENT PLANT.

**CSO SERVICE AREAS**  
SCALE: 1"=2000'

FILE: J:\Projects\09650 Lafayette CSO LTP\06 Studies\6.8 Report.Dwg\096500R74\_1:1\_07/08/09 08:15 GH-H



PLAN



SECTION

TYPICAL CSO DIVERSION STRUCTURE

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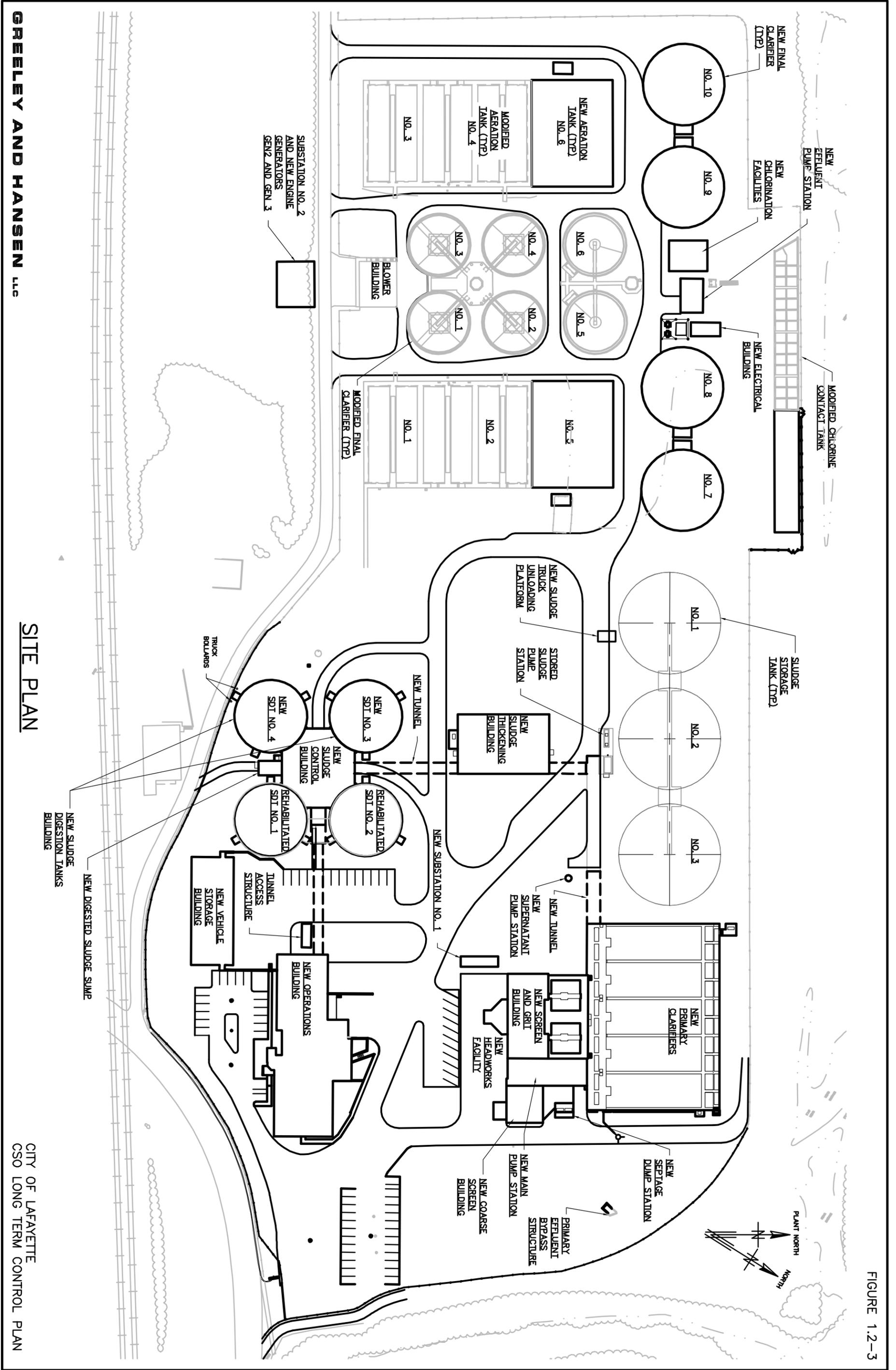


FIGURE 1.2-3

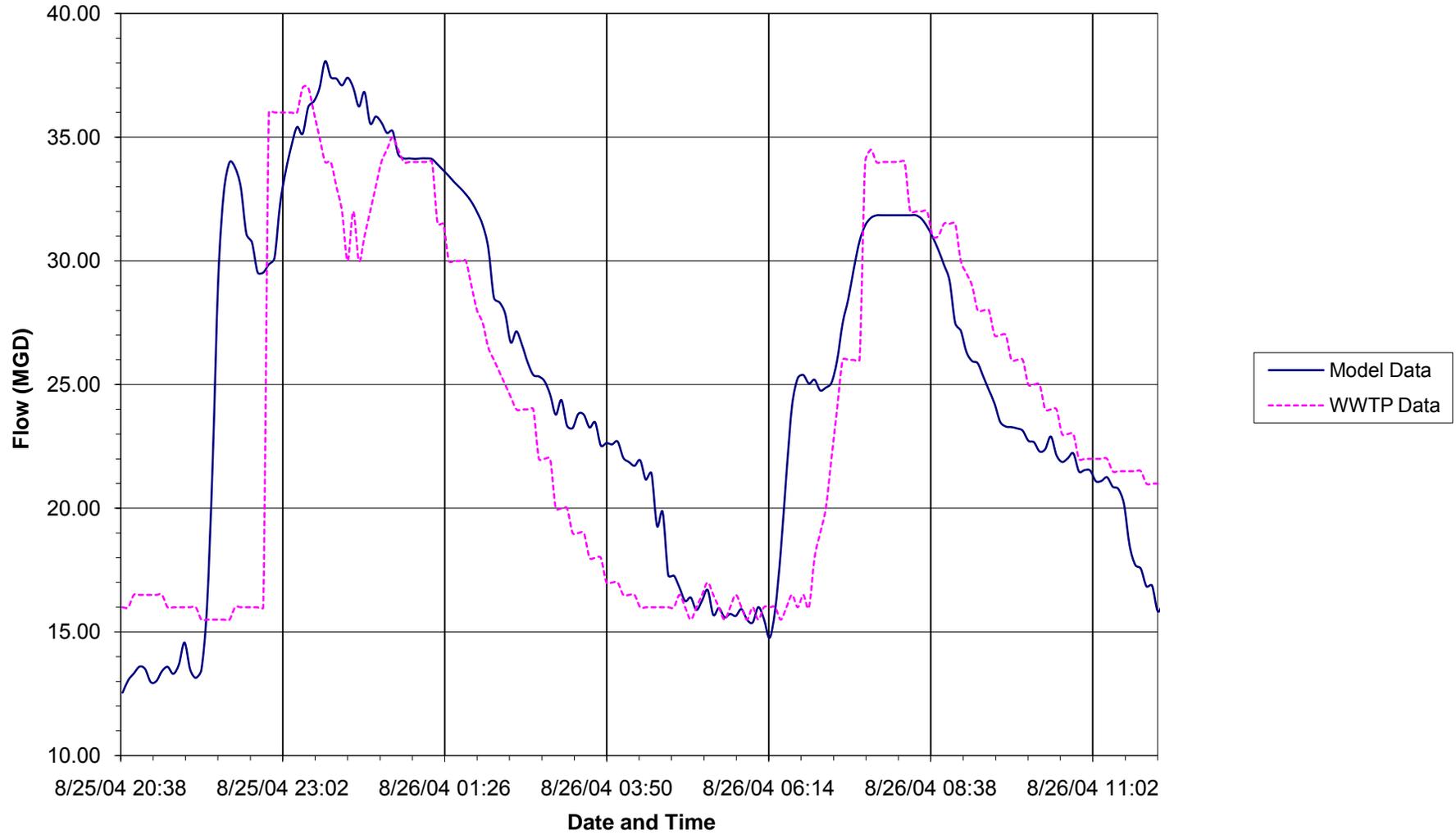
SITE PLAN

GREELEY AND HANSEN LLC

CITY OF LAFAYETTE  
CSO LONG TERM CONTROL PLAN

City of Lafayette, Indiana  
*Combined Sewer Overflow Long Term Control Plan*

**Figure 1.2-4**  
**Modeled vs. Monitored WWTP Flow Data**  
**August 2004 (1-inch rain)**



CITY OF LAFAYETTE, INDIANA

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**Chapter 2**  
**Consideration of Sensitive Areas**

Greeley and Hansen

**2.1 Introduction**

This chapter of the CSO Long Term Control Plan discusses the efforts taken to evaluate the existence of sensitive areas on the Wabash River and Durkee's Run. IDEM's *Combined Sewer Overflow (CSO) Long-Term Control Plan Use Attainability Analysis Guidance*, September 2001 provides the following definition of sensitive areas:

*“Sensitive Areas’ means waters impacted by CSO discharges which must be given the highest priority for CSO discharge elimination, relocation, or control. Examples of sensitive areas include:*

- *Habitat for threatened or endangered species*
- *Primary Contact Recreational Areas such as beaches and other swimming areas*
- *Drinking Water Source Waters*
- *Outstanding State Resource Waters ”*

Lafayette's 2004 *Stream Reach Characterization and Evaluation Report (SRCER)* gathered information to characterize sensitive areas as defined above.

As stated in the *SRCER*, the Indiana Department of Natural Resources and the U.S. Department of Interior, Fish and Wildlife Service were contacted to obtain information on endangered, threatened, or rare (ETR) species. The information obtained indicated that the Pitcher's Stichwort and the Glade Mallow were the only two possible ETR plant species in the area. However, these two species would not occur in the Wabash River, but could occur along the river's banks. Therefore, these ETR species will be protected during construction of any facilities. Also, of the bird, mammal, and insect ETR species, the mayfly is the only specie that habitats in or near the Wabash River. Mayflies are routinely used for

monitoring water quality because their presence can indicate the health of their aquatic environment (Department of Entomology, Purdue University - <http://www.entm.purdue.edu/entomology/mayfly/mayfly.html>). It is anticipated that the habitat of the mayfly will improve with the improvement of the water quality of the Wabash River resulting from implementation of this LTCP.

The Wabash River in this area is not considered a Drinking Water Source Water since there are no public drinking water intakes on the Wabash River either in or downstream of Tippecanoe County. The Wabash River is not listed as an Outstanding State Resource Water.

In the *SR CER*, parks and public access points to the Wabash River were discussed as part of the consideration of Primary Contact Recreational Areas. To properly characterize the public's uses of these parks and the river detailed physical surveys of the Wabash River and Durkee's Run and a public river use survey were performed as part of the Long-Term Control Plan development. These surveys are discussed in the following sections.

## **2.2 Stream Physical Surveys**

In September and November of 2004 Lafayette performed stream physical surveys on the Wabash River and Durkee's Run. These surveys were performed to identify the physical accessibility of each stream and the potential for recreational activities nearby or in each stream. Details of each stream physical survey follow.

### **2.2.1 Wabash River Survey**

In September of 2004 Lafayette performed a physical survey of a 14.5 mile section of the Wabash River from Mascouten Park Boat Ramp, which is approximately 1,500 feet upstream of CSO 001, to the western border of Tippecanoe County.

The survey covered the CSO locations along the Wabash River within the boundaries of Lafayette. Downstream of Lafayette, the survey covered points of interest along the

Wabash River, such as bridges and confluences with other creeks. The survey team began at Mascouten Park, upstream of CSO 001, and proceeded south and west down the river in a motorboat, ending near the Tippecanoe County line. The survey team used detailed check sheets to document their observations along the river. Each check sheet included descriptions about the following attributes for each location:

- Discharges
- Factors that support/encourage recreational use
- Factors that prohibit/discourage recreational use
- Land Use
- Access to River
- Physical Attributes of River

As shown on Figure 2.2-1, an example of one of the check sheets, the survey team could circle information about their observations while also providing additional notes when needed. Also included on the check sheet were the description of the location of where the information was gathered and a table of references to any pictures taken at each site. The survey team used aerial maps to accompany each check sheet. Each aerial map was an 11” by 17” print-out of the location described on each check sheet. On each map, the survey team included additional notes about the access, such as change in slope or vegetation along the river between each survey station location. In addition to making notes on the check sheets and maps, the survey team also recorded each location with a GPS point number and took digital photographs at each location.

### **2.2.2 Durkee’s Run Survey**

In November of 2004 Lafayette performed a physical survey on Durkee’s Run from where it originates at CSO 012 to its confluence with the Wabash River near the WWTP.

The survey covered the CSO locations along Durkee’s Run along with other points of interest, such as golf courses and road crossings. The survey team began at CSO 012

and proceeded west along the river, ending near the Wabash River. To document their findings along the Durkee's Run, the survey team used the same detailed check sheets as used for the Wabash River survey

In addition to making notes on the check sheets and maps, the survey team also recorded each location with a GPS point number and took digital photographs at each location.

### **2.2.3 Results of Stream Physical Surveys**

The results of the Wabash River and Durkee's Run physical surveys were compiled in a visual reference highlighting the physical accessibility of each stream and the potential for recreational activities nearby or in each stream. Accessibility and potential for recreational activities are two main considerations in maintaining public safety in the event of a CSO overflow.

Using the ArcMap 9.0 program, a map of the survey sites was created. The background of the map consisted of satellite images provided by the City's GIS Department. This information is compiled on the CD inserted in the report. As an example, one sheet of the map is included on Figure 2.2-2. Included on the maps for both the Wabash River and Durkee's Run are:

- CSO discharge points
- Stormwater discharge points
- Wastewater treatment discharge point
- Location of photographs taken during survey
- Parks and schools
- Aerial photo background
- Boat ramps, bridges, and trails
- Corresponding location where information was gathered
- River depths
- Physical obstructions that restrict access to the river

- River bank slope indicated by a solid color line:
  - o Green solid line – flat slope
  - o Yellow solid line – moderate slope
  - o Red solid line – steep slope
- River bank vegetation indicated by a dashed color line:
  - o Green dashed line – slight vegetation
  - o Yellow dashed line – moderate vegetation
  - o Red dashed line – heavy vegetation

A summary of the observed locations of access points and riverside trails, along with ratings of riverbank accessibility, are as follows:

Wabash River

- Between Mascouten Park Boat Ramp to halfway between CSO 001 and CSO 002
  - o Boat ramp on west bank
  - o Model airplane field on east bank
  - o Trail on east bank
  - o Easy access on the west bank
  - o Moderate to difficult access on the east bank
- Between halfway between CSO 001 and CSO 002 and CSO 004/Ferry Street
  - o Tapawingo Park on west bank
  - o Trail on east bank
  - o Easy to moderate access on both banks
- Between CSO 004/Ferry Street and State Route 26 Bridge
  - o Tapawingo Park on the west bank
  - o Easy access of the west bank
  - o Difficult access on the east bank
- Between State Route 26 Bridge and CSO 007 Outfall
  - o Trail on the west bank
  - o Moderate to difficult access on west bank

- Difficult access on the east bank
- Between CSO 007 Outfall to Shamrock Park Boat Ramp
  - Shamrock Park on east bank
  - Boat ramp on east bank
  - Easy to moderate access on east bank
  - Easy access on west bank
- Between Shamrock Park boat ramp and Durkee's Run confluence with the Wabash River
  - Trail on east bank
  - Easy access on east bank
  - Moderate to difficult access on west bank
- Between Durkee's Run confluence with the Wabash River and WWTP Outfall
  - Easy access on east bank
  - Difficult access on west bank
- Between WWTP Outfall and US 231 Bridge
  - Easy access on east bank
  - Difficult access on west bank
- Between US 231 Bridge and confluence with Big Wea Creek
  - Moderate to difficult access on both banks
- Between confluence with Big Wea Creek and ditch near Fort Ouiatenon
  - Boat ramp on north bank
  - Park on north bank
  - Moderate access on both banks
- Between ditch near Fort Ouiatenon and Gun Club
  - Boat ramp on north bank
  - Gun Club on north bank

- Easy access at Gun Club boat ramp on north bank
- Moderate to difficult access elsewhere on both banks
  
- Between Gun Club and Granville Bridge
  - Boat ramp on north bank near Granville Bridge
  - Moderate to difficult access on both banks
  
- Between Granville Bridge and Tippecanoe County Line
  - Moderate to difficult access on both banks.

*Durkee's Run*

- Between CSO 009 Outfall and railroad tracks
  - Easy to moderate access on both banks
  
- Between railroad tracks and Sawmill Road Bridge
  - Moderate to difficult access on both banks
  
- Between Sawmill Road Bridge and 4<sup>th</sup> Street Bridge
  - Easy access on south bank
  - Difficult access on north bank
  
- Between 4<sup>th</sup> Street Bridge and 9<sup>th</sup> Street Bridge
  - Golf course on north bank
  - Moderate access on both banks
  
- Between 9<sup>th</sup> Street Bridge and 14<sup>th</sup> Street Bridge
  - Easy access on south bank
  - Moderate access on north bank
  
- Between 14<sup>th</sup> Street Bridge and CSO 012
  - School east of Durkee's Run
  - Trail on south side of Durkee's Run
  - Moderate to difficult access on both banks

There are no areas designated as primary contact recreation. As noted above, there were no observations of any primary contact recreation during the river physical survey of the Wabash River or Durkee's Run.

## **2.3 River Use Survey**

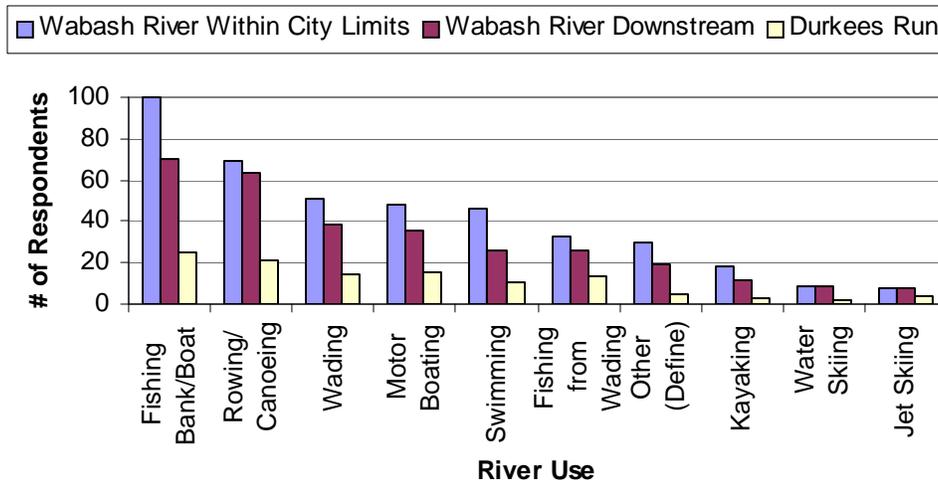
In the fall of 2004 a public river use survey for the Wabash River and Durkee's Run was conducted for the City of Lafayette. The purposes of the survey were to provide public input to water quality improvement planning, to define the public's location-specific water contact uses and use frequency, and to assess the public's level of fee acceptance to improve water quality.

The public river use survey was mailed to the City's 41,000 utility customers in the August 2004 utility bills and was posted on the City's website for the convenience of the respondents. 2,088 surveys were completed and returned, which included responses from 208 (10%) river users and 1,880 (90%) non-users. A copy of the survey is shown on Figure 2.3-1.

Due to the uncertainty involved with interpretation of survey use questions and the limited number of river use respondents, the survey results will be reviewed and verified during the public outreach program.

### **2.3.1 River Use Activities**

Based on the responses of the 208 river users, the survey reported fishing from the bank or boat and rowing or canoeing as the most popular river activities. Figure 2.3-2 shows the reported participation in river activities and their associated locations on each water body. Respondents defined "other" activities as hiking, wildlife watching, playing with dogs, and hunting.



**Figure 2.3-2: River Activities by Survey Respondents**

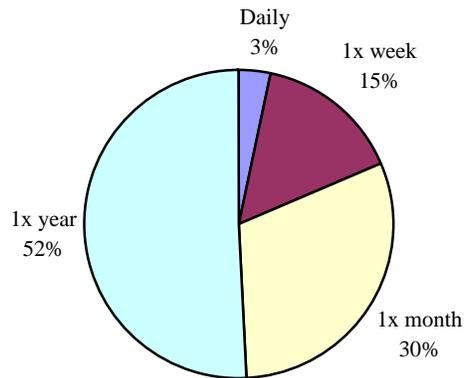
River use varied by location as follows:

- 190 or 91% of river users participate in activities in the Wabash River within City limits;
- 129 or 62% of river users participate in activities in the Wabash River downstream of Lafayette, between the US 231 Bridge and the Granville Bridge; and
- 48 or 23% of river users participate in activities in Durkee’s Run.

The percentages listed above add up to more than 100% because some users participated in activities in multiple locations.

### 2.3.2 River Use Frequency

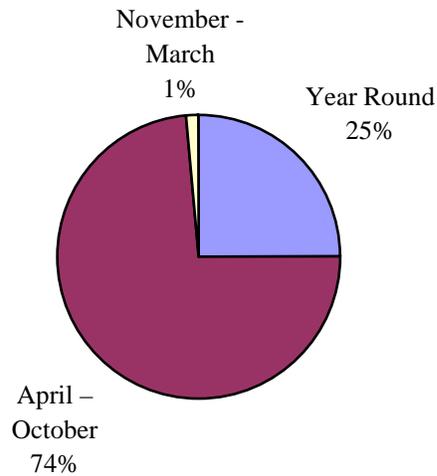
Over half of survey respondents that participate in river activities reported using either the Wabash River or Durkee’s Run only once a year. Figure 2.3-3 shows the distribution of activity frequency, based on all defined activities.



**Figure 2.3-3: Activity Frequency**

### 2.3.3 River Use Time of Year

Based on the 289 responses concerning river usage time of year, Figure 2.3-4 shows the seasonal variance of river use. The majority of survey respondents use either the Wabash River or Durkee’s Run for recreational activities from April to October only.



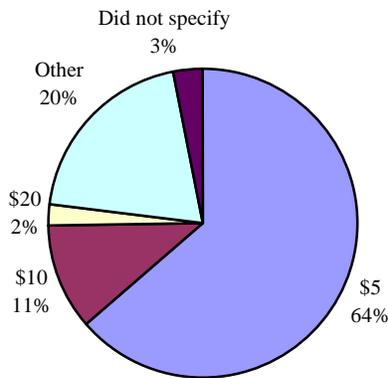
**Figure 2.3-4: River Use Time of Year**

### 2.3.4 Fee Acceptance to Improve Water Quality

The public's level of fee acceptance to improve water quality was not directly linked to respondent's use of the river according to the public use survey. Of those who would not be willing to accept a fee increase, 13% considered themselves river users while 87% indicated they were non-users. Of those who would be willing to accept a fee increase, 21% were users and 79% were non-users. The overall level of acceptance of a fee increase was as follows:

- 556 or 27% would accept a fee increase
- 1,532 or 73% would not accept a fee increase

Of those survey respondents willing to accept an increased sewer fee, Figure 2.3-5 indicates the acceptable amount of sewer fee increase on a monthly sewer bill.



**Figure 2.3-5: Acceptable Sewer Fee Increase Amount on Monthly Sewer Bill**

1,339 respondents provided comments regarding fee acceptance and the river use survey.

Comments of those who would accept a fee to improve water quality included:

- Whatever it takes.
- Water quality is very important.
- Only a small increase.
- Keep the public informed as to how the money is spent.
- I would like to participate in water activities.

Comments of those who would not accept a fee increase to improve water quality included:

- Cannot afford fee increase (on fixed income).
- Only users and polluters should pay (factories).
- Bill is currently too high.
- We just upgraded our wastewater facility.
- City needs to better manage funds.
- Must address upstream polluters to make a difference.

A complete list of comments is included in Appendix A.

### **2.3.5 Survey Respondent Profile**

The profile of the survey respondents was compared to the 2000 U.S. Census data for Lafayette and was found to be a reasonable representation of the Census data.

Table 2.3-1, below, shows the age distribution of survey respondents compared to the Census data. As expected, a small percentage of survey respondents were under 18 because the household bill payers that received the survey are typically adults.

**Table 2.3-1: Age Profile**

Survey		Census	
< 18	0%	< 20	26%
18-64	69%	20-64	62%
>64	22%	>64	12%
No age response	9%		

Table 2.3-2, below, shows the gender distribution of survey respondents compared to the Census data.

**Table 2.3-2: Gender Profile**

Category	Survey	Census
Male	43%	49%
Female	49%	51%
No gender response	8%	n/a

Table 2.3-3, below, shows the marital status of survey respondents compared to the Census data.

**Table 2.3-3: Marital Status Profile**

Category	Survey	Census*
Married	56.4%	50%
Single	36.0%	50%
No marital status response	7.6%	n/a

\*Census calculates percentage of married population over the age of 15

### **2.3.6 Summary**

The conclusions of the public river use survey were as follows:

- The public does not understand that all Lafayette utility customers affect the quality of the Wabash River and Durkee's Run by producing wastewater that is discharged into the rivers during some storm events. In a sense, Lafayette citizens are indirect river users.
- River usage is predominately secondary, not primary contact recreation. There are no areas designated as primary contact recreation.
- The Wabash River represents a recreational resource for the City of Lafayette.
- Wabash River usage is primarily within city limits and downstream in the summer season.
- Due to the uncertainty involved with interpretation of survey use questions and the limited number of river use respondents, the survey results will be reviewed and verified during a public outreach program.

As a result of the public river use survey, it was recommended by the Citizen Advisory Committee (CAC) that the City undertake a public education program to increase the public's understanding of water quality issues and to get the public involved in water quality improvements. For instance, the City employees that conducted the river physical surveys and the CAC both indicated that they have never witnessed any primary contact recreation in the Wabash River or Durkee's Run. Therefore, an expanded public outreach program will be conducted during the summer to verify the results of the river use survey for Wabash River and Durkee's Run. Discussions on the City's current public education program and the proposed public outreach program are included in Chapters 7 and 8, respectively, of the CSO Long Term Control Plan.

Complete survey data is also included in Appendix A.

## **2.4 Conclusions**

The River Use Survey form collected the data for Activity and Time of Year in two different tables. It is difficult to correlate a specific activity with a specific time of year, because the survey participants that had checked swimming had indicated some other activity as well. As a result, it is unknown whether the time of year was meant to refer to swimming or the other activities indicated, such as fishing. 47 (2.25%) out of 2,088 survey respondents

indicated swimming within the City Limits. Of these respondents, 3 (0.14%) indicated daily, 12 (0.57%) indicated weekly, 14 (0.67%) indicated monthly and 18 (0.86%) indicated annually for frequency of use. All respondents indicated either Year Round or April through October for the Time of Year.

None of the remaining Public Participation efforts supported a conclusion that people swim in the Wabash River. Participants consistently indicated that they had never seen anyone swimming in the Wabash River. In addition, during the physical survey of the Wabash River, no swimming was observed while on the river. Aside from a very small percentage of the River Use Survey responses, discussed above, there has been no other evidence of people swimming in the Wabash River.

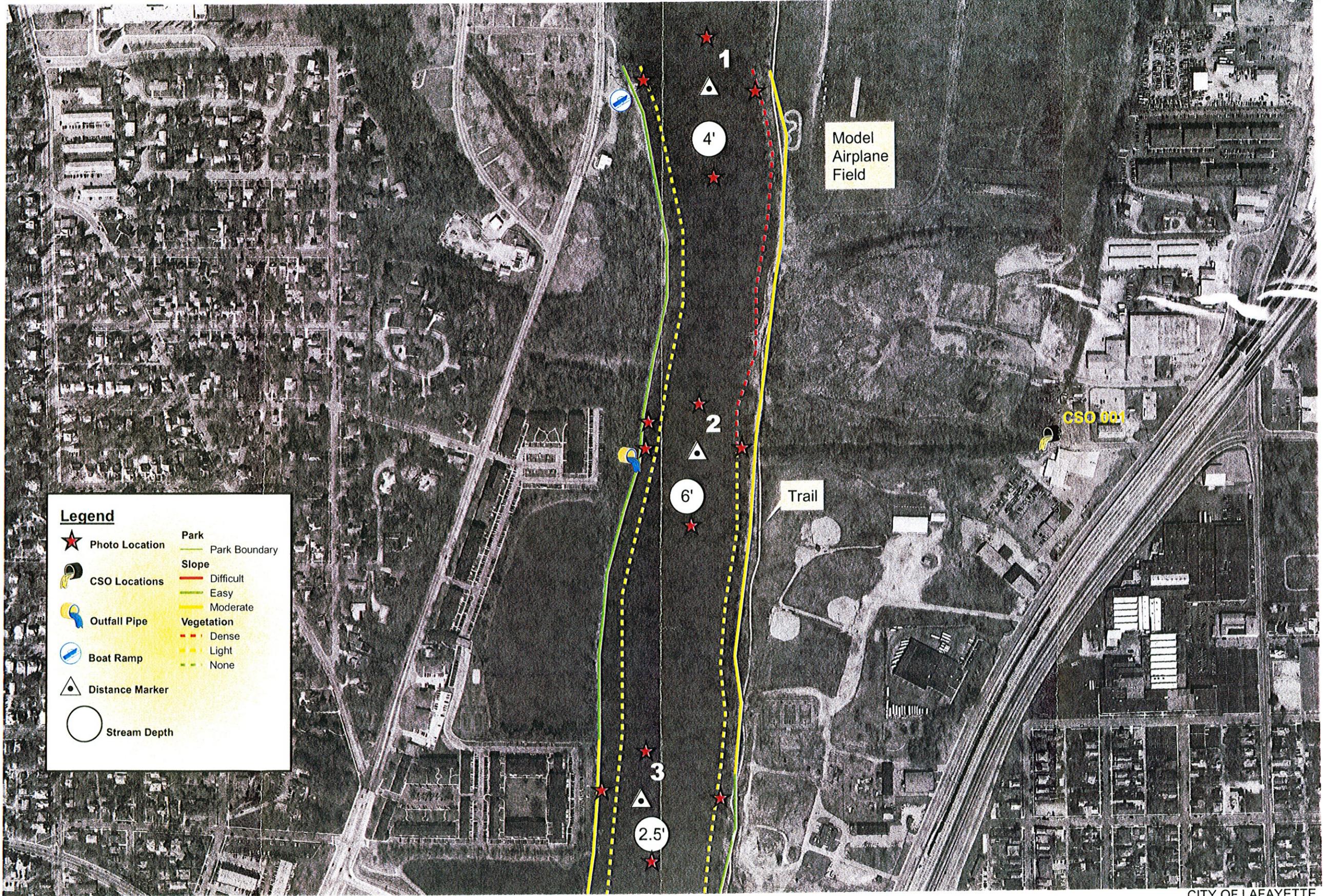
Based on the physical river survey, there are no beaches or designated swimming areas in the study area. In addition, the physical survey indicated that 69% the Wabash River Bank where access to the river bank is difficult. This is summarized in Section 2.2.3 of the LTCP report.

The City has also contacted Kathy Atwell, Interim Executive Director - Tippecanoe County Historical Association, to verify that swimming does not occur and is not an official event at the Feast of the Hunters Moon at Fort Ouiatenon.

The City concludes at this time that Primary Contact Recreation is not a current use of the Wabash River.

<b>Wabash River Cross Section #2</b>					
<b>Description: CSO 001 Outfall - Greenbush St.</b>					
<b>GPS Point Number:</b>					
<b>Discharges (circle one)</b>	Yes	No	Notes:		
Location	West Bank	East Bank			
Type (i.e. CSO outfall)					
<b>Factors that support/encourage recreational use (circle one)</b>	School	Park	Trail	Boat Ramp	Notes:
	Other:				
<b>Factors that prohibit/discourage recreational use (circle one)</b>	Warning Signs	City Ordinance	Fence	Steep Banks	Notes:
	Other:				
<b>Land Use (circle one)</b>					
West Bank	Public	Residential	Wooded	Industrial	Commercial
	Open	Other:			
East Bank	Public	Residential	Wooded	Industrial	Commercial
	Open	Other:			
<b>Access to River (circle one)</b>					
West Bank - Slope	Easy	Moderate	Difficult	Notes:	
West Bank - Vegetation	None	Light	Dense	Notes:	
East Bank - Slope	Easy	Moderate	Difficult	Notes:	
East Bank - Vegetation	None	Light	Dense	Notes:	
<b>River's Physical Attributes</b>	<b>West Bank</b>	<b>Center</b>	<b>East Bank</b>	Notes:	
Depth (ft)					
Substrate (i.e. sand, rock, silt)					
Approximate Velocity (ft/s)					

Pictures	Picture No.	Additional Description (if needed)
West Bank		
East Bank		
Looking Upstream		
Looking Downstream		
Additional Picture - GPS Point No. =		
Additional Picture - GPS Point No. =		
Additional Picture - GPS Point No. =		
Additional Picture - GPS Point No. =		



**Legend**

	Photo Location		Park
	CSO Locations		Park Boundary
	Outfall Pipe		Slope
	Boat Ramp		Difficult
	Distance Marker		Easy
	Stream Depth		Moderate
			Vegetation
			Dense
			Light
			None

1 inch equals 400 feet

# CITY OF LAFAYETTE

1. Please check the appropriate water activities and how frequently you or your household participate in along the Wabash River and Durkees Run Ditch. Check all that apply. The City limits are identified for this purpose as from the US 52 Bridge to the US 231 Bridge. Downstream is identified as from the US 231 Bridge to the Granville Bridge.

Activities	<i>Within City Limits</i>					<i>Downstream</i>					<i>Durkees Run</i>				
	Frequency					Frequency					Frequency				
	Daily	1x week	1x month	1x year	Never	Daily	1x week	1x month	1x year	Never	Daily	1x week	1x month	1x year	Never
Fishing Bank/Boat															
Fishing from Wading															
Rowing/Canoeing															
Motor Boating															
Kayaking															
Jet Skiing															
Water Skiing															
Swimming															
Wading															
Other (Define)															

2. Please check the appropriate time of year you or your household participates in any of the water activities.

Time of Year	River Location		
	<i>Within City Limits</i>	<i>Downstream</i>	<i>Durkees Run</i>
Year Round	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
April - October	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
November - March	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. To improve water quality for the Wabash River, would you be willing to accept a sewer fee increase on your sewer bill?

Yes	
No	

If no, explain. \_\_\_\_\_

If yes, please indicate the amount of the sewer fee increase you would accept on your monthly sewer bill.

\$5 increase	
--------------	--

\$10 increase	
---------------	--

\$20 increase	
---------------	--

Other	
-------	--

Respondent Profile (please check all that apply)

Married		Male		Age less than 18	
Single		Female		Age 18-64	

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Chapter 3  
Evaluation of Alternatives**

Greeley and Hansen

**3.1 Introduction**

This chapter includes a discussion on how the CSO control technologies were selected for consideration during the three Alternatives Workshops. This chapter also summarizes the evaluation of the selected CSO control alternatives, including the incorporation of the Phase I improvements, the four common projects, and the integrated CSO control alternatives, based on site considerations, comparative cost analysis, and end-of-pipe performance. The performance of each integrated CSO control alternative was compared to the base conditions discussed below. Chapter 4 presents the cost-performance evaluation of the integrated alternatives.

**3.2 Base Conditions**

During the collection system model calibration for the Lafayette's 2004 *Stream Reach Characterization and Evaluation Report (SRCER)*, the SWMM model simulated the collection system for 2001 conditions, which was prior to the recent WWTP upgrades and collection system improvements. This model became the initial base conditions for the cost-performance analysis. The annual average CSO overflow volumes and frequencies for these base conditions are shown in Table 3.2-1.

**3.3 Phase I Improvements**

There are several collection system and WWTP improvements that were initiated during the development of the LTCP. The goal of these improvements is to reduce CSO volumes, frequencies, and durations and help maximize wet weather flows to the WWTP. These improvement projects are either in operation or under construction. These projects are

considered Phase I of the LTCP and the new base conditions for the cost-performance analysis. These Phase I improvement projects are discussed in more detail in Section 1.2.4 of this report and can be grouped into the following general projects:

- Elimination of Shamrock Park CSO (CSO 008),
- Elimination of Romney Road CSO (CSO 017), and
- WWTP Upgrade and Expansion.

Using the calibrated SWMM model, the annual average CSO overflow volumes and frequencies for these Phase I improvements were estimated and are shown in Table 3.3-1. For the Phase I improvements, the reduction in annual overflow volume from the base conditions is approximately 20 percent. Additional information on end-of-pipe performance for each integrated alternative compared to the base conditions and to Phase I improvements is discussed in Section 3.7 of this chapter.

### **3.4 Identification of CSO Control Technologies**

To help the City identify feasible CSO control technologies to consider, a matrix of over 70 possible control technologies was developed. This matrix included several technologies that were grouped into the following categories as recommended in EPA's 1995 *Combined Sewer Overflows: Guidance for Long-Term Control Plan*:

- Source Control Technologies,
- Storage Technologies,
- Treatment Technologies, and
- Collection System Controls.

Each technology was evaluated based on the following environmental impacts and improvements:

- CSO Volume Reduction,
- Light Solids Reduction,
- Heavy Solids Reduction,

- Soluble Reduction,
- Bacteria Reduction, and
- Floatables Reduction.

Implementation and operation factors were also evaluated for each technology. This completed matrix is included in Table 3.4-1.

This CSO control technologies matrix was used as a discussion guide when screening each technology during the CSO Control Alternatives Workshops.

### **3.4.1 Alternative Workshops**

The City held three CSO Control Alternatives Workshops at the Water Pollution Control Department. The attendees at each workshop consisted of the technical group involved with the development of the LTCP, which included:

- City of Lafayette Water Pollution Control Department Staff,
- City Engineer,
- Director of the Redevelopment Department, and
- Engineering Consultants.

#### **3.4.1.1 Alternatives Workshop #1 – Screening of CSO Control Technologies**

The first CSO Control Alternatives Workshop was held on September 3, 2004. The goals of the first workshop were to understand the alternative evaluation process and to screen the potential CSO control technologies to be integrated into alternatives at the second CSO Control Alternatives Workshop.

For the first workshop, a new matrix (Table 3.4-2) for CSO control technology screening was developed. This matrix contained all the technologies evaluated in Table 3.4-1 and additionally included the following titled columns:

- Eliminate,
- Consider,
- Common to All, and
- Reasons/Notes.

During the first workshop, the technical group reviewed each technology and determined which technology the City could eliminate, consider, or establish as common to all the alternatives developed. At the end of the screening process, the matrix of CSO control technologies was narrowed down to 59 technologies to be either considered as a CSO control alternative or as a common technology to all alternatives. The completed CSO control technology screening matrix is shown in Table 3.4-2. This table includes the reasons each technology was chosen for either elimination or consideration.

There were several technologies that were considered “Common to All.” The following “Common to All” technologies are implemented as part of the CSO Operational Plan:

- Sump Pump Disconnect Program,
- Catch Basin Cleaning,
- Illicit Connection Control,
- Roof Leader Disconnect Program, and
- Street Sweeping Program.

The following “Common to All” technologies are implemented as part of the City’s Pretreatment Program:

- Industrial Storage/Loading/Unloading Areas,
- Industrial Spill Control, and
- Industrial Pretreatment Program.

The following “Common to All” technologies are implemented as part of the City’s Public Education Program:

- Water Conservation,
- Catch Basin Stenciling,
- Community Cleanup Program,
- Recycling Programs,
- Animal Waste Management,
- Lawn and Garden Maintenance,
- Adopt-a-River, and
- CSO Warning Signage.

The following “Common to All” technologies are implemented as part of the City’s Phase 2 Stormwater Program:

- Onsite Erosion Control/New Construction,
- Soil Stabilization Measures, and
- Stabilized Construction Entrance.

The City has an aggressive solid waste collection and disposal program and is currently implementing the following applicable “Common to All” technologies:

- Illegal Dumping Control,
- Solid Waste Program,
- Litter Ordinance Enforcement, and
- Hazardous Waste Collection.

Other “Common to All” technologies that the City is currently implementing are the following:

- Streambank Stabilization/Restoration
- Septic Tank Improvements/Barret Law, and
- Parking Lot Storage.

The results of CSO Control Alternatives Workshop #1 were presented to the Citizen Advisory Committee on October 7, 2004.

After the first workshop, feasible technologies were applied to the entire collection system and the WWTP. The technologies were evaluated for feasibility on the available sites. The following preliminary alternatives were identified and evaluated:

- Complete sewer separation,
- Offline storage tanks,
- Storage tunnel/parallel conveyance sewers, and
- High rate treatment at the CSOs.

Conclusions from the preliminary alternative evaluation are as follows:

- Complete sewer separation will be disruptive to neighborhoods.
- Complete sewer separation will result in additional storm water being discharged to the receiving stream. Storm water quality is a concern.
- Several sites were suitable for buried off-line storage tanks for CSOs.
- Two sites near CSOs were suitable for high rate CSO treatment.

#### **3.4.1.2 Alternatives Workshop #2 – Development of Preliminary Alternatives**

The second CSO Control Alternatives Workshop was held on October 7, 2004 following the Citizen Advisory Committee Meeting. The goal of the second workshop was to integrate the screened CSO control technologies into three or more alternatives. The workshop opened with a review of the feasible technologies identified at the previous workshop and the initial preliminary alternative evaluation. From the initial preliminary alternative evaluation, four common projects were defined along with eight preliminary alternatives. The four common projects are projects determined necessary to be included in all of the evaluated CSO control technologies alternatives. The common projects include:

- Parking Lot and Pearl River Lift Stations Replacement
- Railroad Corridor Sewers Utilization,
- Durkee's Run Priority Projects, and
- Wabash Riverfront Park Priority Projects.

As discussed in Chapter 1 of this report, the Parking Lot and Pearl River Lift Stations are two lift stations that significantly limit flows to the WWTP. When the peak wet weather capacities at each lift station are reached, overflows occur. Therefore, to utilize the new peak hydraulic capacity of the WWTP and to minimize the impacts from CSOs, the pumping capacity of the Parking Lot Lift Station and the Pearl River Lift Station will need to be expanded. Therefore, the expansion of the Parking Lot and Pearl River Lift Stations is considered a common project to be included in all of the alternatives evaluated.

In the 1990s, the City completed a railroad relocation project. As a result, a large railroad corridor was abandoned. To utilize this abandoned land and to relieve some flow from the CSOs in the northern portion of the City, two sewers, a storm sewer and a sanitary sewer, were installed along the abandoned railroad corridor. These sewers were installed from Underwood Street down to Columbia Street. Since these sewers could either be used for storage or conveyance of wastewater for any alternative evaluation, the utilization of the railroad corridor sewers are considered another common project to be included in all of the alternatives evaluated.

There are five CSOs that discharge into Durkee's Run. CSOs 00, 011, and 012 discharge directly into Durkee's Run, whereas CSOs 010 and 015 discharge into an unnamed ditch which then discharges into Durkee's Run. The City and the Citizen Advisory Committee considered this portion of Durkee's Run to be a priority area because there are several schools, a golf course, and a YMCA adjacent to Durkee's Run. Therefore, during preliminary alternative evaluation, it was determined that a combination of parallel throttle pipes, storage tanks, and some sewer separation in these areas along Durkee's Run be used to alleviate CSO discharges. Since this portion of Durkee's Run is a priority area, the Durkee's Run projects are considered another common project to be included in all of the alternatives evaluated.

The City has created a park master plan along the Wabash River in the northern portion of the City. The master plan includes several park amenities within Wabash Riverfront Park near CSOs 001 and 002. The City and the Citizen Advisory Committee considered the portion of the Wabash River along Wabash Riverfront Park to be a priority area because of

the park amenities. Therefore, during preliminary alternative evaluation, it was determined that either a storage tank or a high rate facility near CSOs 001 and 002 be used to alleviate CSO discharges. Since this portion of the Wabash River is a priority area, Wabash Riverfront Park Priority Projects are considered another common project to be included in all of the alternatives evaluated.

For CSO Control Alternatives Workshop #2, eight preliminary alternatives were developed incorporating the four common projects along with the four feasible control technologies identified during CSO Control Alternatives Workshop #1. The eight preliminary alternatives are generally described as follows:

- Alternative 1A – Parallel interceptors along the Wabash River and Durkee’s Run with CSO storage near the WWTP
- Alternative 1B - Parallel interceptors along the Wabash River and Durkee’s Run with CSO storage near CSO 001 and the WWTP
- Alternative 2A – Parallel interceptors along the Wabash River and Durkee’s Run with a high rate treatment facility near the WWTP
- Alternative 2B - Parallel interceptors along the Wabash River and Durkee’s Run with a high rate treatment facility near CSO 001 and the WWTP
- Alternative 3A – Satellite CSO storage at various CSOs with the railroad corridor sewers used as a storage pipe
- Alternative 3B – Satellite CSO storage at various CSOs with the railroad corridor sewers used as a conveyance sewer
- Alternative 4A – Satellite high rate treatment facilities at CSO 001 and near the WWTP with areas of sewer separation
- Alternative 4B – Satellite high rate treatment facilities at CSO 001 and near the WWTP

Details of each component of each preliminary alternative listed above are found in Table 3.4-3.

As these eight preliminary alternatives were discussed during the second workshop, ideas of combining two or more of these alternatives into different integrated CSO control

alternatives were mentioned. Ideas included having CSO storage tanks along various CSOs along the Wabash River and a parallel interceptor along Durkee's Run.

At the end of the second workshop, it was concluded that different components from each preliminary alternative, the four common projects, and high rate treatment facilities, off-line CSO storage tanks, and parallel interceptors (three of the four control technologies from the first workshop) could be integrated into three different alternatives. The sewer separation components (the fourth control technology from the first workshop) of preliminary alternatives 3B and 4A were eliminated because it was not economically feasible to separate a small acreage of combined sewers.

#### **3.4.1.3 Alternatives Workshop #3 – Development of Integrated Alternatives**

The third CSO Control Alternatives Workshop was held on October 21, 2004. The goal of this workshop was to integrate the preliminary alternatives into three final alternatives to present to the Citizen Advisory Committee. To help develop the three final integrated CSO control alternatives based on different components from each preliminary alternative, the four common projects, and high rate treatment facilities, off-line CSO storage tanks, and parallel interceptors, the CSO control technologies were evaluated on a CSO by CSO basis by the technical group. Table 3.4-4 includes descriptions of the feasibility of high rate treatment facilities, off-line CSO storage tanks, and parallel interceptors at each CSO site.

The Railroad Corridor Sewers are also included for evaluation in Table 3.4-4. After the development of the preliminary alternatives, further investigation of using the Railroad Corridor Sewers for storage was completed. It was determined that due to the invert elevations of the currently installed sewers, wastewater would need to be pumped up into the sewers in order to use them for storage. This was not a feasible and cost-effective option for the City. Therefore, the Railroad Corridor Sewers were evaluated as sewers for conveyance and not for storage of wastewater. Also, after further investigation it was found hydraulically feasible to eliminate the Parking Lot Lift Station, upgrade the Pearl River Lift Station, and convey flow from the Parking Lot Lift Station to the new Pearl River Lift Station.

Using the conclusions made in Table 3.4-4, three integrated CSO control alternatives were developed using components from each preliminary alternative, the four common projects, and high rate treatment facilities, off-line CSO storage tanks, and parallel interceptors.

- Alternative 1 - CSO storage tanks along the Wabash River and Durkee's Run
- Alternative 2 - CSO storage tanks along the Wabash River and a parallel interceptor along Durkee's Run
- Alternative 3 - High-rate treatment facilities at CSO 001 and near the WWTP with storage tanks along the Wabash River and a parallel interceptor along Durkee's Run

Each of these three integrated CSO control alternatives will include floatable controls at each remaining CSO outfall. These three integrated CSO control alternatives at each level of control are discussed in the next section.

CSO Control Alternative 1 includes the following components:

- CSO storage tanks at the following locations:
  - CSO 002
  - Between CSOs 003 and 004
  - CSO 006
  - CSO 009
  - CSO 012
- Elimination of the Parking Lot Lift Station and upgrade of the Pearl River Lift Station with conveyance from the Parking Lot Lift Station to the Pearl River Lift Station
- Force main from the Pearl River Lift Station
- Extension of the Railroad Corridor Sewers from Columbia Street to the Pearl River Lift Station
- Parallel Throttle Pipes at CSOs 010 and 015

As the desired level of control for the alternative increased, different components of the alternative were modified. For example at greater levels of control a CSO storage tank was needed near CSO 007.

CSO Control Alternative 2 includes the following components:

- CSO storage tanks at the following locations:
  - CSO 002
  - Between CSOs 003 and 004
  - CSO 006
  - CSO 009
- Elimination of the Parking Lot Lift Station and upgrade of the Pearl River Lift Station with conveyance from the Parking Lot Lift Station to the Pearl River Lift Station
- Force main from the Pearl River Lift Station
- Extension of the Railroad Corridor Sewers from Columbia Street to the Pearl River Lift Station
- Parallel Interceptor along Durkee's Run
- Parallel Throttle Pipes at CSOs 010 and 015

As the desired level of control for the alternative increased, different components of the alternative were modified. For example at greater levels of control a CSO storage tank was needed near CSO 007.

CSO Control Alternative 3 includes the following components:

- High rate treatment facilities at the following locations:
  - CSO 001
  - Near WWTP
- CSO storage tanks at the following locations:
  - Between CSOs 003 and 004
  - CSO 006

- Elimination of the Parking Lot Lift Station and upgrade of the Pearl River Lift Station with conveyance from the Parking Lot Lift Station to the Pearl River Lift Station
- Force main from the Pearl River Lift Station
- Extension of the Railroad Corridor Sewers from Columbia Street to the Pearl River Lift Station
- Parallel interceptor along Durkee's Run
- Parallel throttle pipes at CSOs 010 and 015

As the desired level of control for the alternative increased, different components of the CSO control alternative were modified. For example at greater levels of control a CSO storage tank was needed near CSO 012.

Once each integrated CSO control alternative was developed, analysis of each alternative at different sized design storms was completed using the calibrated SWMM collection system model developed for Lafayette's *SR CER*. Each alternative at each level of control is discussed in the next section.

### **3.5 Analysis of Integrated CSO Control Alternatives**

In 1996, Greeley and Hansen prepared *Amendment No. 1 to the Wastewater Treatment Plant and Collection System Facilities Plan* for the City of West Lafayette. In that report, seven typical design storms were developed for the West Lafayette CSO control analysis based on hourly precipitation data from the National Climatic Data Center (NCDC) from 1953 – 1994 from a gage located in West Lafayette. These same design storms were used for the City of Lafayette during the development of Lafayette's *SR CER*.

New design storms were created during the development of Lafayette's *Combined Sewer Overflow Long Term Control Plan (LTCP)*. During the evaluation of CSO, storm water, and non-point source pollutant loads on the Wabash River in the vicinity in Lafayette (as discussed in Chapter 4 of this report) a "typical" year of rainfall was developed based on hourly precipitation data from the NCDC from 1949 – 2001 from the gage located in West Lafayette. Since additional historical data was available since the creation of the seven

design storms in 1996, new design storms were created from this data to obtain a wider range of storms than previously used. Having a wider range of design storms meant having a wider range of levels of control that could be used in the analysis of CSO control for each integrated alternative. This wider range of levels of control was designed to correspond to the range of estimated overflow events per year as described in Chapter 3 of EPA's 1995 *Combined Sewer Overflows: Guidance for Long-Term Control Plan*.

The rainfall hyetograph (bar graph of rainfall amount versus elapsed time) for each design storm is shown on Figures 3.5-1A through K. The data for the rainfall hyetographs for each design storm, shown in Table 3.5-1, was used to define the duration, the average total rainfall, the maximum one-hour intensity, and the number of hours into the storm when the peak (maximum intensity) occurred. These storm characteristics are shown in Table 3.5-2. The typical design storm hyetographs were used as input to the calibrated SWMM collection system model to estimate the overflow volume for each CSO structure for each design storm.

The SWMM model was used to size the integrated CSO control alternatives. Initially, peak flow rates and overflow volumes were determined for the typical design storms as shown below. These storms were designed using the rainfall return frequencies that correspond to the ranges of estimated overflow events per year in accordance with EPA's 1995 *CSO Guidance*. Ultimately, these design storms were used at the different levels of control during evaluation of the integrated CSO control alternatives.

<i>Design Storm</i>	<i>Rainfall (inches)</i>	<i>Duration (hours)</i>	<i>Return Frequency</i>	<i>Estimated Overflow Events Per Year</i>
D	0.48	7.0	2 week	24
E	0.81	10.0	1 month	12
F	1.13	11.0	2 month	6
G	1.38	13.0	3 month	4
H	1.85	15.0	6 month	2
J	2.82	20.0	2 year	0.5

Sewers, lift stations, storage tanks, and treatment facilities for each of the integrated CSO control alternatives were then sized to eliminate overflows and handle the peak flow rates generated for each of the level of control design storms. In addition, for each of the integrated CSO control alternatives, storage facilities were sized to handle the overflow volumes generated by each of the level of control design storms. Once the components of the CSO control alternatives were developed for these variously sized design storms, each design storm was run through the model to make certain no overflows occurred.

### **3.5.1 Potential Sites for CSO Control**

With each increase in storm size, the size of each CSO control facility increases, in particular, CSO storage tanks and high rate treatment facilities. Potential sites for each facility were evaluated to determine if the facility could fit on the site.

During this analysis it was discovered that there were tank size limitations at specific sites for the higher levels of control. For example, each integrated CSO control alternative proposes that an underground CSO storage tank be located between CSOs 003 and 004. The area of land in this proposed location is only large enough to fit an underground tank sized to store approximately 2.0 million gallons (MG) of wastewater, as shown on Figure 3.5-2, which is inadequate at higher levels of control. As another example, each CSO control alternative proposes that an underground CSO storage tank be located near CSO 006. However, the area of land in this proposed location is only large enough to fit an underground tank sized to store approximately 4.2 million gallons (MG) of wastewater, as shown on Figure 3.5-3, which is inadequate at higher levels of control. As a further example, CSO Control Alternative 1 proposes that an underground CSO storage tank be located near CSO 012. However, the area of land in this proposed location is only large enough to fit an underground tank sized to store approximately 6.0 million gallons (MG) of wastewater, as shown on Figure 3.5-4, which is inadequate at higher levels of control.

The land areas near CSO 002 and CSO 009 are large enough to provide adequate space for either a CSO storage tank or a high rate treatment facility as indicated in each of the alternative descriptions listed in Section 3.4.1.3 of this report. Aerial photographs depicting the areas around CSOs 001/002 and 009 are shown on Figures 3.5-5 and 3.5-6, respectively.

Details of each alternative for each level of control, including required sizes of each CSO control technology used in each alternative, are included in Table 3.5-3. Layouts of each alternative for each level of control are shown on Figures 3.5-7 through 3.5-22.

Once the integrated CSO control analysis was complete, each alternative was evaluated for the recommended plan based on the following:

- Annual percent in overflow volume reduction and annual percent in overflow occurrence reduction estimated from collection system model,
- Overall cost comparison of the alternative projects sized to capture and treat different size typical design storms, and
- Cost-performance curve to show relationship of level of CSO control to present worth cost and hours of exceedance of the *E. coli* Water Quality Standard.

### **3.6 End of Pipe Performance**

#### **3.6.1 Typical Year Rainfall**

EPA's CSO Guidance recommends that CSO control alternatives be evaluated based on continuous simulation of the collection system and river models to evaluate conditions in an average year (EPA, 1999). A typical year analysis was conducted for the City of Lafayette. After investigating annual and summer rainfall and stream flow conditions for 53 years of data (1949 – 2001), the calendar year 1968 was selected to represent the “typical” year. This year has five back-to-back rainfall events of at least 0.5 inches per storm that occurred during the summer period, which is an important factor when evaluating storage versus treatment alternatives. Table 3.6-1 shows the statistics for 1968 and comparisons to the annual and summer historical averages. The typical year analysis is presented in Appendix B.

### **3.6.2 Continuous Simulation**

The typical year rainfall was entered into the SWMM model and used to simulate base conditions at 1-hour rainfall intervals to obtain accurate overflow volume, frequency, and duration of the CSO discharges. The SWMM model base conditions run took approximately 72 hours to run, and produced large amounts of data to be processed. It was estimated it would take approximately 5 months to use the SWMM model to complete the continuous simulation evaluation of all 18 alternatives.

The base conditions SWMM model was also run using level of control storms as input. The volume, frequency, and duration of the CSOs for each level of control storm were exported from the SWMM model. This data was then inputted into a simple spreadsheet continuous simulation model, which computed the typical year annual overflow volume and frequency. The simple spreadsheet model uses actual SWMM model results for a range of storm events to calculate each storm event CSO volume and duration. Using an interpolation of the SWMM model results, the volume and duration for each CSO is calculated for each storm event during the typical year. A tabulation of the storm events that caused overflows is summed to calculate frequency of each overflow for the typical year. Similarly, the volume calculated for each event of the typical year is summed to get annual overflow volume.

Table 3.6-2 shows a comparison of the typical year SWMM model continuous simulation and the typical year simple spreadsheet model continuous simulation. It shows that there is only a two percent difference in volume and frequency between the two typical year models, with the simple spreadsheet model being more conservative on volume. Since the results from both models were within 2%, the run time of the SWMM continuous simulation model was extremely long, and the data generated by the SWMM continuous simulation model was immense, the simple spreadsheet model was chosen to perform the alternative analysis.

### **3.6.3 Estimated Annual Overflow Volume and Frequency**

SWMM models were created for each of the Alternatives 1, 2 and 3 for the various levels of control. The integrated alternatives for each level of control were constructed in the

SWMM model so that the peak flow rate was captured, conveyed, or treated, without causing an overflow event at that level of control. This process was repeated until all 18 alternative models were created. Each alternative model sized for each level control was then run with each design storm to determine the performance of each alternative over a range of storm event sizes. The volume and duration of for each CSO was then exported from the SWMM model from each model run to create a model result matrix. Tables 3.6-3 through 3.6-20 present the matrices created for each alternative for input into the simple spreadsheet model. Data from these matrices were input into the simple spreadsheet continuous model to calculate the annual overflow volume and frequency for the typical year 1968. The process was repeated for each integrated alternative at each level of control for all 18 alternatives.

Tables 3.6-21 and 3.6-22 show the estimated average annual overflow volume and frequency, respectively, for each CSO for Alternatives 1, 2 and 3. The volumes, frequencies, and percent captures are summarized as follows:

<b>Alternative 1 - Storage</b>			
<b>Item</b>	<b>Estimated Annual Overflow Volume (MG)</b>	<b>Estimated Maximum Overflow Frequency</b>	<b>Percent Capture (%)</b>
Base	952	96	54
<b>Phase 1 - Common Technologies</b>	757	96	63
<b>Phase 2</b>			
Storm D	442	19	79
Storm E	292	13	86
Storm F	180	7	91
Storm G	135	4	93

<b>Alternative 2 - Conveyance</b>			
<b>Item</b>	<b>Estimated Annual Overflow Volume (MG)</b>	<b>Estimated Maximum Overflow Frequency</b>	<b>Percent Capture (%)</b>
Base	952	96	54
<b>Phase 1 - Common Technologies</b>	757	96	63
<b>Phase 2</b>			
Storm D	413	19	80
Storm E	297	13	86
Storm F	180	7	91
Storm G	126	4	94
Storm H	84	2	96
Storm J	31	1	99

<b>Alternative 3 - High Rate Treatment</b>			
<b>Item</b>	<b>Estimated Annual Overflow Volume (MG)</b>	<b>Estimated Maximum Overflow Frequency</b>	<b>Percent Capture (%)</b>
Base	952	96	54
<b>Phase 1 - Common Technologies</b>	757	96	63
<b>Phase 2</b>			
Storm D	314	19	85
Storm E	169	13	92
Storm F	84	7	96
Storm G	53	4	97
Storm H	37	2	98
Storm J	14	1	99

The percent capture is defined as the volume of combined sewage treated during wet weather on a system wide annual average basis divided by the total volume of the combined sewage collected in the combined sewer system during wet weather on a system wide annual average basis. The equation is as follows:

$$\% \text{ Capture} = \frac{\text{Total System Volume} - \text{CSO Volume}}{\text{Total System Volume}}$$

From the above tables, the following observations can be made:

- Approximately 63% of the volume is captured with the Phase I – Common Technologies.
- A significant increase in percent capture is shown between Phase I and Storm D from 63% to 79 – 85% capture, a 16 to 22% increase.
- The maximum overflow frequency is equivalent with all three alternatives
- The largest increase in percent capture occurs between Storms D and E, ranging between 6 and 7%.
- Alternative 3 has the lowest estimated annual overflow volume.

### **3.7 Comparative Cost Analysis**

Table 3.7-1 shows the summary of the capital cost for each alternative for each integrated CSO control alternative for each level of control (different size storms). Estimated capital cost for sewer separation is shown at the bottom of the table. The costs included in the table are Phase II cost estimates. The total capital cost for the LTCP would include the Phase I cost of \$108,950,000.

Alternative 1 cannot be sized to treat all six storms. The size of the storage tank at Durkee’s Run required for Storms H and J exceeds the space available at the CSO treatment site. Alternative 2 can treat the entire range of design storms. For Storms H and J, Alternative 2 combines with Alternative 1 to provide both an interceptor and storage along Durkee’s Run. Alternative 3 can also treat the entire range of storms, using both an interceptor and storage along Durkee’s Run.

Tables 3.7-2 through 3.7-7 show the breakdown of capital and annual cost estimates for the various alternatives for different size design storms. The capital cost includes construction, construction contingency, and engineering, legal and administrative costs. The construction cost was estimated based on the size and capacity of the various facilities from the SWMM model and on the unit costs and cost equations in Appendix C – Basis of Cost Estimates. The annual operating and maintenance costs are based on the unit costs and percentage of construction cost as shown in Table 4 of Appendix C – Basis of Cost Estimates.

The capital and operating and maintenance cost for each alternative for the various levels of control were estimated and the net present worth was calculated to compare alternatives. The total present worth was calculated using the following assumptions:

- 20 return period,
- Inflation rate of 3% per year, and
- Interest rate of 7% per year.

Table 3.7-8 shows a summary of the total present worth for each alternative for the various levels of control.

From the cost comparison the following observations are made:

- Overall, Alternative 2 is the most costly alternative.
- Vortex separators are the least cost effective of the high rate treatment options.
- For all the storms, the net present worth for Alternative 3 - Enhanced High Rate Clarification and Sedimentation Basin are approximately equal, within 5%. The present worth for these two alternatives are less than all the other alternatives for Storms E through Storm J.

### **3.8 Updated Alternative Evaluation**

In September 2007, the City of Lafayette entered into an Agreed Judgment with the Indiana Department of Environmental Management, which requires the City to revise this CSO LTCP (submitted May 12, 2005) to comply with the technology based and water quality based requirements of the Clean Water Act, State law and regulation, and the City's NPDES permit. As part of this requirement, the City evaluated additional alternatives at different design storms, including the 1 year/1 hour and 10 year/1 hour design storms. Details of this additional evaluation are included in the following sections.

### 3.8.1 One Year/One Hour Storm Evaluation

As shown on Figure 4.7-1 (the “knee-of-the-curve”), the level of control using the G design storm results in 4 (four) overflows per year. This is not the “knee-of-the-curve”, but it is thought from previous experience with state and federal regulatory agencies to be an acceptable level of control to meet the Presumptive Approach. Therefore, alternative 2 using the G level of control (Figure 3.5-17) was used as a starting point for alternative analysis with the 1 year/1 hour and 10 year/1 hour design storms.

IDEM’s Nonrule Policy Document titled “CSO Treatment Facilities” (October 29, 2007) provides guidance and design criteria for sizing of CSO treatment facilities. This document states storage facilities must capture flows from storms no smaller than the 1 year/1hour and then to provide transport for the entire storage volume to the WWTP for full treatment. For flows generated during storms no smaller than the 10 year/1 hour, treatment, including disinfection, is required.

When evaluating this alternative (Alternative A), the storage facilities along the Wabash River (near CSOs 001, 006, and 009) were sized to completely capture the 1 year/1 hour storm. Since it was not feasible to locate storage facilities along Durkee’s run, only a parallel interceptor, the interceptor was sized to convey all flow from Durkee’s Run’s outfalls; CSOs 012, 011, 010, and 015, to the CSO 009 treatment facility near the WWTP for full treatment during the 10 year/1 hour storm. The 1 year/1 hour and 10 year/1 hour storms were run and these adjustments were made to the calibrated SWMM model that was used during the original CSO LTCP development.

An updated figure (Figure 3.8-1) with adjusted tank volumes and interceptor sizes follows. Below is a summary of all the changes between the original alternative 2 with the G level of control and Alternative A for the 1 year/1 hour and 10 year/1 hour level of control:

- The storage facility near CSO 002 was moved to CSO 001 and increased from 4.94 MG to 9.7 MG,
- The conveyance sewer from CSO 001 to CSO 002 was eliminated,

- The storage facility between CSOs 003 and 004 was eliminated and replaced with a 1.4 MG storage tunnel,
- The conveyance sewer between the Parking Lot Lift Station and the Pearl River Lift Station was increased from 72-inch to 120-inch tunnel and extended up to CSO 003,
- The storage facility near CSO 006 was increased from 4.24 MG to 9.9 MG,
- The storage facility near CSO 007 was eliminated and replaced with a 72-inch conveyance sewer from CSO 007 to the storage facility near CSO 006 to minimize the number of disinfection facilities,
- The parallel interceptor along Durkee’s Run was increased from 54-inch to 96-inch, and
- The storage facility near CSO 009 was increased from 10.12 MG to 12.6 MG.

Since the storage facilities were sized for the 1 year/1 hour storm and the parallel interceptor along Durkee’s Run was sized for the 10 year/1 hour, there were 0 (zero) overflows for the 1 year/1 hour storm and only 3 (three) for the 10 year/1 hour storm, as listed in the table below:

<i>CSO</i>	<i>CSO Volume (MG) during 10 year/1 hour storm</i>	<i>Peak Flow of CSO (MGD) during 10 year/1 hour storm</i>
001	4.70	50.70
006	8.70	217.00
009	6.90	56.40

As discussed above, there are significant differences in storage facility sizes and sewers between the G level of control and the 1 year/1 hour and 10 year/1 hour storms. The main reason is the volume and intensity differences between the storms. The storms are more intense and the 10 year/1 hour is significantly larger in volume than the G storm, as summarized below:

<i>Storm</i>	<i>Volume (inches)</i>	<i>Duration (hr)</i>
G	1.38	13
1 year/1 hour	1.24	1
10 year/1 hour	2.10	1

Since there are significant differences between the original alternative 2 and the alternative discussed above, there are several challenges that will need to be further evaluated to consider this a viable alternative. Some of these challenges include:

- Finding a location large enough for the 9.9 MG storage facility near CSO 006. Original evaluation indicated a site constraint where only a 4.2 MG volume by 15 ft. deep facility could fit. Recent developments indicate that the site where the paper factory may be a possibility, however, further investigation and research need to be conducted.
- The peak flow of CSO 006 is approximately 217 MGD. The IDEM Nonrule Policy document states that flows generated by a 10 year/1 hour storm need to be disinfected. The size and complexity of a facility capable of disinfecting flows up to 127 MGD pose a challenge.

The next step was to perform a cost estimate of this alternative to compare with the updated alternative evaluations, which are included below.

### **3.8.2 Additional Alternatives**

In addition to evaluating Alternative A using the 1 year/1 hour storm, the G design storm was used along with the F design storm, which is approximately 7 (seven) overflows per year and the H design storm, which is approximately 2 (two) overflows per year. These three design storms were run through Alternative A. Alternative A basically consists of storage facilities at CSOs 001, 006, and 009 and a parallel interceptor along the existing Durkee's Run interceptor. Components of this alternative were sized so that no overflows would occur for each design storm. A comparison of the major components of each alternative is summarized in the table below and shown in Figures 3.8-1 through 3.8-4:

<b>ALTERNATIVE A</b>						
<i>Design Storm</i>	<i>Rainfall (inches)</i>	<i>Storm Duration (hours)</i>	<i>CSO Storage Facility Volume (MG)</i>			<i>Durkee's Run Interceptor Diameter (in.)</i>
			<i>CSO 001</i>	<i>CSO 006</i>	<i>CSO 009</i>	
1 year/1 hour	1.24	1	9.7	9.9	12.6	96
F	1.13	11	4.6	3.1	11.0	42
G	1.38	13	5.9	5.3	13.8	48
H	1.85	15	8.4	8.4	20.3	54

In addition to evaluating Alternative A another alternative, Alternative B, was developed that varied slightly from Alternative A. The difference between Alternative A and Alternative B is that a storage facility at the upstream end of Durkee's Run (near CSOs 011 and 012) replaced the parallel interceptor along Durkee's Run. Components of this alternative were sized so that no overflows would occur for the three design storms discussed above and the 1 year/1 hour storm. A comparison of the major components of each alternative is summarized in the table below and shown in the attached Figures 3.8-5 through 3.8-8:

<b>ALTERNATIVE B</b>						
<i>Design Storm</i>	<i>Rainfall (inches)</i>	<i>Storm Duration (hours)</i>	<i>CSO Storage Facility Volume (MG)</i>			<i>Durkee's Run CSOs 011/012</i>
			<i>CSO 001</i>	<i>CSO 006</i>	<i>CSO 009</i>	
1 year/1 hour	1.24	1	9.3	9.9	7.8	5.9
F	1.13	11	4.6	3.1	10.3	2.5
G	1.38	13	5.9	5.3	12.3	3.5
H	1.85	15	8.4	8.3	15.0	5.1

Preliminary cost estimates have been prepared for each of the two alternatives at the four different levels of control. An additional option for each of the levels of control has been included in the cost estimate. This option is to have a high-rate treatment facility at CSO 009 instead of the CSO storage facility. The costs are included in the table below:

<i>Design Storm</i>	<b>ALTERNATIVE A</b>		<b>ALTERNATIVE B</b>	
	<i>Capital Cost</i>	<i>Capital Cost with Option</i>	<i>Capital Cost</i>	<i>Capital Cost with Option</i>
1 year/1 hour	\$270,922,000	\$262,973,000	\$257,819,000	\$213,400,000
F	\$184,870,000	\$154,080,000	\$199,371,000	\$158,716,894
G	\$215,291,000	\$179,091,000	\$234,546,000	\$185,433,037
H	\$281,146,000	\$227,838,000	\$309,497,000	\$237,675,300

The next step in this alternative evaluation process is to conduct the typical year analysis (continuous simulation). The typical year will be run through each alternative to determine the annual overflow volume and frequency. This typical year analysis data will then be used for the water quality river model. With the data from the water quality river model, a “knee-of-the-curve” can be developed.

### **3.9 References**

United States Environmental Protection Agency (EPA). Combined Sewer Overflows Guidance For Long-Term Control Plans. Office of Water. EPA 832-B-95-002. September 1995.

City of Lafayette. Stream Reach Characterization and Evaluation Report. Greeley and Hansen and Limno-Tech, Inc. 2004.

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**Table 3.2-1  
Annual Average Overflows - Base Conditions**

Greeley and Hansen  
May 2005

<i>Annual Average Overflows (Typical Year)</i>														
<i>Receiving Stream</i>	<i>Wabash River</i>								<i>Durkee's Run Ditch</i>				<i>Elliot Ditch</i>	
<i>CSO Number</i>	<i>001</i>	<i>002</i>	<i>003</i>	<i>004</i>	<i>006</i>	<i>007</i>	<i>008</i>	<i>009</i>	<i>010</i>	<i>011</i>	<i>012</i>	<i>015</i>	<i>017</i>	<i>Total</i>
Total Volume (MG)	248	99	141	77	33	55	11	151	6	10	111	1	7	952
# of Overflow Events	96	96	96	96	96	96	96	96	96	96	96	19	38	96

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**Table 3.3-1  
Annual Average Overflows - Phase I Improvements**

Greeley and Hansen  
May 2005

<i>Annual Average Overflows (Typical Year)</i>														
<i>Receiving Stream</i>	<i>Wabash River</i>								<i>Durkee's Run Ditch</i>				<i>Elliot Ditch</i>	
<i>CSO Number</i>	<i>001</i>	<i>002</i>	<i>003</i>	<i>004</i>	<i>006</i>	<i>007</i>	<i>008</i>	<i>009</i>	<i>010</i>	<i>011</i>	<i>012</i>	<i>015</i>	<i>017</i>	<i>Total</i>
Total Volume (MG)	251	99	141	77	33	28	0	3	6	10	109	1	0	757
# of Overflow Events	96	96	96	96	96	28	0	7	96	96	96	19	0	96

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**Table 3.4-1  
CSO Control Technologies Matrix**

Greeley and Hansen  
May 2005

TECHNOLOGIES	ENVIRONMENTAL IMPACTS AND IMPROVEMENTS							IMPLEMENTATION AND OPERATION FACTORS
	CSO Volume Reduction	Light Solids Reduction	Heavy Solids Reduction	Soluble Reduction <sup>(1)</sup>	Bacteria Reduction	Floatables Reduction	Other	
<b>SOURCE CONTROL TECHNOLOGIES</b>								
<i>Stormwater Management</i>								
Wet Storage Ponds	yes	yes	yes	no	no	yes		Siting, land requirements make location selection difficult; low cost solution; if stormwater is discharged to the river, bacteria is at a lower concentration
Dry Storage Ponds	yes	yes	yes	no	no	yes		Siting, land requirements make location selection difficult; low cost solution; if stormwater is discharged to the river, bacteria is at a lower concentration
Wetlands Treatment	yes	yes	yes	yes	yes	yes		Siting, land requirements make location selection difficult; low cost solution; expensive if influent pumping is required
Sump Pump Disconnect Program	yes	no	no	no	no	no		Sump pumps are connected to combined sewers in some old neighborhoods; cost to homeowner; interaction with homeowners required
Catch Basin Cleaning	no	yes	yes	no	no	yes		Labor intensive; specialized equipment required
Illicit Connection Control	no	yes	yes	no	no	yes		City removed some illicit connections
Roof Leader Disconnect Program	yes	no	no	no	no	no		Rrainleaders are connected to combined sewers in some old neighborhods; cost to homeowner; interaction with homeowners required
Leaching Catch Basins (Dry Wells)	yes	yes	yes	yes	yes	yes		Limited by potential for contaminating ground water; required for parking lots of new developments
Swales & Filter Strips	yes	yes	yes	yes	yes	yes		Limited by potential for contaminating ground water; good BMP; low operational cost
Porous Pavement	yes	yes	no	yes	yes	no		Not durable; clogs in winter; oil and grease will clog; high maintenance and related costs
Parking Lot Storage	yes	yes	yes	no	no	yes		Limited by potential for lot and yard flooding; freezing potential; low operational cost; ex. Skokie and Wilmette, IL
Street Storage (Catch Basin Inlet Control)	yes	yes	yes	no	no	yes		Limited by potential for pedestrians getting their feet wet; freezing potential; low operational cost; ex. Evanston, IL
"Green Solutions" Landscaped Infiltration	yes	yes	yes	yes	yes	yes		Siting, land requirements make location selection difficult; low cost solution; improves aesthetics

<sup>(1)</sup> Soluble organics and toxic compound reduction

TECHNOLOGIES	ENVIRONMENTAL IMPACTS AND IMPROVEMENTS							IMPLEMENTATION AND OPERATION FACTORS
	CSO Volume Reduction	Light Solids Reduction	Heavy Solids Reduction	Soluble Reduction <sup>(1)</sup>	Bacteria Reduction	Floatables Reduction	Other	
<b>SOURCE CONTROL TECHNOLOGIES (continued)</b>								
<i>Solid Waste Collection/Disposal</i>								
Illegal Dumping Control	no	no	yes	no	no	yes		Aggressive City recycling program
Solid Waste Program	no	no	no	no	no	yes		Ongoing City commitment
Hazardous Waste Collection	no	no	no	no	no	no	Toxics Removal	Disposal through existing solid waste district
<i>Public Education</i>								
Water Conservation	yes	no	no	no	no	no		Coordination with Water Department required
Catch Basin Stenciling	no	no	no	no	no	yes	Toxics Reduction	Ongoing City commitment
Community Cleanup Program	no	no	no	no	no	yes		Inexpensive; sense of community spirit; educational BMP; aesthetic enhancement
Public Education Programs	--	--	--	--	--	--	--	Ongoing City commitment
Recycling Programs	no	no	no	no	no	yes	Toxics Reduction	Ongoing City commitment
Warning Signage	no	no	no	no	no	no		CSO Public Notification Program; low O&M costs

<sup>(1)</sup> Soluble organics and toxic compound reduction

TECHNOLOGIES	ENVIRONMENTAL IMPACTS AND IMPROVEMENTS							IMPLEMENTATION AND OPERATION FACTORS
	CSO Volume Reduction	Light Solids Reduction	Heavy Solids Reduction	Soluble Reduction <sup>(1)</sup>	Bacteria Reduction	Floatables Reduction	Other	
<b>SOURCE CONTROL TECHNOLOGIES (continued)</b>								
<i>Construction Related</i>								
Onsite Erosion Control/ New Construction	no	no	yes	no	no	no		Contractor/owner pays for erosion control; low City O&M; reduces clogging of catch basin; reduces sediment and silt loads to stream; enforcement
Soil Stabilization Measures	no	no	yes	no	no	no		Construction associated; ongoing; in Building Code; reduces silt loads to stream; enforcement
Stabilized Construction Entrance	no	no	yes	no	no	no		Ongoing; in Building Code and related City construction projects specifications; enforcement
<i>Good Housekeeping</i>								
Industrial Spill Control	no	no	no	no	no	no	Toxics Reduction	On-going Pretreatment Program regulated by State and City
Street Sweeping Programs	no	no	yes	no	no	yes		Does not address flow or bacteria
Litter Ordinance Enforcement	no	no	no	no	no	yes		Aesthetic enhancement; labor intensive
<i>Miscellaneous</i>								
Industrial Pretreatment Program	no	no	no	no	no	no	Toxics Reduction	Ongoing Industrial Pretreatment Program
Streambank Stabilization/Restoration	no	no	yes	no	no	no		On-going program; aesthetic enhancement; streambank restoration; canopy growth provides cool temps; blocks U.V.; reduces Greenway O&M
Septic Tank Improvements/ Barrett Law	no	no	no	no	yes	no		Important for bacteria reduction in localized areas and streams during dry weather periods

<sup>(1)</sup> Soluble organics and toxic compound reduction

TECHNOLOGIES	ENVIRONMENTAL IMPACTS AND IMPROVEMENTS							IMPLEMENTATION AND OPERATION FACTORS
	CSO Volume Reduction	Light Solids Reduction	Heavy Solids Reduction	Soluble Reduction <sup>(1)</sup>	Bacteria Reduction	Floatables Reduction	Other	
<b>STORAGE TECHNOLOGIES</b>								
<i>Storage Before Sewer</i>								
Industrial Discharge Detention	yes	yes	yes	no	no	yes	Toxics Reduction	Industry to hold stormwater or combined sewage until after the storm; ex. New Energy
Wet Storage Ponds	yes	yes	yes	no	no	yes		Siting, land requirements make location selection difficult; low cost solution; stormwater is discharged to the river, bacteria is at a lower concentration
Dry Storage Ponds	yes	yes	yes	no	no	yes		Siting, land requirements make location selection difficult; low cost solution; stormwater is discharged to the river, bacteria is at a lower concentration
<i>Storage in Sewer System</i>								
In-line Storage – Interceptor	yes	yes	yes	no	no	yes		Increases O&M costs; increases potential for basement flooding; maximizes use of existing facilities; interceptors have very little wet weather capacity
In-line Storage – Trunk Sewer	yes	yes	yes	yes	yes	yes		Increases O&M costs; increases potential for basement flooding; maximizes use of existing facilities
<i>Off-line Storage</i>								
Tunnels	yes	yes	yes	yes	yes	yes		Eliminates land restrictions and costs associated with storage basins; can provide large storage volumes with relatively minimal disturbance to ground surface - beneficial in congested urban areas; takes advantage of uneven distribution of rainfall; use as conveyance; higher cost than open storage
Off-line Covered Storage Basins/ Sedimentation Tanks	yes	yes	yes	yes	yes	yes		Includes variation of retention, detention and flow-through systems; requires large area for location of underground basin; increases O&M costs; potentially high neighborhood disturbance; cost increases with depth; ex. several Michigan CSO Projects
Off-line Open Storage Basins/ Sedimentation Tanks	yes	yes	yes	yes	yes	yes		Includes variation of retention, detention and flow-through systems; requires area for location of above-ground basin; increases O&M costs; odor issues a consideration; ex. Louisville, KY

<sup>(1)</sup> Soluble organics and toxic compound reduction

TECHNOLOGIES	ENVIRONMENTAL IMPACTS AND IMPROVEMENTS							IMPLEMENTATION AND OPERATION FACTORS
	CSO Volume Reduction	Light Solids Reduction	Heavy Solids Reduction	Soluble Reduction <sup>(1)</sup>	Bacteria Reduction	Floatables Reduction	Other	
<b>TREATMENT TECHNOLOGIES</b>								
<i>At CSO Facility</i>								
Conventional Clarification	no	yes	yes	no	no	yes		Peak loading = 1 gpm/ft <sup>2</sup> ; ex. storage/chlorine contact tanks; solids and disinfection are concerns; larger footprint than vortex separation or ballasted flocculation but easier to
High Rate Clarification	no	yes	yes	no	no	yes		Peak loading = 40 gpm/ft <sup>2</sup> ; currently being piloted in Indianapolis; ex. Actiflo, Densadeg, Microsen; high O&M costs; limited ammonia removal; smaller footprint
Vortex Separation	no	no	yes	no	no	yes		Peak loading = 10 gpm/ft <sup>2</sup> ; solids reduction varies widely; increased O&M costs; ex. Columbus, GA
Compressed Media Filtration	no	yes	yes	no	no	yes		Peak loading = 20 gpm/ft <sup>2</sup> ; 70% particle removal; limited ammonia removal; backwashing is required
Biological Treatment	no	yes	yes	yes	no	no		Higher level of treatment
Chemical Disinfection (Cl <sub>2</sub> , Br <sub>2</sub> , ClO <sub>2</sub> ) and Dechlorination	no	no	no	no	yes	no		Effective against bacteria; easily available; widely used; inexpensive; effective when solids are present; requires operator attention; long detention time and dechlorination required, creating added expense; health concerns; produces chlorinated byproducts
UV Disinfection	no	no	no	no	yes	no		Good results in Columbus, GA. Being piloted in Richmond, VA; few safety risks; less effective when suspended solids above 30 mg/l are present
Mechanical Screens	no	no	no	no	no	yes		Mechanical device requires additional O&M; weir-mounted is less expensive
Over/under Baffles	no	no	no	no	no	yes		Might have to completely rebuild CSO diversion structure
Netting Systems	no	no	no	no	no	yes		Labor intensive

<sup>(1)</sup> Soluble organics and toxic compound reduction

TECHNOLOGIES	ENVIRONMENTAL IMPACTS AND IMPROVEMENTS							IMPLEMENTATION AND OPERATION FACTORS
	CSO Volume Reduction	Light Solids Reduction	Heavy Solids Reduction	Soluble Reduction <sup>(1)</sup>	Bacteria Reduction	Floatables Reduction	Other	
<b>TREATMENT TECHNOLOGIES (continued)</b>								
<i>At Existing Treatment Facility</i>								
Maximize Flow to WWTP Plant	yes	yes	yes	yes	yes	yes		NPDES Permit requirement
Screening	no	no	no	no	no	yes		
Conventional Clarification	no	yes	yes	no	no	yes		Peak loading = 1 gpm/ft <sup>2</sup> ; ex. Storage/chlorine contact tanks; solids and disinfection a concern; larger footprint than vortex separation or ballasted flocculation but easier to
High Rate Clarification	no	yes	yes	no	no	yes		Peak loading = 40 gpm/ft <sup>2</sup> ; currently being piloted in Indianapolis; ex. Actiflo, Densadeg, Microsen; high O&M costs; limited ammonia removal; smaller footprint
Vortex Separation	no	no	yes	no	no	yes		Peak loading = 10 gpm/ft <sup>2</sup> ; solids reduction varies widely; increased O&M costs; ex. Columbus, GA
Compressed Media Filtration	no	yes	yes	no	no	yes		Peak loading = 20 gpm/ft <sup>2</sup> ; 70% particle removal; limited ammonia removal; backwashing is required
Deepbed Filtration	no	yes	yes	no	no	yes		Efficient at removing BOD, ammonia, and solids
Biological Treatment	no	yes	yes	yes	no	no		Higher level of treatment
Chemical Disinfection (Cl <sub>2</sub> , Br <sub>2</sub> , ClO <sub>2</sub> ) and Dechlorination	no	no	no	no	yes	no		Effective against bacteria; easily available; widely used; inexpensive; effective when solids are present; requires operator attention; long detention time and dechlorination required, creating added expense; health concerns; produces chlorinated byproducts
UV Disinfection	no	no	no	no	yes	no		Good results in Columbus, GA. Being piloted in Richmond, VA; few safety risks; less effective when suspended solids above 30 mg/l are present
Equalization Open Storage	yes	yes	yes	yes	yes	yes		Odors must be monitored; requires a lot of space
Equalization Closed Storage	yes	yes	yes	yes	yes	yes		Requires a lot of space

<sup>(1)</sup> Soluble organics and toxic compound reduction

TECHNOLOGIES	ENVIRONMENTAL IMPACTS AND IMPROVEMENTS							IMPLEMENTATION AND OPERATION FACTORS
	CSO Volume Reduction	Light Solids Reduction	Heavy Solids Reduction	Soluble Reduction <sup>(1)</sup>	Bacteria Reduction	Floatables Reduction	Other	
<b>COLLECTION SYSTEM CONTROLS</b>								
<i>O&amp;M / Repair</i>								
Infiltration/Inflow Reduction	yes	no	no	no	no	no		Labor intensive; reducing infiltration may have minimal impact on CSO volume due to its small magnitude compared to inflow
CSO Diversion Structure Improvement Program	yes	yes	yes	yes	yes	yes		Relatively easy to implement
Sewer System Cleaning/Flushing	yes	yes	yes	yes	yes	yes		Maximizes existing collection system; reduces first flush effect; labor intensive
Sewer/CSO Diversion Structure Maintenance	no	no	no	no	no	no		Inspection; removal of debris; increases flow to plant
Outfall Maintenance Program	no	no	no	no	no	no		Reduces stream intrusion into sewer collection system
House Lateral Repairs	yes	no	no	no	no	no		House laterals typically account for 1/2 the sewer system length and significant sources of I/I; repairs by homeowners
<i>Engineering/Structural</i>								
Real Time Control	yes	yes	yes	yes	yes	yes		Highly automated system; mechanical controls require O&M, increases potential for sewer backups; can hold overflows in more sensitive areas
Sewer Separation	yes	no	no	no	no	no		Part of most CSO LTCPs; required to correct basement backup problems; expensive; disruptive to neighborhoods; effectiveness of separation has been reassessed in recent years - increased loads of stormwater runoff pollutants (sediments, bacteria, oil, metals).
Outfall Consolidation/Relocation	no	no	no	no	no	no		Directs flow away from specific area; low operational cost; reduces permitting/monitoring; can be used in conjunction w/storage and treatment technologies

<sup>(1)</sup> Soluble organics and toxic compound reduction

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**Table 3.4-2  
CSO Control Technology Screening**

**Greeley and Hanson  
May 2005**

<b>TECHNOLOGIES</b>	<b>Eliminate</b>	<b>Consider</b>	<b>Common to All</b>	<b>REASONS/NOTES</b>
<b>COLLECTION SYSTEM CONTROLS</b>				
<i>O&amp;M / Repair</i>				
Infiltration/Inflow Reduction		X		Implemented as part of the CSO Operational Plan
CSO Diversion Structure Improvement Program		X		Implemented as part of the CSO Operational Plan
Sewer System Cleaning/Flushing		X		Implemented as part of the CSO Operational Plan
Sewer/CSO Diversion Structure Maintenance		X		Implemented as part of the CSO Operational Plan
Outfall Maintenance Program		X		City is currently implementing flap gates at two CSOs (CSOs 006 and CSO 007)
House Lateral Repairs		X		Repairs are made by homeowners
<i>Engineering/Structural</i>				
Real Time Control		X		RTC not feasible with in-line storage. Consider RTC for Parking Lot lift station upgrade.
Sewer Separation		X		Only need approximately 1500 feet of storm sewer to separate CSO Area 015. Consider separation in other small areas
Outfall Consolidation/Relocation		X		By YMCA: CSOs 011, 012, and 015 and CSOs 001 and 002.

TECHNOLOGIES	Eliminate	Consider	Common to All	REASONS/NOTES
<b>STORAGE TECHNOLOGIES</b>				
<i>Storage Before Sewer</i>				
Industrial Discharge Detention		X		Staley's North Plant - yard drain goes into combined sewer
Wet Storage Ponds	X			Adequate space unavailable out in collection system
Dry Storage Ponds	X			Adequate space unavailable out in collection system
<i>Storage in Sewer System</i>				
In-line Storage – Interceptor	X			Evaluation of the collection system indicated in-line storage is not feasible for the City.
In-line Storage – Trunk Sewer	X			Evaluation of the collection system indicated in-line storage is not feasible for the City.
<i>Off-Line Storage</i>				
Tunnels or Storage Conduits		X		Consider existing storm sewer in the Railroad Corridor as storage tunnel.
Off-line Covered Storage Basins/Sedimentation Tanks		X		Under Skate Park by CSO 002 and by YMCA.
Off-line Open Storage Basins/Sedimentation Tanks		X		Consideration for remote site near WWTP

TECHNOLOGIES	Eliminate	Consider	Common to All	REASONS/NOTES
<b>TREATMENT TECHNOLOGIES</b>				
<i>At CSO Facility</i>				
Conventional Clarification	X			Adequate space unavailable out in collection system
High Rate Clarification		X		Consider at a site near WWTP
Vortex Separation		X		Consider near CSO 001
Compressed Media Filtration		X		Consider near CSO 001
Biological Treatment		X		Consider near CSO 001
Chemical Disinfection (Cl <sub>2</sub> , Br <sub>2</sub> , ClO <sub>2</sub> ) &		X		Consider near CSO 001
UV Disinfection		X		Consider near CSO 001
Mechanical Screens		X		Consider near CSO 001
Over/under Baffles		X		Consider near CSO 001
Netting Systems	X			Eliminate due to high maintenance costs.

TECHNOLOGIES	Eliminate	Consider	Common to All	REASONS/NOTES
<b>TREATMENT TECHNOLOGIES (continued)</b>				
<i>At Existing Treatment Facility</i>				
Maximize Flow through Treatment Plant			X	Consider additional force main from Parking Lot Lift Station to WWTP or parallel interceptor
Screening		X		Note 1
Conventional Clarification	X			Note 1
High Rate Clarification		X		Note 1
Vortex Separation		X		Note 1
Compressed Media Filtration		X		Note 1
Deepbed Filtration		X		Note 1
Biological Treatment		X		Note 1
Chemical Disinfection (Cl <sub>2</sub> , Br <sub>2</sub> , ClO <sub>2</sub> ) &		X		Note 1
UV Disinfection		X		Note 1
Equalization Open Storage		X		Note 1
Equalization Closed Storage		X		Note 1
Note 1: WWTP has greater capacity than what is conveyed to the WWTP through the interceptor. Higher levels of CSO control may include alternatives that convey flow to the WWTP greater than 52 MGD.				

TECHNOLOGIES	Eliminate	Consider	Common to All	REASONS/NOTES
<b>SOURCE CONTROL TECHNOLOGIES</b>				
<i>Stormwater Management</i>				
Wet Storage Ponds	X			Adequate space unavailable out in collection system
Dry Storage Ponds	X			Adequate space unavailable out in collection system
Wetlands Treatment	X			Adequate space unavailable out in collection system
Sump Pump Disconnect Program			X	Implemented as part of the CSO Operational Plan
Catch Basin Cleaning			X	Implemented as part of the CSO Operational Plan
Illicit Connection Control			X	Implemented as part of the CSO Operational Plan
Roof Leader Disconnect Program			X	Implemented as part of the CSO Operational Plan
Leaching Catch Basins (Dry Wells)	X			Not feasible for Lafayette geology
Swales & Filter Strips		X		Consider in new additions
Porous Pavement	X			Not feasible for Lafayette. Freezing is a concern.
Parking Lot Storage			X	In ordinance
Street Storage (Catch Basin Inlet Control)	X			Not an acceptable alternative for public
"Green Solutions" Landscaped Infiltration	X			Not feasible for Lafayette.

TECHNOLOGIES	Eliminate	Consider	Common to All	REASONS/NOTES
<b>SOURCE CONTROL TECHNOLOGIES (continued)</b>				
<i>Solid Waste Collection/Disposal</i>				
Illegal Dumping Control			X	Aggressive City recycling program
Solid Waste Program			X	Ongoing City commitment
Hazardous Waste Collection			X	Disposal through existing solid waste district
<i>Public Education</i>				
Water Conservation			X	Coordination with Water Department required
Catch Basin Stenciling			X	Ongoing City commitment
Community Cleanup Program			X	
Recycling Programs			X	Ongoing City commitment
Animal Waste Management			X	
Lawn & Garden Maintenance			X	City conducts leaf/shrub pick-up
Adopt-a-River			X	"Detrash the Wabash" Program
Warning Signage			X	At all CSOs, CSO Public Notification Program

TECHNOLOGIES	Eliminate	Consider	Common to All	REASONS/NOTES
<b>SOURCE CONTROL TECHNOLOGIES (continued)</b>				
<i>Construction Related</i>				
Onsite Erosion Control/ New Construction			X	Required as part of Phase 2 Stormwater
Soil Stabilization Measures			X	Required as part of Phase 2 Stormwater
Stabilized Construction Entrance			X	Required as part of Phase 2 Stormwater
<i>Good Housekeeping</i>				
Industrial Storage/ Loading/Unloading Areas			X	Implemented as part of the Pretreatment Program
Industrial Spill Control			X	Implemented as part of the Pretreatment Program
Street Sweeping Programs			X	Part of CSO Operational Plan - City indicated that they clean the catch basins after every rain.
Litter Ordinance Enforcement			X	
<i>Miscellaneous</i>				
Industrial Pretreatment Program			X	Implemented as part of the Pretreatment Program
Streambank Stabilization/Restoration			X	During riverfront projects
Septic Tank Improvements/ Barrett Law			X	The City will be eliminating some

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**Description of Preliminary Alternatives  
Table 3.4-3**

Greeley and Hansen  
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<i>Alternative</i>	<i>Description</i>
1A	Parallel Interceptor from CSO 001 down to WWTP Diversion structures from each CSO to Parallel Interceptor Eliminate existing Pearl River Lift Station New Lift Station at Parking Lot to replace existing Lift Station A Force Main from Parking Lot Lift Station to WWTP Railroad Corridor Sewers used as conveyance from Greenbush St. to WWTP Parallel Interceptor along Durkee's Run Diversion structures from CSOs 011 and 012 to Parallel Interceptor Parallel Throttle Pipe at CSOs 010 and 015 CSO Storage Tank near WWTP
1B	Parallel Interceptor from CSO 001 down to Parking Lot Lift Station Diversion structures from CSOs 001, 002, 003, and 004 to Parallel Interceptor Eliminate existing Pearl River Lift Station New Lift Station at Parking Lot to replace existing Lift Station A Force Main from Parking Lot Lift Station to WWTP Parallel Interceptor from CSO 006 to WWTP Diversion structures from CSO 007s and 008 to Parallel Interceptor Railroad Corridor Sewers used as conveyance from Greenbush St. to WWTP Parallel Interceptor along Durkee's Run Diversion structures from CSOs 011 and 012 to Parallel Interceptor Parallel Throttle Pipes at CSOs 010 and 015 CSO Storage Tanks near WWTP and CSO 001
2A	Parallel Interceptor from CSO 001 down to WWTP Diversion structures from each CSO to Parallel Interceptor Eliminate existing Pearl River Lift Station New Lift Station at Parking Lot to replace existing Lift Station A Force Main from Parking Lot Lift Station to WWTP Railroad Corridor Sewers used as conveyance from Greenbush St. to WWTP Parallel Interceptor along Durkee's Run Diversion structures from CSOs 011 and 012 to Parallel Interceptor Parallel Throttle Pipe at CSOs 010 and 015 High Rate Treatment Facility near WWTP

<i>Alternative</i>	<i>Description</i>
2B	<p>Parallel Interceptor from CSO 001 down to Parking Lot Lift Station            Diversion structures from CSOs 001, 002, 003, and 004 to Parallel Interceptor            Eliminate existing Pearl River Lift Station            New Lift Station at Parking Lot to replace existing Lift Station            A Force Main from Parking Lot Lift Station to WWTP            Parallel Interceptor from CSO 006 to WWTP            Diversion structures from CSO 007s and 008 to Parallel Interceptor            Railroad Corridor Sewers used as conveyance from Greenbush St. to WWTP            Parallel Interceptor along Durkee's Run            Diversion structures from CSOs 011 and 012 to Parallel Interceptor            Parallel Throttle Pipes at CSOs 010 and 015            High Rate Treatment Facilities near WWTP and CSO 001</p>
3A	<p>CSO Storage Tanks near CSOs 001, 004, 008, 012, and WWTP            Conveyance Sewer from CSO 002 to CSO Storage Tank at CSO 001            Eliminate existing Pearl River Lift Station            New Lift Station at Parking Lot to replace existing Lift Station            A Force Main from Parking Lot Lift Station to WWTP            Conveyance Sewer from CSOs 006 and 007 to CSO Storage Tank at CSO 008            Railroad Corridor Sewers used as storage with three lift stations at intersections with trunk sewers            Parallel Throttle Pipes at CSOs 010 and 015</p>
3B	<p>CSO Storage Tanks near CSOs 001, 004, 008, 012, and WWTP            Conveyance Sewer from CSO 002 to CSO Storage Tank at CSO 001            Eliminate existing Pearl River Lift Station            New Lift Station at Parking Lot to replace existing Lift Station            A Force Main from Parking Lot Lift Station to WWTP            Conveyance Sewer from CSOs 006 and 007 to CSO Storage Tank at CSO 008            Railroad Corridor Sewers used as conveyance from Greenbush St. to WWTP            Parallel Throttle Pipes at CSOs 010 and 015            Sewer Separation in portion of city designated CSO 012 Service Area            High Rate Treatment Facilities near CSO 001 and WWTP</p>
4A	<p>Conveyance Sewer from CSO 002 to HRT Facility at CSO 001            Eliminate existing Pearl River Lift Station            New Lift Station at Parking Lot to replace existing Lift Station            A Force Main from Parking Lot Lift Station to WWTP            Parallel Interceptor from CSO 006 to WWTP            Diversion structures from CSO 007s and 008 to Parallel Interceptor            Railroad Corridor Sewers used as conveyance from Greenbush St. to WWTP            Parallel Interceptor along Durkee's Run            Diversion structures from CSOs 010, 011, and 012 to Parallel Interceptor            Sewer Separation in CSO Service Areas 012 and 015</p>

<i>Alternative</i>	<i>Description</i>
4B	High Rate Treatment Facilities near CSO 001 and WWTP Conveyance Sewer from CSO 002 to HRT Facility at CSO 001 Eliminate existing Pearl River Lift Station New Lift Station at Parking Lot to replace existing Lift Station A Force Main from Parking Lot Lift Station to WWTP Parallel Interceptor from CSO 006 to WWTP Diversion structures from CSO 007s and 008 to Parallel Interceptor Railroad Corridor Sewers used as conveyance from Greenbush St. to WWTP Parallel Interceptor along Durkee's Run Diversion structures from CSOs 011, and 012 to Parallel Interceptor Parallel Throttle Pipes at CSOs 010 and 015

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**Table 3.4-4  
CSO Control Technology Evaluation on CSO by CSO Basis**

Greeley and Hansen  
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	<i>CSOs</i>										
	<i>001</i>	<i>002</i>	<i>003</i>	<i>004</i>	<i>006</i>	<i>007</i>	<i>009</i>	<i>010</i>	<i>011</i>	<i>012</i>	<i>015</i>
<i>HRT</i>	Site available closer to Salem St.	Not feasible due to site restrictions	Not feasible due to site restrictions	Not feasible due to site restrictions	Not feasible due to site restrictions	Not feasible due to site restrictions	Site available near WWTP	Not feasible due to site restrictions	Not feasible due to site restrictions	Not feasible due to site restrictions	Not feasible due to site restrictions
<i>Storage Tank</i>	Site available closer to Salem St.	Flows to CSO will be stored at tank near CSOs 003 and 004	Site available for tank near Parking Lot Lift Station to capture flows to CSOs 003 and 004	Site available for tank near Parking Lot Lift Station to capture flows to CSOs 003 and 004	Site available for tank near existing Pearl River Lift Station	Not feasible due to site restrictions	Site available near WWTP	Not feasible due to site restrictions	Not feasible due to site restrictions	Site available near the YMCA	Not feasible due to site restrictions
<i>Railroad Corridor Sewers</i>	Sewers decrease flows to CSO	Sewers decrease flows to CSO	Sewers decrease flows to CSO	Sewers decrease flows to CSO	Sewers increase flows to CSO	Sewers do not extend to this CSO	Sewers do not extend to this CSO	Sewers do not extend to this CSO	Sewers do not extend to this CSO	Sewers do not extend to this CSO	Sewers do not extend to this CSO
<i>Parallel Interceptor</i>	Already implemented as part of the Railroad Relocation project	Already implemented as part of the Railroad Relocation project	New sewer from storage tank to new Pearl River Lift Station	New sewer from storage tank to new Pearl River Lift Station	New sewer from new Pearl River Lift Station to convey wet weather flows to WWTP	New sewer decreases flows to CSO	New sewer decreases flows to CSO	New sewer along Durkee's Run to decrease flows to CSO and parallel throttle pipe to eliminate/decrease flows to CSO	New sewer along Durkee's Run to decrease flows to CSO	New sewer from CSO to WWTP to decrease flows to CSO	Parallel Interceptor along Durkee's Run to decrease flows to CSO and parallel throttle pipe to eliminate/decrease flows to CSO

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**Table 3.5-1  
Design Storm Hyetographs**

**Greeley and Hansen  
May 2005**

<i>Hour</i>	<i>Rainfall (inches)</i>										
	<i>Storm A</i>	<i>Storm B</i>	<i>Storm C</i>	<i>Storm D</i>	<i>Storm E</i>	<i>Storm F</i>	<i>Storm G</i>	<i>Storm H</i>	<i>Storm I</i>	<i>Storm J</i>	<i>Storm K</i>
1	0.08	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.06
2		0.11	0.15	0.23	0.03	0.04	0.04	0.05	0.05	0.05	0.06
3		0.04	0.06	0.10	0.06	0.08	0.04	0.05	0.05	0.05	0.06
4		0.02	0.03	0.04	0.36	0.47	0.08	0.08	0.11	0.11	0.12
5			0.02	0.04	0.14	0.19	0.55	0.11	0.11	0.11	0.12
6			0.02	0.02	0.06	0.08	0.22	0.68	0.89	0.12	0.14
7				0.02	0.05	0.08	0.11	0.29	0.38	0.12	0.16
8					0.03	0.04	0.08	0.10	0.15	0.89	1.18
9					0.03	0.04	0.08	0.10	0.10	0.41	0.54
10					0.02	0.04	0.04	0.08	0.10	0.17	0.25
11						0.03	0.04	0.08	0.08	0.11	0.16
12							0.03	0.05	0.08	0.11	0.16
13							0.03	0.05	0.05	0.08	0.11
14								0.04	0.05	0.08	0.11
15								0.04	0.04	0.08	0.08
16									0.04	0.08	0.08
17									0.04	0.05	0.08
18										0.05	0.06
19										0.05	0.06
20										0.05	0.06
<b><i>Total Rainfall</i></b>	0.08	0.19	0.30	0.48	0.81	1.13	1.38	1.85	2.37	2.82	3.65
<b><i>Maximum Intensity</i></b>	0.08	0.11	0.15	0.23	0.36	0.47	0.55	0.68	0.89	0.89	1.18
<b><i>Estimated Rainfall Frequency</i></b>				2 Week	1 Month	2 Month	3 Month	6 Month	1 Year	2 Year	25 Year

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**Table 3.5-1  
Design Storm Hyetographs**

**Greeley and Hansen  
May 2005**

<i>Hour</i>	<i>Rainfall (inches)</i>										
	<i>Storm A</i>	<i>Storm B</i>	<i>Storm C</i>	<i>Storm D</i>	<i>Storm E</i>	<i>Storm F</i>	<i>Storm G</i>	<i>Storm H</i>	<i>Storm I</i>	<i>Storm J</i>	<i>Storm K</i>
1	0.08	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.06
2		0.11	0.15	0.23	0.03	0.04	0.04	0.05	0.05	0.05	0.06
3		0.04	0.06	0.10	0.06	0.08	0.04	0.05	0.05	0.05	0.06
4		0.02	0.03	0.04	0.36	0.47	0.08	0.08	0.11	0.11	0.12
5			0.02	0.04	0.14	0.19	0.55	0.11	0.11	0.11	0.12
6			0.02	0.02	0.06	0.08	0.22	0.68	0.89	0.12	0.14
7				0.02	0.05	0.08	0.11	0.29	0.38	0.12	0.16
8					0.03	0.04	0.08	0.10	0.15	0.89	1.18
9					0.03	0.04	0.08	0.10	0.10	0.41	0.54
10					0.02	0.04	0.04	0.08	0.10	0.17	0.25
11						0.03	0.04	0.08	0.08	0.11	0.16
12							0.03	0.05	0.08	0.11	0.16
13							0.03	0.05	0.05	0.08	0.11
14								0.04	0.05	0.08	0.11
15								0.04	0.04	0.08	0.08
16									0.04	0.08	0.08
17									0.04	0.05	0.08
18										0.05	0.06
19										0.05	0.06
20										0.05	0.06
<b>Total Rainfall</b>	0.08	0.19	0.30	0.48	0.81	1.13	1.38	1.85	2.37	2.82	3.65
<b>Maximum Intensity</b>	0.08	0.11	0.15	0.23	0.36	0.47	0.55	0.68	0.89	0.89	1.18
<b>Estimated Rainfall Frequency</b>				2 Week	1 Month	2 Month	3 Month	6 Month	1 Year	2 Year	25 Year

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**Table 3.5-2  
Design Storm Categories**

Greeley and Hansen  
May 2005

<i>Design Storm</i>	<i>Duration of Storm (Hour)</i>	<i>Average Total Rainfall for Storm (T.R.) (inch)</i>	<i>Average Maximum One-Hour Intensity (M.I.) (inch/hour)</i>	<i>Number of Hours Into Storm Peak Occurs</i>	<i>M.I./T.R.</i>	<i>T.R./Duration (inch/hour)</i>	<i>Rainfall Range (inches)</i>	<i>Occurrence %</i>	<i>Approximate Return Period</i>
A	2	0.08	0.08	1	0.931	0.053	0.010 - 0.100	40.36%	
B	4	0.19	0.11	2	0.587	0.045	0.110 - 0.230	15.39%	
C	6	0.30	0.15	2	0.510	0.053	0.231 - 0.350	9.90%	
D	7	0.48	0.23	2	0.478	0.072	0.351 - 0.600	15.11%	2 Week
E	10	0.81	0.36	4	0.449	0.082	0.601 - 1.000	10.47%	1 Month
F	11	1.13	0.47	4	0.419	0.102	1.001 - 1.200	2.33%	2 Month
G	13	1.38	0.55	5	0.401	0.106	1.201 - 1.55	2.65%	3 Month
H	15	1.85	0.68	6	0.367	0.121	1.551 - 2.200	2.41%	6 Month
I	17	2.37	0.89	6	0.376	0.139	2.201 - 2.500	0.45%	1 Year
J	20	2.82	0.89	8	0.316	0.141	2.501 - 3.200	0.45%	2 Year
K	20	3.65	1.18	8	0.324	0.182	3.201 & Larger	0.47%	

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**Table 3.5-3  
Description of Integrated Alternatives**

Greeley and Hansen  
May 2005

<i>Level of Control</i>	<i>Alternative</i>	<i>Description</i>
D	1	0.86 MG Storage Tank with Screen Facility between CSO 001 and CSO 002 120" Conveyance Sewer from CSO 001 to Storage Tank Eliminate existing Parking Lot Lift Station New 54" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station 1.86 MG Storage Tank with Screen Facility near Pearl River Lift Station New 30 MGD Lift Station at Pearl River to replace existing Lift Station New 30" Force Main from Pearl River Lift Station to WWTP 2.51 MG Storage Tank with Screen Facility at CSO 009 1.14 MG Storage Tank with Screen Facility near CSO 012 New 36" Parallel Throttle Pipe at CSO 010 New 24" Parallel Throttle Pipe at CSO 015 Screening Facilities at Outfalls of CSOs 003, 004, and 007 New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station
D	2	0.53 MG Storage Tank with Screen Facility between CSO 001 and CSO 002 120" Conveyance Sewer from CSO 001 to Storage Tank Eliminate existing Parking Lot Lift Station New 54" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station 2.00 MG Storage Tank with Screen Facility near Pearl River Lift Station New 30 MGD Lift Station at Pearl River to replace existing Lift Station New 30" Force Main from Pearl River Lift Station to WWTP 3.69 MG Storage Tank with Screen Facility at CSO 009 36" Parallel Interceptor along Durkee's Run New 36" Parallel Throttle Pipe at CSO 010 New 24" Parallel Throttle Pipe at CSO 015 Screening Facility at Outfalls of CSOs 003, 004, 007, 011, and 012 New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station
D	3	18.0 MGD High Rate Treatment Facility between CSO 001 and CSO 002 120" Conveyance Sewer from CSO 001 to HRT Facility Increase Throttle Pipe at CSO 003 from 15" to 30" Increase Throttle Pipe at CSO 004 from 18" to 30" Increase Interceptor from CSO 003 to CSO 004 from 42" to 54" Eliminate existing Parking Lot Lift Station New 66" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station 2.47 MG Storage Tank with Screen Facility near Pearl River Lift Station New 30 MGD Lift Station at Pearl River to replace existing Lift Station New 30" Force Main from Pearl River Lift Station to WWTP 38.8 MGD High Rate Treatment Facility at CSO 009 36" Parallel Interceptor along Durkee's Run New 36" Parallel Throttle Pipe at CSO 010 New 24" Parallel Throttle Pipe at CSO 015 Screening Facility at Outfalls of CSOs 003, 004, 007, 011, and 012 New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station

<i>Level of Control</i>	<i>Alternative</i>	<i>Description</i>
E	1	2.29 MG Storage Tank with Screen Facility between CSO 001 and CSO 002 120" Conveyance Sewer from CSO 001 to Storage Tank 1.82 MG Storage Tank with Screen Facility between CSO 003 and CSO 004 Eliminate existing Parking Lot Lift Station New 54" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station 4.24 MG Storage Tank with Screen Facility near Pearl River Lift Station New 34 MGD Lift Station at Pearl River to replace existing Lift Station New 30" Force Main from Pearl River Lift Station to WWTP 5.91 MG Storage Tank with Screen Facility at CSO 009 3.11 MG Storage Tank with Screen Facility near CSO 012 New 36" Parallel Throttle Pipe at CSO 010 New 24" Parallel Throttle Pipe at CSO 015 Screening Facility at Outfalls of CSO 007 New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station
E	2	1.96 MG Storage Tank with Screen Facility between CSO 001 and CSO 002 120" Conveyance Sewer from CSO 001 to Storage Tank 1.92 MG Storage Tank with Screen Facility between CSO 003 and CSO 004 Eliminate existing Parking Lot Lift Station New 54" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station 4.24 MG Storage Tank with Screen Facility near Pearl River Lift Station New 35 MGD Lift Station at Pearl River to replace existing Lift Station New 30" Force Main from Pearl River Lift Station to WWTP 9.65 MG Storage Tank with Screen Facility at CSO 009 42" Parallel Interceptor along Durkee's Run New 36" Parallel Throttle Pipe at CSO 010 New 24" Parallel Throttle Pipe at CSO 015 Screening Facility at Outfalls of CSOs 007, 011, and 012 New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station
E	3	43.0 MGD High Rate Treatment Facility between CSO 001 and CSO 002 120" Conveyance Sewer from CSO 001 to HRT Facility 1.62 MG Storage Tank with Screen Facility between CSO 003 and CSO 004 Increase Interceptor from CSO 003 to CSO 004 from 42" to 48" Eliminate existing Parking Lot Lift Station New 54" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station 4.3 MG Storage Tank with Screen Facility near Pearl River Lift Station New 35 MGD Lift Station at Pearl River to replace existing Lift Station New 30" Force Main from Pearl River Lift Station to WWTP 81.8 MGD High Rate Treatment Facility at CSO 009 42" Parallel Interceptor along Durkee's Run New 36" Parallel Throttle Pipe at CSO 010 New 24" Parallel Throttle Pipe at CSO 015 Screening Facility at Outfalls of CSOs 007, 011, and 012 New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station

<i>Level of Control</i>	<i>Alternative</i>	<i>Description</i>
F	1	<p>3.80 MG Storage Tank with Screen Facility between CSO 001 and CSO 002  120" Conveyance Sewer from CSO 001 to Storage Tank  1.75 MG Storage Tank with Screen Facility between CSO 003 and CSO 004  Increase Throttle Pipe at CSO 003 from 15" to 24"  Eliminate existing Parking Lot Lift Station  New 60" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station  4.29 MG Storage Tank with Screen Facility near Pearl River Lift Station  New 55 MGD Lift Station at Pearl River to replace existing Lift Station  New 42" Force Main from Pearl River Lift Station to WWTP  0.15 MG Storage Tank with Screen Facility near CSO 007  72" Conveyance Sewer from CSO 007 to Storage Tank  11.83 MG Storage Tank with Screen Facility at CSO 009  5.10 MG Storage Tank with Screen Facility near CSO 012  New 36" Parallel Throttle Pipe at CSO 010  New 24" Parallel Throttle Pipe at CSO 015  New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>
F	2	<p>3.3 MG Storage Tank with Screen Facility between CSO 001 and CSO 002  120" Conveyance Sewer from CSO 001 to Storage Tank  Increase Throttle Pipe at CSO 003 from 15" to 30"  Increase Throttle Pipe at CSO 004 from 18" to 36"  Increase Interceptor from CSO 003 to CSO 004 from 42" to 54"  2.0 MG Storage Tank with Screen Facility between CSO 003 and CSO 004  Eliminate existing Parking Lot Lift Station  New 66" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station  4.3 MG Storage Tank with Screen Facility near Pearl River Lift Station  New 54 MGD Lift Station at Pearl River to replace existing Lift Station  New 42" Force Main from Pearl River Lift Station to WWTP  0.4 MG Storage Tank with Screen Facility near CSO 007  72" Conveyance Sewer from CSO 007 to Storage Tank  18.3 MG Storage Tank with Screen Facility at CSO 009  48" Parallel Interceptor along Durkee's Run  New 36" Parallel Throttle Pipe at CSO 010  New 24" Parallel Throttle Pipe at CSO 015  Screening Facility at Outfalls of CSOs 011, and 012  New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>
F	3	<p>61.4 MGD High Rate Treatment Facility between CSO 001 and CSO 002  120" Conveyance Sewer from CSO 001 to HRT Facility  1.90 MG Storage Tank with Screen Facility between CSO 003 and CSO 004  Eliminate existing Parking Lot Lift Station  New 54" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station  4.23 MG Storage Tank with Screen Facility near Pearl River Lift Station  New 55 MGD Lift Station at Pearl River to replace existing Lift Station  New 42" Force Main from Pearl River Lift Station to WWTP  129.3 MGD High Rate Treatment Facility at CSO 009  48" Parallel Interceptor along Durkee's Run  New 36" Parallel Throttle Pipe at CSO 010  New 24" Parallel Throttle Pipe at CSO 015  Screening Facility at Outfalls of CSOs 011, and 012  New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>

<i>Level of Control</i>	<i>Alternative</i>	<i>Description</i>
G	1	<p>4.94 MG Storage Tank with Screen Facility between CSO 001 and CSO 002  120" Conveyance Sewer from CSO 001 to Storage Tank  1.86 MG Storage Tank with Screen Facility between CSO 003 and CSO 004  Increase Interceptor from CSO 003 to CSO 004 from 42" to 54"  Eliminate existing Parking Lot Lift Station  New 60" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station  4.3 MG Storage Tank with Screen Facility near Pearl River Lift Station  New 70 MGD Lift Station at Pearl River to replace existing Lift Station  New 48" Force Main from Pearl River Lift Station to WWTP  0.65 MG Storage Tank with Screen Facility near CSO 007  72" Conveyance Sewer from CSO 007 to Storage Tank  17.23 MG Storage Tank with Screen Facility at CSO 009  6.11 MG Storage Tank with Screen Facility near CSO 012  New 36" Parallel Throttle Pipe at CSO 010  New 24" Parallel Throttle Pipe at CSO 015  New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>
G	2	<p>4.94 MG Storage Tank with Screen Facility between CSO 001 and CSO 002  120" Conveyance Sewer from CSO 001 to Storage Tank  Increase Throttle Pipe at CSO 003 from 15" to 30"  Increase Throttle Pipe at CSO 004 from 18" to 30"  Increase Interceptor from CSO 003 to CSO 004 from 42" to 60"  1.90 MG Storage Tank with Screen Facility between CSO 003 and CSO 004  Eliminate existing Parking Lot Lift Station  New 72" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station  4.24 MG Storage Tank with Screen Facility near Pearl River Lift Station  New 68 MGD Lift Station at Pearl River to replace existing Lift Station  New 48" Force Main from Pearl River Lift Station to WWTP  1.33 MG Storage Tank with Screen Facility near CSO 007  72" Conveyance Sewer from CSO 007 to Storage Tank  23.5 MG Storage Tank with Screen Facility at CSO 009  54" Parallel Interceptor along Durkee's Run  New 36" Parallel Throttle Pipe at CSO 010  New 24" Parallel Throttle Pipe at CSO 015  Screening Facility at Outfalls of CSOs 011, and 012  New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>
G	3	<p>75.6 MGD High Rate Treatment Facility between CSO 001 and CSO 002  120" Conveyance Sewer from CSO 001 to HRT Facility  1.90 MG Storage Tank with Screen Facility between CSO 003 and CSO 004  Increase Interceptor from CSO 003 to CSO 004 from 42" to 48"  Eliminate existing Parking Lot Lift Station  New 54" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station  4.22 MG Storage Tank with Screen Facility near Pearl River Lift Station  New 71 MGD Lift Station at Pearl River to replace existing Lift Station  New 48" Force Main from Pearl River Lift Station to WWTP  165.8 MGD High Rate Treatment Facility at CSO 009  54" Parallel Interceptor along Durkee's Run  New 36" Parallel Throttle Pipe at CSO 010  New 24" Parallel Throttle Pipe at CSO 015  Screening Facility at Outfalls of CSOs 007, 011, and 012  New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>

<i>Level of Control</i>	<i>Alternative</i>	<i>Description</i>
H	2	<p>6.95 MG Storage Tank with Screen Facility between CSO 001 and CSO 002</p> <p>120" Conveyance Sewer from CSO 001 to Storage Tank</p> <p>Increase Throttle Pipe at CSO 003 from 15" to 42"</p> <p>Increase Throttle Pipe at CSO 004 from 18" to 42"</p> <p>Increase Interceptor from CSO 003 to CSO 004 from 42" to 54"</p> <p>2.09 MG Storage Tank with Screen Facility between CSO 003 and CSO 004</p> <p>Eliminate existing Parking Lot Lift Station</p> <p>New 60" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station</p> <p>4.7 MG Storage Tank with Screen Facility near Pearl River Lift Station</p> <p>New 95 MGD Lift Station at Pearl River to replace existing Lift Station</p> <p>New 54" Force Main from Pearl River Lift Station to WWTP</p> <p>30.37 MG Storage Tank with Screen Facility at CSO 009</p> <p>5.82 MG Storage Tank with Screen Facility near CSO 012</p> <p>30" Parallel Interceptor along Durkee's Run</p> <p>New 36" Parallel Throttle Pipe at CSO 010</p> <p>New 24" Parallel Throttle Pipe at CSO 015</p> <p>Screening Facility at Outfalls of CSO 007</p> <p>New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>
H	3	<p>103 MGD High Rate Treatment Facility between CSO 001 and CSO 002</p> <p>120" Conveyance Sewer from CSO 001 to HRT Facility</p> <p>Increase Throttle Pipe at CSO 003 from 15" to 42"</p> <p>Increase Throttle Pipe at CSO 004 from 18" to 42"</p> <p>Increase Interceptor from CSO 003 to CSO 004 from 42" to 54"</p> <p>2.09 MG Storage Tank with Screen Facility between CSO 003 and CSO 004</p> <p>Eliminate existing Parking Lot Lift Station</p> <p>New 60" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station</p> <p>4.7 MG Storage Tank with Screen Facility near Pearl River Lift Station</p> <p>New 95 MGD Lift Station at Pearl River to replace existing Lift Station</p> <p>New 54" Force Main from Pearl River Lift Station to WWTP</p> <p>144 MGD High Rate Treatment Facility at CSO 009</p> <p>5.82 MG Storage Tank with Screen Facility near CSO 012</p> <p>30" Parallel Interceptor along Durkee's Run</p> <p>New 36" Parallel Throttle Pipe at CSO 010</p> <p>New 24" Parallel Throttle Pipe at CSO 015</p> <p>Screening Facility at Outfalls of CSOs 007</p> <p>New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>

<i>Level of Control</i>	<i>Alternative</i>	<i>Description</i>
J	2	<p>11.8 MG Storage Tank with Screen Facility between CSO 001 and CSO 002  120" Conveyance Sewer from CSO 001 to Storage Tank  Increase Throttle Pipe at CSO 003 from 15" to 36"  Increase Throttle Pipe at CSO 004 from 18" to 36"  Increase Interceptor from CSO 003 to CSO 004 from 42" to 66"  1.96 MG Storage Tank with Screen Facility between CSO 003 and CSO 004  Eliminate existing Parking Lot Lift Station  New 72" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station  6.88 MG Storage Tank with Screen Facility near Pearl River Lift Station  New 120 MGD Lift Station at Pearl River to replace existing Lift Station  New 54" Force Main from Pearl River Lift Station to WWTP  0.81 MG Storage Tank with Screen Facility near CSO 007  72" Conveyance Sewer from CSO 007 to Storage Tank  53.94 MG Storage Tank with Screen Facility at CSO 009  7.40 MG Storage Tank with Screen Facility near CSO 012  36" Parallel Interceptor along Durkee's Run  New 36" Parallel Throttle Pipe at CSO 010  New 24" Parallel Throttle Pipe at CSO 015  New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>
J	3	<p>148 MGD High Rate Treatment Facility between CSO 001 and CSO 002  120" Conveyance Sewer from CSO 001 to HRT Facility  Increase Throttle Pipe at CSO 003 from 15" to 36"  Increase Throttle Pipe at CSO 004 from 18" to 36"  Increase Interceptor from CSO 003 to CSO 004 from 42" to 66"  1.96 MG Storage Tank with Screen Facility between CSO 003 and CSO 004  Eliminate existing Parking Lot Lift Station  New 72" Conveyance Sewer from Parking Lot Lift Station to Pearl River Lift Station  6.88 MG Storage Tank with Screen Facility near Pearl River Lift Station  New 120 MGD Lift Station at Pearl River to replace existing Lift Station  New 54" Force Main from Pearl River Lift Station to WWTP  0.81 MG Storage Tank with Screen Facility near CSO 007  72" Conveyance Sewer from CSO 007 to Storage Tank  192 MGD High Rate Treatment Facility at CSO 009  7.40 MG Storage Tank with Screen Facility near CSO 012  36" Parallel Interceptor along Durkee's Run  New 36" Parallel Throttle Pipe at CSO 010  New 24" Parallel Throttle Pipe at CSO 015  New 108" Conveyance Sewer from Columbia St. in Railroad Corridor to Pearl River Lift Station</p>

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Table 3.6-1  
1968 Typical Year Statistics**

Greeley and Hansen  
May 2005

<i>Ambient Factor</i>	<i>Criterion</i>	<i>Historical Annual Average<sup>1</sup></i>	<i>1968 Annual</i>	<i>Historical Summer<sup>1, 2</sup> Average</i>	<i>1968 Summer</i>
Rainfall	Number of Storms > 0.09"	82	92	51	60
	Annual Volume (in.)	36.43	37.40	25.01	25.30
	5 <sup>th</sup> Largest Event (in.)	1.42	1.70	1.22	1.40
	Number of back-to-back storms <sup>3</sup>	7	8	5	5
Flow	25 <sup>th</sup> Percentile (cfs)	2,200	2,825	1,970	2,395
	50 <sup>th</sup> Percentile (cfs)	4,000	4,040	3,430	3,200
	75 <sup>th</sup> Percentile (cfs)	8,410	7,268	6,820	5,823

Notes:

<sup>1</sup> The historical averages are based on 53 years of data recorded from 1949 through 2001.

<sup>2</sup> Summer is defined as April 1 through October 31.

<sup>3</sup> "Back-to-back" storms are defined as storms occurring within 24 hours of each other, with the first storm having at least 0.5" of total rainfall and the second storm having at least 0.09" of total rainfall.

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Table 3.6-2  
SWMM Model vs. Simple Model Comparison**

Greeley and Hansen  
May 2005

<i>CSO Number</i>	<i>SWMM Model 1968 Overflow Volume (MG) (Qtr 1)</i>	<i>SWMM Model 1968 Overflow Volume (MG) (Qtr 2)</i>	<i>SWMM Model 1968 Overflow Volume (MG) (Qtr 3)</i>	<i>SWMM Model 1968 Overflow Volume (MG) (Qtr 4)</i>	<i>SWMM Model 1968 Overflow Volume (MG) (Total)</i>	<i>Simple Model 1968 Overflow Volume (MG) (Total)</i>	<i>Percent Difference</i>
001	22.32	115.88	67.14	44.32	249.67	248	-0.47
002	15.78	34.89	17.83	24.16	92.66	99	6.23
003	20.00	52.43	29.00	31.25	132.67	141	6.06
004	7.86	36.01	19.82	14.42	78.11	77	-1.80
006	2.42	17.89	10.68	5.28	36.27	33	-9.24
007	4.39	24.92	12.86	8.24	50.40	55	9.08
008	1.36	3.88	1.71	2.22	9.17	11	16.96
009	21.75	49.72	31.01	36.66	139.13	151	8.14
010	0.46	3.38	2.03	0.95	6.83	6	-6.58
011	0.33	6.11	3.64	0.87	10.96	10	-7.96
012	7.66	59.27	34.93	16.59	118.44	111	-6.50
015	0.00	0.32	0.31	0.03	0.66	1	-24.04
017	0.00	1.10	0.25	0.00	1.35	1	-22.81
<b>Total</b>					926.33	946	<b>2.06</b>

<i>CSO Number</i>	<i>SWMM Model 1968 Overflow Frequency (Qtr 1)</i>	<i>SWMM Model 1968 Overflow Frequency (Qtr 2)</i>	<i>SWMM Model 1968 Overflow Frequency (Qtr 3)</i>	<i>SWMM Model 1968 Overflow Frequency (Qtr 4)</i>	<i>SWMM Model 1968 Overflow Frequency (Total)</i>	<i>Simple Model 1968 Overflow Frequency (Total)</i>	<i>Percent Difference</i>
001	26	39	26	34	125	96	-30.21
002	22	38	24	31	115	96	-19.79
003	19	35	22	20	96	96	0.00
004	26	42	26	35	129	96	-34.38
006	17	24	18	29	88	96	8.33
007	10	22	13	19	64	96	33.33
008	10	23	13	21	67	96	30.21
009	10	22	14	19	65	96	32.29
010	33	45	30	45	153	96	-59.38
011	16	25	17	31	89	96	7.29
012	18	25	18	32	93	96	3.13
015	0	8	4	3	15	19	21.05
017	0	1	1	0	2	2	0.00
<b>Total</b>					1101	1077	<b>-2.23</b>

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-3  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Base

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Total CSO Volume <sup>3</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017		
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.		
A	0.08	2	0.005	0.041	0.136	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	1.143	0.184
B	0.19	4	0.468	0.609	0.737	0.179	0.047	0.004	0.016	0.580	0.008	0.001	0.002	0.000	0.000	2.486	2.652
C	0.30	6	1.169	1.033	1.284	0.429	0.155	0.109	0.062	1.389	0.017	0.009	0.241	0.000	0.005	3.381	5.901
D	0.48	7	2.959	1.550	1.965	1.007	0.411	0.531	0.138	2.360	0.045	0.036	1.096	0.000	0.028	4.083	12.127
E	0.81	10	6.376	2.345	3.141	2.012	0.846	1.348	0.259	3.897	0.149	0.169	2.937	0.011	0.100	5.155	23.592
F	1.13	11	9.913	3.108	4.278	3.000	1.316	2.143	0.393	5.533	0.262	0.383	4.713	0.022	0.209	5.964	35.274
G	1.38	13	12.506	3.716	5.212	3.719	1.673	2.723	0.479	6.774	0.351	0.579	6.113	0.032	0.320	6.757	44.195
H	1.85	15	17.694	4.832	6.881	5.155	2.342	5.871	1.106	7.901	0.518	0.960	8.676	0.053	0.586	7.799	62.575
I	2.37	17	23.507	5.739	8.553	6.801	3.232	7.565	1.330	10.180	0.730	1.464	12.476	0.084	0.979	8.508	82.640
J	2.82	20	27.990	6.986	10.242	8.169	3.834	8.956	1.567	12.820	0.865	1.753	14.708	0.088	1.397	9.649	99.374
K	3.65	20	39.248	7.965	12.547	11.042	5.512	11.074	1.672	15.206	1.254	2.731	22.332	0.138	2.361	9.906	133.084

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	
			001	002	003	004	006	007	008	009	010	011	012	015	017		
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.		
A	0.08	2	2.5	2.0	4.0						1.5						4.0
B	0.19	4	3.0	3.5	4.0	2.5	1.0	1.0	1.5	2.5	2.0	2.5	1.5				8.0
C	0.30	6	3.5	5.5	6.5	3.5	4.0	2.5	3.5	5.0	2.5	2.5	2.5				10.0
D	0.48	7	5.0	6.5	8.0	5.0	5.0	5.0	5.0	7.0	4.0	3.5	4.0				11.5
E	0.81	10	7.0	8.5	9.0	7.0	4.0	7.0	7.5	9.0	6.5	5.0	5.5	2.0			14.0
F	1.13	11	9.0	10.0	10.5	9.0	5.0	9.0	9.0	11.0	9.0	7.5	7.5	2.5			16.5
G	1.38	13	10.0	12.0	12.5	11.0	6.0	10.0	10.5	12.0	11.0	8.5	8.0	3.5			18.5
H	1.85	15	13.5	15.0	5.0	13.5	9.5	12.5	13.0	15.0	14.0	11.5	12.0	4.0			21.5
I	2.37	17	15.5	16.0	17.0	16.0	11.0	14.5	15.0	17.0	16.0	12.5	14.0	4.5			23.0
J	2.82	20	19.0	20.0	20.0	19.0	15.5	18.0	17.0	20.0	19.0	17.0	17.0	2.5	0.5		26.5
K	3.65	20	19.0	20.0	20.5	19.0	17.5	18.5	19.0	20.5	19.5	17.5	18.0	3.0	6.0		27.0

- Notes: <sup>1</sup> WWTP volume and duration is wet weather flow only.  
<sup>2</sup> Base dry weather flow to WWTP is 13 MGD.  
<sup>3</sup> Total CSO overflow volume, does not include WWTP flow.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-4  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Phase I

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1, 2</sup> (MG)	Total CSO Volume <sup>3</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017		
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.		
A	0.08	2	0.005	0.042	0.136	0.000	0.000	0.000		0.000	0.001	0.000	0.000	0.000		1.873	0.185
B	0.19	4	0.469	0.608	0.736	0.178	0.047	0.000		0.000	0.008	0.001	0.002	0.000		3.861	2.048
C	0.30	6	1.168	1.032	1.283	0.428	0.155	0.000		0.000	0.017	0.009	0.241	0.000		5.683	4.333
D	0.48	7	2.955	1.548	1.961	1.004	0.410	0.184		0.000	0.046	0.036	1.094	0.000		7.703	9.238
E	0.81	10	6.377	2.346	3.143	2.013	0.846	0.702		0.000	0.149	0.169	2.937	0.011		10.721	18.693
F	1.13	11	9.913	3.109	4.279	3.001	1.316	1.201		0.000	0.262	0.384	4.713	0.022		13.576	28.201
G	1.38	13	12.515	3.713	5.213	3.716	1.672	1.599		0.000	0.350	0.580	6.113	0.032		15.862	35.503
H	1.85	15	17.693	4.832	6.882	5.155	2.342	2.375		0.151	0.518	0.962	8.676	0.053		19.874	49.638
I	2.37	17	24.176	5.667	8.528	6.724	3.231	3.436		0.670	0.729	1.464	11.955	0.084		22.947	66.663
J	2.82	20	28.451	7.012	10.251	8.196	3.834	4.043		0.954	0.865	1.755	14.185	0.088		27.188	79.632
K	3.65	20	41.254	7.921	12.536	10.988	5.511	6.158		2.227	1.253	2.732	20.225	0.138		29.255	110.944
1-year	1.24	1	13.657	1.284	3.511	3.505	2.291	2.098		0.265	0.411	0.886	11.307	0.097		9.363	39.312
10-year	2.10	1	16.781	1.717	5.444	6.393	4.411	4.167		1.157	0.886	2.532	26.904	0.212		10.772	70.604

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1, 2</sup> (hrs.)	
			001	002	003	004	006	007	008	009	010	011	012	015	017		
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.		
A	0.08	2	4.0	1.5	3.0	0.0	0.0	0.0		0.0	1.0	0.0	0.0	0.0		4.0	
B	0.19	4	2.5	3.0	4.0	2.5	2.0	0.0		0.0	2.0	5.0	1.5	0.0		7.0	
C	0.30	6	3.5	5.0	6.0	3.5	4.0	0.0		0.0	5.0	5.5	4.5	0.0		9.0	
D	0.48	7	5.0	6.5	7.5	5.0	2.5	2.5		0.0	4.0	3.5	4.0	0.0		11.0	
E	0.81	10	6.5	8.5	9.0	7.0	5.0	4.0		0.0	7.0	5.5	5.0	2.0		14.0	
F	1.13	11	9.0	10.0	11.0	9.0	5.0	5.5		0.0	9.0	7.5	7.5	2.5		15.0	
G	1.38	13	10.5	12.0	12.5	11.0	6.0	6.0		0.0	11.0	8.5	8.0	3.5		17.0	
H	1.85	15	13.0	15.0	16.0	14.0	9.5	8.5		2.5	14.0	11.5	12.0	4.0		19.0	
I	2.37	17	15.5	17.0	17.0	15.5	11.0	10.0		2.0	16.0	12.5	14.0	4.5		21.0	
J	2.82	20	19.0	20.0	20.0	19.0	16.5	14.0		5.5	19.0	17.0	17.0	4.5		25.0	
K	3.65	20	19.0	20.0	20.5	19.0	17.5	16.5		5.0	19.5	17.5	18.0	3.0		26.0	

- Notes: <sup>1</sup> WWTP volume and duration is wet weather flow only.  
<sup>2</sup> Base dry weather flow to WWTP is 13 MGD.  
<sup>3</sup> Total CSO overflow volume, does not include WWTP flow.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long Term Control Plan

Table 3.6-5  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm D - Alternative 1

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1, 2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	7.07	0.000
B	0.19	4														6.155	7.07	0.000
C	0.30	6														8.294	7.07	0.000
D	0.48	7														9.951	7.07	0.000
E	0.81	10	1.433		0.737	0.489	3.032	0.011		2.450	0.129	1.837				12.244	7.07	10.117
F	1.13	11	2.987		1.336	0.906	5.875	0.180		5.034	0.344	3.613				14.316	7.07	20.275
G	1.38	13	4.174		1.840	1.235	8.105	0.385		6.687	0.539	5.014				15.988	7.07	27.979
H	1.85	15	6.301		2.774	1.792	12.271	0.890		10.333	0.921	7.577				18.981	7.07	42.859
I	2.37	17	9.696		3.837	2.535	17.310	4.058		11.002	1.426	10.865				20.924	7.07	60.729
J	2.82	20	11.081		5.020	3.058	21.167	4.584		14.478	1.716	13.088				24.465	7.07	74.192
K	3.65	20	18.193		6.910	4.498	29.536	6.356		17.247	2.696	19.132				26.578	7.07	104.570

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1, 2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10	4.0		5.0	3.5	4.5	1.0		7.0	5.0	5.0				10.0	24.0	7.0
F	1.13	11	5.0		6.0	5.0	5.5	1.5		9.0	7.5	7.5				11.0	24.0	9.0
G	1.38	13	6.0		7.0	6.0	7.0	2.0		10.0	8.0	8.0				13.0	24.0	10.0
H	1.85	15	8.0		9.0	7.5	10.0	2.0		12.0	11.5	12.0				16.0	24.0	12.0
I	2.37	17	9.5		11.0	9.0	11.0	14.0		14.5	12.0	14.0				18.0	24.0	14.5
J	2.82	20	13.5		16.0	13.0	16.0	15.0		18.0	17.0	17.0				22.0	24.0	18.0
K	3.65	20	14.5		16.5	16.0	17.0	15.5		19.0	17.5	18.0				23.0	24.0	19.0

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-6  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm E - Alternative 1

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	17.37	0.000
B	0.19	4														6.155	17.37	0.000
C	0.30	6														8.294	17.37	0.000
D	0.48	7														10.219	17.37	0.000
E	0.81	10														12.104	17.37	0.000
F	1.13	11	1.551		0.595	0.408	2.664	0.136		2.931	0.214	1.773				14.056	17.37	10.273
G	1.38	13	2.736		1.088	0.722	4.718	0.315		4.703	0.409	3.174				15.844	17.37	17.864
H	1.85	15	4.861		1.933	1.248	8.407	2.881		6.288	0.791	5.737				18.752	17.37	32.145
I	2.37	17	8.256		3.003	1.981	13.173	4.076		9.356	1.296	9.025				20.748	17.37	50.166
J	2.82	20	9.643		4.115	2.451	16.370	4.560		13.553	1.586	11.248				24.337	17.37	63.526
K	3.65	20	16.754		6.023	3.853	24.545	5.941		16.902	2.566	17.292				26.477	17.37	93.877

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10														9.0	24.0	0.0
F	1.13	11	5.0		6.0	4.5	5.0	1.0		8.0	7.5	7.5				11.0	24.0	8.0
G	1.38	13	6.0		7.0	5.5	6.0	1.5		9.0	8.0	8.0				13.0	24.0	9.0
H	1.85	15	8.0		9.0	7.0	8.0	11.0		12.5	11.5	12.0				18.0	24.0	12.5
I	2.37	17	9.5		10.0	8.5	9.5	13.0		14.5	12.5	13.0				19.0	24.0	14.5
J	2.82	20	13.5		15.0	12.0	16.5	15.0		18.0	17.0	17.0				24.0	24.0	18.0
K	3.65	20	15.0		16.0	14.0	16.5	15.0		19.0	17.0	18.0				32.0	24.0	19.0

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-7  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm F - Alternative 1

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	26.92	0.000
B	0.19	4														6.155	26.92	0.000
C	0.30	6														8.294	26.92	0.000
D	0.48	7														10.219	26.92	0.000
E	0.81	10														12.104	26.92	0.000
F	1.13	11														14.169	26.92	0.000
G	1.38	13	1.145		0.392	0.242	1.465	0.168		2.675		0.199	1.404			15.969	26.92	7.690
H	1.85	15	3.210		0.948	0.654	3.963	0.590		9.086		0.581	3.967			18.763	26.92	22.998
I	2.37	17	6.704		1.834	1.261	7.745	1.212		13.748		1.086	7.255			20.820	26.92	40.844
J	2.82	20	7.938		2.241	1.388	8.992	1.328		21.764		1.376	9.478			24.269	26.92	54.505
K	3.65	20	14.998		4.126	2.424	15.723	2.398		27.274		2.356	15.522			26.341	26.92	84.821

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10														9.0	24.0	0.0
F	1.13	11														12.0	24.0	0.0
G	1.38	13	6.0		4.0	3.0	3.5	1.5		9.5		8.0	8.0			16.0	24.0	9.5
H	1.85	15	8.5		4.5	3.0	4.0	2.0		12.0		11.5	12.0			17.0	24.0	12.0
I	2.37	17	9.5		6.0	4.0	4.0	2.5		14.0		13.0	13.0			18.5	24.0	14.0
J	2.82	20	13.5		6.0	4.0	6.0	3.0		17.5		17.0	17.0			22.0	24.0	17.5
K	3.65	20	14.0		9.0	6.0	8.5	3.5		18.0		17.5	18.0			24.0	24.0	18.0

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-8  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm G - Alternative 1

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	35.09	0.000
B	0.19	4														6.155	35.09	0.000
C	0.30	6														8.294	35.09	0.000
D	0.48	7														10.219	35.09	0.000
E	0.81	10														12.104	35.09	0.000
F	1.13	11														14.169	35.09	0.000
G	1.38	13														15.971	35.09	0.000
H	1.85	15	2.015		0.475	0.389	2.462	0.527		6.757			2.567			18.754	35.09	15.192
I	2.37	17	5.493		1.199	0.954	5.929	1.272		23.011			5.854			20.828	35.09	43.711
J	2.82	20	6.902		1.368	1.094	6.584	1.436		21.109			8.077			24.277	35.09	46.570
K	3.65	20	13.966		2.752	2.127	12.062	2.722		29.152			14.122			26.414	35.09	76.903

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10														9.0	24.0	0.0
F	1.13	11														12.0	24.0	0.0
G	1.38	13														13.0	24.0	0.0
H	1.85	15	8.5		3.5	4.5	3.0	3.0		12.0			12.0			15.0	24.0	12.0
I	2.37	17	9.5		4.0	5.0	3.5	4.0		14.5			14.0			17.0	24.0	14.5
J	2.82	20	14.0		7.0	6.5	3.5	4.0		17.5			18.0			21.0	24.0	18.0
K	3.65	20	17.0		10.0	9.0	5.5	6.0		18.0			18.0			22.0	24.0	18.0

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-9  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm D - Alternative 2

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	7.04	0.000
B	0.19	4														6.155	7.04	0.000
C	0.30	6														8.294	7.04	0.000
D	0.48	7														10.219	7.04	0.000
E	0.81	10	1.438		0.734	0.484	3.055	0.087		3.714	0.036	0.046	0.687			12.431	7.04	10.281
F	1.13	11	2.827		1.383	0.938	5.980	3.805		1.064	0.096	0.190	1.749			14.630	7.04	18.031
G	1.38	13	3.898		1.917	1.291	8.269	4.991		2.111	0.146	0.345	2.576			16.326	7.04	25.545
H	1.85	15	5.783		2.927	1.904	12.551	6.695		4.950	0.247	0.660	4.177			19.317	7.04	39.894
I	2.37	17	9.141		3.986	2.662	17.527	8.644		7.408	0.408	1.117	6.619			21.291	7.04	57.513
J	2.82	20	10.046		5.289	3.303	21.691	9.923		11.083	0.455	1.309	7.050			24.809	7.04	70.148
K	3.65	20	17.050		7.202	4.750	30.120	12.604		14.385	0.749	2.202	11.202			26.911	7.04	100.264

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10	2.5		5.0	4.0	4.5	2.0		7.0	1.5	2.5	1.5			10.0	24.0	7.0
F	1.13	11	3.0		6.0	5.0	5.5	9.0		9.0	2.5	4.5	2.0			11.5	24.0	9.0
G	1.38	13	4.0		7.0	6.0	6.5	10.0		10.0	3.0	5.0	2.5			13.0	24.0	10.0
H	1.85	15	5.0		9.5	8.0	10.0	12.0		12.5	3.5	6.5	3.0			16.0	24.0	12.5
I	2.37	17	7.0		11.0	9.0	11.0	14.0		15.0	4.0	7.5	3.5			18.0	24.0	15.0
J	2.82	20	9.0		16.0	13.0	16.0	15.0		18.0	5.0	9.0	3.5			22.0	24.0	18.0
K	3.65	20	11.0		17.0	16.5	17.0	15.5		18.5	6.5	11.0	5.0			23.0	24.0	18.5

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-10  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm E - Alternative 2

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	17.77	0.000
B	0.19	4														6.155	17.77	0.000
C	0.30	6														8.294	17.77	0.000
D	0.48	7														10.219	17.77	0.000
E	0.81	10														12.284	17.77	0.000
F	1.13	11	1.383		0.648	0.439	2.711	0.252		4.608	0.021	0.047	0.270			14.281	17.77	10.378
G	1.38	13	2.452		1.172	0.773	4.776	0.461		7.486	0.047	0.140	0.713			16.128	17.77	18.021
H	1.85	15	4.331		2.073	1.337	8.491	0.922		13.741	0.118	0.392	1.855			18.923	17.77	33.261
I	2.37	17	7.693		3.148	2.081	13.231	1.586		18.665	0.241	0.790	3.838			21.031	17.77	51.271
J	2.82	20	8.599		4.370	2.655	16.487	1.724		25.595	0.269	0.956	4.103			24.572	17.77	64.758
K	3.65	20	15.595		6.294	4.080	24.593	2.852		31.973	0.490	1.749	7.401			26.698	17.77	95.026

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10														10.0	24.0	0.0
F	1.13	11	4.0		6.0	4.5	5.0	1.5		8.5	1.0	2.5	1.0			11.0	24.0	8.5
G	1.38	13	4.0		7.0	5.5	6.0	2.0		10.0	1.0	3.0	1.0			13.0	24.0	10.0
H	1.85	15	5.0		9.0	7.0	8.0	2.5		12.5	2.0	4.0	2.0			16.0	24.0	12.5
I	2.37	17	6.5		10.0	8.0	9.5	3.0		14.5	2.0	5.0	2.0			18.0	24.0	14.5
J	2.82	20	9.0		14.0	12.0	13.0	3.0		18.0	2.5	5.0	2.0			21.0	24.0	18.0
K	3.65	20	11.0		16.0	14.5	16.5	4.0		19.0	3.5	7.0	3.0			32.5	24.0	19.0

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-11  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm F - Alternative 2

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	28.30	0.000
B	0.19	4														6.155	28.30	0.000
C	0.30	6														8.294	28.30	0.000
D	0.48	7														10.219	28.30	0.000
E	0.81	10														12.104	28.30	0.000
F	1.13	11														14.231	28.30	0.000
G	1.38	13	1.033		0.405	0.310	1.482	0.257		4.012	0.013	0.018	0.117			16.039	28.30	7.648
H	1.85	15	2.848		0.984	0.864	4.045	0.766		12.369	0.056	0.190	0.791			18.857	28.30	22.915
I	2.37	17	6.144		1.919	1.648	7.849	1.485		18.872	0.152	0.513	2.308			20.964	28.30	40.890
J	2.82	20	7.087		2.376	1.926	9.250	1.635		28.889	0.175	0.649	2.503			24.426	28.30	54.491
K	3.65	20	13.987		4.288	3.255	16.053	2.817		37.382	0.361	1.339	5.453			26.488	28.30	84.936

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10														10.0	24.0	0.0
F	1.13	11														11.0	24.0	0.0
G	1.38	13	4.0		5.0	3.0	4.0	2.0		10.0	1.0	1.0	0.5			12.0	24.0	10.0
H	1.85	15	5.0		5.5	3.0	4.5	2.5		12.5	1.0	2.0	1.0			15.5	24.0	12.5
I	2.37	17	6.5		6.5	3.5	6.0	3.0		14.5	2.0	3.0	1.5			17.5	24.0	14.5
J	2.82	20	9.0		7.0	4.0	7.0	3.5		17.5	2.0	4.0	2.0			25.0	24.0	17.5
K	3.65	20	11.0		10.0	6.5	9.0	4.5		18.5	2.5	5.0	2.0			33.0	24.0	18.5

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

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Combined Sewer Overflow Long-Term Control Plan

Table 3.6-12  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm G - Alternative 2

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	35.91	0.000
B	0.19	4														6.155	35.91	0.000
C	0.30	6														8.294	35.91	0.000
D	0.48	7														10.219	35.91	0.000
E	0.81	10														12.284	35.91	0.000
F	1.13	11														14.231	35.91	0.000
G	1.38	13														17.049	35.91	0.000
H	1.85	15	2.037		0.563	0.533	2.258	0.893		8.606	0.027	0.081	0.320			19.745	35.91	15.319
I	2.37	17	5.511		1.369	1.226	5.640	2.039		15.626	0.098	0.344	1.501			21.739	35.91	33.355
J	2.82	20	6.948		1.519	1.346	6.229	2.352		26.418	0.114	0.461	1.603			25.084	35.91	46.991
K	3.65	20	14.015		2.927	2.484	11.804	4.218		36.326	0.287	1.073	4.239			27.119	35.91	77.373

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10														9.0	24.0	0.0
F	1.13	11														12.0	24.0	0.0
G	1.38	13														12.5	24.0	0.0
H	1.85	15	8.5		4.0	2.5	3.0	4.0		12.0	1.0	2.0	1.0			16.0	24.0	12.0
I	2.37	17	9.5		4.0	3.5	3.5	5.0		14.5	1.5	3.0	1.5			18.0	24.0	14.5
J	2.82	20	14.0		5.0	3.5	4.0	5.5		18.0	2.0	3.5	2.0			21.0	24.0	18.0
K	3.65	20	17.0		6.0	5.0	6.0	8.0		19.0	2.5	4.5	2.5			21.0	24.0	19.0

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

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Combined Sewer Overflow Long-Term Control Plan

Table 3.6-13  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm H - Alternative 2

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	49.93	0.000
B	0.19	4														6.155	49.93	0.000
C	0.30	6														8.294	49.93	0.000
D	0.48	7														10.219	49.93	0.000
E	0.81	10														12.284	49.93	0.000
F	1.13	11														14.231	49.93	0.000
G	1.38	13														17.049	49.93	0.000
H	1.85	15														19.590	49.93	0.000
I	2.37	17	3.444		0.763	0.596	2.906	0.699		8.053	0.042	0.100	2.771			21.573	49.93	19.373
J	2.82	20	4.875		0.888	0.687	3.358	0.770		18.559	0.049	0.177	3.645			24.865	49.93	33.007
K	3.65	20	11.861		2.068	1.618	7.584	1.592		28.807	0.171	0.657	8.989			26.931	49.93	63.347

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10														9.0	24.0	0.0
F	1.13	11														12.0	24.0	0.0
G	1.38	13														12.5	24.0	0.0
H	1.85	15														15.0	24.0	0.0
I	2.37	17	10.0		3.5	3.0	3.0	2.0		15.0	1.0	2.0	6.5			18.0	24.0	15.0
J	2.82	20	14.0		4.0	3.0	3.0	2.5		18.0	1.5	2.0	9.0			21.0	24.0	18.0
K	3.65	20	17.0		5.0	4.0	3.5	2.5		18.0	2.0	3.0	11.0			21.0	24.0	18.0

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long-Term Control Plan*

**Table 3.6-14  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm J - Alternative 2**

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)													WWTP Volume <sup>1,2</sup> (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														2.538	82.79	0.000
B	0.19	4														6.155	82.79	0.000
C	0.30	6														8.294	82.79	0.000
D	0.48	7														10.219	82.79	0.000
E	0.81	10														12.284	82.79	0.000
F	1.13	11														14.231	82.79	0.000
G	1.38	13														17.049	82.79	0.000
H	1.85	15														19.590	82.79	0.000
I	2.37	17														22.100	82.79	0.000
J	2.82	20														24.912	82.79	0.000
K	3.65	20	7.029		0.979	0.728	3.903	0.833		11.953	0.171	0.657	4.338			24.925	82.79	30.592

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)													WWTP Duration <sup>1,2</sup> (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)
			001	002	003	004	006	007	008	009	010	011	012	015	017			
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.			
A	0.08	2														4.0	24.0	0.0
B	0.19	4														4.0	24.0	0.0
C	0.30	6														6.0	24.0	0.0
D	0.48	7														8.5	24.0	0.0
E	0.81	10														9.0	24.0	0.0
F	1.13	11														12.0	24.0	0.0
G	1.38	13														12.5	24.0	0.0
H	1.85	15														15.0	24.0	0.0
I	2.37	17														19.5	24.0	0.0
J	2.82	20														24.0	24.0	0.0
K	3.65	20	15.5		4.0	2.5	3.0	2.5		18.5	2.0	3.0	6.0			31.5	24.0	18.5

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-15  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm D - Alternative 3

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)												WWTP Volume <sup>1,2</sup> (MG)	High Rate Treatment 001 Volume (MG)	High Rate Treatment 009 Volume (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													2.538			2.47	0.000	
B	0.19	4													6.155	0.013	0.192	2.47	0.000	
C	0.30	6													8.294	0.207	1.661	2.47	0.000	
D	0.48	7													11.390	0.912	4.279	2.47	0.000	
E	0.81	10	0.746		0.485	0.204	3.559			0.847	0.036	0.046	0.689		13.424	1.598	7.207	2.47	6.612	
F	1.13	11	1.719		0.982	0.525	6.728	0.092		1.698	0.096	0.190	1.751		15.429	2.053	9.850	2.47	13.782	
G	1.38	13	2.497		1.329	0.766	9.244	0.240		2.447	0.146	0.345	2.578		17.053	2.442	11.508	2.47	19.593	
H	1.85	15	4.079		2.941	1.271	13.763	0.643		3.445	0.247	0.660	4.180		19.917	2.936	15.474	2.47	31.229	
I	2.37	17	6.868		2.941	1.937	18.921	1.253		4.669	0.408	1.117	6.623		21.756	3.653	18.690	2.47	44.736	
J	2.82	20	7.188		3.126	2.055	24.219	1.374		5.199	0.455	1.309	7.054		25.147	4.806	24.099	2.47	51.979	
K	3.65	20	12.587		4.744	3.097	33.379	2.474		7.914	0.749	2.202	11.207		27.196	6.578	26.255	2.47	78.353	

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)												WWTP Duration <sup>1,2</sup> (hrs.)	High Rate Treatment 001 Duration (hrs.)	High Rate Treatment 009 Duration (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													4.0			24.0	0.0	
B	0.19	4													4.0	1.5	1.0	24.0	0.0	
C	0.30	6													6.0	2.0	4.0	24.0	0.0	
D	0.48	7													8.0	2.5	6.0	24.0	0.0	
E	0.81	10	1.5		2.0	1.5	4.5	0.0		1.5	1.5	2.5	1.5		9.5	4.0	7.5	24.0	4.5	
F	1.13	11	2.0		3.0	2.0	6.0	1.0		2.0	2.5	4.0	2.0		11.0	5.0	9.0	24.0	6.0	
G	1.38	13	2.5		3.0	2.5	6.5	1.5		3.0	3.0	5.0	2.5		12.5	6.0	10.0	24.0	6.5	
H	1.85	15	2.5		3.5	3.0	9.0	2.0		4.0	3.5	6.0	3.0		18.0	8.5	13.0	24.0	9.0	
I	2.37	17	2.5		4.0	3.0	11.0	2.5		5.0	4.0	7.5	3.5		18.0	9.5	15.0	24.0	11.0	
J	2.82	20	3.0		4.0	3.5	16.5	2.5		5.5	5.0	9.0	3.5		21.5	13.5	18.5	24.0	16.5	
K	3.65	20	3.5		8.0	5.0	17.0	3.0		8.0	6.5	11.0	5.0		22.0	17.0	19.0	24.0	17.0	

- Notes: <sup>1</sup> WWTP volume and duration is wet weather flow only.  
<sup>2</sup> Base dry weather flow to WWTP is 26 MGD.  
<sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.  
<sup>4</sup> Total CSO overflow volume only, does not include WWTP, High Rate Treatment, or Storage Tank volumes.  
<sup>5</sup> Maximum CSO duration only, does not include WWTP, High Rate Treatment, or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-16  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm E - Alternative 3

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)												WWTP Volume <sup>1,2</sup> (MG)	High Rate Treatment 001 Volume (MG)	High Rate Treatment 009 Volume (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													2.538			5.93	0.000	
B	0.19	4													6.155	0.013	0.192	5.93	0.000	
C	0.30	6													8.294	0.207	1.661	5.93	0.000	
D	0.48	7													10.219	0.912	4.279	5.93	0.000	
E	0.81	10													13.255	2.491	10.265	5.93	0.000	
F	1.13	11	0.490		0.561	0.400	2.774	0.053		0.629	0.021	0.047	0.270		15.146	3.489	14.574	5.93	5.245	
G	1.38	13	1.001		0.992	0.699	4.310	0.179		1.080	0.047	0.140	0.714		16.862	4.136	17.259	5.93	9.162	
H	1.85	15	2.141		1.652	1.185	8.740	0.543		1.931	0.118	0.392	1.855		19.574	5.038	23.283	5.93	18.558	
I	2.37	17	4.636		2.590	1.863	13.583	1.138		2.769	0.241	0.790	3.836		21.537	6.086	27.810	5.93	31.444	
J	2.82	20	4.886		3.382	2.313	16.887	1.245		3.019	0.269	0.956	4.101		24.894	7.359	35.337	5.93	37.058	
K	3.65	20	9.546		5.191	3.603	25.190	2.268		4.400	0.490	1.749	7.399		26.823	9.923	40.761	5.93	59.836	

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)												WWTP Duration <sup>1,2</sup> (hrs.)	High Rate Treatment 001 Duration (hrs.)	High Rate Treatment 009 Duration (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													4.0			24.0	0.0	
B	0.19	4													4.0	1.5	1.0	24.0	0.0	
C	0.30	6													6.0	2.0	4.0	24.0	0.0	
D	0.48	7													8.5	2.5	6.0	24.0	0.0	
E	0.81	10													9.0	4.0	6.5	24.0	0.0	
F	1.13	11	1.0		5.0	5.0	5.0	0.5		1.0	1.0	2.0	1.0		11.0	5.0	8.5	24.0	5.0	
G	1.38	13	1.5		6.0	6.0	6.0	1.0		1.5	1.0	3.0	1.0		13.0	6.0	10.0	24.0	6.0	
H	1.85	15	1.5		8.0	7.5	8.0	1.5		2.0	2.0	4.0	2.0		16.5	8.5	12.5	24.0	8.0	
I	2.37	17	2.0		9.5	9.5	9.5	2.0		2.5	2.5	5.0	2.0		18.0	10.0	14.0	24.0	9.5	
J	2.82	20	2.0		13.5	13.5	13.5	2.0		2.5	2.5	5.5	2.0		22.0	14.0	18.0	24.0	13.5	
K	3.65	20	3.0		16.0	16.0	16.0	3.0		3.5	3.5	7.0	3.0		31.0	17.0	19.0	24.0	16.0	

- Notes: <sup>1</sup> WWTP volume and duration is wet weather flow only.  
<sup>2</sup> Base dry weather flow to WWTP is 26 MGD.  
<sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.  
<sup>4</sup> Total CSO overflow volume only, does not include WWTP, High Rate Treatment, or Storage Tank volumes.  
<sup>5</sup> Maximum CSO duration only, does not include WWTP, High Rate Treatment, or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-17  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm F - Alternative 3

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)												WWTP Volume <sup>1,2</sup> (MG)	High Rate Treatment 001 Volume (MG)	High Rate Treatment 009 Volume (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													2.538			6.15	0.000	
B	0.19	4													6.155	0.013	0.192	6.15	0.000	
C	0.30	6													8.294	0.207	1.661	6.15	0.000	
D	0.48	7													10.219	0.912	4.279	6.15	0.000	
E	0.81	10													13.255	2.491	10.265	6.15	0.000	
F	1.13	11													15.128	3.867	20.284	6.15	0.000	
G	1.38	13	0.310		0.348	0.248	1.497	0.076		0.381	0.013	0.018	0.117		16.885	4.685	24.427	6.15	3.008	
H	1.85	15	1.210		0.845	0.646	4.071	0.378		1.132	0.056	0.190	0.790		19.558	5.859	32.961	6.15	9.318	
I	2.37	17	3.265		1.665	1.240	7.941	0.953		2.085	0.151	0.513	2.307		21.547	7.297	39.391	6.15	20.121	
J	2.82	20	3.476		1.960	1.424	9.132	1.049		2.281	0.175	0.649	2.501		24.852	8.577	50.968	6.15	22.648	
K	3.65	20	7.665		3.711	2.553	15.843	2.007		3.397	0.361	1.339	5.452		26.973	11.521	59.405	6.15	42.330	

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)												WWTP Duration <sup>1,2</sup> (hrs.)	High Rate Treatment 001 Duration (hrs.)	High Rate Treatment 009 Duration (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													4.0			24.0	0.0	
B	0.19	4													4.0	1.5	1.0	24.0	0.0	
C	0.30	6													6.0	2.0	4.0	24.0	0.0	
D	0.48	7													8.5	2.5	6.0	24.0	0.0	
E	0.81	10													9.0	4.0	6.5	24.0	0.0	
F	1.13	11													11.0	5.0	8.5	24.0	0.0	
G	1.38	13	0.5		5.0	4.0	3.0	0.5		1.0	0.5	1.0	0.5		13.0	6.0	10.0	24.0	5.0	
H	1.85	15	1.0		5.0	5.0	3.0	1.5		1.5	1.0	2.0	1.0		16.0	8.0	12.0	24.0	5.0	
I	2.37	17	1.5		6.0	5.5	4.5	2.0		2.0	3.0	1.5			18.0	9.5	14.5	24.0	6.0	
J	2.82	20	2.0		6.5	7.0	6.0	2.0		2.0	4.0	2.0			22.0	13.5	17.5	24.0	7.0	
K	3.65	20	2.5		9.0	10.0	9.0	2.5		2.5	5.0	2.5			31.0	17.0	18.0	24.0	10.0	

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP, High Rate Treatment, or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP, High Rate Treatment, or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-18  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm G - Alternative 3

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)												WWTP Volume <sup>1,2</sup> (MG)	High Rate Treatment 001 Volume (MG)	High Rate Treatment 009 Volume (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													2.538			6.12	0.000	
B	0.19	4													6.155	0.013	0.192	6.12	0.000	
C	0.30	6													8.294	0.207	1.661	6.12	0.000	
D	0.48	7													10.219	0.912	4.279	6.12	0.000	
E	0.81	10													13.255	2.491	10.265	6.12	0.000	
F	1.13	11													15.128	3.867	20.284	6.12	0.000	
G	1.38	13													16.971	4.897	27.200	6.12	0.000	
H	1.85	15	0.645		0.508	0.433	2.339	0.095		0.816	0.027	0.081	0.322		19.657	6.375	36.444	6.12	5.267	
I	2.37	17	2.408		1.313	1.053	5.646	0.478		1.875	0.099	0.344	1.504		21.647	8.090	43.529	6.12	14.720	
J	2.82	20	2.491		1.474	1.166	6.247	0.544		2.139	0.114	0.461	1.606		24.990	9.429	56.645	6.12	16.242	
K	3.65	20	6.082		2.979	2.185	11.437	1.362		3.383	0.287	1.073	4.245		27.047	12.664	67.895	6.12	33.032	

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)												WWTP Duration <sup>1,2</sup> (hrs.)	High Rate Treatment 001 Duration (hrs.)	High Rate Treatment 009 Duration (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													4.0			24.0	0.0	
B	0.19	4													4.0	1.5	1.0	24.0	0.0	
C	0.30	6													6.0	2.0	4.0	24.0	0.0	
D	0.48	7													8.5	2.5	6.0	24.0	0.0	
E	0.81	10													9.0	4.0	6.5	24.0	0.0	
F	1.13	11													11.0	5.0	8.5	24.0	0.0	
G	1.38	13													12.5	6.0	9.5	24.0	0.0	
H	1.85	15	1.0		3.5	2.5	2.5	0.5		1.0	1.0	1.5	1.0		15.0	8.0	12.0	24.0	3.5	
I	2.37	17	1.0		4.0	3.0	3.0	1.5		1.5	1.5	2.5	1.0		18.0	9.0	14.0	24.0	4.0	
J	2.82	20	1.5		4.0	3.0	3.5	1.5		2.0	2.0	3.0	1.5		22.0	13.5	17.5	24.0	4.0	
K	3.65	20	2.0		6.0	5.0	5.5	2.0		2.0	2.0	4.0	2.0		32.0	15.0	18.0	24.0	6.0	

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP, High Rate Treatment, or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP, High Rate Treatment, or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-19  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm H - Alternative 3

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)												WWTP Volume <sup>1,2</sup> (MG)	High Rate Treatment 001 Volume (MG)	High Rate Treatment 009 Volume (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													2.538			12.61	0.000	
B	0.19	4													6.155	0.013	0.192	12.61	0.000	
C	0.30	6													8.294	0.207	1.661	12.61	0.000	
D	0.48	7													11.390	0.912	4.279	12.61	0.000	
E	0.81	10													13.255	2.491	10.265	12.61	0.000	
F	1.13	11													15.128	3.867	20.284	12.61	0.000	
G	1.38	13													16.971	4.897	27.200	12.61	0.000	
H	1.85	15													19.583	7.049	34.591	12.61	0.000	
I	2.37	17	1.125		0.761	0.596	2.903	0.762		0.339	0.042	0.100	2.771		21.590	9.340	41.494	12.61	9.398	
J	2.82	20	1.156		0.887	0.687	3.364	0.854		0.442	0.049	0.177	3.645		24.937	10.756	53.314	12.61	11.261	
K	3.65	20	3.910		2.068	1.620	7.609	1.724		1.200	0.171	0.657	8.988		26.725	15.067	63.578	12.61	27.948	

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)												WWTP Duration <sup>1,2</sup> (hrs.)	High Rate Treatment 001 Duration (hrs.)	High Rate Treatment 009 Duration (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													4.0			24.0	0.0	
B	0.19	4													4.0	1.5	1.0	24.0	0.0	
C	0.30	6													6.0	2.0	4.0	24.0	0.0	
D	0.48	7													8.5	2.5	6.0	24.0	0.0	
E	0.81	10													9.0	4.0	6.5	24.0	0.0	
F	1.13	11													11.0	5.0	8.5	24.0	0.0	
G	1.38	13													13.0	6.0	9.5	24.0	0.0	
H	1.85	15													16.0	8.0	12.0	24.0	0.0	
I	2.37	17	1.0		3.0	2.5	2.5	2.0		1.0	1.0	1.5	6.5		18.0	9.0	14.5	24.0	6.5	
J	2.82	20	1.0		3.5	3.0	2.5	2.0		1.0	1.0	2.0	8.5		23.5	13.0	18.0	24.0	8.5	
K	3.65	20	1.5		4.0	3.5	3.5	2.5		2.0	2.0	3.0	11.0		31.5	15.5	18.5	24.0	11.0	

- Notes: <sup>1</sup> WWTP volume and duration is wet weather flow only.  
<sup>2</sup> Base dry weather flow to WWTP is 26 MGD.  
<sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.  
<sup>4</sup> Total CSO overflow volume only, does not include WWTP, High Rate Treatment, or Storage Tank volumes.  
<sup>5</sup> Maximum CSO duration only, does not include WWTP, High Rate Treatment, or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-20  
Estimated CSO Volume and Duration in Response to Typical Design Storm Events - Storm J - Alternative 3

Greeley and Hansen  
May 2005

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Volume (MG)												WWTP Volume <sup>1,2</sup> (MG)	High Rate Treatment 001 Volume (MG)	High Rate Treatment 009 Volume (MG)	Storage Tank Volume <sup>3</sup> (MG)	Total CSO Volume <sup>4</sup> (MG)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													2.538			17.05	0.000	
B	0.19	4													6.155	0.013	0.192	17.05	0.000	
C	0.30	6													8.294	0.207	1.661	17.05	0.000	
D	0.48	7													11.390	0.912	4.279	17.05	0.000	
E	0.81	10													13.255	2.491	10.265	17.05	0.000	
F	1.13	11													15.128	3.867	20.284	17.05	0.000	
G	1.38	13													16.971	4.897	27.200	17.05	0.000	
H	1.85	15													19.583	7.049	34.591	17.05	0.000	
I	2.37	17													23.000	10.000	48.000	17.05	0.000	
J	2.82	20													24.925	11.983	59.474	17.05	0.000	
K	3.65	20	1.959		0.986	0.736	4.016	0.871		0.374	0.171	0.657	4.338		26.900	17.007	72.389	17.05	14.110	

Typical Design Storm	Rainfall (inches)	Storm Duration (hours)	CSO Overflow Duration (hrs.)												WWTP Duration <sup>1,2</sup> (hrs.)	High Rate Treatment 001 Duration (hrs.)	High Rate Treatment 009 Duration (hrs.)	Storage Tank Duration <sup>3</sup> (hrs.)	Max. CSO Duration <sup>5</sup> (hrs.)	
			001	002	003	004	006	007	008	009	010	011	012	015						017
			1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.						679.9 ac.
A	0.08	2													4.0			24.0	0.0	
B	0.19	4													4.0	1.5	1.0	24.0	0.0	
C	0.30	6													6.0	2.0	4.0	24.0	0.0	
D	0.48	7													8.5	2.5	6.0	24.0	0.0	
E	0.81	10													9.0	4.0	6.5	24.0	0.0	
F	1.13	11													11.0	5.0	8.5	24.0	0.0	
G	1.38	13													13.0	6.0	9.5	24.0	0.0	
H	1.85	15													16.0	8.0	12.0	24.0	0.0	
I	2.37	17													20.0	11.0	15.5	24.0	0.0	
J	2.82	20													23.0	13.5	18.0	24.0	0.0	
K	3.65	20	1.000		4.000	2.000	3.000	2.500		1.000	2.000	3.000	6.000		31.5	16.5	18.5	24.0	6.0	

- Notes:
- <sup>1</sup> WWTP volume and duration is wet weather flow only.
  - <sup>2</sup> Base dry weather flow to WWTP is 26 MGD.
  - <sup>3</sup> Storage Tank volume and duration is not included in WWTP totals.
  - <sup>4</sup> Total CSO overflow volume only, does not include WWTP, High Rate Treatment, or Storage Tank volumes.
  - <sup>5</sup> Maximum CSO duration only, does not include WWTP, High Rate Treatment, or Storage Tank duration.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-21  
Estimated CSO Volume for Typical Year 1968

Greeley and Hansen LLC  
May 2005

Level of Control	Alternative 1 - 1968 Typical Year CSO Volume (MG)													Total CSO Volume (MG)
	001	002	003	004	006	007	008	009	010	011	012	015	017	
	1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.	
Base Condition	248	99	141	77	33	55	11	151	6	10	111	1	7	952
Phase I	251	99	141	77	33	28	0	3	6	10	109	1	0	757
Design Storm D	69	0	29	19	127	14	0	95	0	9	79	0	0	442
Design Storm E	48	0	18	12	77	15	0	64	0	7	52	0	0	292
Design Storm F	29	0	8	5	33	5	0	61	0	5	32	0	0	180
Design Storm G	21	0	4	3	20	5	0	59	0	0	23	0	0	135
Design Storm H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Design Storm J	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Level of Control	Alternative 2 - 1968 Typical Year CSO Volume (MG)													Total CSO Volume (MG)
	001	002	003	004	006	007	008	009	010	011	012	015	017	
	1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.	
Base Condition	248	99	141	77	33	55	11	151	6	10	111	1	7	952
Phase I	251	99	141	77	33	28	0	3	6	10	109	1	0	757
Design Storm D	65	0	30	20	129	65	0	52	3	6	42	0	0	413
Design Storm E	43	0	19	12	77	8	0	114	1	4	17	0	0	297
Design Storm F	27	0	9	7	34	6	0	85	1	2	9	0	0	180
Design Storm G	22	0	5	4	20	7	0	61	0	2	6	0	0	126
Design Storm H	15	0	3	2	11	2	0	38	0	1	12	0	0	84
Design Storm J	7	0	1	1	4	1	0	12	0	1	4	0	0	31

Level of Control	Alternative 3 - 1968 Typical Year CSO Volume (MG)													Total CSO Volume (MG)
	001	002	003	004	006	007	008	009	010	011	012	015	017	
	1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.	
Base Condition	248	99	141	77	33	55	11	151	6	10	111	1	7	952
Phase I	251	99	141	77	33	28	0	3	6	10	109	1	0	757
Design Storm D	43	0	22	12	144	6	0	36	3	6	42	0	0	314
Design Storm E	22	0	16	11	77	5	0	16	1	4	17	0	0	169
Design Storm F	13	0	8	5	34	4	0	8	1	2	9	0	0	84
Design Storm G	9	0	5	4	19	2	0	6	0	2	6	0	0	53
Design Storm H	5	0	3	2	11	2	0	2	0	1	12	0	0	37
Design Storm J	2	0	1	1	4	1	0	0	0	1	4	0	0	14

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long-Term Control Plan

Table 3.6-22  
Estimated CSO Frequency for Typical Year 1968

Greeley and Hansen  
May 2005

Level of Control	Alternative 1 - 1968 Typical Year CSO Frequency													Maximum CSO Frequency
	001	002	003	004	006	007	008	009	010	011	012	015	017	
	1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.	
Base Condition	96	96	96	96	96	96	96	96	96	96	96	19	38	96
Phase I	96	96	96	96	96	28	0	7	96	96	96	19	0	96
Design Storm D	19	0	19	19	19	19	0	19	0	19	19	0	0	19
Design Storm E	13	0	13	13	13	13	0	13	0	13	13	0	0	13
Design Storm F	7	0	7	7	7	7	0	7	0	7	7	0	0	7
Design Storm G	4	0	4	4	4	4	0	4	0	0	4	0	0	4
Design Storm H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Design Storm J	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Level of Control	Alternative 2 - 1968 Typical Year CSO Frequency													Maximum CSO Frequency
	001	002	003	004	006	007	008	009	010	011	012	015	017	
	1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.	
Base Condition	96	96	96	96	96	96	96	96	96	96	96	19	38	96
Phase I	96	96	96	96	96	28	0	7	96	96	96	19	0	96
Design Storm D	19	0	19	19	19	19	0	19	19	19	19	0	0	19
Design Storm E	13	0	13	13	13	13	0	13	13	13	13	0		13
Design Storm F	7	0	7	7	7	7	0	7	7	7	7	0	0	7
Design Storm G	4	0	4	4	4	4	0	4	4	4	4	0	0	4
Design Storm H	2	0	2	2	2	2	0	2	2	2	2	0	0	2
Design Storm J	1	0	1	1	1	1	0	1	1	1	1	0	0	1

Level of Control	Alternative 3 - 1968 Typical Year CSO Frequency													Maximum CSO Frequency
	001	002	003	004	006	007	008	009	010	011	012	015	017	
	1052.4 ac.	101.6 ac.	366.0 ac.	268.5 ac.	405.8 ac.	318.4 ac.	16.0 ac.	225.7 ac.	68.6 ac.	72.7 ac.	681.8 ac.	19.6 ac.	679.9 ac.	
Base Condition	96	96	96	96	96	96	96	96	96	96	96	19	38	96
Phase I	96	96	96	96	96	28	0	7	96	96	96	19	0	96
Design Storm D	19	0	19	19	19	13	0	19	19	19	19	0	0	19
Design Storm E	13	0	13	13	13	13	0	13	13	13	13	0	0	13
Design Storm F	7	0	7	7	7	7	0	7	7	7	7	0	0	7
Design Storm G	4	0	4	4	4	4	0	4	4	4	4	0	0	4
Design Storm H	2	0	2	2	2	2	0	2	2	2	2	0	0	2
Design Storm J	1	0	1	1	1	1	0	1	1	1	1	0	0	1

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Table 3.7-1  
Capital Cost Summary**

Greeley and Hansen  
May 2005

<i>Alternative</i>	<i>D Storm (24 overflows/yr)</i>	<i>E Storm (12 overflows/yr)</i>	<i>F Storm (6 overflows/yr)</i>	<i>G Storm (4 overflows/yr)</i>	<i>H Storm (1-2 overflows/yr)</i>	<i>J Storm (0.5 overflows/yr)</i>
Alternative 1 - Storage Tanks	\$91,110,000	\$156,460,000	\$216,670,000	\$263,010,000	N/A	N/A
Alternative 2 - Parallel Interceptor	\$92,410,000	\$163,390,000	\$225,230,000	\$269,800,000	\$342,790,000	\$490,350,000
Alternative 3 - High Rate Treatment - Vortex Separators	\$90,110,000	\$147,610,000	\$203,490,000	\$257,350,000	\$301,810,000	\$431,490,000
Alternative 3 - High Rate Treatment - Enhanced High Rate Clarification	\$90,950,000	\$132,760,000	\$163,010,000	\$185,640,000	\$243,180,000	\$314,130,000
Alternative 3 - High Rate Treatment - Sedimentation Basin	\$90,490,000	\$139,390,000	\$168,460,000	\$189,880,000	\$241,650,000	\$298,300,000

ENRCCI = 7300

CITY OF LAFAYETTE, INDIANA

**Combined Sewer Overflow Long Term Control Plan**

Table 3.7-2  
Preliminary Opinion of Probable Capital Costs - Alternative 1: Storage

Greeley and Hansen  
May 2005

<b><i>CAPITAL COST</i></b>	<b><i>D Storm</i></b>	<b><i>E Storm</i></b>	<b><i>F Storm</i></b>	<b><i>G Storm</i></b>
<b><i>Wabash River</i></b>				
1. Screening Facility	1,090,000	610,000	940,000	1,140,000
2. Lift Station	7,520,000	8,460,000	13,320,000	16,720,000
3. Storage Tank CSOs 001/002 (including conveyance, screening & pumping)	6,946,257	13,797,663	20,047,388	24,740,832
4. Storage Tank at CSO 003/CSO004 (including screenign & pumping)	-	10,090,000	9,790,000	10,260,000
5. Storage Tank at Pearl River Lift Station	9,210,000	18,190,000	18,370,000	18,400,000
6. Storage Tank at CSO 007 (including screening & pumping)	-	-	-	5,660,000
7. Storage Tank at CSO 009 (including screening & pumping)	13,300,000	25,970,000	45,920,000	58,980,000
5. Regulator Modifications	200,000	340,000	380,000	420,000
6. Interceptor Upgrade from CSO 003 to CSO 004	-	-	-	561,000
7. New Sewer from CSO 004 to Pearl River Lift Station	1,657,500		1,852,500	1,852,500
8. New Forcemain from Pearl River Lift Station to WWTP	5,572,500	5,572,500	5,632,500	6,090,000
<i>Wabash River Subtotal</i>	<i>45,500,000</i>	<i>83,030,000</i>	<i>116,250,000</i>	<i>144,820,000</i>
<b><i>Durkee's Run</i></b>				
18. New Throttle Pipes at CSO 010 and CSO 015	650,000	650,000	650,000	650,000
20. Storage Tank at CSO 012 (including screening & pumping) <sup>1</sup>	6,430,000	14,360,000	23,030,000	26,690,000
21. Regulatory Modification	50,000	50,000	50,000	50,000
<i>Durkee's Run Subtotal</i>	<i>7,130,000</i>	<i>15,060,000</i>	<i>23,730,000</i>	<i>27,390,000</i>
<b><i>Railroad Corridor</i></b>				
22. Railroad Corridor Sewer	10,750,000	10,750,000	10,750,000	10,750,000
<i>Railroad Corridor Subtotal</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>
Capital Cost Subtotal	63,380,000	108,840,000	150,730,000	182,960,000
Contingency (25%)	15,850,000	27,210,000	37,680,000	45,740,000
Engineering, Legal & Administrative (15%)	11,880,000	20,410,000	28,260,000	34,310,000
<b>TOTAL CAPITAL COST</b>	<b>\$91,110,000</b>	<b>\$156,460,000</b>	<b>\$216,670,000</b>	<b>\$263,010,000</b>

<sup>1</sup> Pumping was only included for F and G levels of control

CITY OF LAFAYETTE, INDIANA

**Combined Sewer Overflow Long Term Control Plan**

Table 3.7-3  
Preliminary Opinion of Probable Capital Costs - Alternative 2: Convey and Treat

Greeley and Hansen  
May 2005

<b><i>CAPITAL COST</i></b>	<b><i>D Storm</i></b>	<b><i>E Storm</i></b>	<b><i>F Storm</i></b>	<b><i>G Storm</i></b>	<b><i>H Storm</i></b>	<b><i>J Storm</i></b>
<b><i>Wabash River</i></b>						
1. Screening Facility	530,000	620,000	930,000	1,110,000	1,400,000	1,610,000
2. Lift Station	7,520,000	8,690,000	13,090,000	16,270,000	22,250,000	27,610,000
3. Storage Tank CSOs 001/002 (inc.conveyance, screening & pumping)	5,112,455	12,397,663	18,087,388	24,740,832	31,950,832	48,120,832
4. Storage Tank at CSO 003/CSO004 (including screening & pumping)		10,520,000	10,870,000	10,430,000	11,250,000	10,780,000
5. Storage Tank at Pearl River Lift Station	9,780,000	18,190,000	18,400,000	18,190,000	19,810,000	27,130,000
6. Storage Tank at CSO 007 (including screening & pumping)			3,290,000	7,900,000		5,430,000
7. Storage Tank at CSO 009 (including screening & pumping)	17,720,000	38,820,000	65,900,000	81,220,000	100,640,000	162,670,000
5. Regulator Modifications	200,000	340,000	380,000	420,000	460,000	500,000
6. Interceptor Upgrade from CSO 003 to CSO 004			561,000	627,000	561,000	683,760
7. New Sewer from CSO 004 to Pearl River Lift Station	1,657,500	1,657,500	2,020,200	2,246,400	1,852,500	2,246,400
8. New Forcemain from Pearl River Lift Station to WWTP	5,572,500	5,572,500	5,632,500	6,090,000	6,855,000	6,855,000
<i>Wabash River Subtotal</i>	<i>48,090,000</i>	<i>96,810,000</i>	<i>139,160,000</i>	<i>169,240,000</i>	<i>197,030,000</i>	<i>293,640,000</i>
<b><i>Durkee's Run</i></b>						
18. New Throttle Pipes at CSO 010 and CSO 015	650,000	650,000	650,000	650,000	650,000	650,000
19. Parallel Interceptor	4,800,252	5,454,412	6,124,190	7,048,503	4,334,155	4,809,953
20. Storage Tank at CSO 012 (including screening & pumping) <sup>1</sup>					25,650,000	31,210,000
21. Regulatory Modification					50,000	50,000
<i>Durkee's Run Subtotal</i>	<i>5,450,000</i>	<i>6,100,000</i>	<i>6,770,000</i>	<i>7,700,000</i>	<i>30,680,000</i>	<i>36,720,000</i>
<b><i>Railroad Corridor</i></b>						
22. Railroad Corridor Sewer	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000
<i>Railroad Corridor Subtotal</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>
Capital Cost Subtotal	64,290,000	113,660,000	156,680,000	187,690,000	238,460,000	341,110,000
Contingency (25%)	16,070,000	28,420,000	39,170,000	46,920,000	59,620,000	85,280,000
Engineering, Legal & Administrative (15%)	12,050,000	21,310,000	29,380,000	35,190,000	44,710,000	63,960,000
<b>TOTAL CAPITAL COST</b>	<b>\$92,410,000</b>	<b>\$163,390,000</b>	<b>\$225,230,000</b>	<b>\$269,800,000</b>	<b>\$342,790,000</b>	<b>\$490,350,000</b>

<sup>1</sup> Pumping was only included for F and G levels of control.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long Term Control Project

Table 3.7-4

Preliminary Opinion of Probable Capital Costs - Alternative 3: High Rate Treatment

Greeley and Hansen  
May 2005

CAPITAL COST	Vortex Separators						Enhanced High Rate Clarification						Sedimentation Basin					
	D Storm	E Storm	F Storm	G Storm	H Storm	J Storm	D Storm	E Storm	F Storm	G Storm	H Storm	J Storm	D Storm	E Storm	F Storm	G Storm	H Storm	J Storm
<b>Pearl River Lift Station</b>																		
1. Screening Facility	530,000	620,000	1,220,000	1,430,000	1,960,000	2,450,000	530,000	620,000	1,220,000	1,430,000	1,960,000	2,450,000	530,000	620,000	1,220,000	1,430,000	1,960,000	2,450,000
2. Lift Station	7,520,000	9,400,000	14,100,000	17,730,000	24,820,000	27,610,000	7,520,000	9,400,000	14,100,000	17,730,000	24,820,000	27,610,000	7,520,000	9,400,000	14,100,000	17,730,000	24,820,000	27,610,000
3. Storage Tank at Pearl River Lift Station	11,640,000	18,400,000	18,150,000	18,120,000	19,810,000	27,130,000	11,640,000	18,400,000	18,150,000	18,120,000	19,810,000	27,130,000	11,640,000	18,400,000	18,150,000	18,120,000	19,810,000	27,130,000
4. Storage Tank at CSO 003/CSO004 (including pumping and screening)	-	9,210,000	10,430,000	10,430,000	11,250,000	10,700,000	-	9,210,000	10,430,000	10,430,000	11,250,000	10,700,000	-	9,210,000	10,430,000	10,430,000	11,250,000	10,700,000
5. Regulator Modifications	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
6. Interceptor Upgrade from CSO 003 to CSO 004	561,000	475,200	475,200	475,200	561,000	683,760	561,000	475,200	475,200	561,000	683,760	561,000	475,200	475,200	561,000	683,760	561,000	683,760
7. New Sewer from CSO 004 to Pearl River Lift Station	2,020,200	1,657,500	1,657,500	1,657,500	1,852,500	2,246,400	2,020,200	1,657,500	1,657,500	1,657,500	1,852,500	2,246,400	2,020,200	1,657,500	1,657,500	1,657,500	1,852,500	2,246,400
8. New Forcemain from Pearl River Lift Station to WWTP	5,572,500	5,572,500	5,632,500	6,090,000	6,855,000	6,855,000	5,572,500	5,572,500	5,632,500	6,090,000	6,855,000	6,855,000	5,572,500	5,572,500	5,632,500	6,090,000	6,855,000	6,855,000
<i>Pearl River Lift Station Subtotal</i>	<i>27,990,000</i>	<i>45,490,000</i>	<i>51,820,000</i>	<i>56,080,000</i>	<i>67,260,000</i>	<i>77,830,000</i>	<i>27,990,000</i>	<i>45,490,000</i>	<i>51,820,000</i>	<i>56,080,000</i>	<i>67,260,000</i>	<i>77,830,000</i>	<i>27,990,000</i>	<i>45,490,000</i>	<i>51,820,000</i>	<i>56,080,000</i>	<i>67,260,000</i>	<i>77,830,000</i>
<b>Wet Weather Treatment Facilities</b>																		
9. Screening	970,000	2,030,000	2,710,000	3,150,000	3,260,000	3,970,000	970,000	2,030,000	2,710,000	3,150,000	3,260,000	3,970,000	970,000	2,030,000	2,710,000	3,150,000	3,260,000	3,970,000
10. Vortex Separators	4,880,000	7,920,000	10,230,000	11,800,000	12,130,000	14,770,000	-	-	-	-	-	-	-	-	-	-	-	-
11. Compressed Media Filter	8,210,000	23,440,000	50,460,000	79,190,000	75,010,000	136,930,000	-	-	-	-	-	-	-	-	-	-	-	-
12. Enhanced High Rate Clarification	-	-	-	-	-	-	8,370,000	13,820,000	19,330,000	23,710,000	24,060,000	32,260,000	-	-	-	-	-	-
13. Solids Storage Tank	-	-	-	-	-	-	5,300,000	7,200,000	13,200,000	17,400,000	22,300,000	37,800,000	-	-	-	-	-	-
14. Sedimentation Basin	-	-	-	-	-	-	-	-	-	-	-	-	13,350,000	25,640,000	36,320,000	44,060,000	45,290,000	59,040,000
15. Chlorine Contact Tank	2,970,000	5,060,000	6,720,000	7,840,000	8,090,000	9,980,000	2,970,000	5,060,000	6,720,000	7,840,000	8,090,000	9,980,000	2,970,000	5,060,000	6,720,000	7,840,000	8,090,000	9,980,000
16. Chemical Storage Building	200,000	200,000	200,000	210,000	240,000	340,000	200,000	200,000	200,000	210,000	240,000	340,000	200,000	200,000	200,000	210,000	240,000	340,000
17. Conveyance Cost at HRT 001	1,270,000	1,700,000	1,900,000	2,300,000	2,530,000	3,400,000	1,270,000	1,700,000	1,900,000	2,300,000	2,530,000	3,400,000	1,270,000	1,700,000	1,900,000	2,300,000	2,530,000	3,400,000
<i>Wet Weather Treatment Facilities Subtotal</i>	<i>18,500,000</i>	<i>40,350,000</i>	<i>72,220,000</i>	<i>104,490,000</i>	<i>101,260,000</i>	<i>169,390,000</i>	<i>19,080,000</i>	<i>30,010,000</i>	<i>44,060,000</i>	<i>54,610,000</i>	<i>60,480,000</i>	<i>87,750,000</i>	<i>18,760,000</i>	<i>34,630,000</i>	<i>47,850,000</i>	<i>57,560,000</i>	<i>59,410,000</i>	<i>76,730,000</i>
<b>Durkee's Run</b>																		
18. New Throttle Pipes at CSO 010 and CSO 015	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000
19. Parallel Interceptor	4,800,000	5,450,000	6,120,000	7,050,000	4,330,000	4,810,000	4,800,000	5,450,000	6,120,000	7,050,000	4,330,000	4,810,000	4,800,000	5,450,000	6,120,000	7,050,000	4,330,000	4,810,000
20. Storage Tank at CSO 012 (including pumping and screening)	-	-	-	-	25,650,000	31,210,000	-	-	-	-	25,650,000	31,210,000	-	-	-	-	25,650,000	31,210,000
21. Regulatory Modification	-	-	-	-	50,000	50,000	-	-	-	-	50,000	50,000	-	-	-	-	50,000	50,000
<i>Durkee's Run Subtotal</i>	<i>5,450,000</i>	<i>6,100,000</i>	<i>6,770,000</i>	<i>7,700,000</i>	<i>30,680,000</i>	<i>36,720,000</i>	<i>5,450,000</i>	<i>6,100,000</i>	<i>6,770,000</i>	<i>7,700,000</i>	<i>30,680,000</i>	<i>36,720,000</i>	<i>5,450,000</i>	<i>6,100,000</i>	<i>6,770,000</i>	<i>7,700,000</i>	<i>30,680,000</i>	<i>36,720,000</i>
<b>Miscellaneous Items</b>																		
22. Railroad Corridor Sewer	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000	10,750,000
23. Storage Tank at CSO 007 (including pumping and screening)	-	-	-	-	-	5,430,000	-	-	-	-	-	5,430,000	-	-	-	-	-	5,430,000
24. Regulatory Modifications	-	-	-	-	-	50,000	-	-	-	-	-	50,000	-	-	-	-	-	50,000
<i>Miscellaneous Subtotal</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>16,230,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>16,230,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>10,750,000</i>	<i>16,230,000</i>
Capital Cost Subtotal	62,690,000	102,690,000	141,560,000	179,020,000	209,950,000	300,170,000	63,270,000	92,350,000	113,400,000	129,140,000	169,170,000	218,530,000	62,950,000	96,970,000	117,190,000	132,090,000	168,100,000	207,510,000
Contingency (25%)	15,670,000	25,670,000	35,390,000	44,760,000	52,490,000	75,040,000	15,820,000	23,090,000	28,350,000	32,290,000	42,290,000	54,630,000	15,740,000	24,240,000	29,300,000	33,020,000	42,030,000	51,880,000
Engineering, Legal & Administrative (15%)	11,750,000	19,250,000	26,540,000	33,570,000	39,370,000	56,280,000	11,860,000	17,320,000	21,260,000	24,210,000	31,720,000	40,970,000	11,800,000	18,180,000	21,970,000	24,770,000	31,520,000	38,910,000
<b>TOTAL CAPITAL COST</b>	<b>\$90,110,000</b>	<b>\$147,610,000</b>	<b>\$203,490,000</b>	<b>\$257,350,000</b>	<b>\$301,810,000</b>	<b>\$431,490,000</b>	<b>\$90,950,000</b>	<b>\$132,760,000</b>	<b>\$163,010,000</b>	<b>\$185,640,000</b>	<b>\$243,180,000</b>	<b>\$314,130,000</b>	<b>\$90,490,000</b>	<b>\$139,390,000</b>	<b>\$168,460,000</b>	<b>\$189,880,000</b>	<b>\$241,650,000</b>	<b>\$298,300,000</b>

CITY OF LAFAYETTE, INDIANA

**Combined Sewer Overflow Long Term Control Plan**

Table 3.7-5  
Preliminary Opinion of Probable O&M Costs - Alternative 1: Storage

Greeley and Hansen  
May 2005

<b>O&amp;M COST</b>	<b>D Storm</b>	<b>E Storm</b>	<b>F Storm</b>	<b>G Storm</b>
<b>Wabash River</b>				
1. Screening Facility	20,000	20,000	30,000	30,000
2. Lift Station	320,000	340,000	490,000	590,000
3. Storage Tank CSOs 001/002 (including conveyance, screening & pumping)	363,000	554,000	725,000	866,000
4. Storage Tank at CSO 003/CSO004 (including screenign & pumping)	-	480,000	470,000	490,000
5. Storage Tank at Pearl River Lift Station	320,000	340,000	490,000	590,000
6. Storage Tank at CSO 007 (including screening & pumping)	-	-	-	320,000
7. Storage Tank at CSO 009 (including screening & pumping)	570,000	960,000	1,650,000	2,160,000
5. Regulator Modifications	1,000	1,000	1,000	1,000
6. Interceptor Upgrade from CSO 003 to CSO 004	-	-	-	1,000
7. New Sewer from CSO 004 to Pearl River Lift Station	4,000	4,000	5,000	5,000
8. New Forcemain from Pearl River Lift Station to WWTP	14,000	14,000	14,000	15,000
<i>Wabash River Subtotal</i>	<i>1,610,000</i>	<i>2,710,000</i>	<i>3,880,000</i>	<i>5,070,000</i>
<b>Durkee's Run</b>				
18. New Throttle Pipes at CSO 010 and CSO 015	2,000	2,000	2,000	2,000
20. Storage Tank at CSO 012 (including screening & pumping) <sup>1</sup>	280,000	520,000	880,000	990,000
21. Regulatory Modification	0	0	0	0
<i>Durkee's Run Subtotal</i>	<i>282,000</i>	<i>522,000</i>	<i>882,000</i>	<i>992,000</i>
<b>Railroad Corridor</b>				
22. Railroad Corridor Sewer	27,000	27,000	27,000	27,000
<i>Railroad Corridor Subtotal</i>	<i>27,000</i>	<i>27,000</i>	<i>27,000</i>	<i>27,000</i>
Annual O&M Cost	\$1,919,000	\$3,259,000	\$4,789,000	\$6,089,000
Present Worth Factor <sup>2</sup>	7.84	7.84	7.84	7.84
<b>PRESENT WORTH O&amp;M COSTS</b>	<b>\$15,040,000</b>	<b>\$25,550,000</b>	<b>\$37,550,000</b>	<b>\$47,740,000</b>
<b>TOTAL PRESENT WORTH</b>	<b>\$106,150,000</b>	<b>\$182,010,000</b>	<b>\$254,220,000</b>	<b>\$310,750,000</b>

<sup>1</sup> Pumping was only included for F and G levels of control.

<sup>2</sup> Present Worth Factor based on an interest rate of 8% over 20 years.

CITY OF LAFAYETTE, INDIANA

**Combined Sewer Overflow Long Term Control Plan**

Table 3.7-6  
Preliminary Opinion of Probable O&M Costs - Alternative 2: Convey and Treat

Greeley and Hansen  
May 2005

<b>O&amp;M COST</b>	<b>D Storm</b>	<b>E Storm</b>	<b>F Storm</b>	<b>G Storm</b>	<b>H Storm</b>	<b>J Storm</b>
<b>Wabash River</b>						
1. Screening Facility	20,000	20,000	30,000	30,000	40,000	50,000
2. Lift Station	320,000	350,000	480,000	580,000	760,000	1,190,000
3. Storage Tank CSOs 001/002 (inc.conveyance, screening & pumping)	303,000	504,000	665,000	856,000	1,076,000	1,656,000
4. Storage Tank at CSO 003/CSO004 (including screening & pumping)	-	490,000	510,000	490,000	520,000	500,000
5. Storage Tank at Pearl River Lift Station	380,000	640,000	640,000	640,000	680,000	900,000
6. Storage Tank at CSO 007 (including screening & pumping)	-	-	280,000	420,000	-	350,000
7. Storage Tank at CSO 009 (including screening & pumping)	720,000	1,350,000	2,250,000	2,710,000	3,300,000	5,150,000
5. Regulator Modifications	1,000	1,000	1,000	1,000	1,000	1,000
6. Interceptor Upgrade from CSO 003 to CSO 004	-	-	1,000	2,000	1,000	2,000
7. New Sewer from CSO 004 to Pearl River Lift Station	4,000	4,000	5,000	6,000	5,000	6,000
8. New Forcemain from Pearl River Lift Station to WWTP	14,000	14,000	14,000	15,000	17,000	17,000
<i>Wabash River Subtotal</i>	<i>1,760,000</i>	<i>3,370,000</i>	<i>4,880,000</i>	<i>5,750,000</i>	<i>6,400,000</i>	<i>9,820,000</i>
<b>Durkee's Run</b>						
18. New Throttle Pipes at CSO 010 and CSO 015	2,000	2,000	2,000	2,000	2,000	2,000
19. Parallel Interceptor	10,000	10,000	20,000	20,000	10,000	10,000
20. Storage Tank at CSO 012 (including screening & pumping) <sup>1</sup>	-	-	-	-	950,000	1,110,000
21. Regulatory Modification	-	-	-	-	1,000	1,000
<i>Durkee's Run Subtotal</i>	<i>10,000</i>	<i>10,000</i>	<i>20,000</i>	<i>20,000</i>	<i>960,000</i>	<i>1,120,000</i>
<b>Railroad Corridor</b>						
22. Railroad Corridor Sewer	27,000	27,000	27,000	27,000	27,000	27,000
<i>Railroad Corridor Subtotal</i>	<i>27,000</i>	<i>27,000</i>	<i>27,000</i>	<i>27,000</i>	<i>27,000</i>	<i>27,000</i>
Annual O&M Cost	\$1,797,000	\$3,407,000	\$4,927,000	\$5,797,000	\$7,387,000	\$10,967,000
Present Worth Factor <sup>2</sup>	7.84	7.84	7.84	7.84	7.84	7.84
<b>PRESENT WORTH O&amp;M COSTS</b>	<b>\$14,090,000</b>	<b>\$26,710,000</b>	<b>\$38,630,000</b>	<b>\$45,450,000</b>	<b>\$57,910,000</b>	<b>\$85,980,000</b>
<b>TOTAL PRESENT WORTH</b>	<b>\$106,500,000</b>	<b>\$190,100,000</b>	<b>\$263,860,000</b>	<b>\$315,250,000</b>	<b>\$400,700,000</b>	<b>\$576,330,000</b>

<sup>1</sup> Pumping was only included for F and G levels of control.

<sup>2</sup> Present Worth Factor based on an interest rate of 8% over 20 years.

CITY OF LAFAYETTE, INDIANA

Combined Sewer Overflow Long Term Control Plan

Table 3.7-7  
Preliminary Opinion of Probable O&M Costs - Alternative 3: High Rate Treatment

Greeley and Hansen  
May 2005

O&M COST	Vortex Separators						Enhanced High Rate Clarification						Sedimentation Basin					
	D Storm	E Storm	F Storm	G Storm	H Storm	J Storm	D Storm	E Storm	F Storm	G Storm	H Storm	J Storm	D Storm	E Storm	F Storm	G Storm	H Storm	J Storm
<b>Pearl River Lift Station</b>																		
1. Screening Facility	20,000	20,000	30,000	30,000	40,000	50,000	20,000	20,000	30,000	30,000	40,000	50,000	20,000	20,000	30,000	30,000	40,000	50,000
2. Lift Station	320,000	360,000	500,000	600,000	760,000	1,190,000	320,000	360,000	500,000	600,000	760,000	1,190,000	320,000	360,000	500,000	600,000	760,000	1,190,000
3. Storage Tank at Pearl River Lift Station	440,000	640,000	640,000	630,000	680,000	900,000	440,000	640,000	640,000	630,000	680,000	900,000	440,000	640,000	640,000	630,000	680,000	900,000
4. Storage Tank at CSO 003/CSO004 (including pumping and screening)	-	460,000	490,000	490,000	520,000	500,000	-	460,000	490,000	490,000	520,000	500,000	-	460,000	490,000	490,000	520,000	500,000
5. Regulator Modifications	0	0	0	1,000	2,000	1,000	0	0	0	1,000	2,000	1,000	0	0	0	1,000	2,000	1,000
6. Interceptor Upgrade from CSO 003 to CSO 004	1,000	1,000	1,000	1,000	1,000	2,000	1,000	1,000	1,000	1,000	1,000	2,000	1,000	1,000	1,000	1,000	1,000	2,000
7. New Sewer from CSO 004 to Pearl River Lift Station	5,000	4,000	4,000	4,000	5,000	6,000	5,000	4,000	4,000	4,000	5,000	6,000	5,000	4,000	4,000	4,000	5,000	6,000
8. New Forcemain from Pearl River Lift Station to WWTP	14,000	14,000	14,000	15,000	17,000	17,000	14,000	14,000	14,000	15,000	17,000	17,000	14,000	14,000	14,000	15,000	17,000	17,000
<b>Pearl River Lift Station Subtotal</b>	<b>800,000</b>	<b>1,500,000</b>	<b>1,680,000</b>	<b>1,770,000</b>	<b>2,030,000</b>	<b>2,670,000</b>	<b>800,000</b>	<b>1,500,000</b>	<b>1,680,000</b>	<b>1,770,000</b>	<b>2,030,000</b>	<b>2,670,000</b>	<b>800,000</b>	<b>1,500,000</b>	<b>1,680,000</b>	<b>1,770,000</b>	<b>2,030,000</b>	<b>2,670,000</b>
<b>Wet Weather Treatment Facilities</b>																		
9. Screening	30,000	60,000	80,000	90,000	100,000	120,000	30,000	60,000	80,000	90,000	100,000	120,000	30,000	60,000	80,000	90,000	100,000	120,000
10. Vortex Separators	480,000	570,000	640,000	680,000	690,000	770,000	-	-	-	-	-	-	-	-	-	-	-	-
11. Compressed Media Filter	250,000	700,000	1,510,000	2,380,000	2,250,000	4,110,000	-	-	-	-	-	-	-	-	-	-	-	-
12. Enhanced High Rate Clarification	-	-	-	-	-	-	990,000	1,160,000	1,320,000	1,450,000	1,450,000	1,700,000	-	-	-	-	-	-
13. Solids Storage Tank	-	-	-	-	-	-	160,000	220,000	400,000	520,000	670,000	1,130,000	-	-	-	-	-	-
14. Sedimentation Basin	-	-	-	-	-	-	-	-	-	-	-	-	580,000	960,000	1,270,000	1,500,000	1,540,000	1,950,000
15. Chlorine Contact Tank	90,000	150,000	200,000	240,000	240,000	300,000	90,000	150,000	200,000	240,000	240,000	300,000	90,000	150,000	200,000	240,000	240,000	300,000
16. Chemical Storage Building	6,000	6,000	6,000	6,300	7,200	10,200	6,000	6,000	6,000	6,300	7,200	10,200	6,000	6,000	6,000	6,300	7,200	10,200
17. Conveyance Cost at HRT 001	3,000	4,000	5,000	6,000	6,000	9,000	3,000	4,000	5,000	6,000	6,000	9,000	3,000	4,000	5,000	6,000	6,000	9,000
<b>Wet Weather Treatment Facilities Subtotal</b>	<b>859,000</b>	<b>1,490,000</b>	<b>2,441,000</b>	<b>3,402,300</b>	<b>3,293,200</b>	<b>5,319,200</b>	<b>1,279,000</b>	<b>1,600,000</b>	<b>2,011,000</b>	<b>2,312,300</b>	<b>2,473,200</b>	<b>3,269,200</b>	<b>709,000</b>	<b>1,180,000</b>	<b>1,561,000</b>	<b>1,842,300</b>	<b>1,893,200</b>	<b>2,389,200</b>
<b>Durkee's Run</b>																		
18. New Throttle Pipes at CSO 010 and CSO 015	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
19. Parallel Interceptor	10,000	10,000	20,000	20,000	10,000	10,000	10,000	10,000	20,000	20,000	10,000	10,000	10,000	10,000	20,000	20,000	10,000	10,000
20. Storage Tank at CSO 012 (including pumping and screening)	-	-	-	-	950,000	1,110,000	-	-	-	-	950,000	1,110,000	-	-	-	-	950,000	1,110,000
21. Regulatory Modification	-	-	-	-	0	0	-	-	-	-	0	0	-	-	-	-	0	0
<b>Durkee's Run Subtotal</b>	<b>12,000</b>	<b>12,000</b>	<b>22,000</b>	<b>22,000</b>	<b>962,000</b>	<b>1,122,000</b>	<b>12,000</b>	<b>12,000</b>	<b>22,000</b>	<b>22,000</b>	<b>962,000</b>	<b>1,122,000</b>	<b>12,000</b>	<b>12,000</b>	<b>22,000</b>	<b>22,000</b>	<b>962,000</b>	<b>1,122,000</b>
<b>Miscellaneous Items</b>																		
22. Railroad Corridor Sewer	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
23. Storage Tank at CSO 007 (including pumping and screening)	-	-	-	-	-	350,000	-	-	-	-	-	350,000	-	-	-	-	-	350,000
24. Regulatory Modifications	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0
<b>Miscellaneous Subtotal</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>377,000</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>377,000</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>27,000</b>	<b>377,000</b>
Annual O&M Cost	1,698,000	3,029,000	4,170,000	5,221,300	6,312,200	9,488,200	2,118,000	3,139,000	3,740,000	4,131,300	5,492,200	7,438,200	1,548,000	2,719,000	3,290,000	3,661,300	4,912,200	6,558,200
Present Worth Factor <sup>2</sup>	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84
<b>PRESENT WORTH O&amp;M COSTS</b>	<b>\$13,310,000</b>	<b>\$23,750,000</b>	<b>\$32,690,000</b>	<b>\$40,930,000</b>	<b>\$49,490,000</b>	<b>\$74,390,000</b>	<b>\$16,610,000</b>	<b>\$24,610,000</b>	<b>\$29,320,000</b>	<b>\$32,390,000</b>	<b>\$43,060,000</b>	<b>\$58,320,000</b>	<b>\$12,140,000</b>	<b>\$21,320,000</b>	<b>\$25,790,000</b>	<b>\$28,700,000</b>	<b>\$38,510,000</b>	<b>\$51,420,000</b>
<b>TOTAL PRESENT WORTH</b>	<b>\$103,420,000</b>	<b>\$171,360,000</b>	<b>\$236,180,000</b>	<b>\$298,280,000</b>	<b>\$351,300,000</b>	<b>\$505,880,000</b>	<b>\$107,560,000</b>	<b>\$157,370,000</b>	<b>\$192,330,000</b>	<b>\$218,030,000</b>	<b>\$286,240,000</b>	<b>\$372,450,000</b>	<b>\$102,630,000</b>	<b>\$160,710,000</b>	<b>\$194,250,000</b>	<b>\$218,580,000</b>	<b>\$280,160,000</b>	<b>\$349,720,000</b>

<sup>1</sup> Pumping was only included for F and G levels of control.  
<sup>2</sup> Present Worth Factor based on an interest rate of 8% over 20 years.

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Table 3.7-8  
Present Worth Cost Summary**

Greeley and Hansen  
May 2005

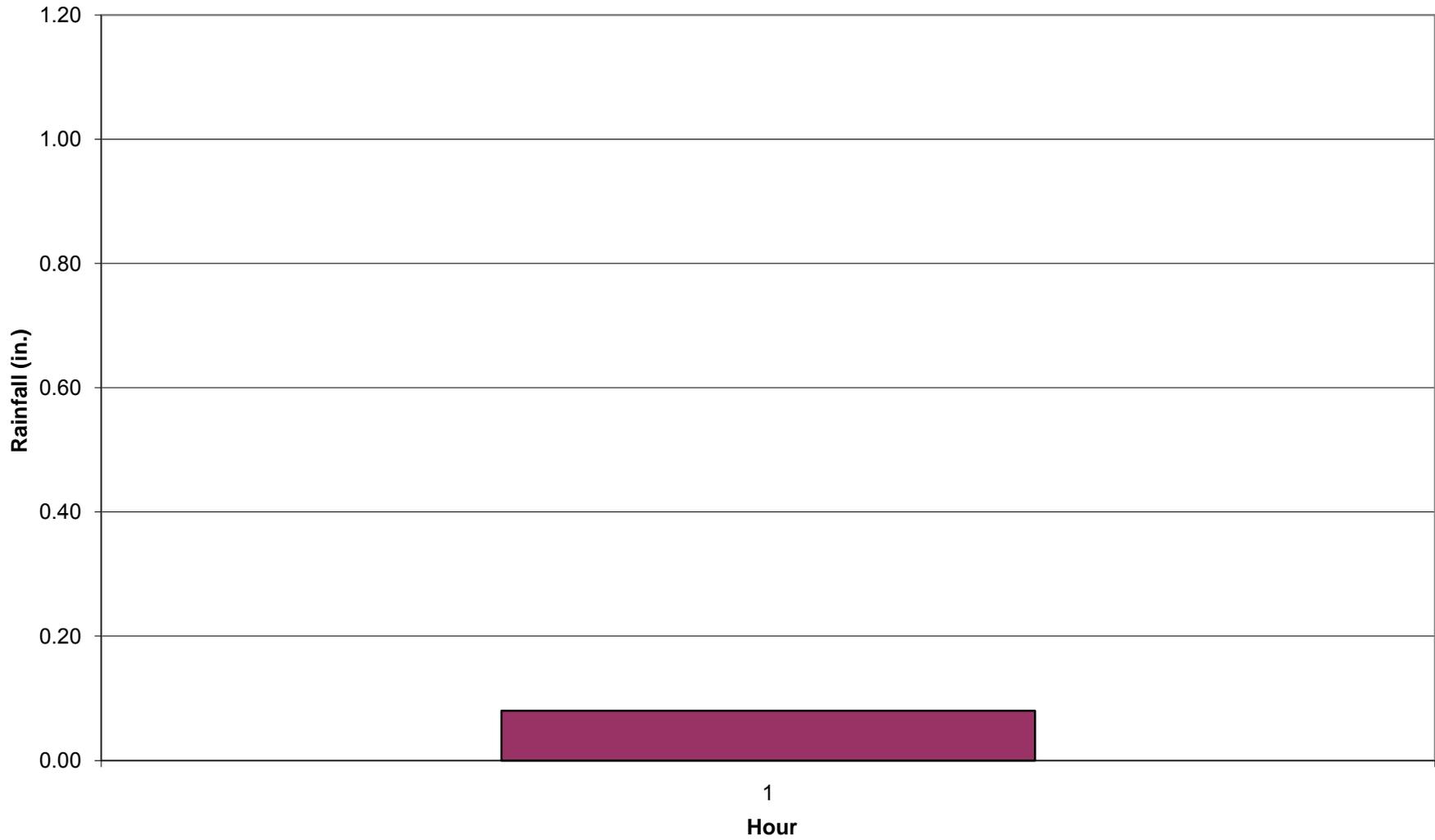
<i>Alternative</i>	<i>D Storm (24 overflows/yr)</i>	<i>E Storm (12 overflows/yr)</i>	<i>F Storm (6 overflows/yr)</i>	<i>G Storm (4 overflows/yr)</i>	<i>H Storm (1-2 overflows/yr)</i>	<i>J Storm (0.5 overflows/yr)</i>
Alternative 1 - Storage Tanks	\$106,150,000	\$182,010,000	\$254,220,000	\$310,750,000	N/A	N/A
Alternative 2 - Parallel Interceptor	\$106,500,000	\$190,100,000	\$263,860,000	\$315,250,000	\$400,700,000	\$576,330,000
Alternative 3 - High Rate Treatment - Vortex Separators	\$103,420,000	\$171,360,000	\$236,180,000	\$298,280,000	\$351,300,000	\$505,880,000
Alternative 3 - High Rate Treatment - Enhanced High Rate Clarification	\$107,560,000	\$157,370,000	\$192,330,000	\$218,030,000	\$286,240,000	\$372,450,000
Alternative 3 - High Rate Treatment - Sedimentation Basin	\$102,630,000	\$160,710,000	\$194,250,000	\$218,580,000	\$280,160,000	\$349,720,000

ENRCCI = 7300

CITY OF LAFAYETTE, INDIANA

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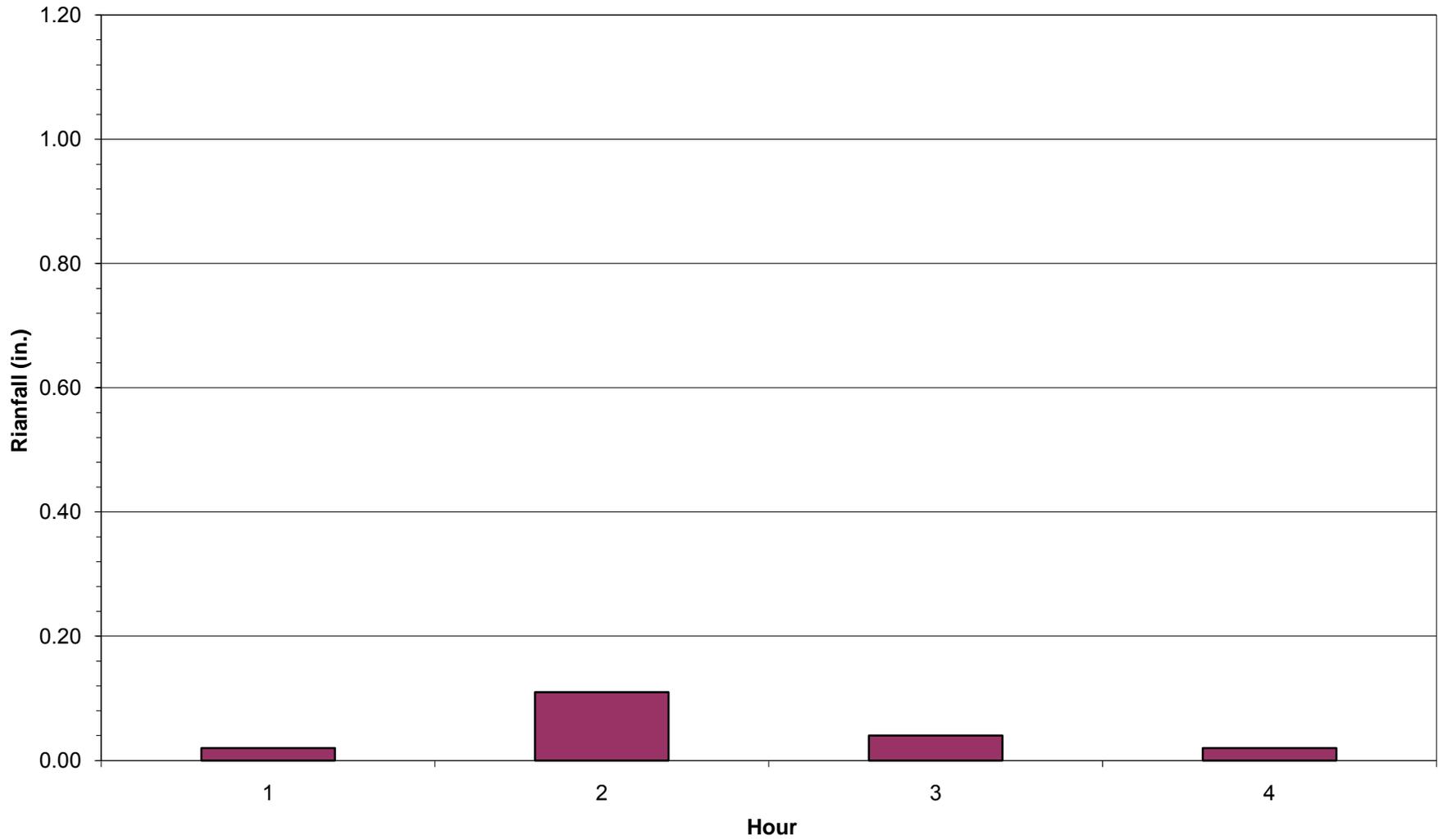
**Figure 3.5-1A**  
**Design Storm A**



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

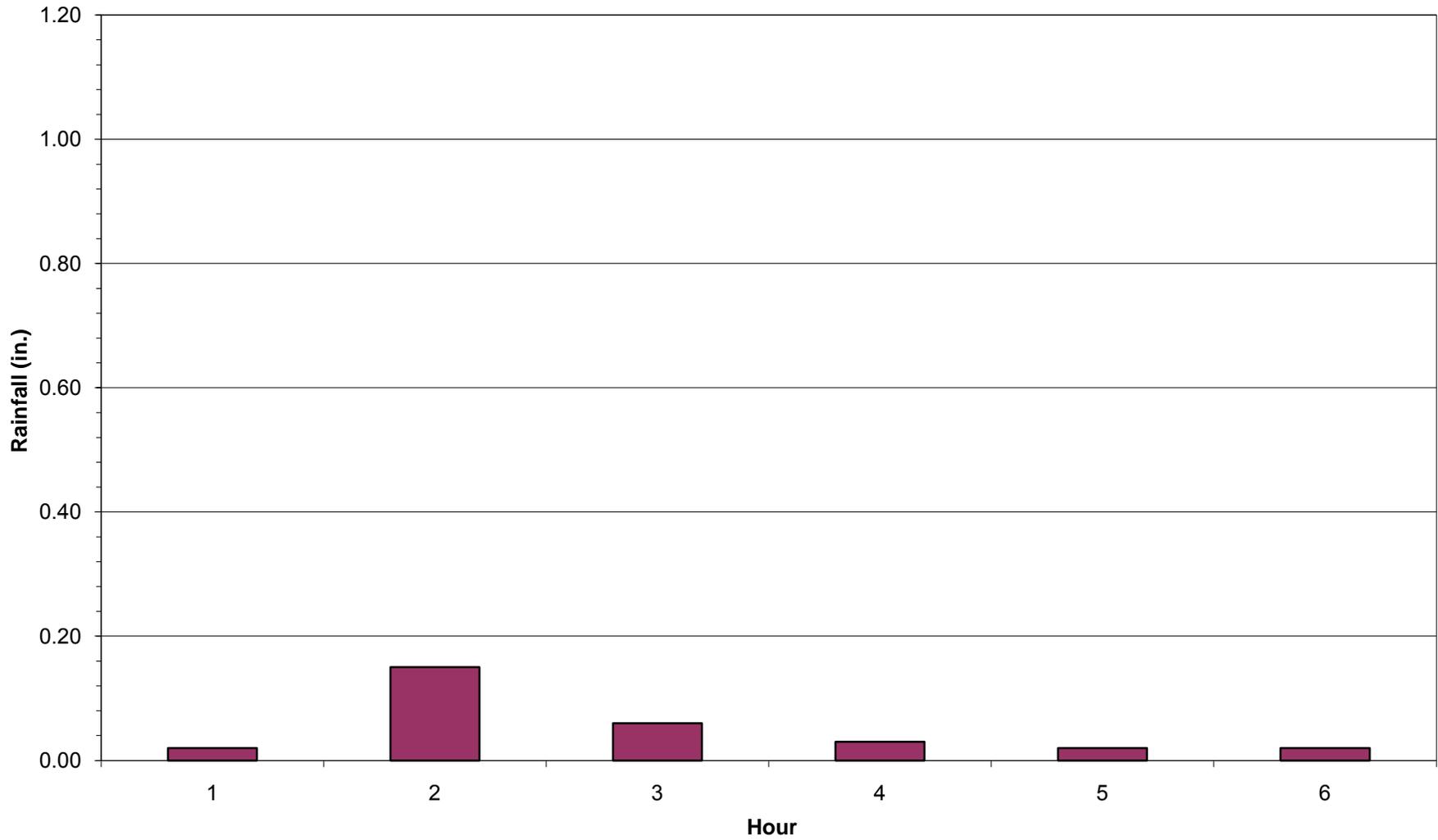
**Figure 3.5-1B**  
**Design Storm B**



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

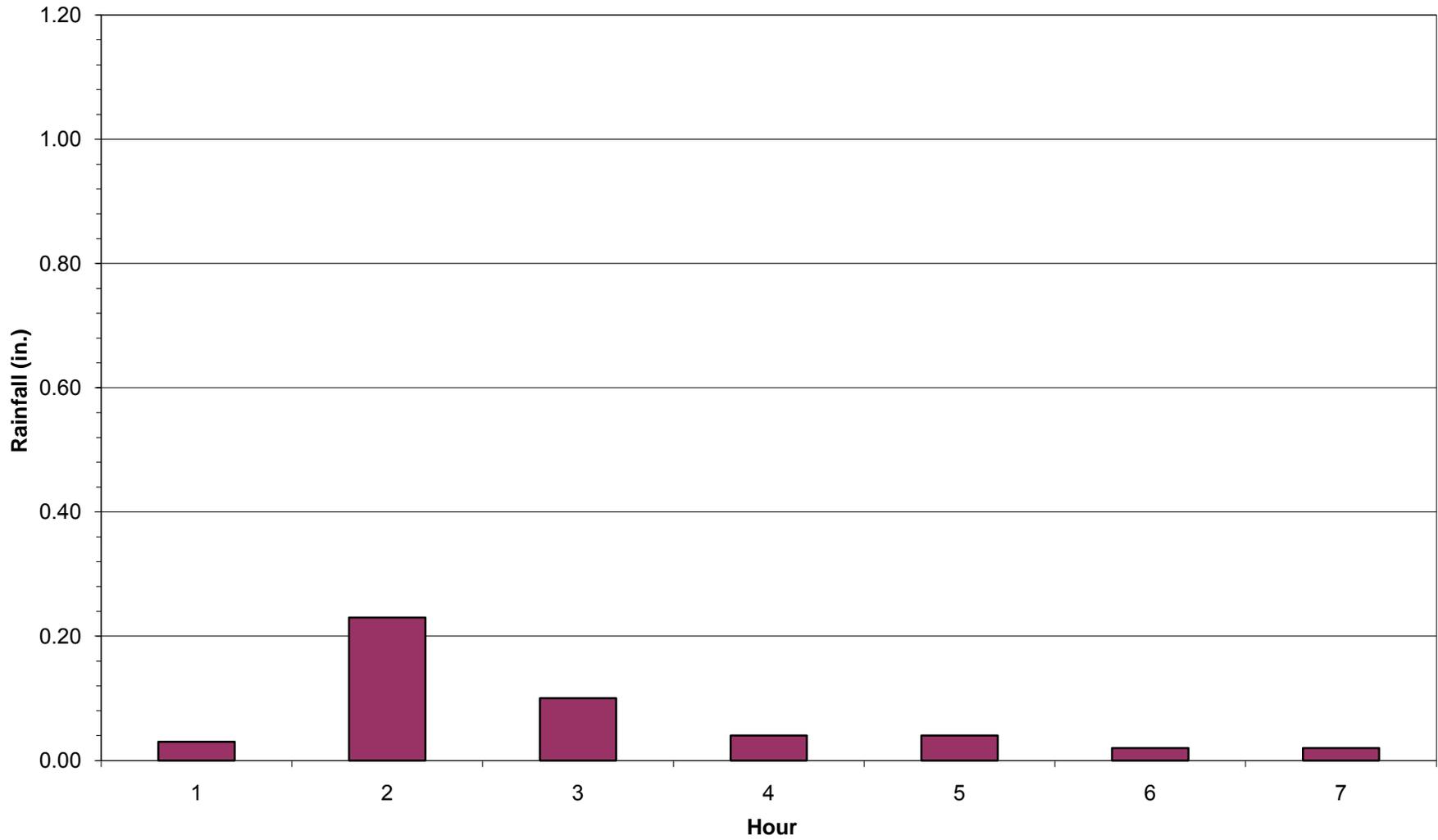
**Figure 3.5-1C**  
**Deisgn Storm C**



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

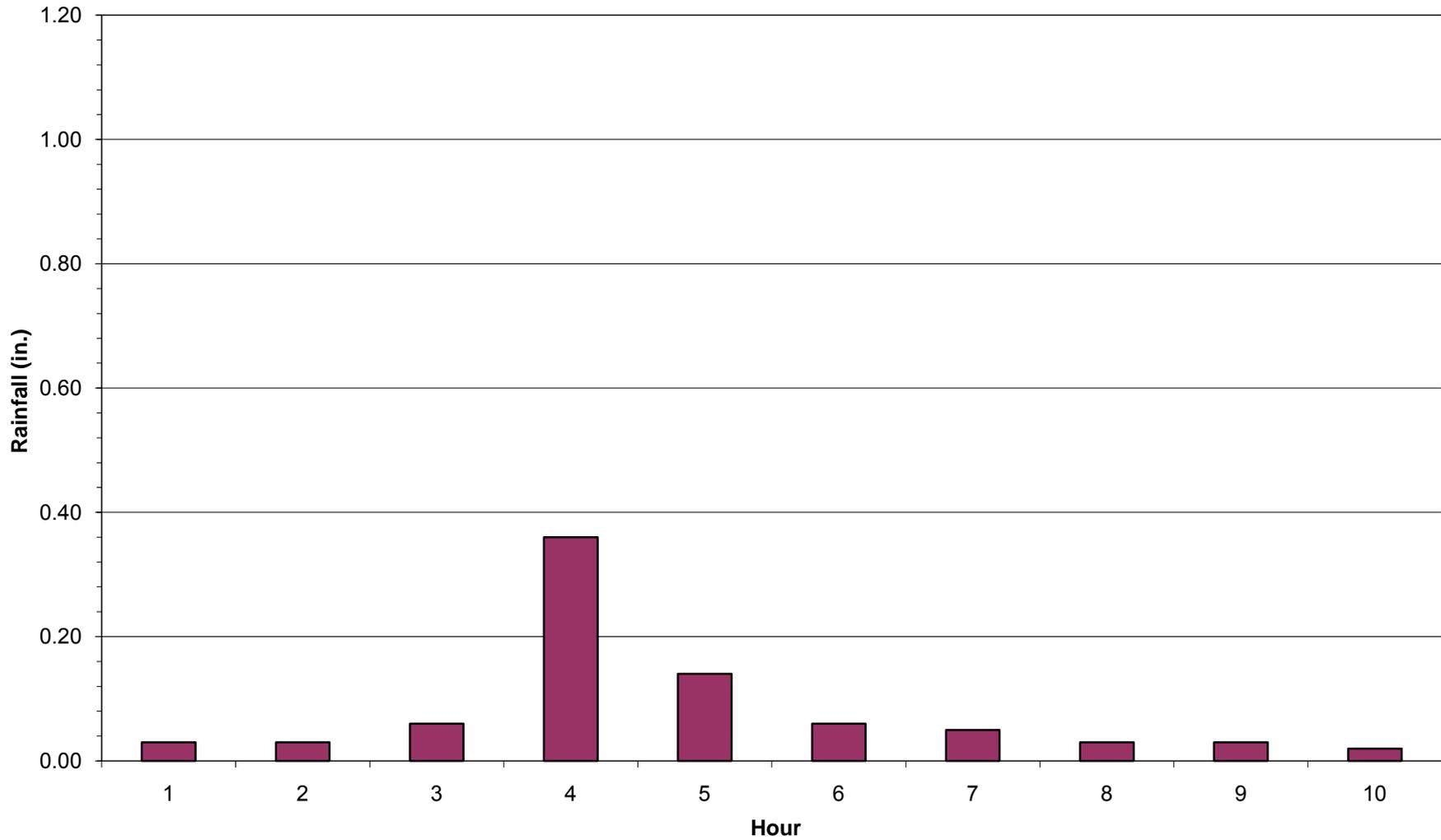
**Figure 3.5-1D**  
**Design Storm D**



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

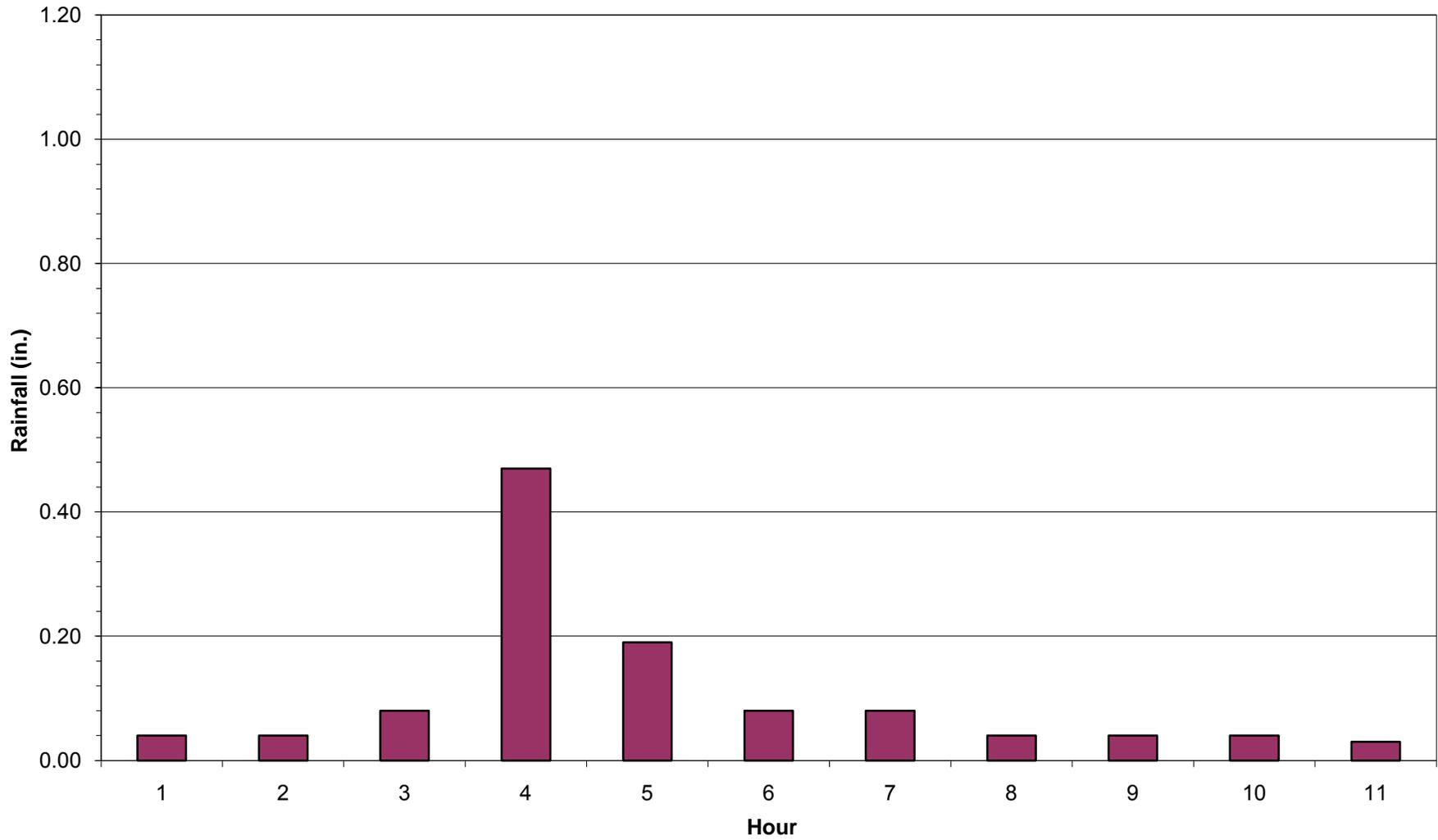
**Figure 3.5-1E**  
**Design Storm E**



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

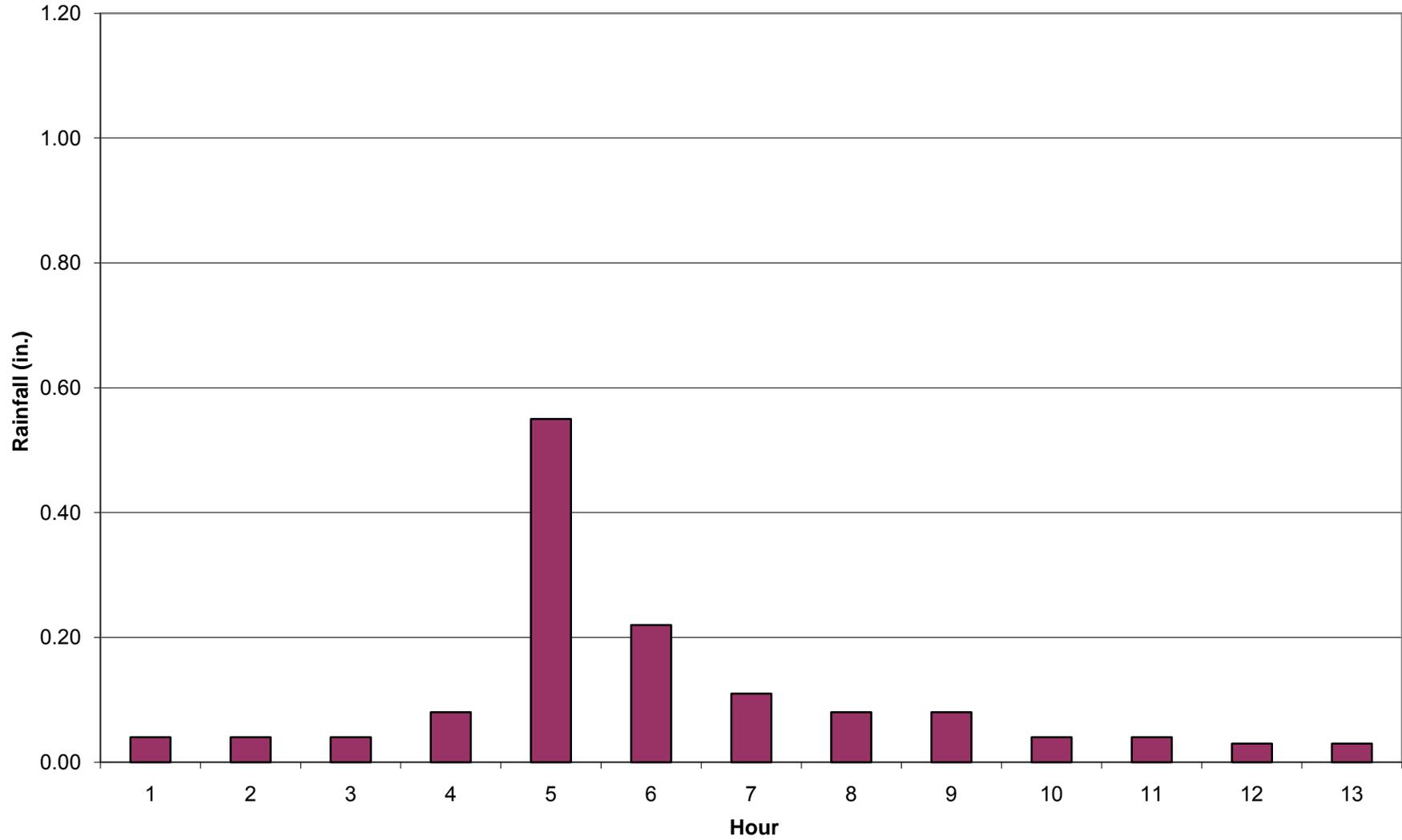
**Figure 3.5-1F**  
**Design Storm F**



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Project*

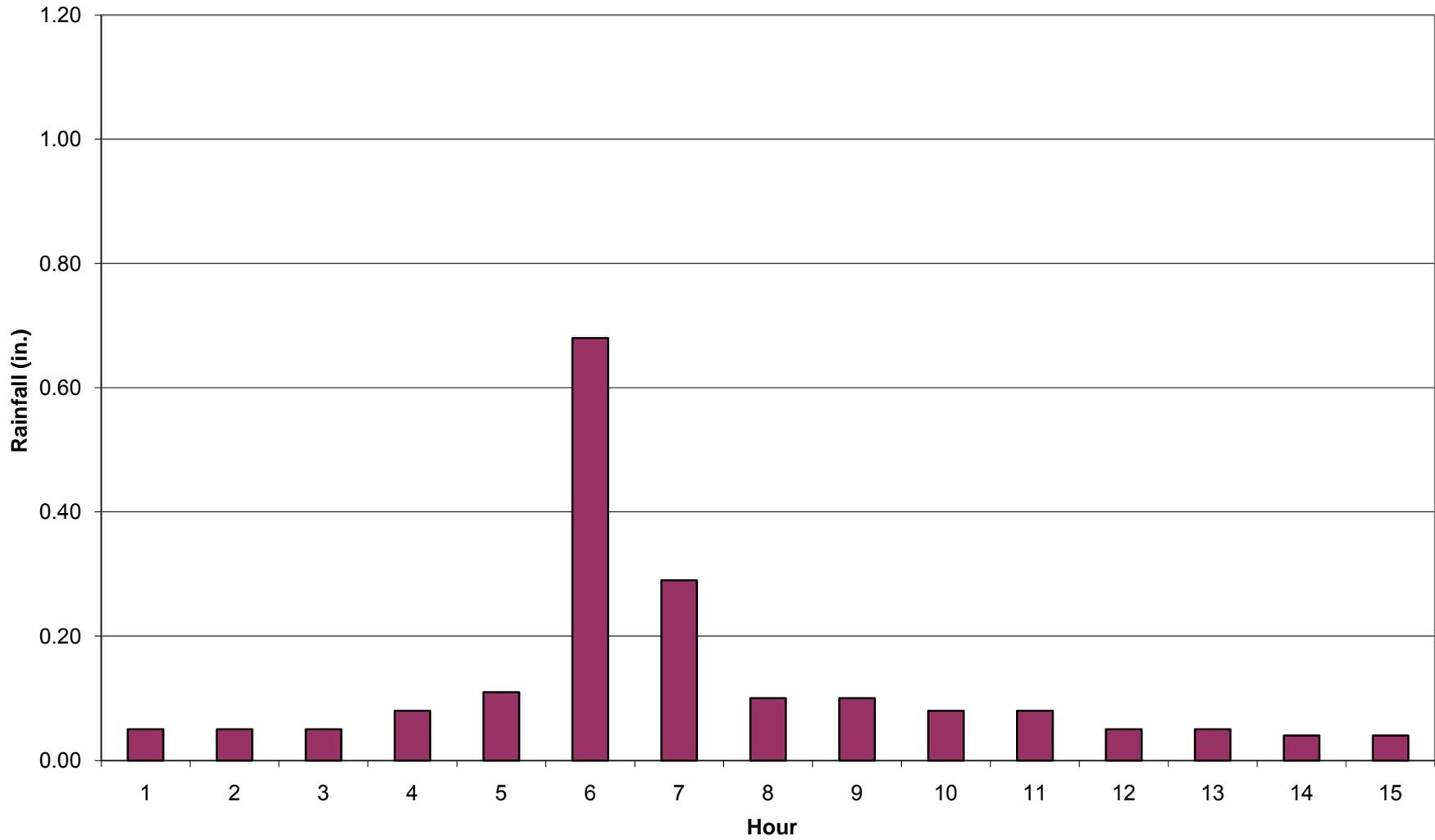
**Figure 3.5-1G**  
**Design Storm G**



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

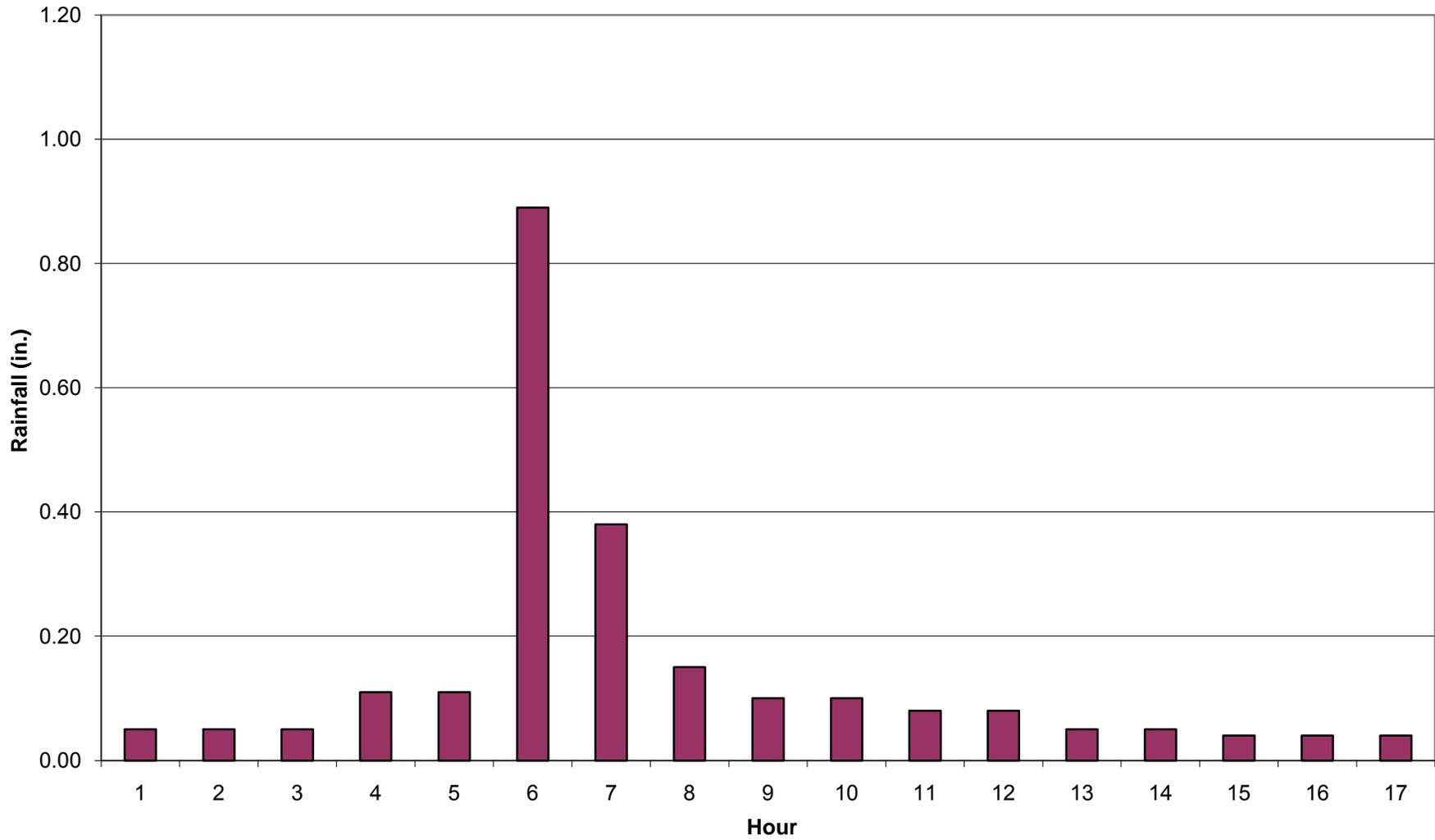
**Figure 3.5-1H**  
**Design Storm H**



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

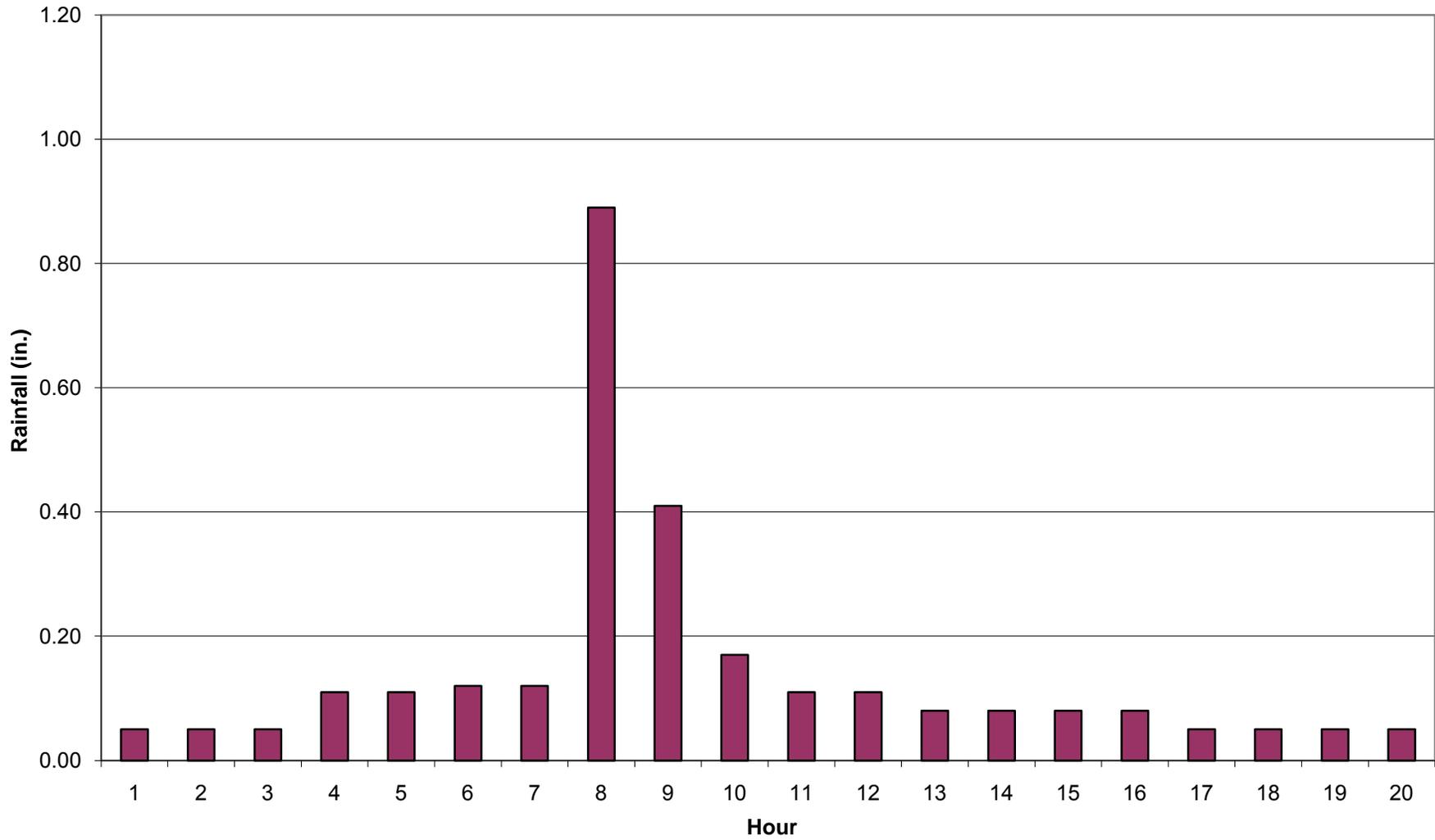
**Figure 3.5-1I**  
**Design Storm I**



CITY OF LAFAYETTE, INDIANA

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**Figure 3.5-1J**  
**Design Storm J**



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**Figure 3.5-1K**  
**Design Storm K**

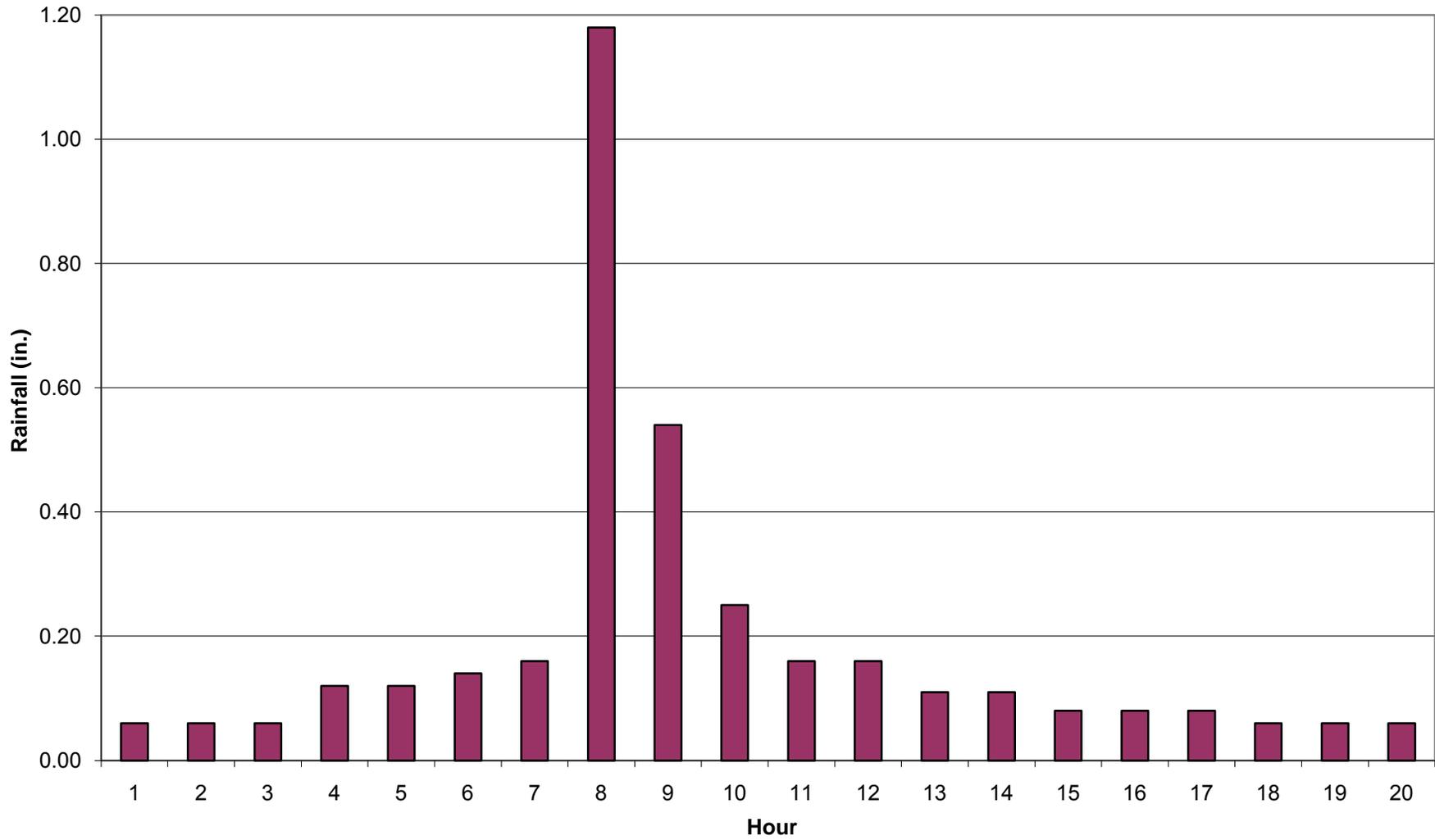


FIGURE 3.5-2



POTENTIAL SITE NEAR CSO 003/004

1 inch equals 200 feet



FIGURE 3.5-3



## POTENTIAL SITE NEAR CSO 006

1 inch equals 200 feet



FIGURE 3.5-4



## POTENTIAL SITE NEAR CSO 012

1 inch equals 200 feet



FIGURE 3.5-5



## POTENTIAL SITE NEAR CSO 001/002

1 inch equals 200 feet



FIGURE 3.5-6

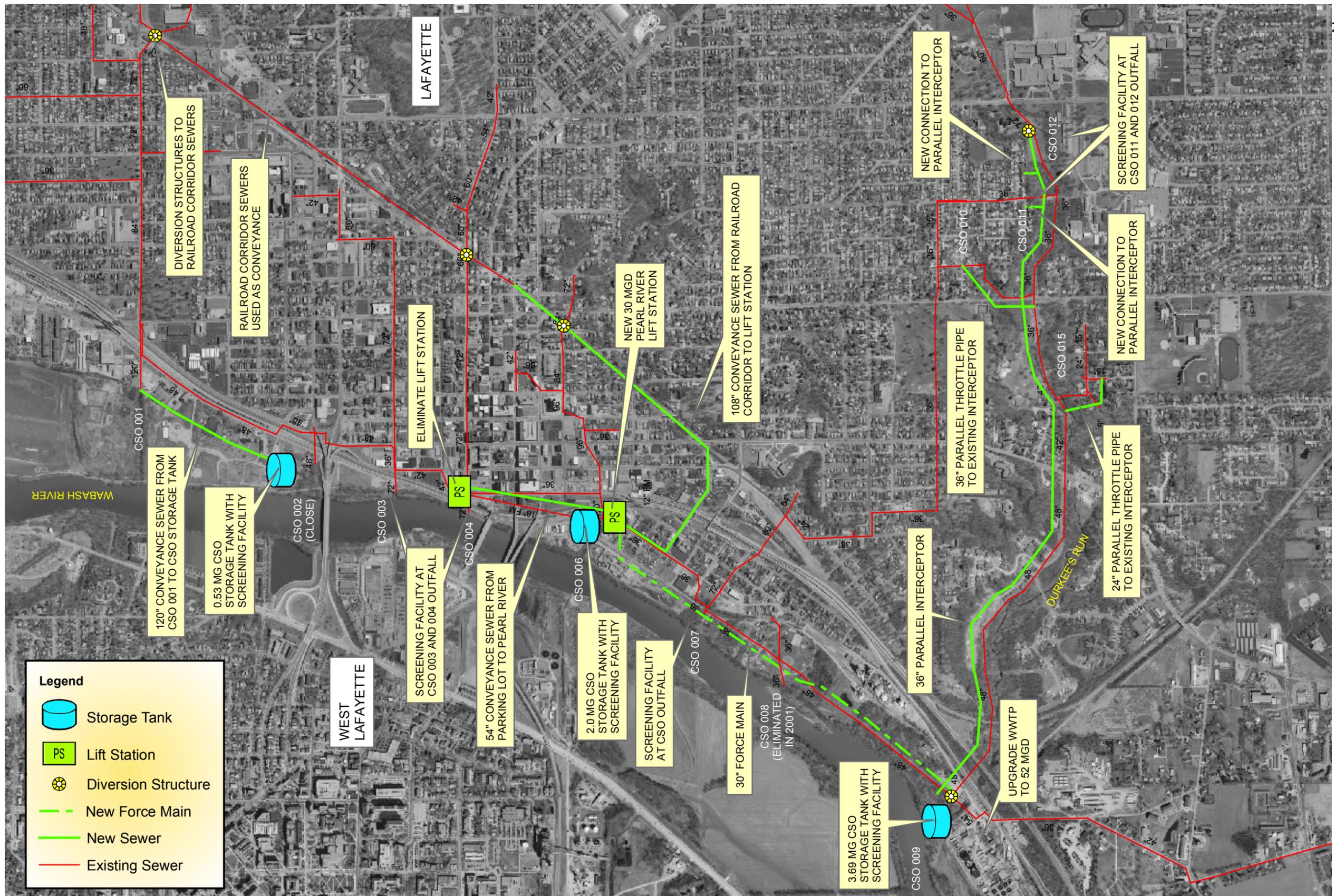


## POTENTIAL SITE NEAR CSO 009

1 inch equals 200 feet







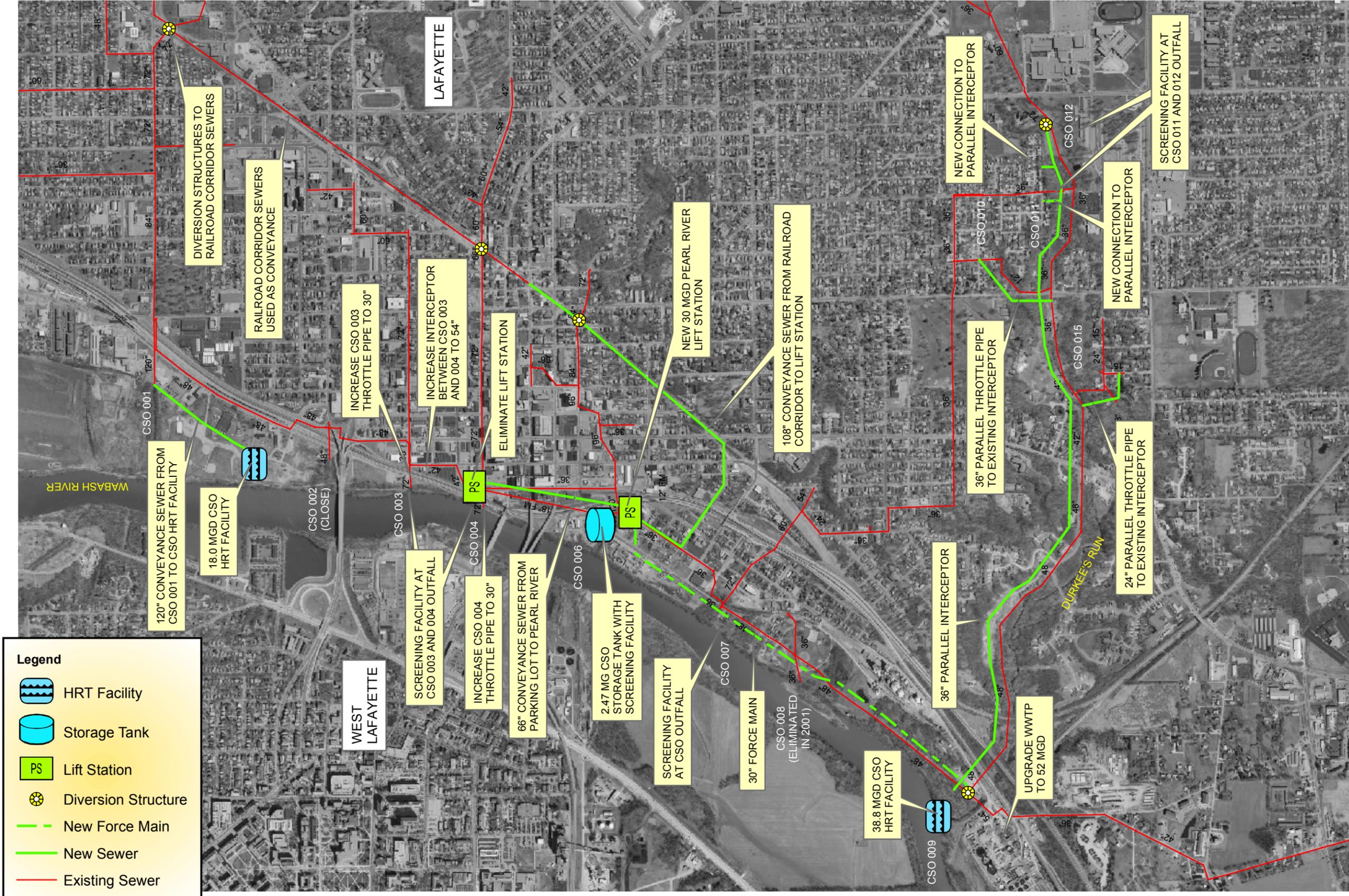
**Legend**

-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

**"D" LEVEL OF CONTROL - ALTERNATIVE 2**

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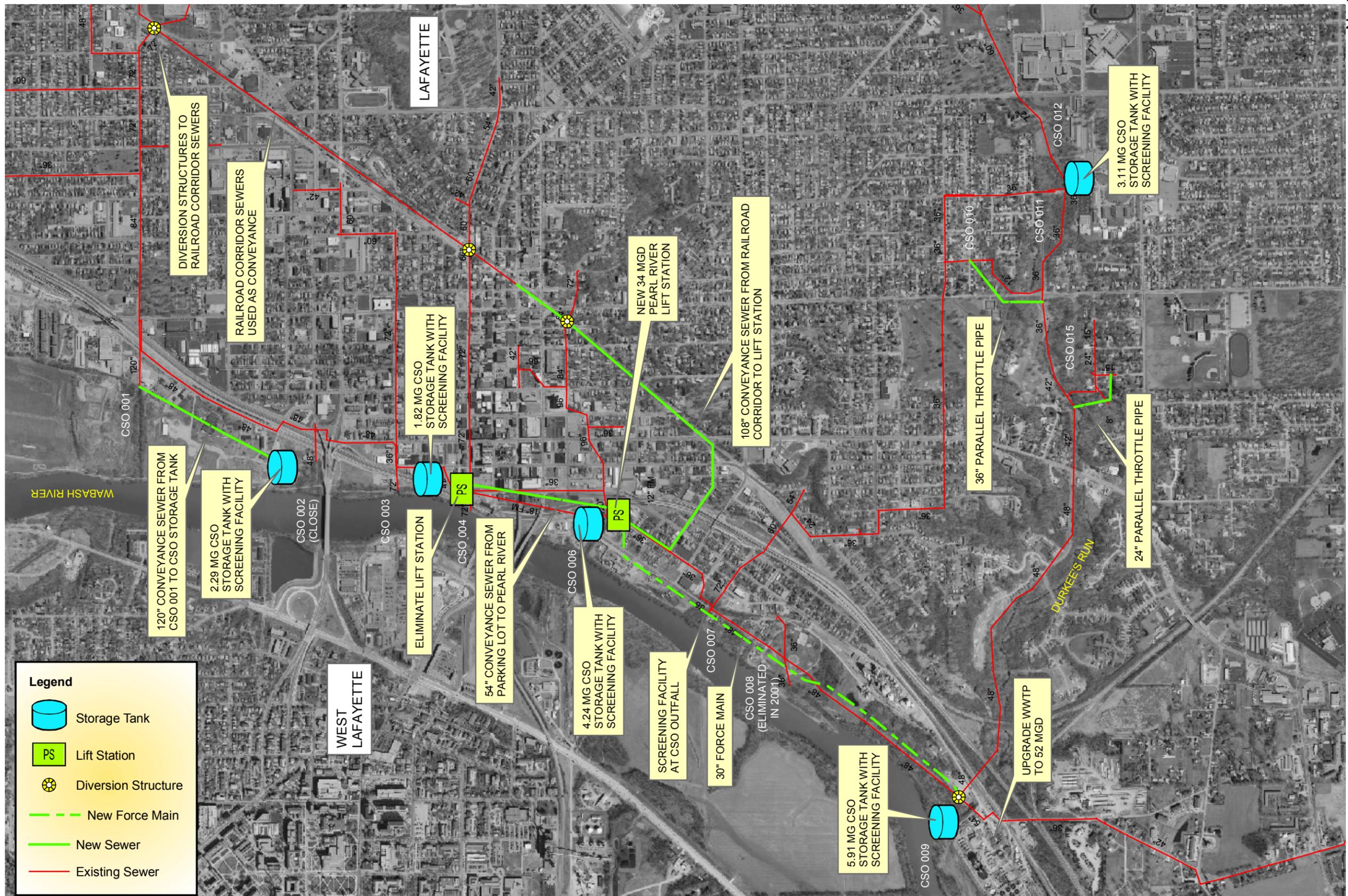
**Legend**

-  HRT Facility
-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

**"D" LEVEL OF CONTROL - ALTERNATIVE 3**

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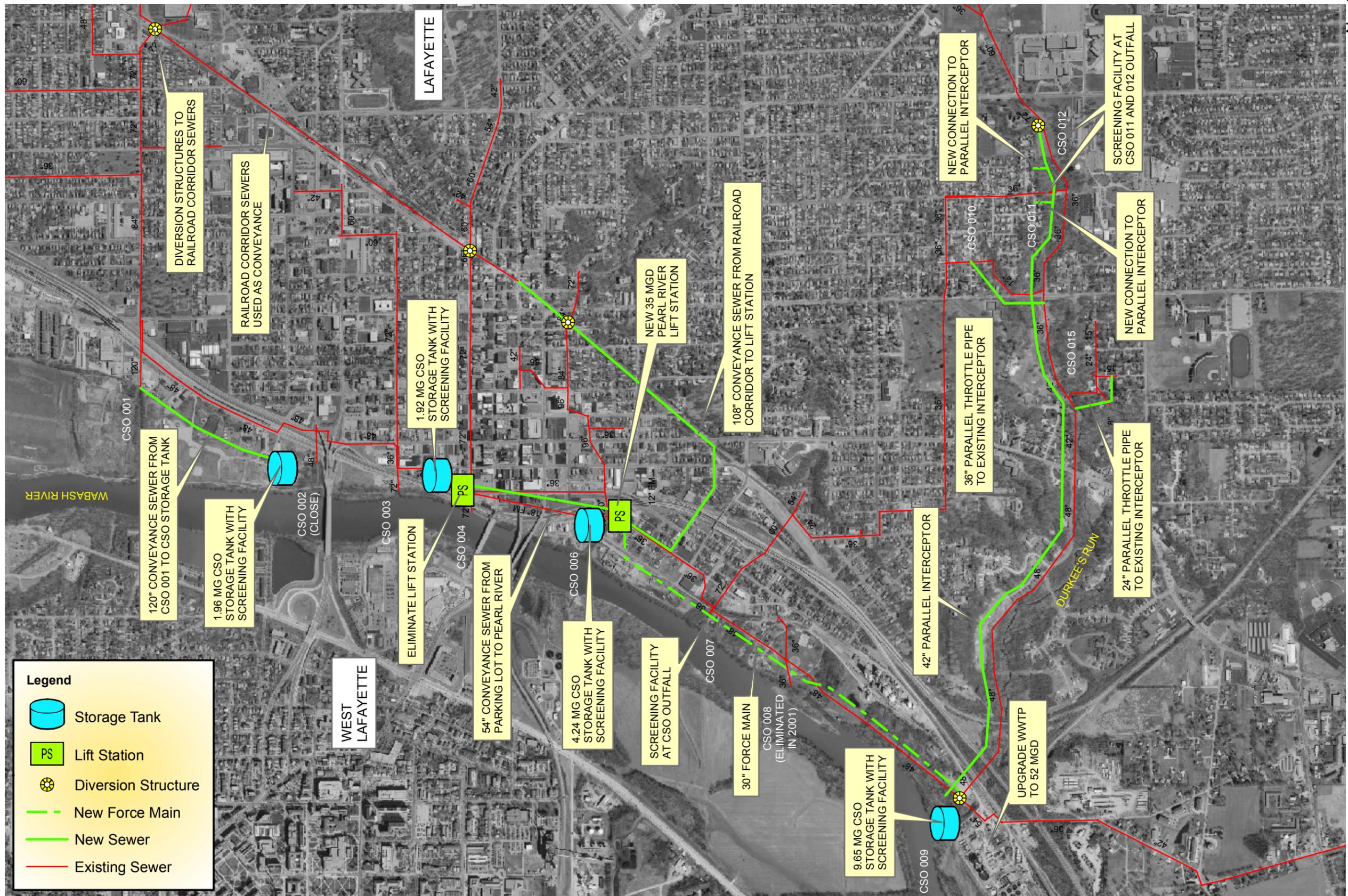




**"E" LEVEL OF CONTROL - ALTERNATIVE 1**

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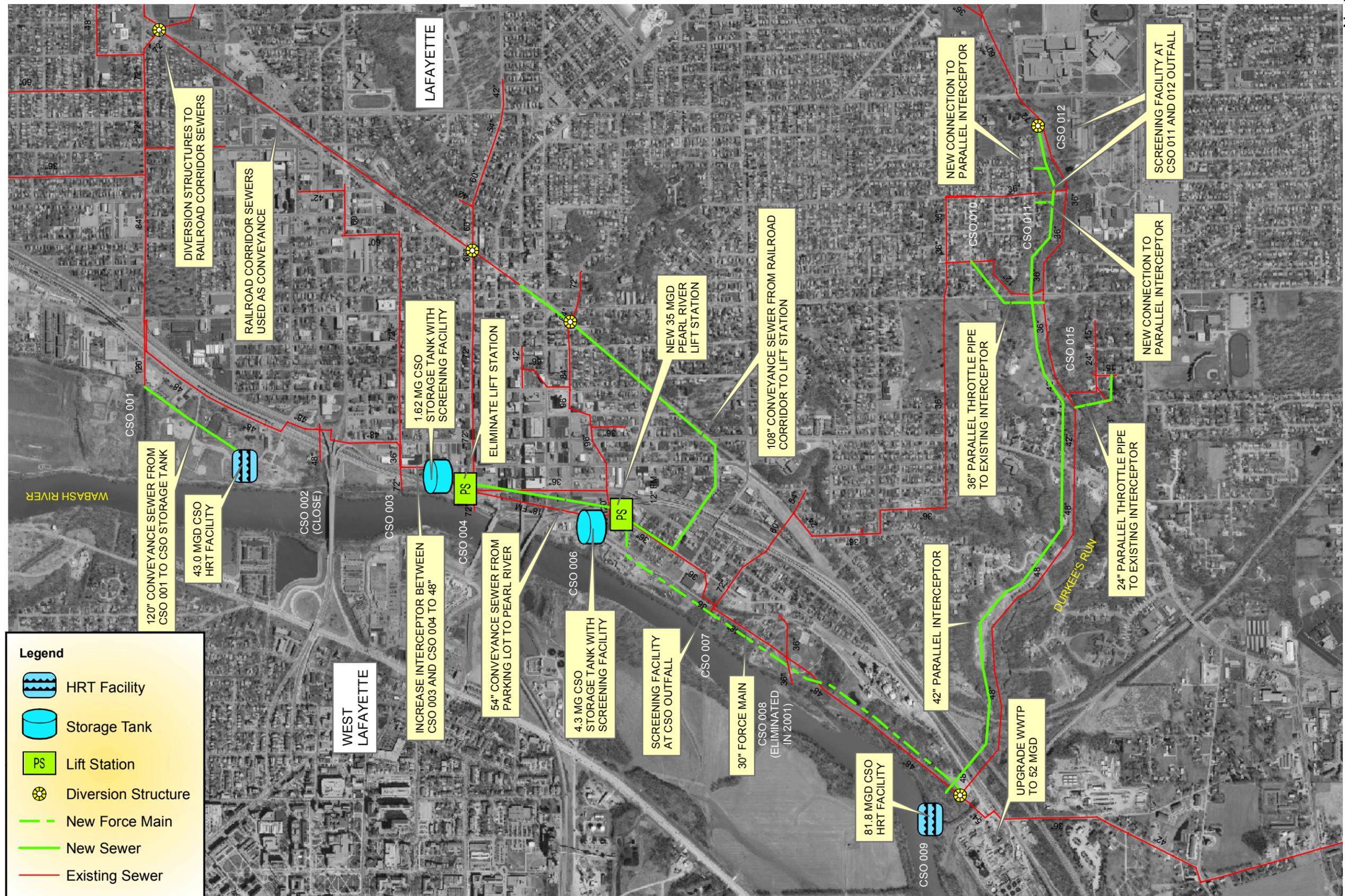
**Legend**

-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

### "E" LEVEL OF CONTROL - ALTERNATIVE 2

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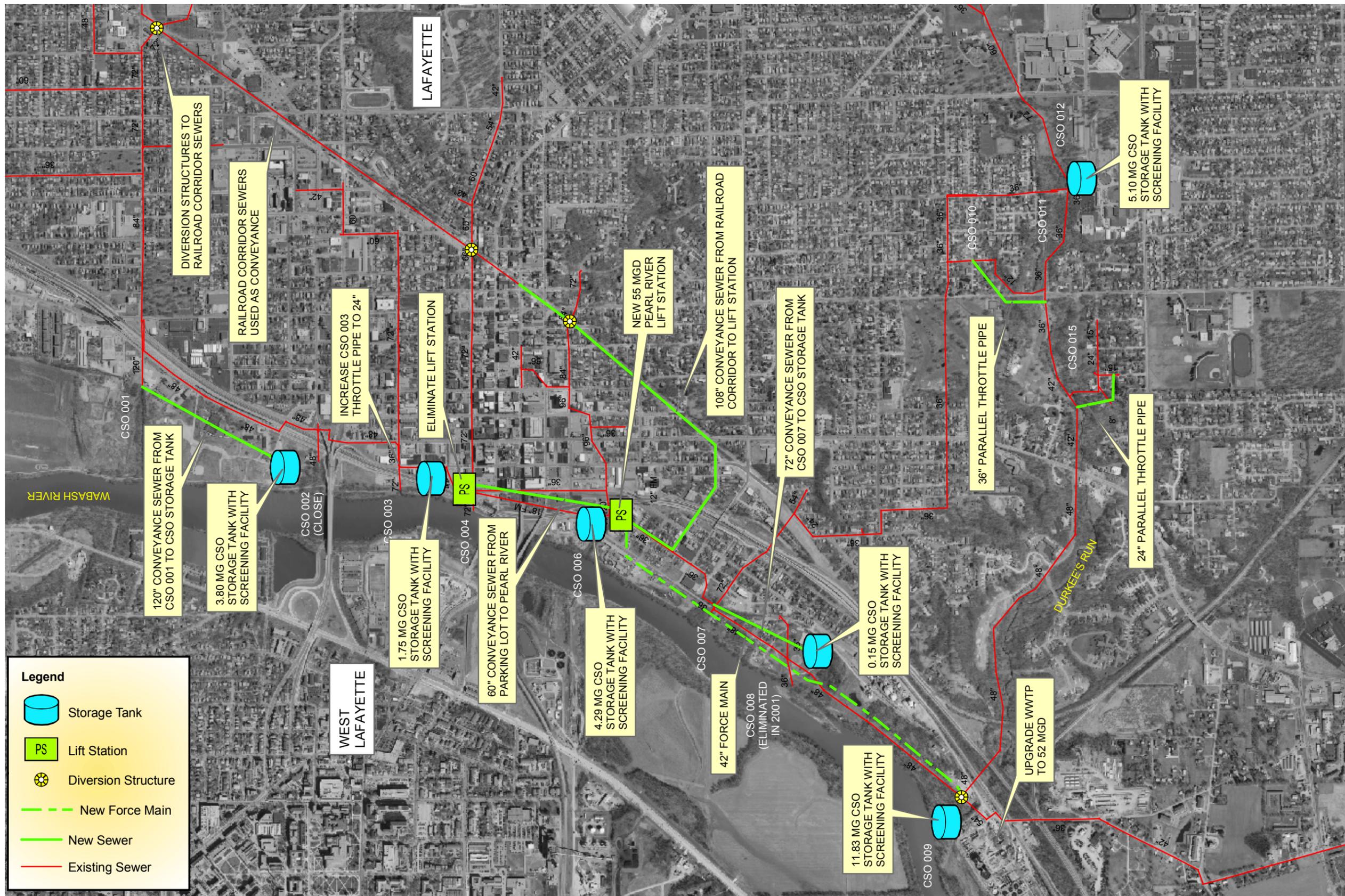
**Legend**

-  HRT Facility
-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

**"E" LEVEL OF CONTROL - ALTERNATIVE 3**

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**Legend**

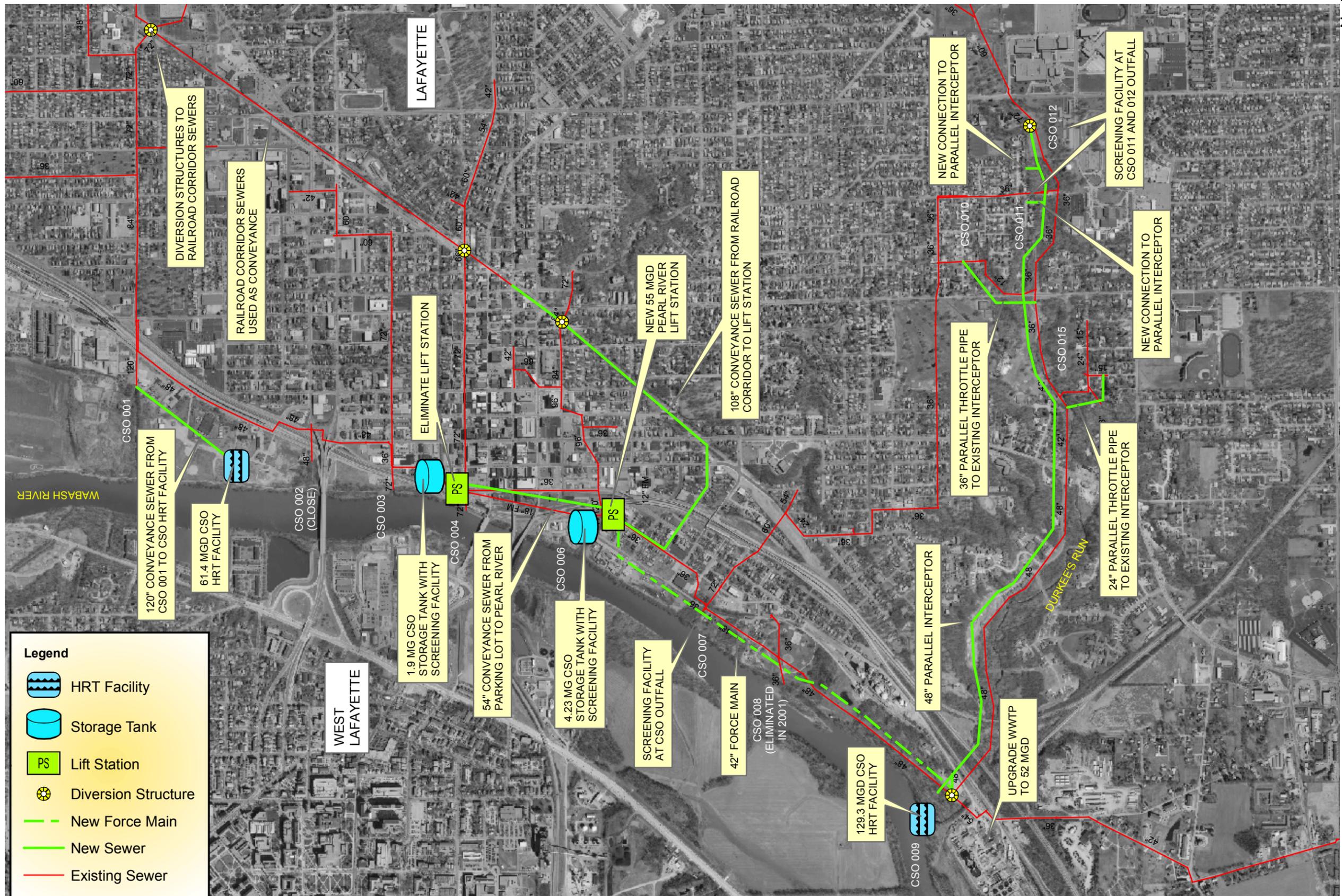
-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

**"F" LEVEL OF CONTROL - ALTERNATIVE 1**

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**"F" LEVEL OF CONTROL - ALTERNATIVE 3**



**Legend**

-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

**"G" LEVEL OF CONTROL - ALTERNATIVE 1**

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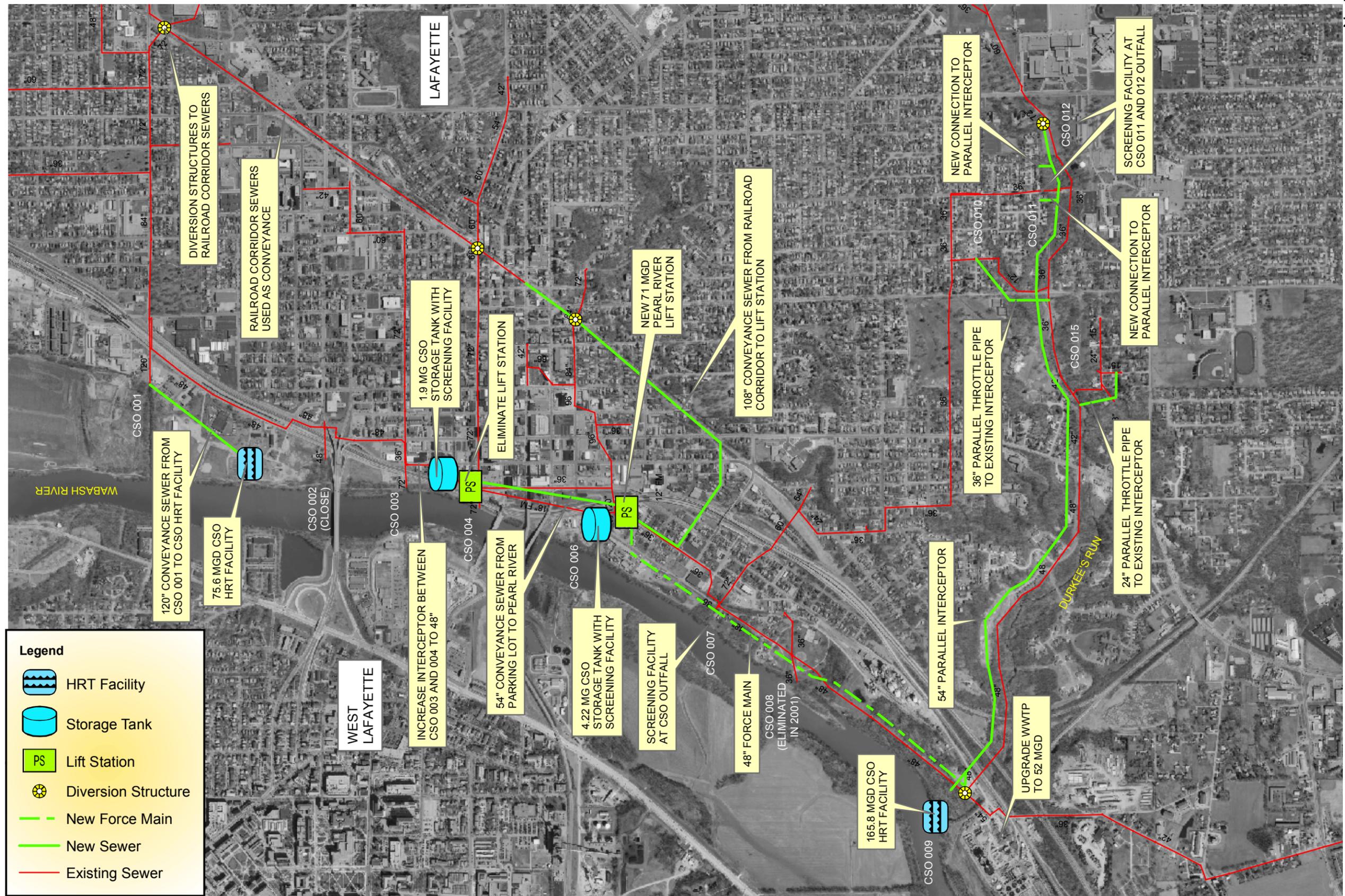


**Legend**

-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  Existing Sewer

**"G" LEVEL OF CONTROL - ALTERNATIVE 2**

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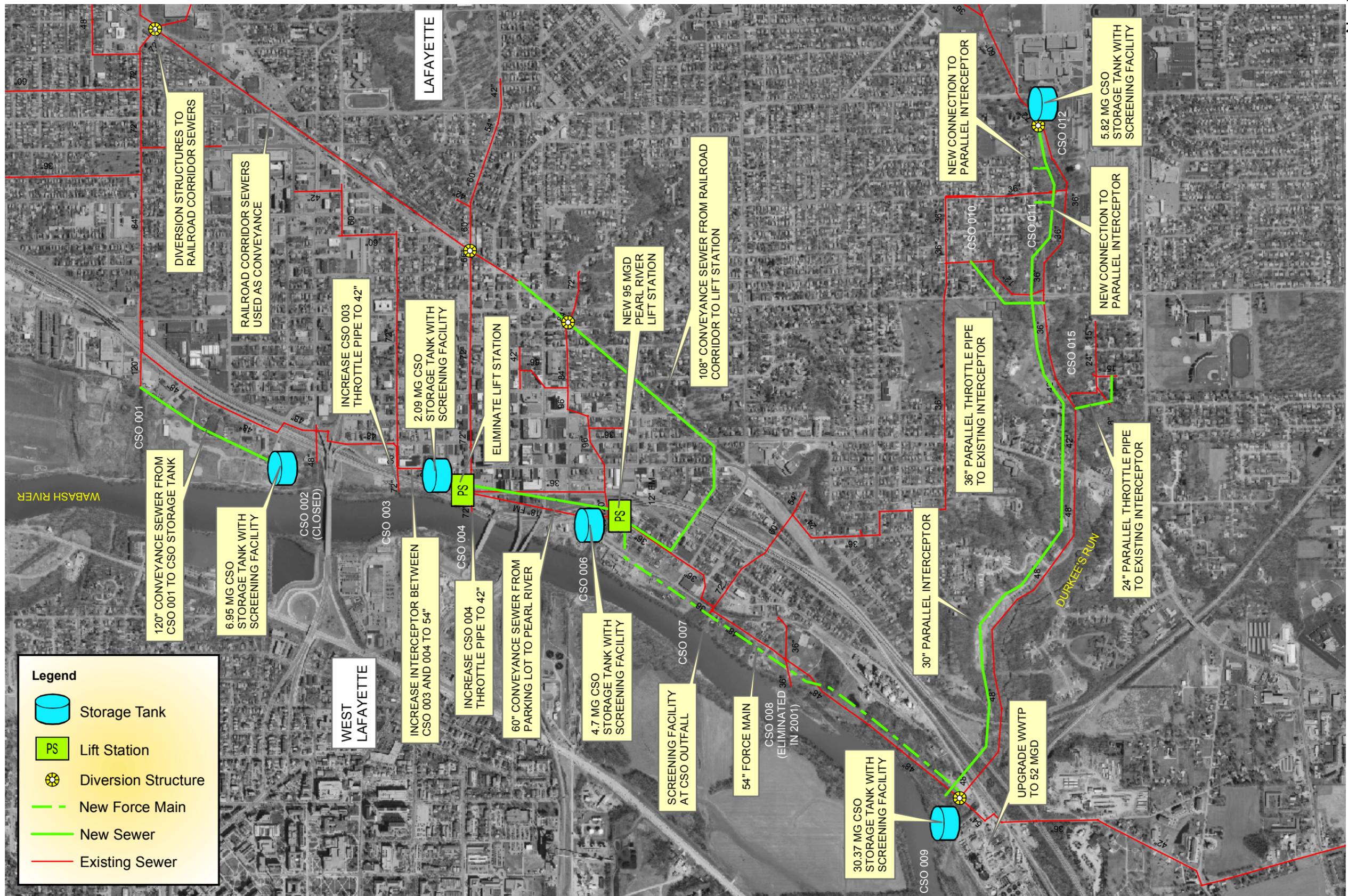
**Legend**

- HRT Facility
- Storage Tank
- Lift Station
- Diversion Structure
- New Force Main
- New Sewer
- Existing Sewer

**"G" LEVEL OF CONTROL - ALTERNATIVE 3**

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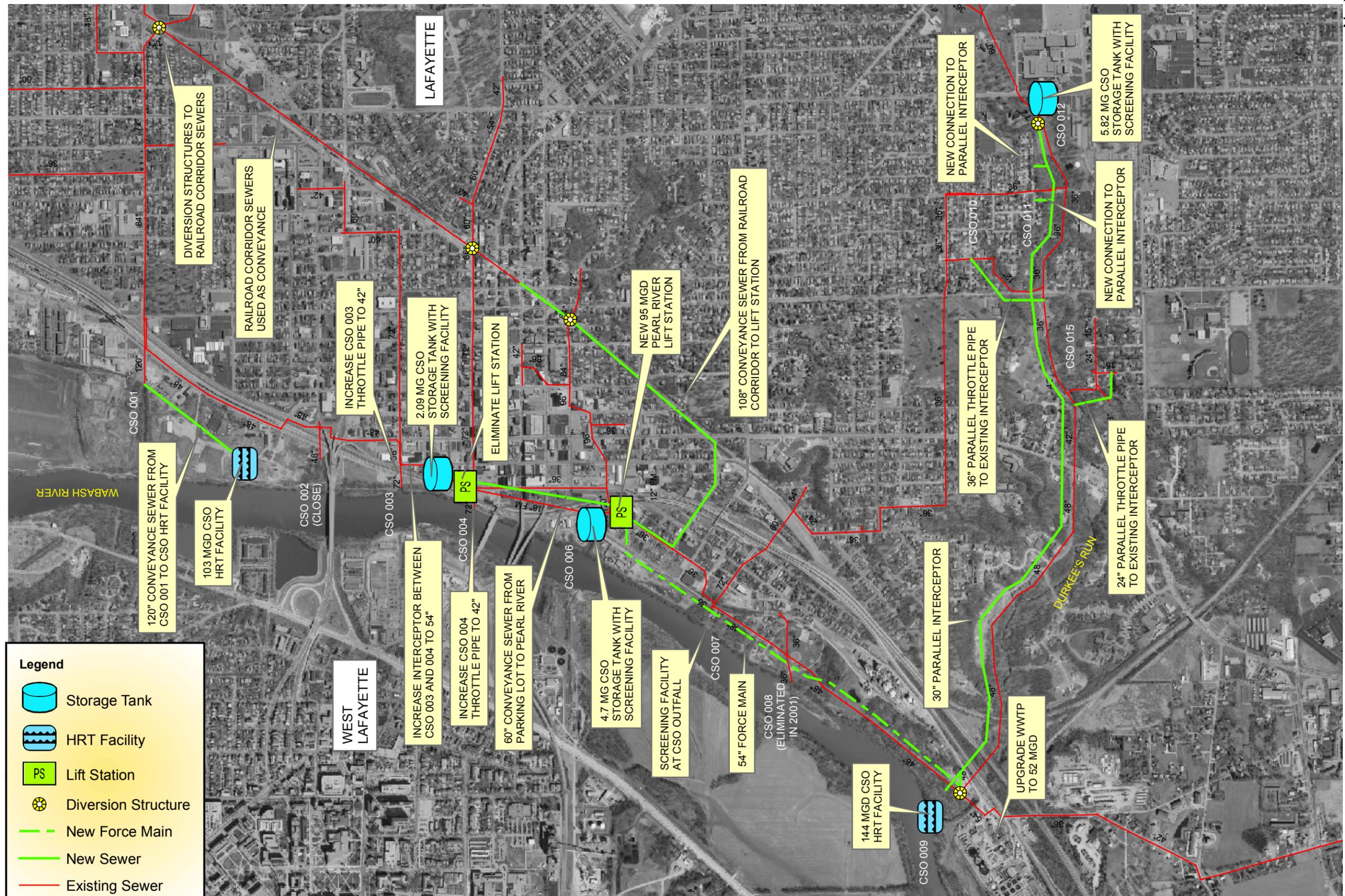




**Legend**

-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

### "H" LEVEL OF CONTROL - ALTERNATIVE 2



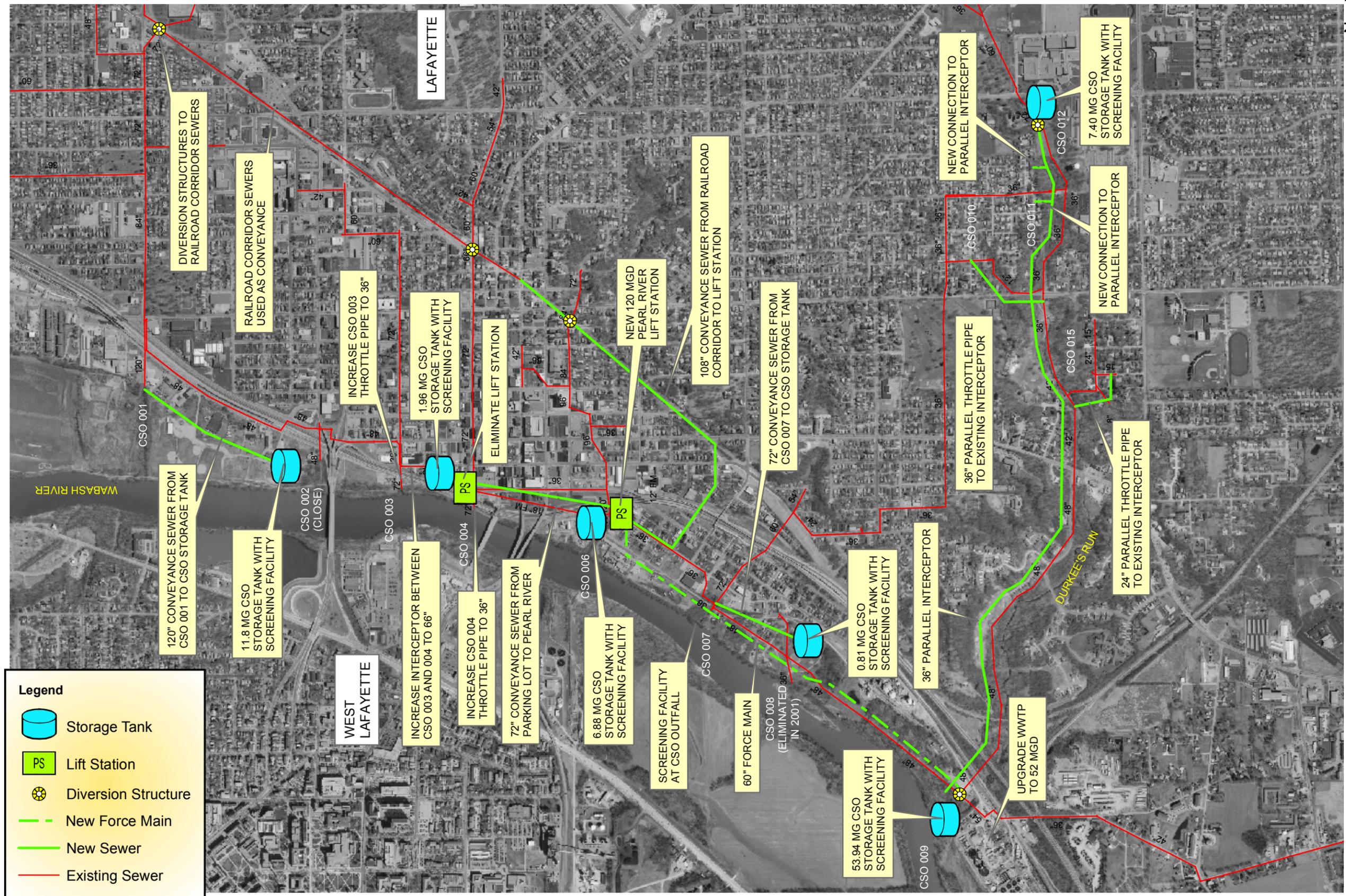
**Legend**

-  Storage Tank
-  HRT Facility
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

**"H" LEVEL OF CONTROL - ALTERNATIVE 3**

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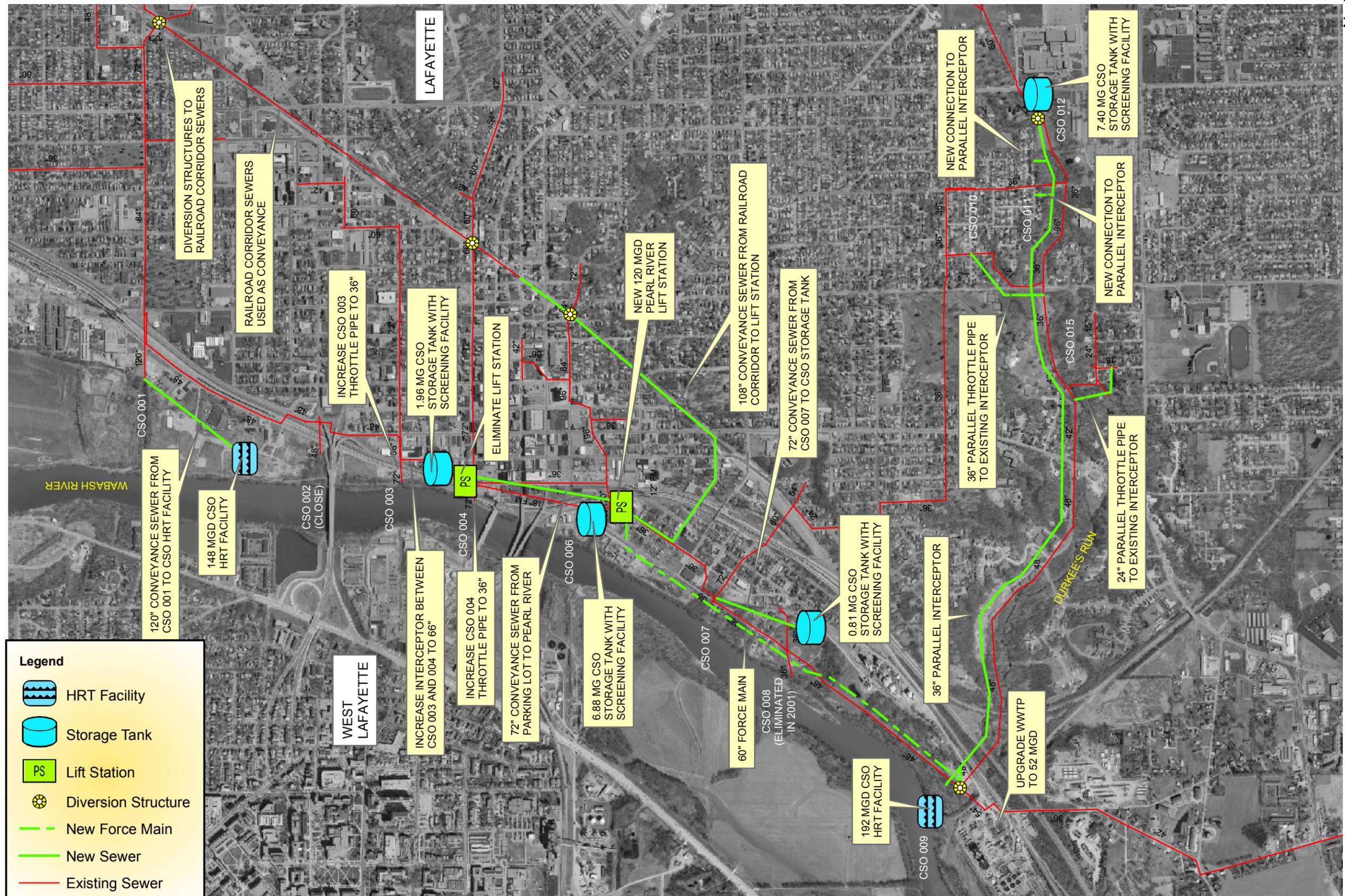
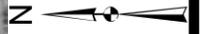
**Legend**

-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Force Main
-  New Sewer
-  Existing Sewer

**"J" LEVEL OF CONTROL - ALTERNATIVE 2**

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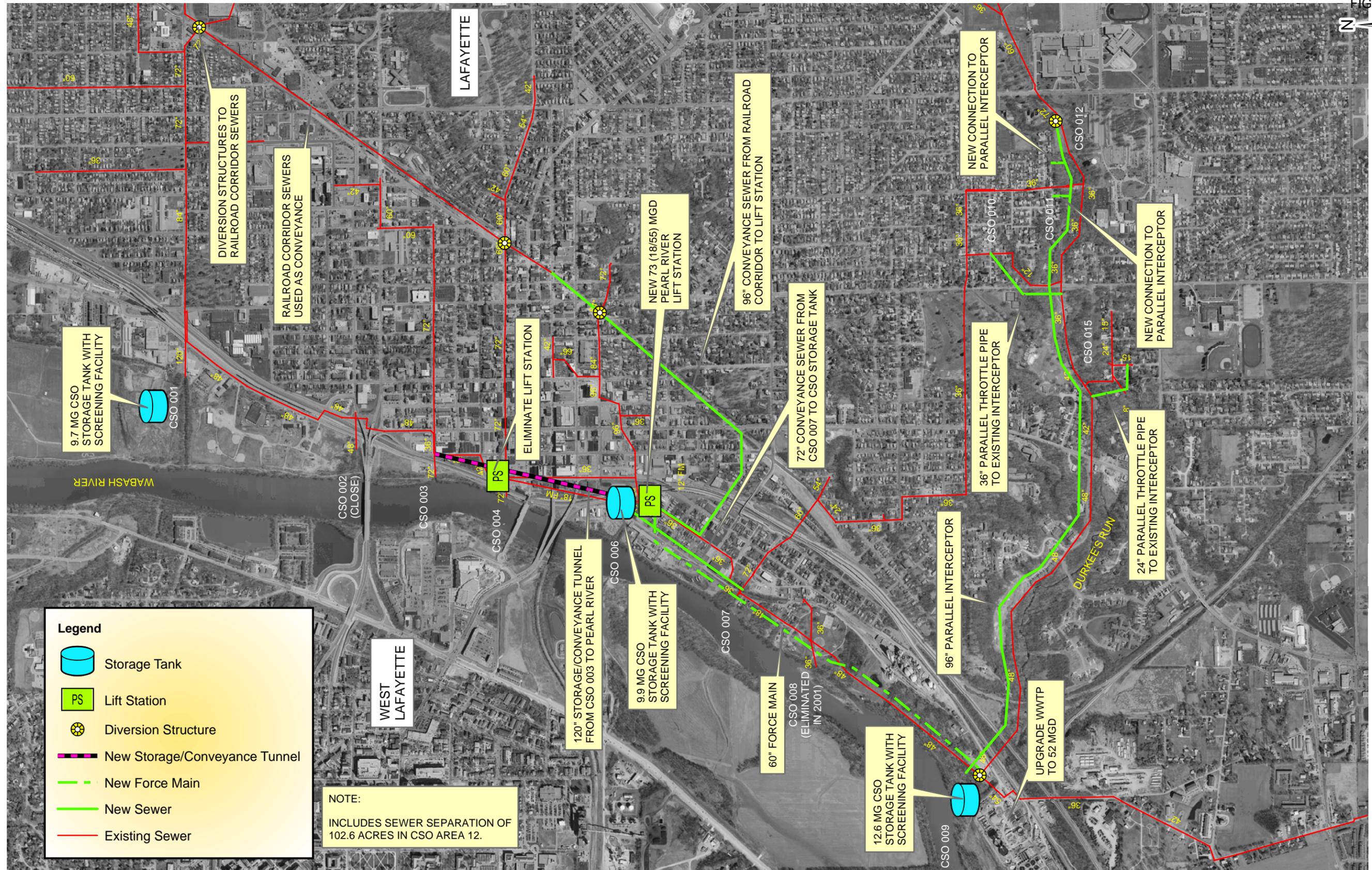
**Legend**

- HRT Facility
- Storage Tank
- Lift Station
- Diversion Structure
- New Force Main
- New Sewer
- Existing Sewer

**"J" LEVEL OF CONTROL - ALTERNATIVE 3**

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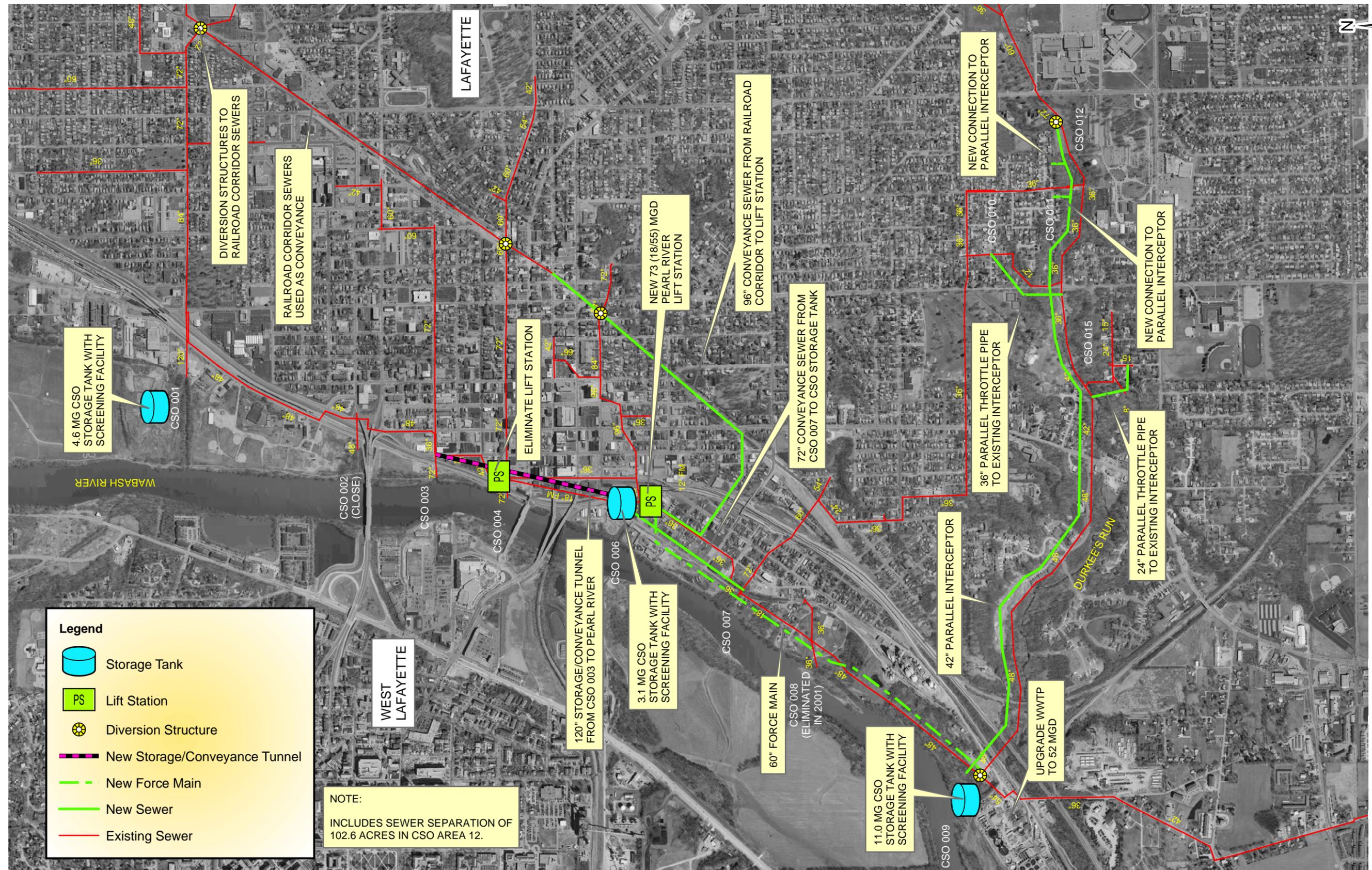




**1 YEAR 1 HOUR LEVEL OF CONTROL - ALTERNATIVE A**

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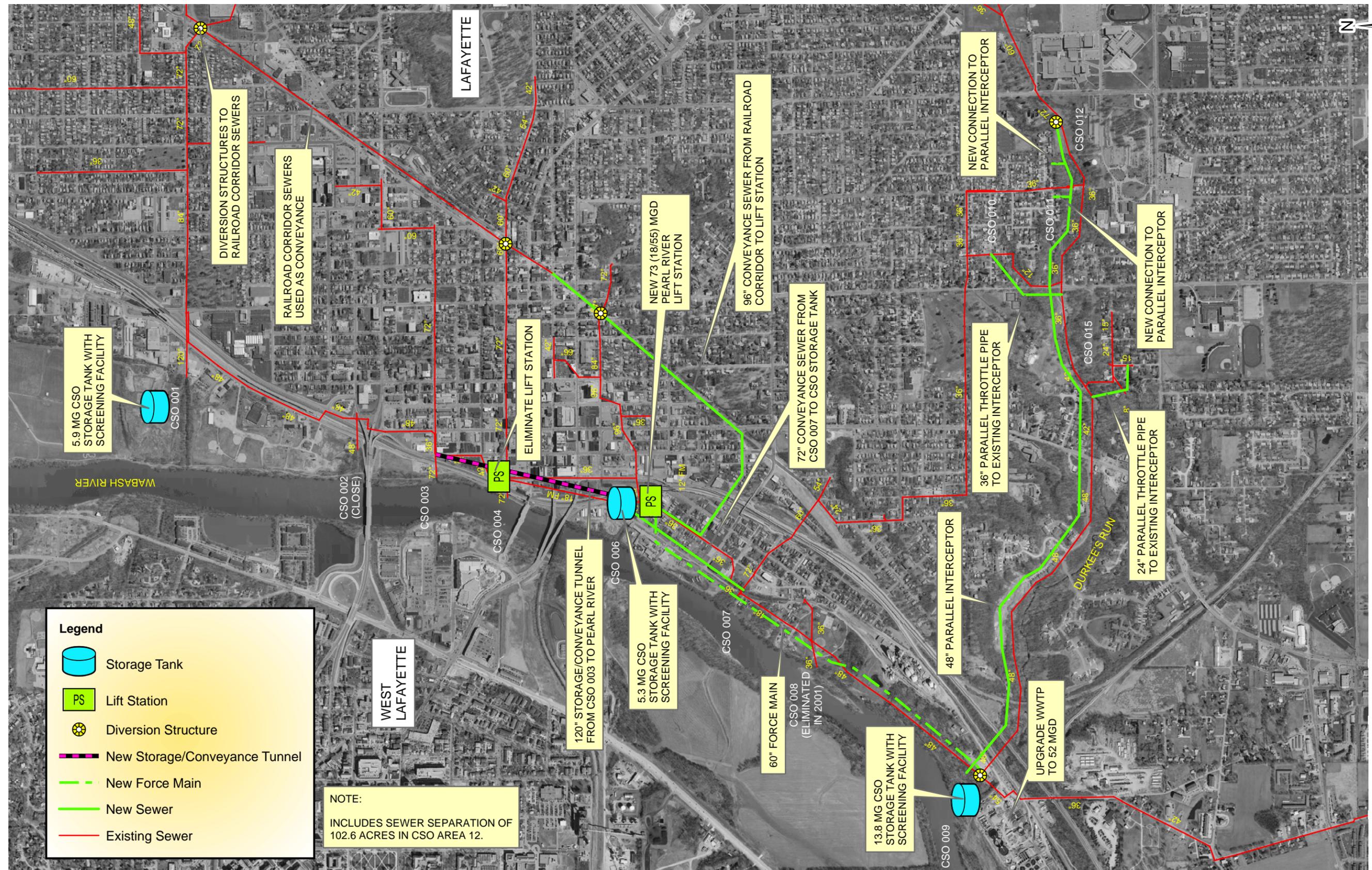




**"F" LEVEL OF CONTROL - ALTERNATIVE A**

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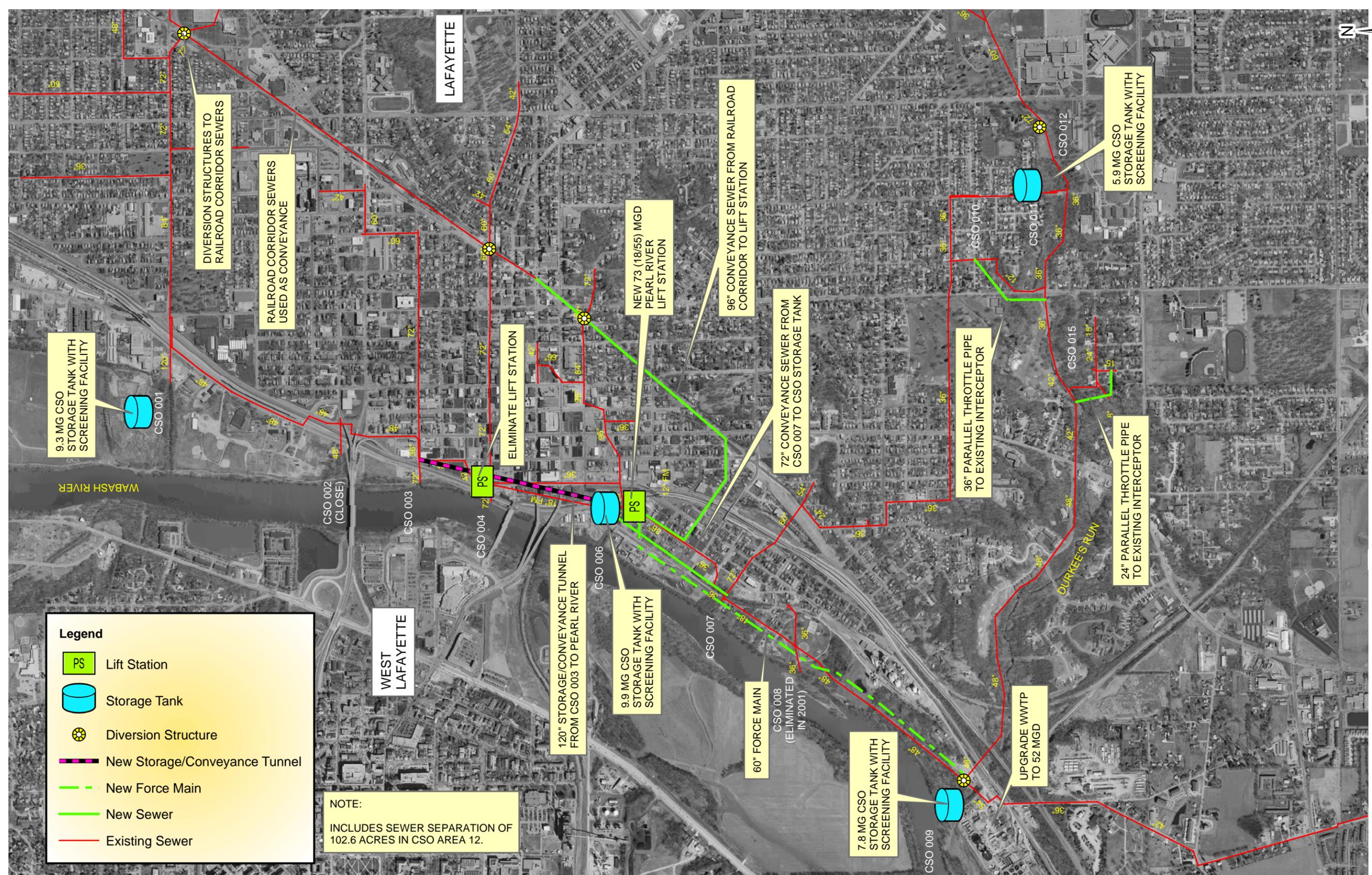


### "G" LEVEL OF CONTROL - ALTERNATIVE A

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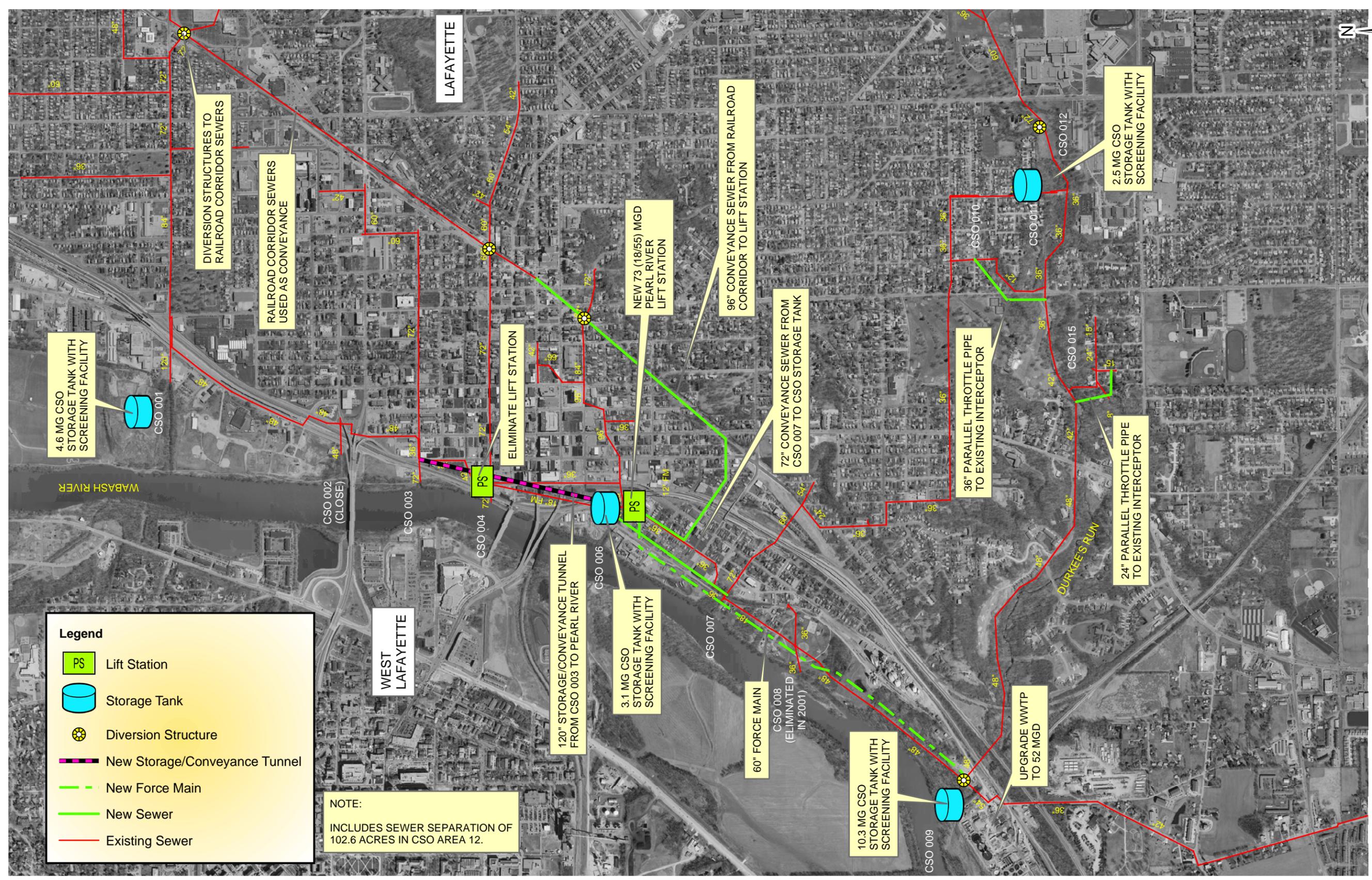
**Legend**

- PS Lift Station
- Storage Tank
- Diversion Structure
- New Storage/Conveyance Tunnel
- New Force Main
- New Sewer
- Existing Sewer

**NOTE:**  
INCLUDES SEWER SEPARATION OF 102.6 ACRES IN CSO AREA 12.

**1 YEAR 1 HOUR LEVEL OF CONTROL - ALTERNATIVE B**

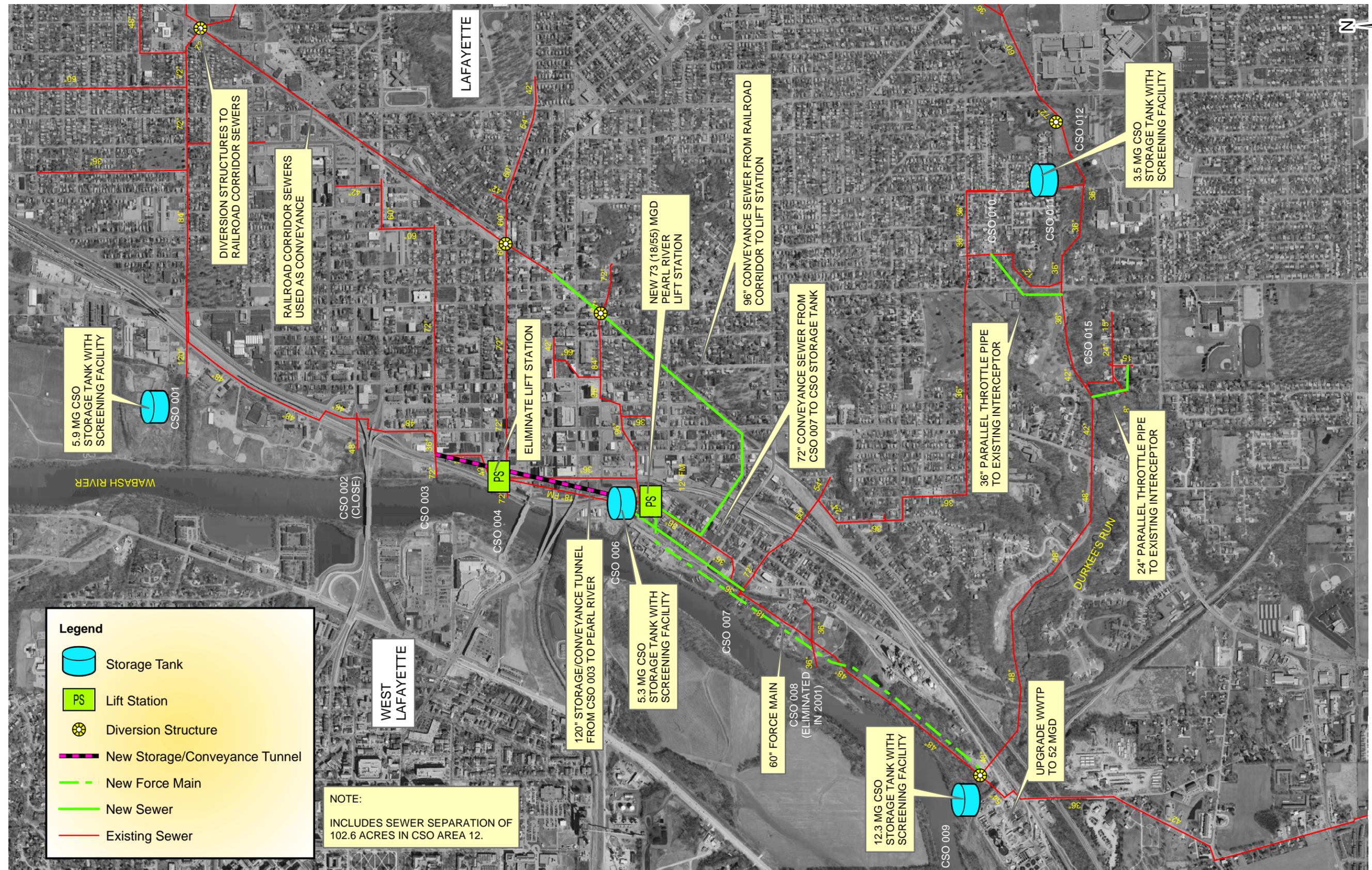
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**"F" LEVEL OF CONTROL - ALTERNATIVE B**

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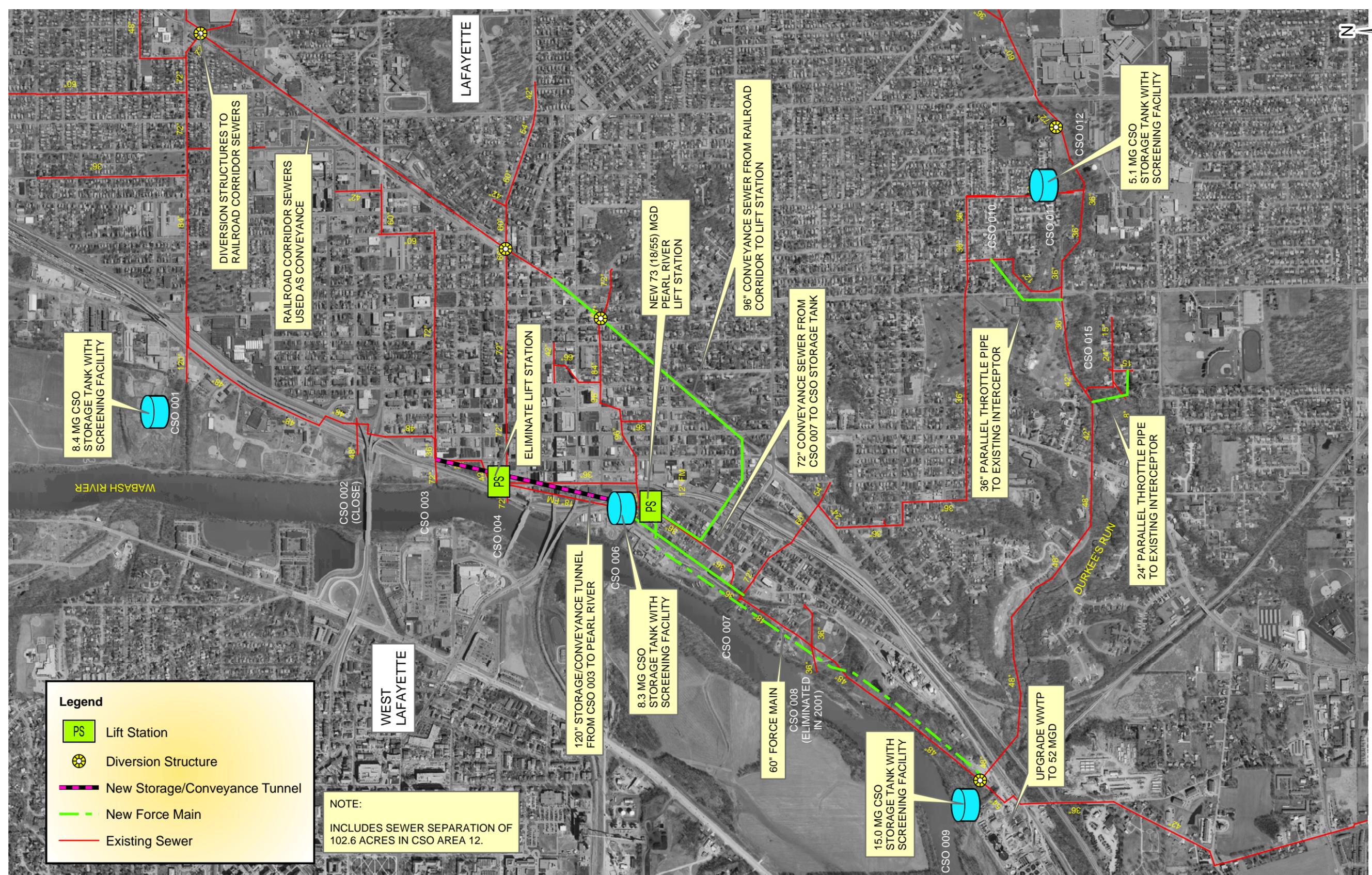




**"G" LEVEL OF CONTROL - ALTERNATIVE B**

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**"H" LEVEL OF CONTROL - ALTERNATIVE B**

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CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Chapter 4**  
**Cost-Performance Considerations**

Limno-Tech, Inc.

**4.1 Introduction**

The computer model of the Wabash River was applied to evaluate the cost-performance considerations associated with CSO control alternatives for a “typical” year. This model and its associated data management tools were developed to evaluate the effects of bacteria loads in the watershed on the river. These tools were used to develop pollutant loads for the different sources of *E. coli*, the pollutant of concern. The loads were then entered into the river model at various locations along the Wabash River for a typical year, and the resulting in-stream *E. coli* concentrations were calculated and compared to current water quality standards to identify the most cost-effective control.

The river model uses a moving frame of reference (Lagrangian) approach to dynamically calculate *E. coli* concentrations in the river in response to a host of time variable discharges including Lafayette CSOs, stormwater, and wastewater treatment plant (WWTP) discharges, as well contributions from West Lafayette, upstream, and tributary sources. The model calculates the influences on each “parcel” of water as it moves through the river system, based on bacteria added from the various discharges and bacterial die-off and settling. The Lagrangian results are then automatically translated into time variable concentration results for each fixed location in the river. This approach provides a complex, dynamic simulation of *E. coli* concentrations in the river based on a multitude of simpler calculations applied to each water parcel in the river. The model domain and location of the City’s CSOs are shown in Figure 4.1-1.

River model *E. coli* calculations were compared against the current water quality standards for *E. coli* for Indiana (Indiana Water Pollution Control Board, 2007). This chapter

presents the results of the river model calculations for current conditions and the proposed control alternatives.

## **4.2 Wabash River Model Application**

The Wabash River model was developed and calibrated as part of the Stream Reach Characterization and Evaluation Report (SRCER, submitted October 2004). The river model covers the five miles of the Wabash River that receive discharges from Lafayette's CSOs as well as eight miles downstream of the City (to river mile 300). The City measured in-stream *E. coli* concentrations for back-to-back storms in October 2001 and for a storm in August 2002. The river model was calibrated to the October dataset and validated to the August dataset, as described in the SRCER. For the Lafayette LTCP, historic rainfall and river flow data were evaluated to determine conditions during a "typical" year and the year 1968 was selected. Documentation on the selection of the typical year is provided in Appendix B and Section 1.4.2. Figure 4.2-1 shows the daily flow and rainfall for the typical year.

The procedures established for the model calibration and validation were used to develop flow and concentration inputs for all sources (except upstream source concentrations) under current conditions using the river flow and rainfall data for 1968. CSO and WWTP flows for the Cities of Lafayette and West Lafayette were developed using updated collection system models and 1968 rainfall. Stormwater and tributary wet weather flows were developed using the 1968 rainfall and the rational method model. Concentrations at the model's upstream boundary (reflecting loads from sources upstream of the City) were specified by randomly selecting values from precipitation- and flow-segregated distributions of the *E. coli* data collected at river mile 314.14 (the model boundary). Additional detail regarding the development of the upstream concentration inputs to the river model is provided in Appendix D.

Section 4.3 contains a comparison of the current condition loads from the different sources and Section 4.5 shows the effect of these loads in the river. Section 4.6 shows the comparison of CSO alternatives; results are presented for all *E. coli* sources and Lafayette CSO sources only. Indiana *E. coli* water quality standards (Section 4.4) apply during the

recreation season (defined as April 1 to October 31 of each year). River model calculations, therefore, are tabulated primarily for the recreation season.

### 4.3 Summary of Sources of Bacteria

Sources of *E. coli* that are included in the river model are:

- CSO, stormwater, and WWTP discharges from the City of Lafayette;
- CSO, stormwater, and WWTP discharges from the City of West Lafayette;
- Sources to the Wabash River upstream of Lafayette; and
- Four tributaries (all located downstream of the Cities).

The locations of sources in or downstream of Lafayette are shown in Table 4.3-1. *E. coli* concentrations for all sources were obtained from the model calibration, except as noted in the previous section. Upstream concentrations were developed from distributions of wet and dry weather concentration data (Appendix D). Tributary concentrations were estimated for wet and dry conditions during the model calibration using the limited available data. Pollutant concentrations for CSO and stormwater sources were held constant throughout the model run, as shown in Table 4.3-2. Concentrations for the WWTP were varied between the recreation season and winter.

As shown in Figure 4.3-1, sources upstream of the City contribute the majority of the annual *E. coli* load to the river under current conditions (~83%). The next largest source of *E. coli* is from Lafayette's CSOs (~13%). The City's stormwater and WWTP, West Lafayette sources (including CSO, stormwater and WWTP), and tributary *E. coli* loads each comprise approximately 1% of the total *E. coli* load to the river. West Lafayette CSOs overflow only when storms exceed 1.38 inches and the resulting load is much smaller than the load from Lafayette's CSOs (magnitude is approximately 6% of Lafayette's CSO load).

### 4.4 Water Quality Standards

As summarized in the SRCER, *E. coli* is the primary focus of CSO control and is also the pollutant that is simulated in the river model. Indiana's water quality standards, Section

327 IAC 2-1-6(d), provide numeric bacteria criteria to establish effluent limits during the recreation season for *E. coli*:

**327 IAC 2-1-6 Minimum surface water quality standards**

*Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3*

*Affected: IC 13-11-2-258; IC 13-18-4; IC 13-30-2-1; IC 14-22-9*

*6.(d) (3) This subsection establishes bacteriological quality for recreational uses during the recreational season as follows:*

*For full body contact recreational uses, E. coli bacteria shall not exceed the following:*

*(A) One hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five(5) samples equally spaced over a thirty (30) day period.*

*(B) Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period, except that in cases where there are at least ten (10) samples at a given site, up to ten percent (10%) of the samples may exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters where the:*

*(i) E. coli exceedances are incidental and attributable solely to E. coli resulting from the discharge of treated wastewater from a wastewater treatment plant as defined at IC 13-11-2-258; and*

*(ii) criterion in clause (A) is met.*

*However, a single sample shall be used for making beach notification and closure decisions. If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in clause (B) must be met.*

The model results were used to evaluate compliance with both the 30-day geometric mean criterion and the single sample maximum criterion.

CSO discharges that remain after implementation of the LTCP have the potential to violate the numeric criteria described above. The State has incorporated a CSO wet weather limited use designation into their water quality standards in accordance with the provisions IC 13-18-3-2.5 (SEA 431):

**327 IAC 2-1-3.1 CSO wet weather limited use designation**

*Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3-2.5*

*Affected: IC 13-14-2-6; IC 13-14-9-14; IC 13-18-4*

*Sec. 3.1.*

*(a) The CSO wet weather limited use subcategory established under section 3 of this rule shall be applied only to waters receiving wet weather discharges from combined sewer overflows.*

*(b) To receive consideration for the CSO wet weather limited use subcategory designation, a CSO community must do the following:*

- (1) Perform a use attainability analysis (UAA) to change the recreational designated use of the waterbody or waterbodies receiving the wet weather discharges from combined sewer overflows.
- (2) Submit the UAA to the department for approval.
- (3) Submit a long term control plan (LTCP) consistent with the application of the CSO wet weather limited use subcategory to the department for approval.
- (c) The LTCP submitted to the department must:
  - (1) specify the water quality-based requirements that will apply to combined sewer overflows under subsection (h) if the waterbody or waterbodies receiving the wet weather overflows are redesignated to the CSO wet weather limited use subcategory; and
  - (2) meet the requirements of Section 402(q) of the Clean Water Act.
- (d) The department shall review the UAA concurrently with the LTCP if they are submitted concurrently. The department shall use the LTCP to satisfy the requirements of the UAA, to the extent possible.
- (e) Upon approval of a UAA, the department shall begin a rulemaking under IC 13-14-9-14 to amend the designated use to a CSO wet weather limited use designation. The rulemaking may commence before full implementation of the approved LTCP.
- (f) Upon completion of the rulemaking required under subsection (e), the department shall submit the amended recreational use designation and the supporting UAA to the U.S. EPA for approval.
- (g) Upon U.S. EPA's approval of the use designation change for the waterbody or waterbodies receiving wet weather overflows from a CSO community, the department shall modify the NPDES permit holder's permit to incorporate the CSO wet weather limited use designation and the approved LTCP into the permit.
- (h) The water quality-based requirements for the CSO wet weather limited use designation shall:
  - (1) be determined by the approved LTCP for the combined sewer system;
  - (2) be consistent with the Clean Water Act; and
  - (3) remain in effect during the time and to the physical extent that the recreational use designation that applied to the waters immediately before the application to the waters of the CSO wet weather limited use subcategory is not attained but for not more than four (4) days after the date the overflow discharge ends.

(Water Pollution Control Board; 327 IAC 2-1-3.1; filed Sep 6, 2007, 12:25 p.m.: 20071003-IR-327050218FRA)

This designated use provides a mechanism for CSO communities to implement their LTCP and comply with water quality standards. Therefore, the City's evaluation of the preferred CSO control alternative includes an assessment of whether the CSO wet weather limited use designation is needed and appropriate (Chapter 9).

#### **4.5 Current Water Quality Conditions**

The river model was used to simulate *E. coli* concentrations in the river for the current conditions using the loads summarized in Section 4.3. The sources of *E. coli* were tracked in-stream with the river model using multiple state variables. Each state variable represents a particular source, such as the Lafayette CSOs, as shown in Table 4.5-1. This

approach allows the model to be used to quantify the relative magnitude of various source contributions on the total in-stream *E. coli* concentration at every model grid node for each hour of the simulation. Figure 4.5-1 is an example that illustrates the modeling approach. Results are shown for total *E. coli* as well as the *E. coli* concentration from other sources (represented in the model as state variables). Results are shown for one hour of the “typical” year simulation when these sources were active.

Five key locations in the Wabash River were identified for characterizing the City’s CSO effects on in-stream water quality and for evaluating the effectiveness of the CSO alternatives considered for the LTCP. These key locations are:

1. River mile 314.00: Upstream of the City’s CSOs
2. River mile 311.90 (Riehle Plaza): Middle of the City’s CSO area and corresponding to one of the City’s sampling locations
3. River mile 310.83 (Shamrock Park): Location where people may access the river
4. River mile 309.00: Downstream of all City sources
5. River mile 303.00 (Granville Bridge): Downstream of all sources and corresponding to an Indiana Department of Environmental Management (IDEM) sampling location.

Figure 4.5-2 presents temporal plots at the key locations for a large storm (1.1 inches) in July. As the figure illustrates, *E. coli* from CSOs and other urban sources pass through the model domain relatively quickly, generally in less than 24 hours. For smaller storms, CSO effects at a particular location last only a few hours.

As noted in Section 4.3, upstream sources are the predominant source of bacteria loadings to the portion of the Wabash River near Lafayette. In-stream concentrations are largely comprised of the bacteria loading from upstream sources (see Figure 4.5-2 and Appendix E). The maximum in-stream *E. coli* concentration due to Lafayette CSO sources was calculated to occur on May 15 at 21:00 (4.10 inch storm) at river mile 310.54 and was 22,150 cfu/100 ml. This location corresponds to the confluence with Durkee’s Run and receives discharges from five CSOs (including the four that discharge to Durkee’s Run).

Figures 4.5-3a and 4.5-3b show the total hours of exceedance and the percent of total hours exceeded (respectively) for the typical year recreation season under current conditions. Results are presented for all of the sources (including those upstream of Lafayette) and for Lafayette CSO sources only. Sources upstream of Lafayette cause exceedances about 57 percent of the time for the recreation season at the start of the Lafayette municipal boundary (river mile 313). Lafayette CSOs cause exceedances a maximum of eight percent of hours. None of the Lafayette non-CSO sources cause exceedances as individual sources.

Because CSO discharges are intermittent, model results for the City's CSOs did not result in exceedances of the State's monthly geometric mean criterion (125 cfu/100 ml). However, when all sources are considered, the river exceeded this criterion during each month of the recreation season, largely because of the magnitude of upstream sources.

#### **4.6 Water Quality Benefits of Proposed Alternatives**

The river model was used to simulate *E. coli* concentrations in the river for the different CSO control alternatives presented in Chapter 3. A simulation was also conducted for complete elimination of Lafayette CSOs, to provide a limit for water quality improvements from Lafayette CSO control. As described in Section 4.3, these runs were conducted by tracking six specific sources of bacteria to the river with the model: Lafayette CSO, SWO and WWTP, West Lafayette sources, upstream and tributary sources.

Benefits of proposed alternatives are presented in terms of reduction in CSO *E. coli* load and exceedance of Indiana's water quality criteria. As noted in Chapter 3.3, Lafayette will achieve a 20 percent system-wide reduction in CSO volume through the planned WWTP expansion (Phase 1). Additionally, two CSO control alternatives (Alternative A and Alternative B) were evaluated at three levels of control. The levels of control were based on providing full capture for three different design storms (F, G, and H), resulting in six, four, and two overflows per year (respectively) for Alternative A and six, four, and three overflows per year for Alternative B. These control options were evaluated by incorporating discharge volumes from the collection system model into the Wabash River model. All of the CSO discharge volumes for the control alternatives were assigned an *E. coli* concentration

of 272,000 cfu/100 mL, the concentration assigned to the majority of Lafayette CSOs under the current conditions scenario.

Table 4.6-1 presents typical year volume and *E. coli* load from the Lafayette CSOs, as well as the percent reduction from current conditions, for each control alternative. The alternatives provide a reduction between 82 and 92 percent of the current Lafayette CSO *E. coli* load, depending on the level of control. Figure 4.6-1 shows how the reduction in Lafayette CSO *E. coli* load affects the load from all sources across the control scenarios.

The effect of the CSO alternatives on water quality can also be evaluated in terms of total hours or percentage of hours of exceeding the water quality standard. Figures 4.6-2 and 4.6-3 illustrate exceedances Alternative A and Alternative B, respectively, evaluated at various levels of control for the entire model domain. Table 4.6-2 presents the total and percent exceedance hours for the Key Locations for the control options, while Table 4.6-3 presents the exceedance evaluation in terms of days. The exceedance results are presented for both Lafayette CSOs and all sources.

As these figures and tables illustrate, exceedance hours from Lafayette CSO sources range from 7% (Phase 1) to 0.3% (Alternative A – 2 overflows/year). However, the frequency of exceedance due to all sources is largely unchanged, regardless of the level of CSO control, because of the load from upstream sources.

Tables 4.6-4a and 4.6-4b present the calculated in-stream geometric mean concentration for each month of the Typical Year at two of the Key Locations (Shamrock Park and Downstream of all Lafayette CSOs). Highlighted cells indicate months during the recreation season with values greater than the Indiana geometric mean criterion. The tables show that each recreation season month exceeds the criteria, even if Lafayette CSOs are completely eliminated. All of the levels of control for both Alternatives A and B reduce the geometric mean concentrations compared to the current conditions. However, there is almost no difference between the various control options in terms of monthly geometric mean concentrations.

#### 4.7 Cost-Performance Considerations

The river model results for each CSO alternative from Section 4.6 were combined with the cost information presented in Chapter 3 to calculate cost-performance curves for each alternative. SEA 431 defines the “knee-of-the-curve” as the point in the cost-performance curve “where the incremental change in the cost of a control alternative per change in performance of the control alternative changes most rapidly” (i.e., the tangential slope of the curve is the greatest). This guidance also indicates that municipalities may choose to use a watershed approach to achieve more cost-effective reductions in *E. coli* through measures other than CSO control (IDEM, 2001).

The cost-performance curve for the base conditions, Phase I improvements, and each alternative is shown on Figure 4.7-1. This curve shows the calculated hours of exceedance of Indiana’s water quality standard (235 cfu/100 ml) during the recreation season. The average number of overflow events per year is shown for each level of control. Nearly equivalent frequencies of water quality standard exceedances are predicted between the two alternatives sized for the same level of control.

SEA 431 and SB 620 indicate that “[the] LTCP can provide the information necessary to identify the duration of a temporary suspension of the water quality standards through the evaluation of control alternatives and their impacts on reducing the frequency and duration of CSO discharges.” The model results for the Lafayette CSOs based on the typical year rainfall and river flow conditions show that this period would be 10-15 hours after typical rainfall events at the level of control indicated by the “knee” of the curve in Figure 4.7-1. Longer periods of suspension could be required to accommodate less typical situations.

#### 4.8 Water Quality Conclusions

Based on the information presented in Section 4.5, Lafayette CSOs currently cause water quality exceedances of Indiana’s single sample *E. coli* criterion of 235 cfu/100 ml approximately eight percent of the recreation season within the boundaries of Lafayette’s CSO area, and to a lesser extent downstream of Lafayette. Sources upstream of Lafayette cause exceedances approximately 57 percent of the time for the typical year and the

recreation season at the start of the Lafayette municipal boundary (river mile 313). Lafayette source exceedances occur much less frequently than exceedances due to upstream sources (approximately 1/5-1/10 of the frequency of exceedances due to upstream sources). Additionally, The Wabash River is a fast-moving, large river with sufficient flow to dilute much of the *E. coli* load from Lafayette's stormwater discharges, and smaller CSO events, to an in-stream concentration below the criterion of 235 cfu/100 mL.

As shown on Figure 4.7-1, improvement in water quality exceedances (measured as hours of exceedance) is similar for the same level of control across the two alternatives. Alternative A, however, offers the most cost-effective alternative for achieving improvement in water quality. Increasingly higher levels of control beyond the beginning of the "knee-of-the-curve" result in substantial increases in cost with little expected improvement in water quality as expressed in reduced hours of exceedance.

## **References**

EPA. 2004. Report to Congress on the Impacts and Control of CSOs and SSOs. Office of Water, Washington, D.C. EPA 833-R-04-001, August 2004, page 4-3.

Indiana WQS: Indiana Water Pollution Control Board, September 2007. Water Quality Standards. Indiana Administrative Code, Title 327, Article 2 (327-IAC-2). Indianapolis, Indiana.

SR CER: City of Lafayette Indiana. Stream Reach Characterization and Evaluation Report. Prepared by Greeley and Hansen. Submitted October 2004.

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**Table 4.3-1**  
**Location of *E. coli* Sources in Lafayette Study Area**

River Mile	Lafayette Sources			West Lafayette Sources	Other Sources	Key Locations
	WWTP	CSO IDs	SWOs			
314.00					Upstream	Sampling Station #1, US 52
313.50						KL-01 Upstream of Lafayette City Boundary
312.80		001		CSO 003, SWO		
312.50				CSO 004, CSO 004A		
312.30		002				
312.00		003,004	SWO			
311.90				CSO 005, SWO		KL-02 Riehle Plaza Bridge, Sampling Station #2
311.65		006		WWTP		
311.32		007				
311.22						
310.83		008				KL-03 Shamrock Park
310.54		009,010,011 012,015	SWO			Durkee's Run Confluence
310.00						Sampling Station #5, US 231
309.50						
309.20	WWTP					
309.00						KL-04 Downstream of Lafayette Inputs
308.21		017			Tributary	Wea Creek Confluence
308.00						
307.50						
307.00					Tributary	
306.50						
306.00					Tributary	
305.50						
305.00						
304.50						
304.00						
303.50					Tributary	
303.00						KL-05 CR 700 (Granville Br)
302.50						
302.00						
301.50						
301.00						
300.50						
300.00						

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**Table 4.3-2**  
Annual Volume and *E. coli* Load by Source for the Typical Year

April 2009

Source	Volume (MG)	Concentration (cfu/100 mL) [Geomean]	<i>E. coli</i> Load (cfu/100 mL)
<b>Lafayette:</b>			
CSO 001	263	272,000	2.70E+15
CSO 002	99	272,000	1.02E+15
CSO 003	137	272,000	1.41E+15
CSO 004	81	272,000	8.29E+14
CSO 006	35	272,000	3.64E+14
CSO 007	62	272,000	6.37E+14
CSO 008	12	272,000	1.25E+14
CSO 009	154	272,000	1.58E+15
CSO 010	7	144,000	3.70E+13
CSO 011	11	144,000	6.06E+13
CSO 012	120	144,000	6.56E+14
CSO 015	1	144,000	3.15E+12
CSO 017	2	272,000	1.70E+13
Durkee's Run SWO	11,901	620 - 4,157 [627]	2.89E+14
Stormwater	38	4,157	6.03E+12
WWTP	5,029	80 - 10,000 [599]	7.92E+14
<b>West Lafayette:</b>			
CSO Total	24	272,000	5.64E+14
SWO Total	685	4,157	1.08E+14
WWTP	3,859	35.6 - 10,000 [373]	5.93E+14
<b>Upstream Wabash:</b>	1,665,785	5 - 33,879 [205]	5.84E+16
<b>Tributaries:</b>	30,209	70 - 620 [137]	1.81E+14

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**Table 4.5-1**  
**State Variables Assignments to *E. coli* Sources in the River Model**  
 April 2009

<b>State Variable ID</b>	<b>Description</b>	<b>Sources Included</b>
EC	Total <i>E. coli</i> concentration	All
ECus	<i>E. coli</i> from upstream sources	Upstream Wabash River (including Wildcat Cr., Tippecanoe R. sources)
ECcso	<i>E. coli</i> from Lafayette CSOs	All Lafayette CSOs (001, 002, 003, 004, 006, 007, 008, 009, 010, 011, 012, 015, 017)
ECswo	<i>E. coli</i> from Lafayette stormwater sources	Durkee's Run non-CSO sources and Lafayette stormwater
ECwl	<i>E. coli</i> from all West Lafayette sources	West Lafayette CSO, WWTP and stormwater sources
Ectr	<i>E. coli</i> from tributary sources	Big Wea Cr., Jordan Cr., Indian Cr., and unnamed tributary
ECwwtp	<i>E. coli</i> from Lafayette WWTP	Lafayette WWTP

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**Table 4.6-1**  
**Comparison of CSO Volume and E. Coli Load Reductions by Control Alternative for**  
**the Typical Year**

April 2009

<b>CSO Control Alternative</b>	<b>Total Lafayette CSO Volume (MG)</b>	<b>Volume Reduction From Current Conditions %</b>	<b>Total Lafayette CSO E. coli Load (cfu/100 mL)</b>	<b>Load Reduction From Current Conditions %</b>
Current Conditions	983	-	9.45E+15	-
Phase 1 Controls	787	20%	7.45E+15	21%
Alternative A – 6 OF/year	165	83%	1.71E+15	82%
Alternative A – 4 OF/year	125	87%	1.29E+15	86%
Alternative A – 2 OF/year	50	95%	5.15E+14	95%
Alternative B - 6 OF/year	153	84%	1.57E+15	83%
Alternative B - 4 OF/year	116	88%	1.20E+15	87%
Alternative B - 3 OF/year	70	93%	7.25E+14	92%

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**Table 4.6-2**  
**Total Hours and Percent Exceedance of *E. coli* Single Sample Maximum Water Quality Criteria at Key Locations During the Typical Year**

April 2009

Scenario	Upstream of Lafayette CSOs		Riehle Plaza		Shamrock Park		Downstream of Lafayette CSOs		CR 700 (Granville Bridge)	
	RM 313.5		RM 311.9		RM 310.83		RM 309		RM 303	
	All sources	Lafayette CSOs	All sources	Lafayette CSOs	All sources	Lafayette CSOs	All sources	Lafayette CSOs	All sources	Lafayette CSOs
Current Conditions	2944 (57.3%)	0 (0.0%)	2953 (57.5%)	325 (6.3%)	2918 (56.8%)	348 (6.8%)	2905 (56.6%)	400 (7.8%)	2567 (50.0%)	397 (7.7%)
Phase 1	2944 (57.3%)	0 (0.0%)	2929 (57.0%)	291 (5.7%)	2899 (56.4%)	321 (6.3%)	2869 (55.9%)	364 (7.1%)	2539 (49.4%)	355 (6.9%)
Alternative A - 6 OF/year	2944 (57.3%)	0 (0.0%)	2846 (55.4%)	27 (0.5%)	2796 (54.4%)	35 (0.7%)	2734 (53.2%)	42 (0.8%)	2372 (46.2%)	52 (1.0%)
Alternative A - 4 OF/year	2944 (57.3%)	0 (0.0%)	2846 (55.4%)	15 (0.3%)	2796 (54.4%)	27 (0.5%)	2734 (53.2%)	36 (0.7%)	2370 (46.1%)	44 (0.9%)
Alternative A - 2 OF/year	2944 (57.3%)	0 (0.0%)	2846 (55.4%)	5 (0.1%)	2796 (54.4%)	8 (0.2%)	2733 (53.2%)	12 (0.2%)	2370 (46.1%)	13 (0.3%)
Alternative B - 6 OF/year	2944 (57.3%)	0 (0.0%)	2846 (55.4%)	28 (0.5%)	2796 (54.4%)	35 (0.7%)	2733 (53.2%)	42 (0.8%)	2370 (46.1%)	51 (1.0%)
Alternative B - 4 OF/year	2944 (57.3%)	0 (0.0%)	2846 (55.4%)	14 (0.3%)	2796 (54.4%)	26 (0.5%)	2733 (53.2%)	34 (0.7%)	2370 (46.1%)	40 (0.8%)
Alternative B - 3 OF/year	2944 (57.3%)	0 (0.0%)	2846 (55.4%)	12 (0.2%)	2796 (54.4%)	16 (0.3%)	2732 (53.2%)	20 (0.4%)	2370 (46.1%)	25 (0.5%)
No Lafayette CSOs	2944 (57.3%)	0 (0.0%)	2846 (55.4%)	0 (0.0%)	2796 (54.4%)	0 (0.0%)	2732 (53.2%)	0 (0.0%)	2370 (46.1%)	0 (0.0%)

Notes:

Indiana Recreation Season = April-October (5,136 hours);  
 Single Sample Maximum Criterion = 235 cfu/100 ml

Method:

Hourly model outputs were compared to water quality standard criterion. Hours when concentration exceeded criterion were included in tally presented above.

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**Table 4.6-3**  
**Total Days and Percent Exceedance of *E. coli* Single Sample Maximum Water Quality Criteria at Key Locations During the Typical Year**

April 2009

Scenario	Upstream of Lafayette CSOs		Riehle Plaza		Shamrock Park		Downstream of Lafayette CSOs		CR 700 (Granville Bridge)	
	RM 313.5		RM 311.9		RM 310.83		RM 309		RM 303	
	All sources	Lafayette CSOs	All sources	Lafayette CSOs	All sources	Lafayette CSOs	All sources	Lafayette CSOs	All sources	Lafayette CSOs
Current Conditions	121 (56.5%)	0 (0.0%)	120 (56.1%)	13 (6.1%)	116 (54.2%)	12 (5.6%)	115 (53.7%)	13 (6.1%)	94 (43.9%)	11 (5.1%)
Phase 1	121 (56.5%)	0 (0.0%)	120 (56.1%)	12 (5.6%)	116 (54.2%)	11 (5.1%)	114 (53.3%)	11 (5.1%)	94 (43.9%)	6 (2.8%)
Alternative A - 6 OF/year	121 (56.5%)	0 (0.0%)	113 (52.8%)	1 (0.5%)	109 (50.9%)	1 (0.5%)	103 (48.1%)	2 (0.9%)	82 (38.3%)	2 (0.9%)
Alternative A - 4 OF/year	121 (56.5%)	0 (0.0%)	113 (52.8%)	1 (0.5%)	109 (50.9%)	1 (0.5%)	103 (48.1%)	1 (0.5%)	82 (38.3%)	1 (0.5%)
Alternative A - 2 OF/year	121 (56.5%)	0 (0.0%)	113 (52.8%)	1 (0.5%)	109 (50.9%)	1 (0.5%)	103 (48.1%)	1 (0.5%)	81 (37.9%)	0 (0.0%)
Alternative B - 6 OF/year	121 (56.5%)	0 (0.0%)	113 (52.8%)	1 (0.5%)	109 (50.9%)	1 (0.5%)	103 (48.1%)	2 (0.9%)	83 (38.8%)	2 (0.9%)
Alternative B - 4 OF/year	121 (56.5%)	0 (0.0%)	113 (52.8%)	1 (0.5%)	109 (50.9%)	1 (0.5%)	103 (48.1%)	1 (0.5%)	82 (38.3%)	1 (0.5%)
Alternative B - 3 OF/year	121 (56.5%)	0 (0.0%)	113 (52.8%)	0 (0.0%)	109 (50.9%)	1 (0.5%)	103 (48.1%)	1 (0.5%)	81 (37.9%)	1 (0.5%)
No Lafayette CSOs	121 (56.5%)	0 (0.0%)	113 (52.8%)	0 (0.0%)	109 (50.9%)	0 (0.0%)	103 (48.1%)	0 (0.0%)	81 (37.9%)	0 (0.0%)

Notes:

Indiana Recreation Season = April-October ((214 days)

Single Sample Maximum Criterion = 235 cfu/100 ml

Method:

Daily geometric means of hourly model outputs were compared to water quality standard criterion. Days when daily geomean exceeded criteria were included in tally presented above.

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**Table 4.6-4**  
**Monthly Geometric Mean In-Stream *E. coli* Concentrations at (a) Shamrock Park**  
**and (b) Downstream of all Lafayette CSOs**  
 April 2009

a. Shamrock Park

Scenario	Geometric mean in-stream <i>E. coli</i> concentration (cfu/100 mL) by month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Current Conditions	235	191	240	189	306	297	199	218	194	287	455	368
Phase 1 Controls	233	191	239	187	302	293	198	216	189	285	451	367
Alternative A – 6 OF/year	220	189	229	173	278	258	178	197	167	269	401	350
Alternative A – 4 OF/year	220	189	229	173	278	257	177	196	167	269	401	350
Alternative A – 2 OF/year	220	189	229	173	277	257	176	196	167	269	401	350
Alternative B - 6 OF/year	220	189	229	173	278	258	178	197	167	269	401	350
Alternative B - 4 OF/year	220	189	229	173	278	257	177	196	167	269	401	350
Alternative B - 3 OF/year	220	189	229	173	277	257	176	196	167	269	401	350
No Lafayette CSOs	220	189	229	173	277	257	175	194	167	269	401	350

b. Downstream of all Lafayette CSOs

Scenario	Geometric mean in-stream <i>E. coli</i> concentration (cfu/100 mL) by month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Current Conditions	298	233	318	209	324	316	213	245	219	303	622	463
Phase 1 Controls	294	233	315	204	316	307	208	239	211	298	610	460
Alternative A - 6 OF/year	296	240	321	188	289	268	189	215	185	280	586	458
Alternative A - 4 OF/year	296	240	321	188	289	267	187	215	185	280	584	458
Alternative A - 2 OF/year	295	240	321	188	289	266	184	212	185	280	582	458
Alternative B - 6 OF/year	292	238	317	188	289	268	188	215	185	280	577	455
Alternative B - 4 OF/year	293	238	317	188	289	267	186	214	185	280	578	454
Alternative B - 3 OF/year	292	238	317	188	289	266	185	214	185	280	574	454
No Lafayette CSOs	220	189	229	173	277	257	175	194	167	269	401	350

Notes:

Indiana Recreation Season = April-October;

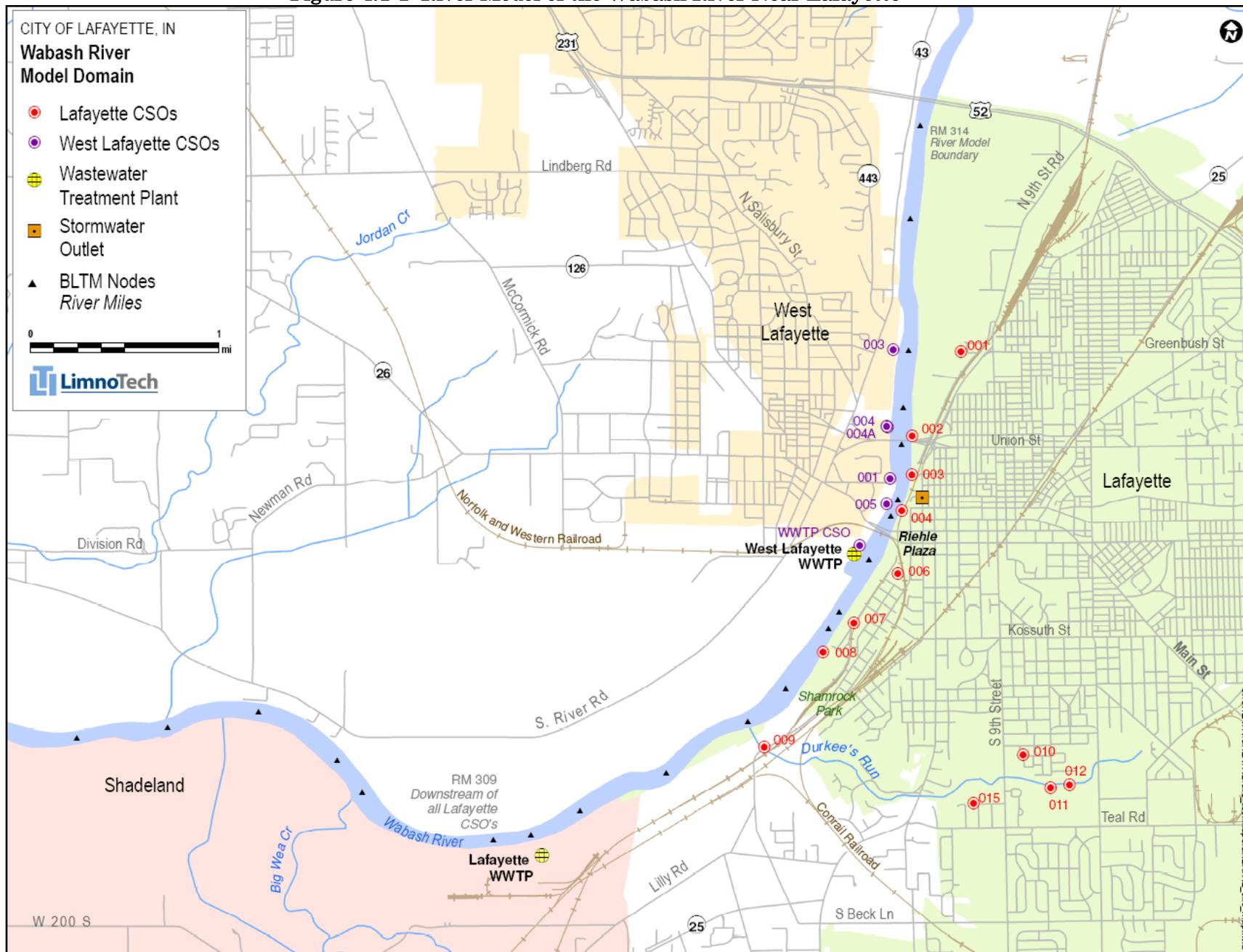
30-day Geometric Mean Criterion = 125 cfu/100 ml

Highlighted values exceed Indiana Criteria. Note that there is no 30-day criterion applicable during the months of November through March.

Method:

Hourly model outputs were averaged (as a geometric mean) for each month.

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**Figure 4.1-1: River Model of the Wabash River Near Lafayette**



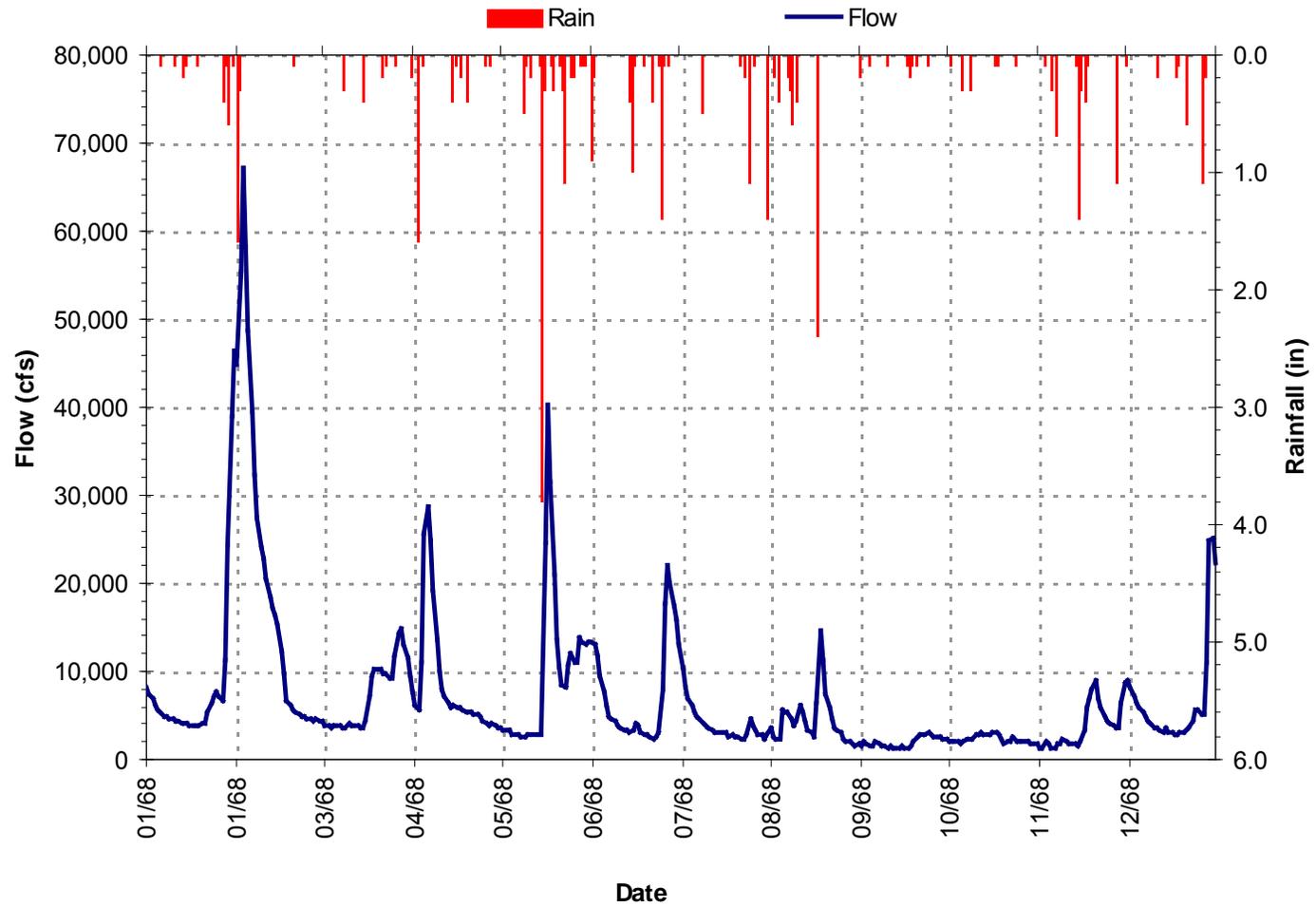
S:\0414\FAC\LA\Fa2018\_1\Map\Map\_GIS\_LAF\_2\_sie.mxd

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**Figure 4.2-1**  
**Daily Rainfall and Wabash River Flow During Typical Year (1968)**

April 2009



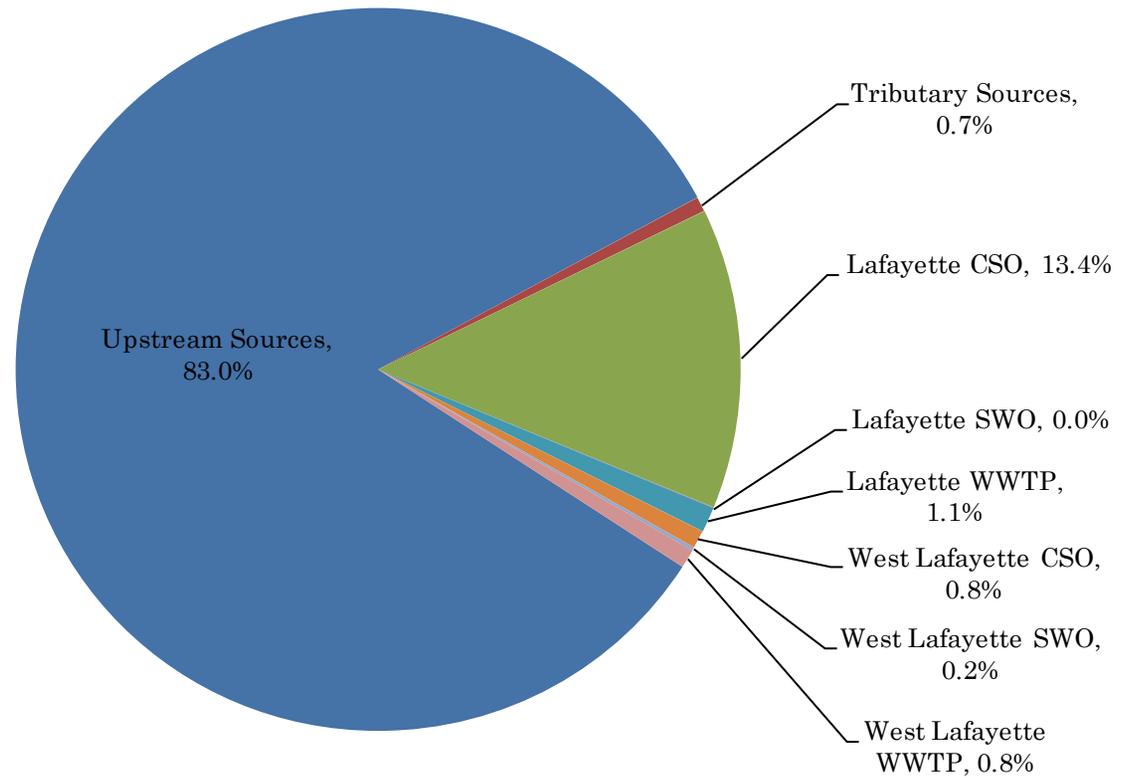
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**Figure 4.3-1**  
**Annual *E. coli* Loadings to Wabash River by Source Type**

April 2009

Total *E. coli* load =  $7.04 \times 10^{16}$  cfu

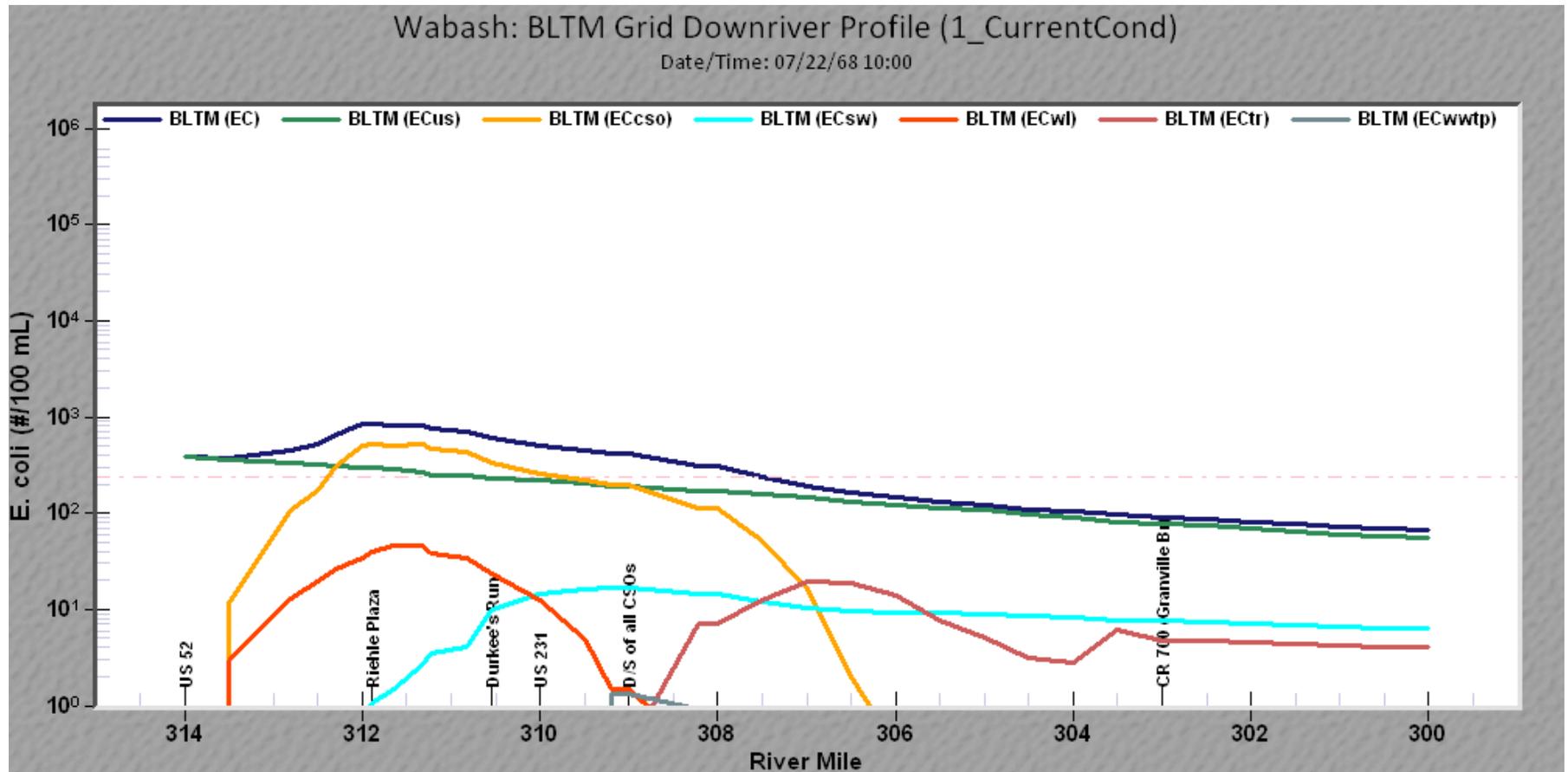


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Figure 4.5-1  
Example River Model Output Display of *E. coli* Concentration in the Wabash River

April 2009



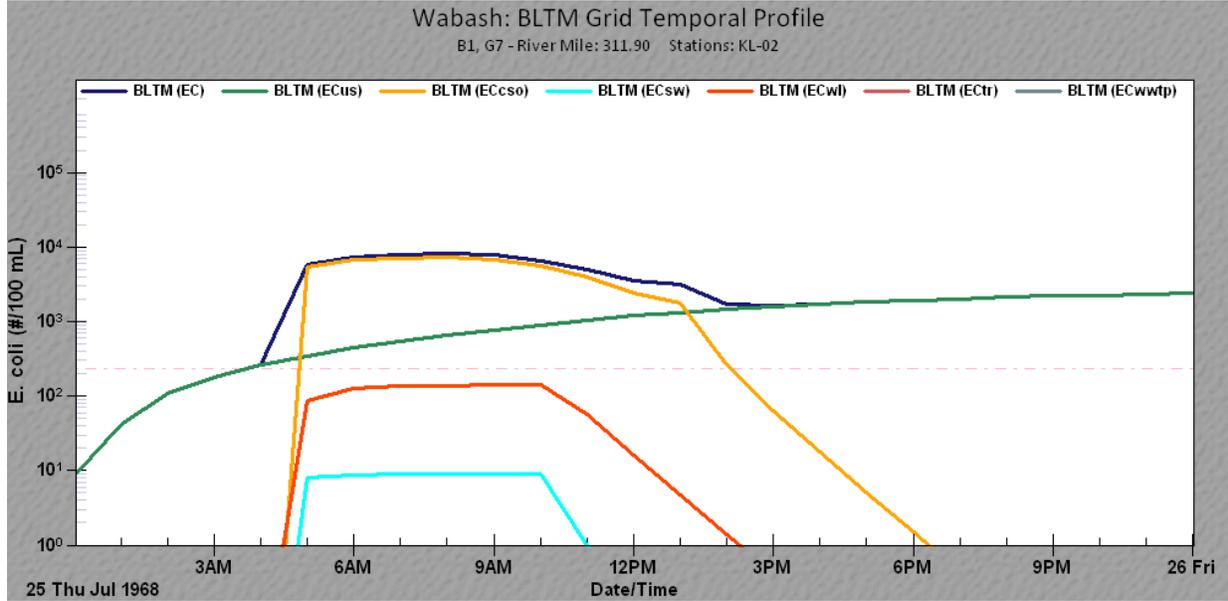
CITY OF LAFAYETTE, INDIANA

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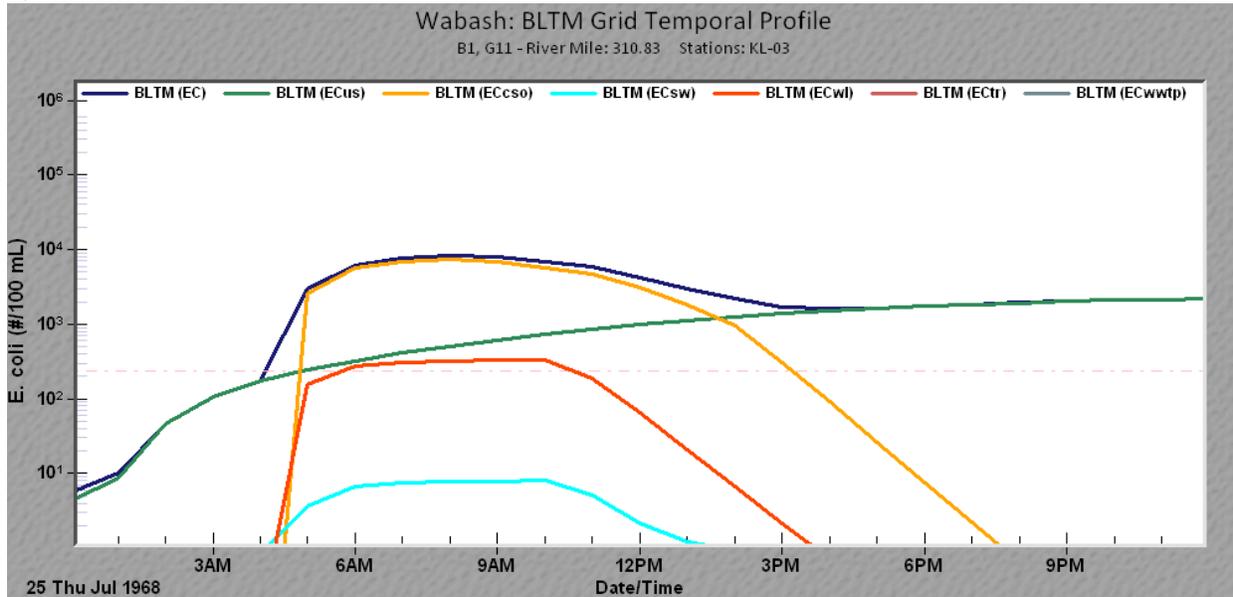
Figures 4.5-2 a and 4.5-2 b  
Model Results By Source at Key Locations for July 25 Storm Event:  
July 25 Storm: Total Rainfall = 1.1 inches; Storm Duration = 6 hours

April 2009

a.) Riehle Plaza



b.) Shamrock Park



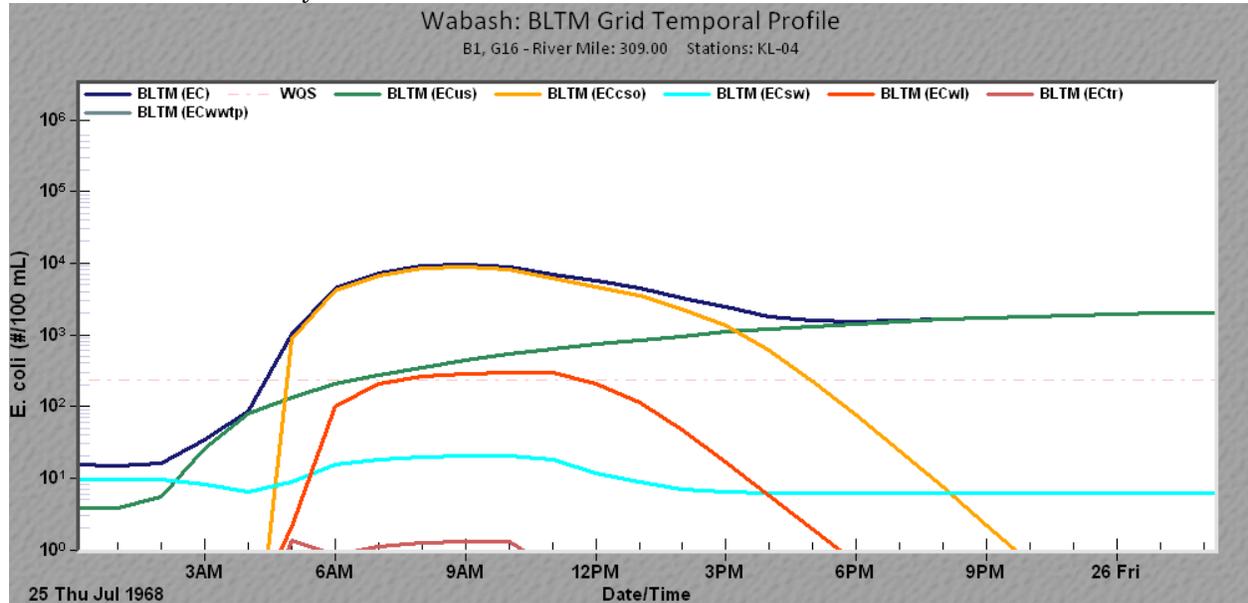
CITY OF LAFAYETTE, INDIANA

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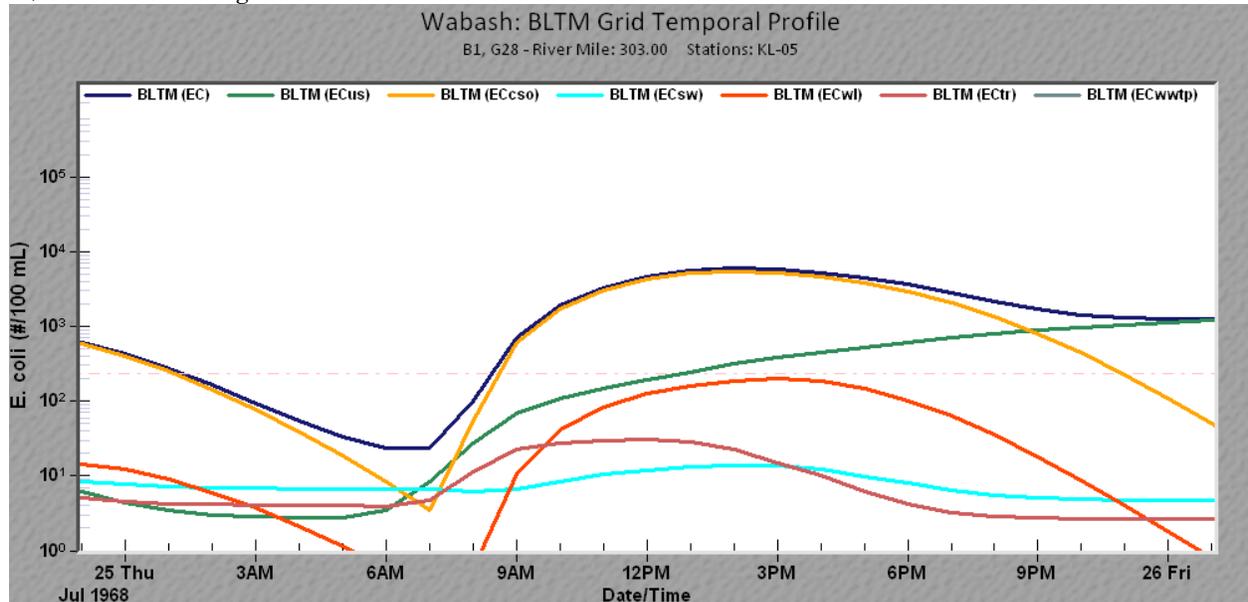
**Figures 4.5-2 c and 4.5-2 d**  
**Model Results By Source at Key Locations for July 25 Storm Event:**  
**July 25 Storm: Total Rainfall = 1.1 inches; Storm Duration = 6 hours**

April 2009

c.) Downstream of Lafayette CSOs



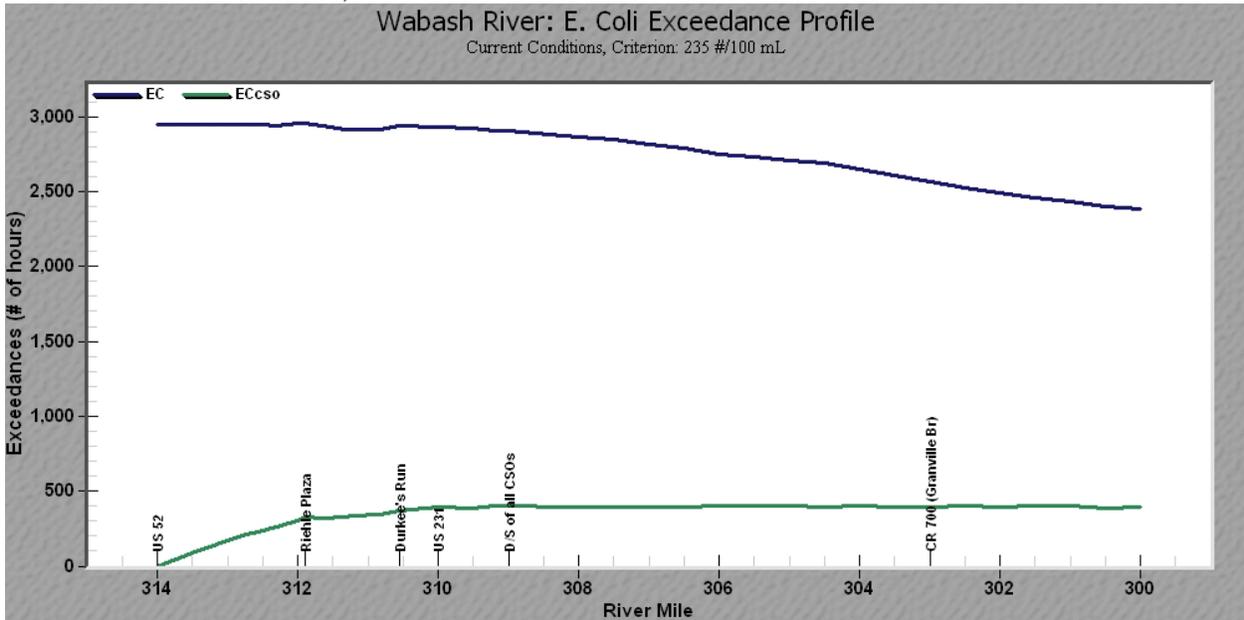
d.) Granville Bridge



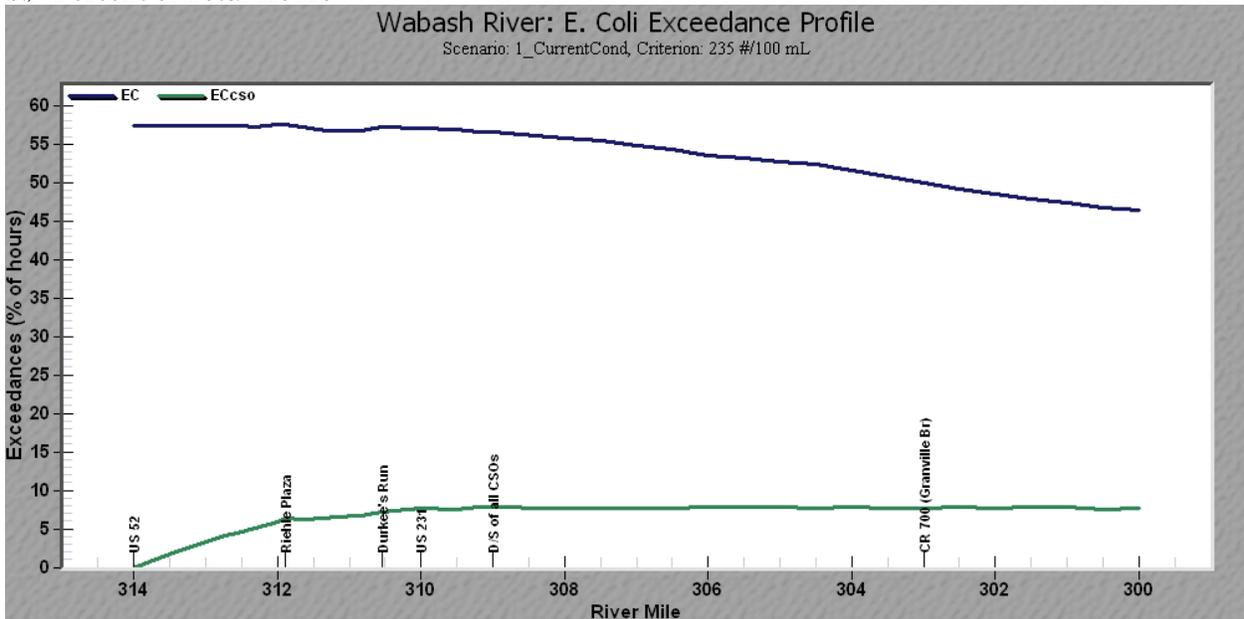
CITY OF LAFAYETTE, INDIANA  
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Figure 4.5-3  
**Exceedance of *E. coli* Water Quality Criteria During the Recreation Season**  
**Total Hours Exceeding 235 cfu/100 ml**  
**Current Conditions**  
 April 2009

a.) Total Hours (Period = 5,136 hours)



b.) Percent of Total Hours

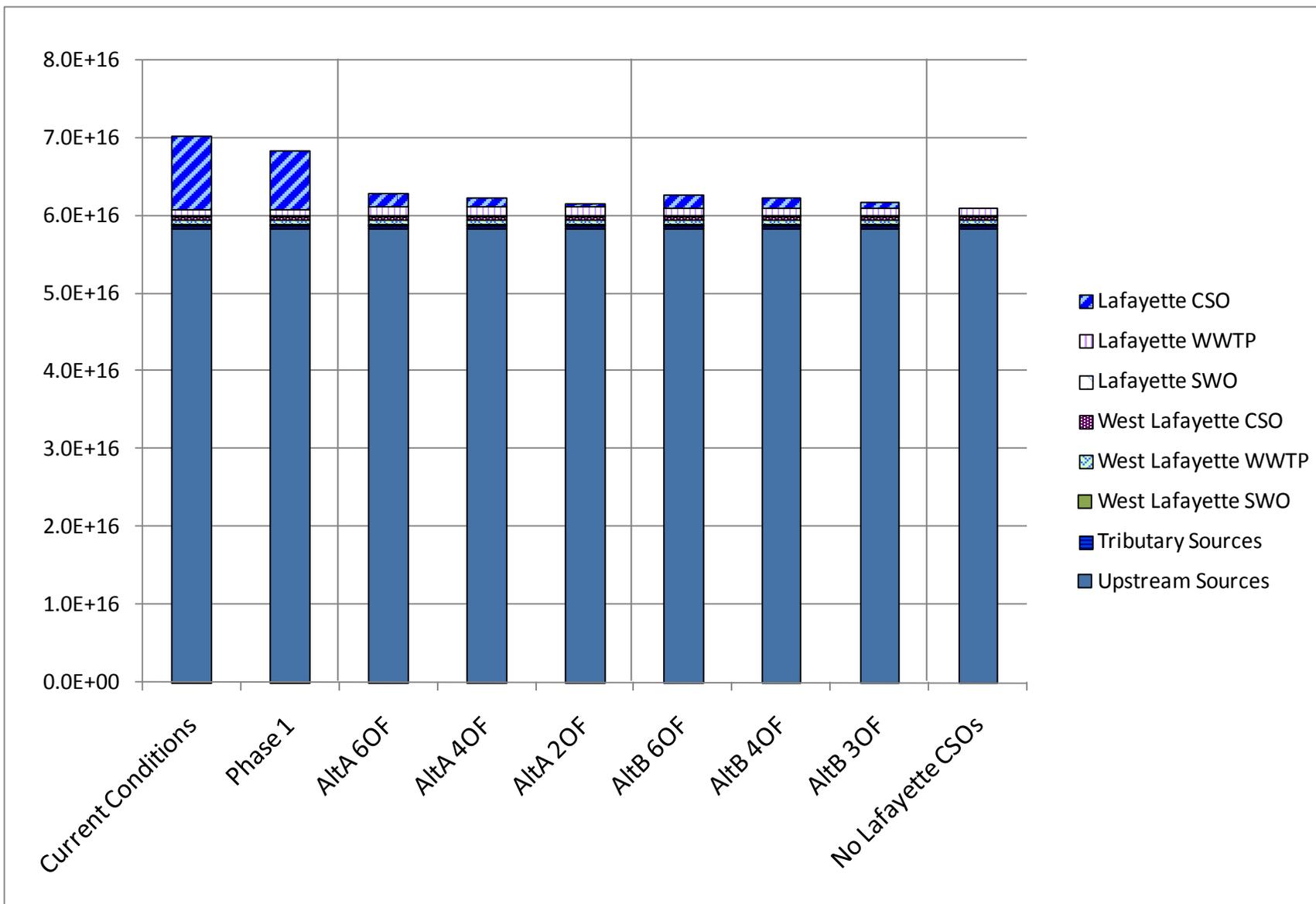


Blue line (EC) represents all sources  
 Green line (ECcso) represents Lafayette CSO sources

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**Figure 4.6-1: *E.coli* Load for Typical Year for Each Control Alternative and Level of Control**  
April 2009

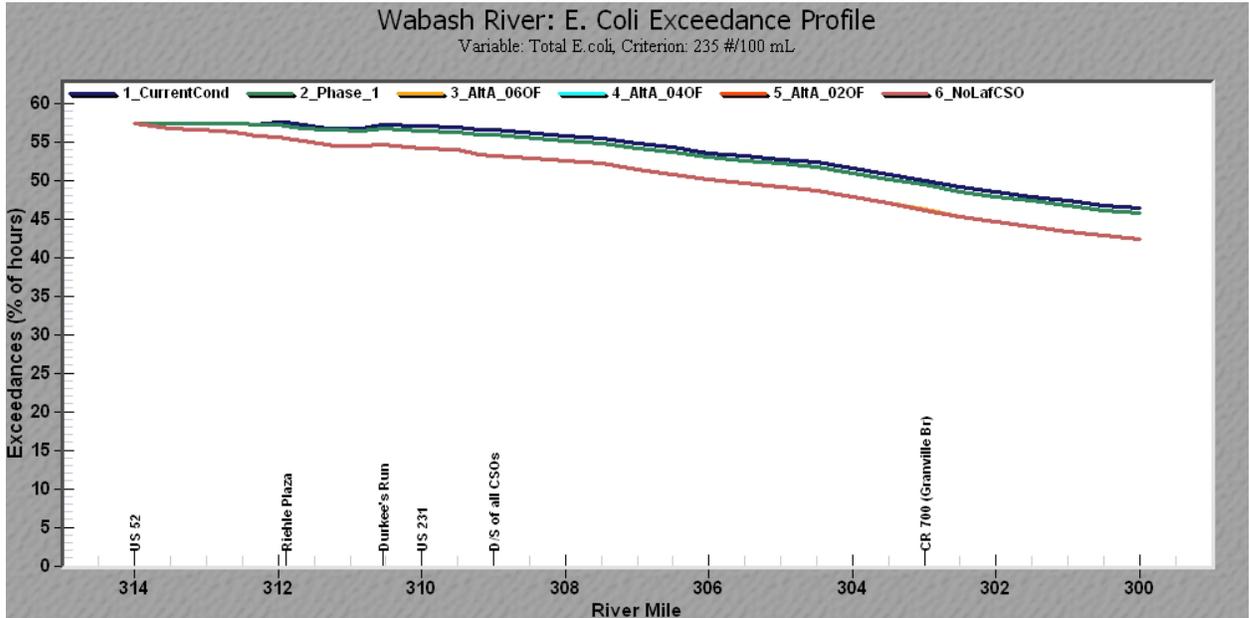


CITY OF LAFAYETTE, INDIANA

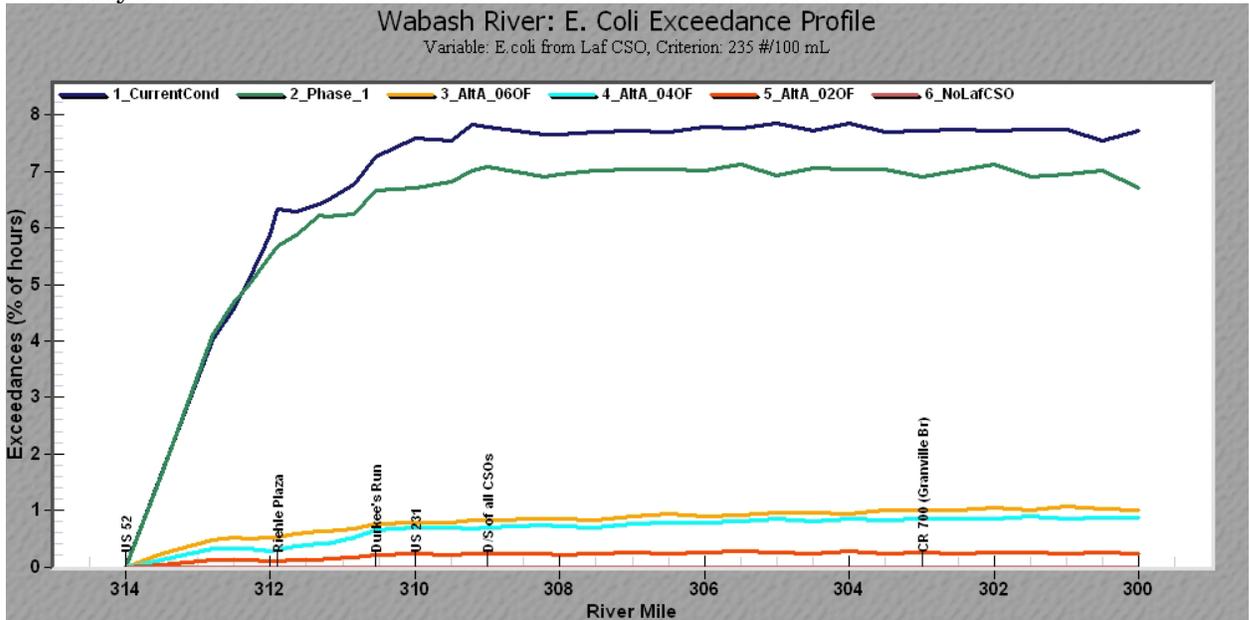
Combined Sewer Overflow Long Term Control Plan

Figure 4.6-2  
Comparison of Exceedance of Water Quality Criteria During the Recreation Season of  
Alternative A Control Scenarios  
Percent of Hours Exceeding 235 cfu/100 ml (Period = 5,136 Hours)  
April 2009

a. All sources



b. Lafayette CSOs



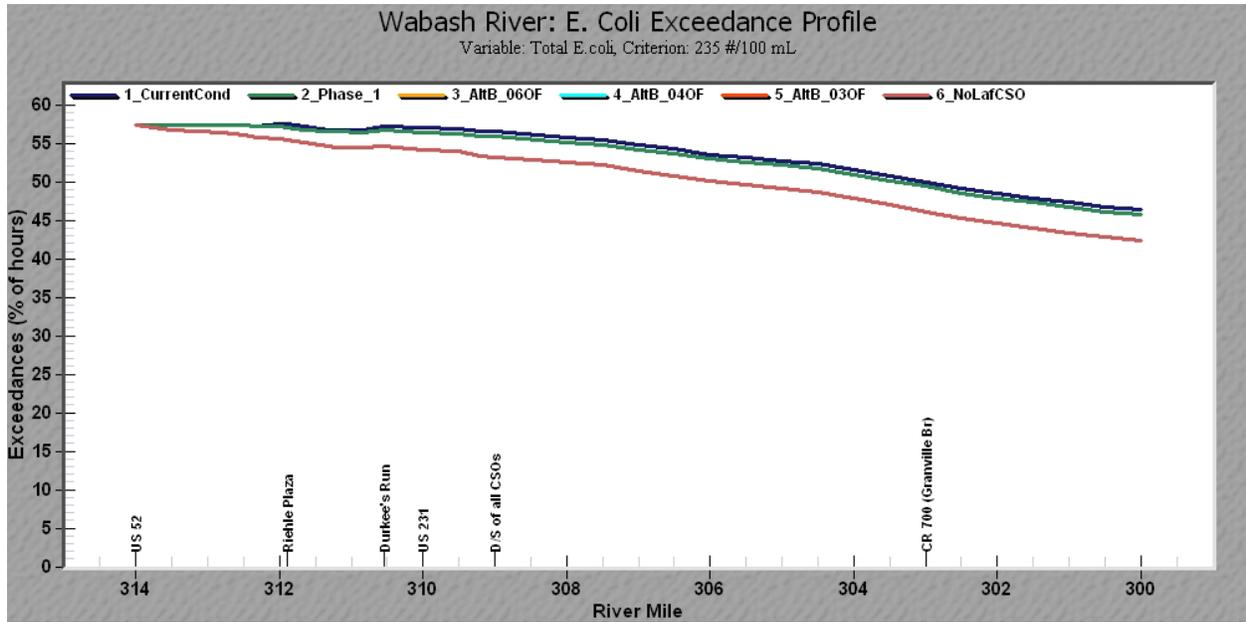
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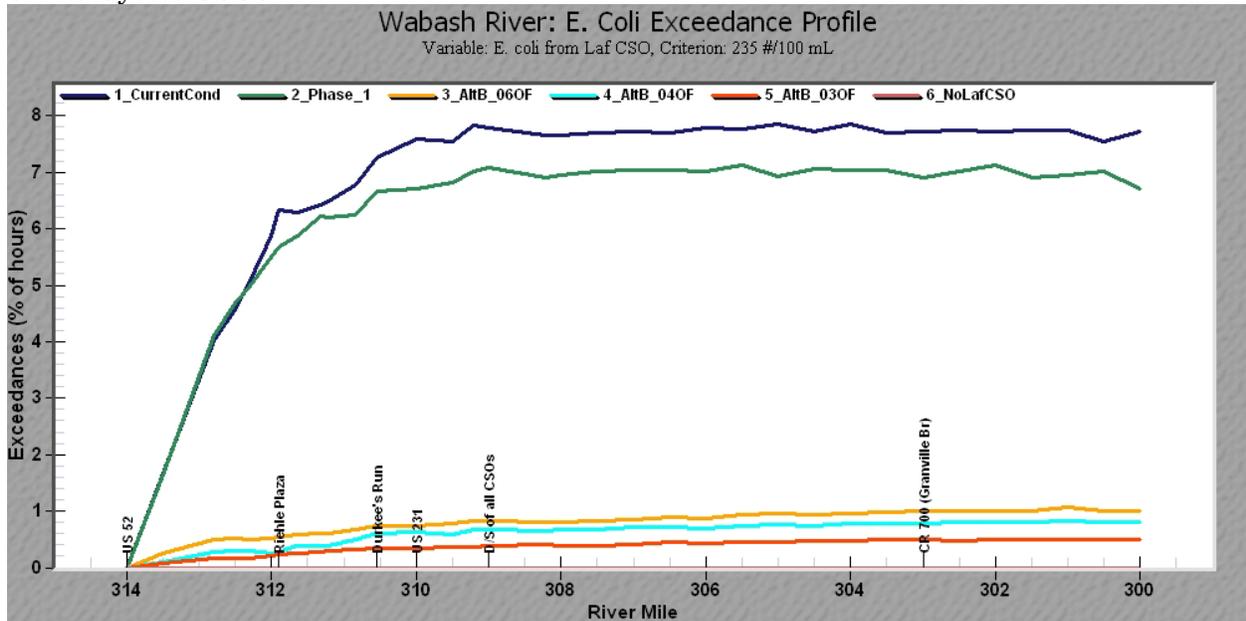
Figure 4.6-3  
Comparison of Exceedance of Water Quality Criteria During the Recreation Season of  
Alternative B Control Scenarios  
Percent of Hours Exceeding 235 cfu/100 ml (Period = 5,136 Hours)

April 2009

a. All sources

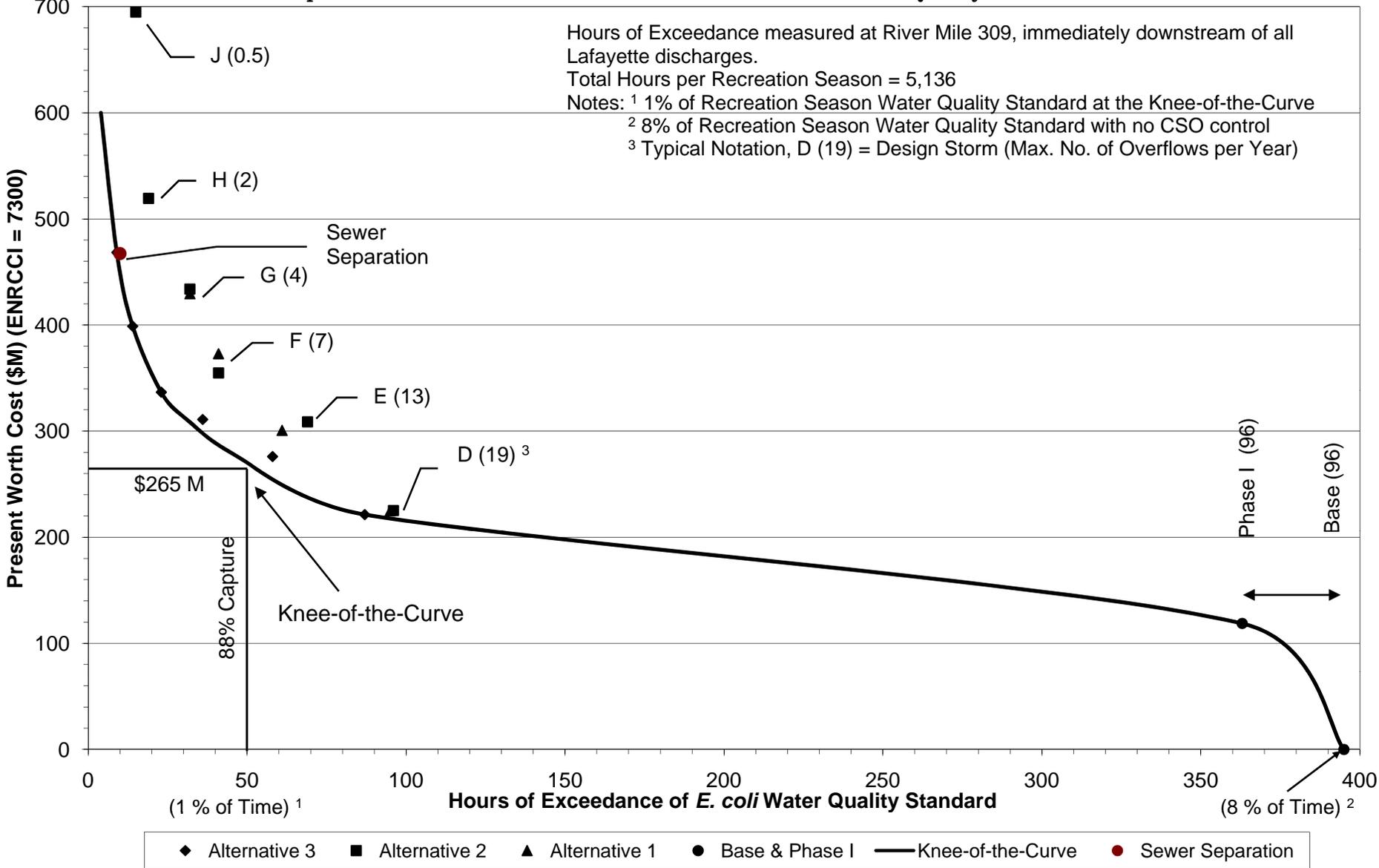


b. Lafayette CSOs



CITY OF LAFAYETTE, INDIANA  
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Figure 4.7-1  
 Cost Performance Curve based on Hours of Exceedance for CSO Only and Storm Water from  
 April to October (Recreation Season) of Indiana *E. coli* Water Quality Standard



CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Chapter 5  
Other CSO LTCP Activities**

Greeley and Hansen

**5.1 Introduction**

This chapter presents other CSO Long Term Control Plan activities that the City of Lafayette has undertaken and will continue to undertake in an effort to control CSOs.

**5.2 Early Action Projects**

There are many improvements to Lafayette's collection system and WWTP that have been or are currently being implemented. These improvements will reduce CSO volumes, frequencies, and durations and help maximize flows to the WWTP. These improvements are considered early action projects because they have been initiated before Lafayette's CSO LTCP is approved by IDEM.

**5.2.1 Phase I Improvements - Implemented**

Several early action projects are anticipated to be in operation approximately the time the LTCP is due. These projects are being considered as part of Phase I of the LTCP. The cost of the Phase I improvements is summarized in Table 5.2-1. These Phase I improvement projects are previously discussed in Section 1.2.4 of this report and include:

- Elimination of Shamrock Park CSO (CSO 008),
- Elimination of Romney Road CSO (CSO 017),
  - Ross Road Lift Station,
  - Prairie Oaks Lift Station,
- Pearl River Lift Station,
  - Backflow prevention at CSOs 006 and 007,

- Elliot Ditch Interceptor Improvements,
- WWTP Upgrade and Expansion, and
- Pearl River Storage and Conveyance Tunnel.

### **5.2.2 Phase I Improvements - Proposed**

There are several other early action projects that will reduce CSO volumes, frequencies, and durations and help maximize flows to the WWTP. These projects include:

- 114-inch storage and conveyance tunnel, and
- Parking Lot Lift Station Elimination.

As discussed in Section 1.2.4 of this report, the 114-inch storage and conveyance tunnel from North Street to the Pearl River Lift Station is currently under construction. Once completed, the Parking Lot Lift Station can be eliminated, thus helping to maximize flows to the WWTP and reducing overflows upstream of the lift station. A Rain Garden will be constructed in the location of the eliminated Parking Lot L.S. Once this is complete, it is proposed to extend the tunnel to the next CSO upstream, CSO 003 (Cincinnati Street). This extension will allow the City to eliminate overflows at CSO 003 and further reduce overflows from upstream CSOs.

### **5.3 CSO Operational Plan Revisions**

Lafayette's CSO Operational Plan was submitted on April 29, 2004. Comments regarding the CSO Operational Plan were received from the Indiana Department of Environmental Management (IDEM) on January 27, 2005. The City submitted responses to IDEM within 120 days of January 27, 2005 as requested by IDEM. Another update of the CSO Operational Plan was submitted to IDEM in July 2009, per the requirements in the City's current NPDES permit.

Also, the CSO Operational Plan will be revised as the CSO Long Term Control Plan is implemented to reflect wastewater treatment plant and collection system changes. Updates will be sent to IDEM annually as required by the NPDES Permit.

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**TABLE 5.2-1  
CSO LTCP Phase I Costs**

Greeley and Hansen  
September 2009

Construction Cost	
CSO 008 Elimination	\$150,000
CSO 017 Elimination	
Prairie Oaks Lift Station	\$3,270,000
Prairie Oaks Force Main and Interceptor	\$12,230,000
Ross Road Lift Station	\$4,900,000
Ross Road Force Main and Interceptor	\$12,200,000
Wastewater Treatment Plant Expansion Project	\$62,000,000
Pearl River CSO Projects	
Division A - Storage and Conveyance Tunnel	\$19,000,000
Division B - Pearl River Lift Station and CSO Screening	\$10,000,000
Division C - Lift Station Elimination and Sewer Separation	\$600,000
Elliot Ditch Interceptor Improvements	\$10,000,000
Subtotal	
	\$134,350,000
Engineering, Legal, Fiscal, Administrative (15%)	
	\$20,200,000
Total Capital Cost	
	\$154,550,000

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Chapter 6  
Financial Capability Assessment**

Greeley and Hansen

**6.1 Introduction**

This financial capability assessment describes the City of Lafayette's capacity for implementing its proposed Long Term Control Plan (LTCP), based on information about its socioeconomic, debt, and financial conditions. This analysis uses an approach that follows United States Environmental Protection Agency (USEPA) advice to "submit any additional documentation that would create a more accurate and complete picture of their financial capability." The additional analysis of various indicators is vital to gaining an understanding of the City's economic situation and the impact that the CSO program will have on residents.

This analysis finds that financial conditions for the City of Lafayette have worsened since the 2005 Financial Capability Assessment. Lafayette's overall financial capability indicator score decreased from 2.17 in 2005 (See Appendix F), to 1.83 in 2009. Implementation of the Recommended Plan will place the City in USEPA's High Burden category. This means that the City must carefully balance the scope and timing of the LTCP with other community efforts, since the additional financial burdens of the CSO program could easily have an adverse impact on the local economy and the City's development efforts.

**6.2 Financial Capability Assessment**

**6.2.1 Approach**

The Indiana Department of Environmental Management (IDEM) and the USEPA recognize that meeting the requirements of the Clean Water Act and Indiana's water quality standards present major challenges for most communities with CSO problems. One of the most significant challenges is formulating a method to finance CSO controls without placing an excessive burden on citizens and industries. In many communities, the requirements contained in the Long-Term Control Plan (LTCP) can represent the most

significant financial obstacle they will face. While government agencies have provided communities with grants for wastewater projects in the past, no dedicated grant programs are currently available.

IDEM and the USEPA also realize that among the many variables affecting a community's financial condition are the scheduling and implementation of CSO related projects. These factors are directly related to the community's ability to afford the proposed development. Consequently, both agencies require a comprehensive affordability analysis within the LTCP to determine its effect on both the current and future fiscal health of any CSO community.

This Financial Capability Assessment is based on the USEPA's *CSO Guidance for Financial Capability Assessment and Schedule Development* (CSO Guidance, published March 27, 1997). The USEPA assessment approach includes the following:

- Assessment of Financial Indicators;
- Determination of a Residential Indicator, defined as Cost per Household as a percent of Median Household Income; and
- Development of Financial Capability Indicators Score.

The Financial Capability Assessment (FCA) will identify other factors in addition to the standard USEPA indicators listed in USEPA's 1997 *CSO Guidance*. The rationale for expanding the economic analysis is found in two USEPA guidance documents.

The first is *Economic Guidance for Water Quality Standards*, USEPA, 1995 (Economic Guidance) which states:

“The information presented here may not adequately address all potential impacts. ... Applicants should feel free to consider additional measures not mentioned here if they judge them to be relevant. Likewise, applicants should not view this guidance as a checklist. In all cases, socioeconomic impacts should not be evaluated incrementally, rather, their cumulative effect on the community should be assessed.”  
(p. 4-1)

The Economic Guidance goes on to state that, “There are no explicit criteria by which to evaluate widespread impacts. It is recommended, however, that changes in the socioeconomic indicators listed below be considered. For each indicator listed, the applicant should estimate the potential change from precompliance conditions if the community were to adopt pollution controls.

- Median Household Income;
- Community Unemployment Rate;
- Overall Net Debt as a Percent of Full Market Value of Taxable Property;
- Percent of Households Below Poverty Line;
- Impact on Community Development Potential; and
- Impact on Property Values.” (p. 4-2)

This section also notes “there may be secondary impacts to the community. Secondary impacts might include depressed economic activity in a community resulting from loss of purchasing power by persons losing their jobs due to increased user fees.” (p. 4-3)

*The Economic Guidance also makes a strong statement about the importance of considering the loss of potential future growth:*

“Affected communities may also be faced with impaired development opportunities if the need to comply with water quality standards discourages other businesses from locating in the area. In situations where the affected facility has not been built, additional expenditures on water pollution controls may delay or cancel the construction. The applicant should, therefore, consider not only the loss of potential jobs and personal income to the community if the entity is not built, but the future losses in jobs, personal income and tax revenues from other businesses that would choose not to locate in the affected community.” (p. 4-5)

*While this statement specifically refers to business growth, the argument is equally appropriate for considering how pollution controls may affect residential growth. The*

*Economic Guidance goes on to note that State tax revenues may decline and costs for unemployment and social services may increase in such situations.*

“The effects of increased unemployment, decreased personal income, and reductions in local expenditures by the entity or group of entities will be compounded as money moves through the local economy.” (p. 4-5)

The second is found in the CSO Guidance which states:

“It must be emphasized that the financial indicators found in this guidance might not present the most complete picture of a permittee’s financial capability to fund the CSO controls. ...Since flexibility is an important aspect of the CSP Policy, permittees are encouraged to submit any additional documentation that would create a more accurate and complete picture of their financial capability.” (p. 7)

## **6.2.2 Financial Indicators**

As mentioned earlier, the EPA guidance for financial capability assessment is intended to assist communities in determining their capacity for implementing rate increases that will permit implementation of necessary programs while avoiding the imposition of substantial and widespread adverse economic impacts. This section examines the financial indicators for the City.

### **6.2.2.1 Debt Indicators**

#### **Bond Rating**

The City has an **A** bond rating from Standard & Poor’s. This bond rating receives the “**Strong**” rating on the USEPA benchmarks. However, this is the lowest of the three “strong” classifications offered by S&P. Thus, it is possible, even likely, that any substantial additional issuing of bonds by the City would result in a downgrading of its bond rating, which would place the City in EPA’s “**Mid-range**” category. Furthermore, Moody’s recent negative outlook for all local governments provides strong evidence that this rating cannot be relied upon as evidence of financial strength.

### **Net Debt as a Percent of Full Market Property Value<sup>1</sup>**

The City's total of all direct and overlapping debt is \$280.55 million (as of February 15, 2009). The total estimated actual value of all real property in the City is \$2,640,252,175 (for the 2008 collection year). Using these two figures, results in a net debt percentage calculation of **10.63%**. This debt level is more than double the 5% threshold required for the City to receive the "**Weak**" rating on the USEPA benchmarks.

### **Per Capital Net Debt**

In place of the preceding "Net Debt" indicator that USEPA uses, IDEM has adopted the indicator "Per Capita Net Debt." According to the latest analysis by the City's financial advisor, H. J. Umbaugh, the City's figure is **\$4,406**, which far exceeds the \$3,000 threshold for receiving a "**Weak**" rating on the IDEM benchmarks.

### **6.2.2.2 Socioeconomic Indicators**

#### **Unemployment Rate**

According to USEPA guidelines, the unemployment rate for the municipality should be compared to the rate for the United States. An unemployment rate within one percentage point of the national rate indicates a "**Mid-Range**" financial capability.

Using the 2008 annual average unemployment available through the Bureau of Labor Statistics (BLS) Survey data, and Census data the Service Area had an unemployment rate of 4.91% compared to a rate of 5.80% for the United States. The **0.89%** difference results in a "**Mid-Range**" score for unemployment.

#### **Median Household Income**

As noted earlier, the 2008 MHI for the Service Area is estimated to be \$40,785. This is **21.5%** lower than the 2008 U. S. estimate (based on the 2004-2007 trend) of \$51,959. Based on this comparison, the City's MHI receives the "**Mid-range**" rating on the USEPA benchmarks. The Service Area's MHI is also lower than that of Tippecanoe County.

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<sup>1</sup> "This indicator compares the level of debt owed by the service area population with the full market value of real property used to support that debt and serves as a measure of financial wealth in the permittee's service area."

<b>Service Area MHI Calculation</b>			
	US	Lafayette	Service Area
Median household income in 1999 (Census)	\$41,994	\$35,859	\$36,460
Median household income in 2004 (Census)	\$44,529	\$38,181	
Median household income in 2007 (Census)	\$50,007	\$37,696	
Median household income in 2008 (UC Econ Center)	\$51,959	\$37,537	\$40,785
Service Area as % of (2008):	78.5%	108.7%	

USEPA Guidance also suggests that other socioeconomic factors such as poverty rate may also provide insight into a community’s financial capability. The City’s poverty rate is, indeed, another reflection of its socioeconomic condition, and a useful indicator of how many households will be severely affected by rising sewer rates. Lafayette’s poverty rate was 17.2% of the population in 2007, a level that is far higher than the national rate of 13.3% and has certainly increased further as a result of the current recession.

### **6.2.2.3 Financial Management Indicators**

#### **Property Tax Revenues as a Percent of Full Market Property Value**

Lafayette’s total property tax revenue (\$81,625,919) as a percentage of full market property value (\$3,146,368,210) is **2.59%**. The County Auditor’s office reports that current housing market conditions are causing declines in property values, so this number is expected to increase. This revenue level receives the “**Mid-range**” rating on the USEPA benchmarks, but it is likely getting weaker.

#### **Property Tax Revenue Collection Rate**

Lafayette’s most recent property tax collection rate has deteriorated substantially. Its **90.8%** collection rate for 2008 merits the “**Weak**” rating on the USEPA benchmarks, a dramatic drop from its strong rating in 2004.

<b>2008 City of Lafayette Property Taxes</b> <b>(from Auditor's February 2009 settlement statement)</b>			
	Net Amount	Uncollected	Collection Rate
<b>Current Property Taxes</b>	<b>\$77,467,788</b>	<b>\$5,810,937</b>	92.5%
Other Current Charges	\$152,058	\$0	100.0%
<b>TOTAL Current</b>	<b>\$77,619,846</b>	<b>\$5,810,937</b>	92.5%
Delinquencies and Penalties	\$4,006,069	\$1,704,722	57.4%
<b>TOTAL CHARGES</b>	<b>\$81,625,915</b>	<b>\$7,515,659</b>	90.8%

#### 6.2.2.4 Overall

Together, the debt, socioeconomic, and financial management indicator benchmarks produce the City's Financial Capability Indicators Score. The table that follows displays Lafayette's actual values for each item, the benchmark rating, and the consequent score, based on the USEPA (and IDEM) benchmarks. In addition, the table contains a column that describes the changes that can be found in this updated assessment, compared with the previous analysis, and a final column that characterizes the trend for each of the indicators.

As indicated, the 2005 Financial Capability Assessment the City's rating has fallen from 2.17 to 1.83. This represents a large decline in the City's financial capability in just four years.

Lafayette Financial Capability					
Indicator	Actual Value	Rating on Benchmark	Score	Changes / Update	Trend
<b>DEBT</b>					
Bond Rating <sup>1</sup>	A	Strong	3.0	Moody's neg. outlook . Impact of more debt	weaker
Net Debt as % of Full Market Value	10.63%	Weak	1.0		weaker
[or IDEM's] <i>Per Capita Net Debt</i>	<i>\$4,406</i>	<i>Weak</i>	<i>1.0</i>		<i>more debt</i>
<b>SOCIOECONOMIC</b>					
Unemployment Rate	4.91%	Mid-range	2.0		weaker
Median Household Income <sup>2</sup>	\$40,785	Mid-range	2.0		weaker
<b>FINANCIAL MANAGEMENT</b>					
Property Tax Revenues as % of Value	2.59%	Mid-range	2.0	falling prop. values	weaker
Property Tax Revenue Collection Rate <sup>3</sup>	90.8%	Weak	1.0	dropped from "strong"	weaker
<b>OVERALL FINANCIAL CAPABILITY INDICATORS SCORE</b>			<b>1.83</b>		

<sup>1</sup> Trending toward "Mid-range" because any substantial additional borrowing is likely to result in a downgrading of the city's rating.

<sup>2</sup> 2008 estimate based on 2004-2007 Census Bureau ACS trend.

<sup>3</sup> 2008 calculation from Tippecanoe County Auditor's Settlement Report (Feb. 5, 2009).

Given the trends and overall conditions the City faces, it must give careful consideration to the scope and timing of the LTCP. The City's current growth and transformation efforts are highly susceptible to destabilization from the imposition of substantial additional financial burdens. Thus, there is considerable danger in imposing too high a burden, which could easily have an adverse impact on the City's community development potential.

### 6.2.3 Residential Indicator

The Residential Indicator measures the financial impact of the current and proposed wastewater treatment and CSO controls on residential users. The Residential Indicator is determined by calculating the annual cost of wastewater treatment per household (CPH) as a percentage of Median Household Income (MHI).

## Wastewater Treatment Revenues and Cost per Household

The City has an estimated 23,680 residential accounts in 2008 (Umbaugh Study). This data indicates that the total residential share of current wastewater treatment costs in 2008 was \$11,572,797. (See Appendix G) When this is divided by the estimated number of residential accounts (23,680), the current annual Cost Per Household comes to \$488.72.

Based on the City's 2004 and 2007 Median Household Income (MHI) figures, the 2008 MHI is estimated to be \$40,785. This means that households in Lafayette paid 1.20% of their annual income for current wastewater treatment costs in 2008 (up from an estimated 0.74% in 2004).

<b>Service Area MHI Calculation</b>		
	Lafayette	Service Area
Median household income in 1999 (Census)	\$35,859	\$36,460
Median household income in 2004 (Census)	\$38,181	
Median household income in 2007 (Census)	\$37,696	
Median household income in 2008 (UC Econ Center)	\$37,537	\$40,785

Annual costs for the City's proposed Phase II CSO LTCP will increase the cost per household. For example, based on Umbaugh's latest analysis,<sup>2</sup> when current and proposed wastewater treatment costs are combined, the residential share is projected to rise to \$22,040,962, or \$930.78 per household, which is 2.28% of the average household income for Lafayette, an increase of more than 90% over the current level. This is a dramatic increase that calls for careful examination of the economic impacts of the CSO program.

### 6.2.4 Financial Capability Matrix

The financial capability matrix combines the results of the residential and financial indicators in order to assess the overall financial burden placed on individual households and the City. This matrix is a useful tool for community leaders and regulators in making decisions when assessing the financial impact of CSO program costs. The table below

<sup>2</sup> As rates rise, this proportion is expected to increase. Recent research by the Economics Center indicates that industrial customers are more sensitive to rate increases, so their consumption is likely to decrease more, resulting in a reduction in their share of sewer costs. As a result, residential customers will probably pay a larger share of new CSO program costs.

highlights the level of burden that the City’s residents will experience as a result of CSO program implementation.

<b>Financial Capability Matrix, Highlighting Lafayette’s Burden</b>			
<b>Financial Capability Indicators Score</b>  (Socioeconomic, Debt and Financial Indicators)	<b>Residential Indicator</b> (Cost Per Household as a percent of MHI)		
	Low (below 1.0%)	Mid-Range (1.0% to 2.0%)	High (above 2.0%)
Weak (below 1.5)	Medium Burden	High Burden	High Burden
Mid-range (between 1.5 and 2.5)	Low Burden	Medium Burden	<b>High Burden</b>
Strong (above 2.5 percent)	Low Burden	Low Burden	Medium Burden

The annual per household costs for implementation of the CSO LTCP program are expected to surpass 2% of MHI, placing City households in the USEPA’s “High Burden” category. This is a substantial deterioration in the City’s position on the matrix, from a relatively modest “Medium Burden” for the proposed program in 2005 to this “High Burden” situation.

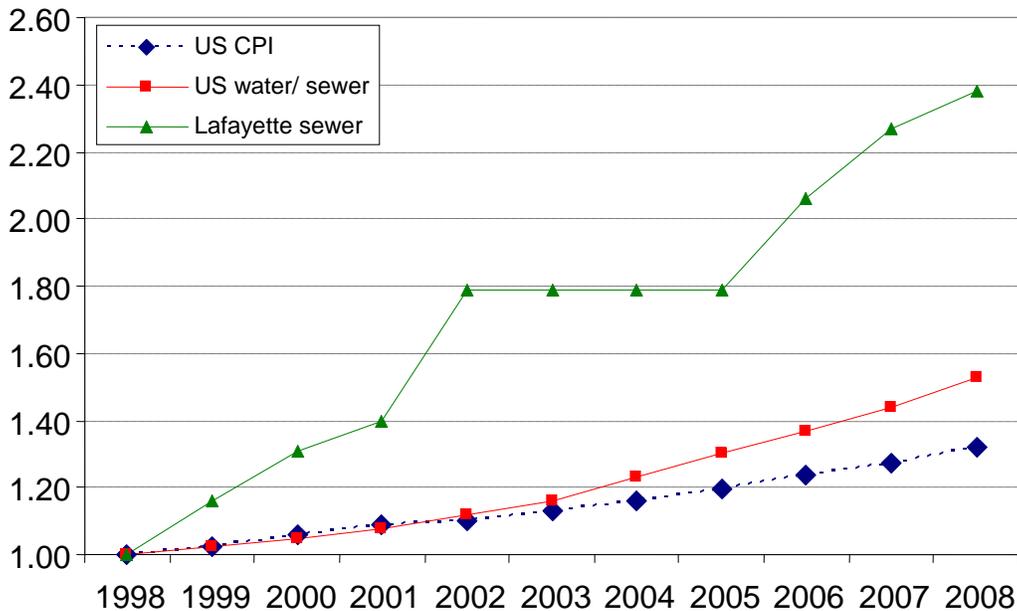
### **6.2.5 Other Affordability Issues**

There are other economic concerns that should also be considered, since they are likely to affect the City’s capacity to move forward with both its CSO program and its broader community goals.

#### **Impact of Rate Increases**

Over the decade from 1998 to 2008, the City’s sewer rates have risen from \$1.65 to \$4.35 per thousand gallons, an average of 10.2% a year. Over this same period, the average monthly bill has increased by 138%. By comparison, the Consumer Price Index (CPI) has increased by 32%, while water and sewer costs nationally have increased by 52%. These rate increases have placed Lafayette residents in the “High Burden” category.

**Lafayette and US Sewer Costs v. US CPI (1998 = 1.00)**



The impact of rate increases is particularly severe for those households with lower incomes. Based on data from the 2007 American Community Survey, 32.3% of all Service Area households have incomes of less than \$25,000. For these residents, the current \$488.72 Cost Per Household represents more than 2% of their income.

Continued rate increases will affect the size of the City’s residential customer base. An August 1997 study, conducted by the Center for Policy Research at Syracuse University, on the economic and fiscal impact of sewer programs in that community, calculated that a 0.4% increase (e.g., 0.6% to 1.0%) in the cost per household as a % of MHI would result in a 0.5% decrease in population, all other things being equal. If this impact were linear over a larger increase, an increase of roughly 1% in the cost per household as a percentage of MHI (from 1.2% to 2.28% of MHI) would, by itself, produce a 1.25% reduction in Lafayette’s household base, all other things being equal.

If population and household levels drop, Lafayette will be forced to increase rates to the remaining households in order to cover its costs of providing service, which will result in additional increases in the cost per household. Thus, it will be very important for the City to monitor any changes in its residential customer base.

## **Industrial Usage**

In the four years since the City's previous Financial Capability Assessment, it has implemented a substantial three-stage rate increase. Sewer rates have risen by 33% from 2004 to 2008. This has had a significant effect on industrial usage. From 2004 to 2008, total billed flow has increased by 3.7%, but this is not uniform. Residential billed flow has increased 13.9%, while non-residential billed flow has decreased by 1.5%. Furthermore, industrial flow for the first quarter of 2009 was 6.1% less than it was in the first quarter of 2008.

The recent history of increased rates in other Midwestern communities has demonstrated that rate increases tend to be revenue neutral on industrial users. That is, as rates increase, industries have responded by using less and less water. As a result, increasing rates may not produce much additional revenue from industrial customers, which means that residential customers will incur an even larger share of the overall financial burden of any CSO program.

## **Impact of Sewer Rate Increases on Industry and the Economy**

Research on the impact of rising costs on businesses indicates that such increases have an adverse impact. The nature of this relationship, and the size of its impact is discussed below.

In general, reduced profit margins lead to lower levels of production, which result in fewer jobs and lower incomes in local communities. Econometric models suggest that energy costs, state taxes, and value added all are related to employment growth. Related research on tax policy has found that higher commercial property tax rates are associated with lower employment and firm growth.

- ***Higher sewer rates can be expected to have a similar negative effect on business output and employment.*** Utility expenses are typically such a small part of business costs that they don't usually affect business decisions. However, those that are sensitive to such issues are usually very sensitive. If water and sewer costs increase rapidly and substantially, they are likely to become a more significant element of total production

costs for more industries, leading to negative impacts. Research indicates that large businesses are able to shift some costs, abandon outdated production methods or move production facilities to other areas in response to these rate increases.

- ***More spending on sewers can be expected to constrain spending in other areas, thus dampening employment and firm growth.*** Other researchers have found that increased highway and education spending increases employment and firm growth. However, if spending on sewers is increased locally, this will reduce resources available for investment in areas that promote economic development. Most studies that suggest taxes have a negative effect on economic activity do so only when public spending is held constant as taxes increase. This is very similar to what will happen when sewer rates rise, because charges increase while the amount of service remains the same.
- ***The connection between increased sewer rates and negative economic development impacts is both direct and indirect.*** A massive sewer project will not only require increases in sewer use fees, but will also necessitate growth in local government expenditures and debt levels. This will have effects on economic variables such as employment and personal income. It will also affect community demographics (population, households, labor force), and this will also produce adverse impacts on the local economy, since the size of labor force is positively related to employment and firm growth.
- ***Large increases create problems for local economic development regardless of initial rate levels.*** In some cases, sewer rate increases eliminate a community's competitive advantage, leading to the loss of both existing and potential new industries. In other cases, increases put communities at a competitive disadvantage, which will produce the same effects.
- ***An increase in current sewer rates to 0.97% of MHI would, by itself, produce a 0.55% decline in employment in the Service Area.*** Based on research and econometric models employed by Syracuse University to assess the impact of similar projects, a 0.4% increase (e.g., from 0.8% to 1.2%) in the cost per household as a percentage of MHI

would result in a 0.5% decrease in employment, all other things being equal. This suggests that an increase to 0.97% of MHI would result in a loss of 175 jobs, with a combined income of more than \$6.5 million.

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**Chapter 7  
Public Participation**

Greeley and Hansen

**7.1 Introduction**

This chapter summarizes the efforts the City of Lafayette has made and will continue to make to insure public involvement in the development and implementation of the CSO Long Term Control Plan (LTCP).

The City has received media coverage regarding CSO issues from Lafayette's local news channel, WLFI Channel 18 since February 2004. A brief summary of the subject of each news report is listed in Table 7.1-1. A DVD containing each news report is located in the front of this report.

A public participation program and associated activities were conducted as part of the development of the LTCP. The goals of the program were to obtain public input in the decision-making process in developing the LTCP. Toward this end, the program included the following elements:

- Citizen Advisory Committee Meetings,
- Public River Use Survey, and
- CSO Public Notification Program.

**7.2 Citizen Advisory Committee**

The City established a Citizen Advisory Committee (CAC) to serve as a liaison resource to represent the public's interests in regard to improving river water quality.

### **7.2.1 Development of Citizen Advisory Committee**

In early 2004, the Mayor of Lafayette appointed each of the seven members of the Citizen Advisory Committee. The Citizen Advisory Committee consisted of members of different neighborhood associations and other areas of the community . The roles of the CAC are as follows:

- Liaisons between the general public and the City Officials,
- Input on water quality goals and level of control,
- Input on actual public uses and priority areas,
- Input on control alternatives,
- Input on the economic impact assessment,
- Comments on the Long Term Control Plan, and
- Development of the Public Education and Community Notification Program.

### **7.2.2 Citizen Advisory Committee Meetings**

Once the Citizen Advisory Committee was formed, the first meeting was held on February 27, 2004. Several CAC meetings were held throughout 2004 and 2005 on the following dates:

- CAC Meeting #1 – February 27, 2004
- CAC Meeting #2 – May 13, 2004
- CAC Meeting #3 – July 8, 2004
- CAC Meeting #4 – October 7, 2004
- CAC Meeting #5 – December 16, 2004
- CAC Meeting #6 – February 17, 2005
- CAC Meeting #7 – March 24, 2005
- CAC Meeting #8 – April 21, 2005
- CAC Meeting #9 – May 5, 2005

Through each meeting, the CAC was informed about each step of the development of the LTCP and was encouraged to provide their input during each step of the development.

Table 7.2-1 lists the topics discussed at each meeting along with any comments that were made. Each power point presentation made to the CAC at each meeting is included on a CD that is located in the front of this report.

The CAC meetings were held in the conference room at the Water Pollution Control Department. Prior to each meeting, an email announcing the date and subject of the meeting was sent out to each CAC member, the Mayor, all City departments, and the local media. Each meeting was tape-recorded and minutes of the meeting were taken. The tape recordings are located at the Water Pollution Control Department and copies of the minutes are in Appendix H.

### **7.3 River Use Survey**

In the fall of 2004, a public river use survey was conducted for the City of Lafayette for the Wabash River and Durkee's Run. The purposes of the survey were to provide public input to water quality improvement planning, to define the public's location-specific water contact use and use frequency, and to assess the public's level of fee acceptance to improve water quality.

The public river use survey was mailed to the City's 41,000 utility customers in the August 2004 utility bills and was posted on the City's website for convenience. A total of 2,088 surveys were completed and returned, which included 208 (10%) river users and 1,880 (90%) non-users. A copy of the survey is shown on Figure 2.3-1. Detailed results of the survey are discussed in Chapter 2 of this report.

### **7.4 CSO Notification Program**

In January 2004, the City of Lafayette started a Combined Sewer Overflow Public Notification Plan to promote and accomplish the following:

- Educate the public, in general, and those persons who, specifically, may come into contact with water that may be affected by a combined sewer overflow discharge tainted water.

- Alert members of the public who may be immediately affected by a combined sewer overflow discharge or the potential for a combined sewer overflow discharge to occur.
- Enable members of the public to protect themselves from possible exposure to waterborne pathogens resulting from contact with or ingestion of water from a waterway that may be affected by a combined sewer overflow discharge.

Each March, as part of the Plan, a public notice is placed in the *Lafayette Journal and Courier* and the City of Lafayette's utility bills. The notice is appropriately worded to explain the nature of the potential health effects of a CSO discharge and steps that affected persons can take to avoid exposure and to allow other media sources, affected public, and other interested public to request receipt of CSO notification. In addition to this public notice, the City provides the community with an informational brochure on an annual basis. A sample of the CSO informational brochure is on Figure 7.4-1.

As part of the CSO Operational Plan, Lafayette has CSO notification signs located at each permitted outfall, as shown on Figure 7.4-2. In the event that the current signs would need to be replaced, they will be replaced with new signs that will contain the following language: "Caution – Sewage or Wastewater pollution. Sewage or Wastewater may be in this water during and for several days after periods of rainfall or snow melt. People who swim in, wade in, or ingest this water may get sick. For more information please call the City of Lafayette Water Pollution Control Department (765) 476-4550." New signs have been posted at all public access points at locations most likely to provide notification to people who may come in direct contact with the water. Private property owners in the affected areas that have an access point to the Wabash River will be offered a sign on an annual basis.

Members of the community may sign up for email notification of CSO discharges through the City's web page: <http://www.city.lafayette.in.us/> A phone number has been established which members of the community can phone to listen to a recorded message giving

information regarding the current water quality of the Wabash River.

## **7.5 Future Public Participation**

The City currently has implemented several public participation programs and will continue to do so in the future. Several of these programs include:

- Water conservation
- Animal Waste Management
- Adopt-a-River Program
- Catch Basin Stenciling – To prevent oil and other contaminants from reaching the river, cautionary signs are placed at catch basins throughout the City. An example of this sign is shown on Figure 7.5-1.
- Household Hazardous Waste Program – Tippecanoe residents can take their household hazardous wastes to a drop off center five days a week through a program managed by The Wildcat Creek Solid Waste District.
- Recycling Program – This program includes curbside recycling and is run by the City’s Street Department.
- Leaf and Yard Waste Control – Leaf collection begins five weeks before Thanksgiving. Every area is picked up at least once by Thanksgiving. This collection is conducted with the sanitation routes.

In addition to the programs listed above, the City has also implemented a CSO Public Notification Program, as discussed in Section 7.4 of this Chapter.

## **7.6 Updated Public Participation**

In September 2007, the City of Lafayette entered into an Agreed Judgment with the Indiana Department of Environmental Management, which requires the City to revise this CSO LTCP (submitted May 12, 2005) so that it complies with the technology based and water quality based requirements of the Clean Water Act, State law and regulation, and the City’s NPDES permit. As part of this requirement, the City conducted additional public

meetings to inform the public of the current LTCP development and to get the public's input in the alternative evaluation and final recommended plan.

On November 17, 2008, the City of Lafayette conducted an evening public meeting in a ballroom at the Holiday Inn City Centre in downtown Lafayette. Prior to the meeting, e-mail invitations to the meeting were sent out to several citizens of the community including, but not limited to, the Mayor of Lafayette, all city departments, television and newspaper personnel, citizens of West Lafayette and Purdue University, and members of various environmental groups. The purpose of this meeting was to review Lafayette's CSO program, discuss the different alternatives being evaluated, and to obtain public input on the alternatives. Copies of the meeting presentation, attendance sheet, and meeting minutes are included in Appendix I.

A second public meeting was also held at the Holiday Inn on May 12, 2009 in the evening. The same list of citizens was contacted via e-mail as before. The purpose of this meeting was to summarize the progress of the LTCP development to date and to inform the public of the findings of the Financial Capability Analysis and Use Attainability Analysis that had been conducted. Copies of the meeting presentation, attendance sheet, and meeting minutes are included in Appendix I. Also included in Appendix I is a summary of the on-line comments from citizens regarding a newspaper article that documented the meeting.

The City of Lafayette conducted a third public meeting on the evening of September 17, 2009 at the Holiday Inn hotel on 515 South Street. The purpose of this meeting was to describe the recommended LTCP. Copies of the meeting presentation, meeting minutes, and newspaper article about the meeting are included in Appendix I.

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**Table 7.1-1  
Description of Media Coverage**

Greeley and Hansen  
May 2005

<i>Date of News Report</i>	<i>Time of News Report</i>	<i>Summary</i>
2/18/2004	6:00 PM	Clean Water Act Requirements
2/23/2004	6:00 PM	Public Education Program
2/27/2004	6:00 PM	Public Notification Program
3/1/2004	6:00 PM	Warning of Overflows
3/30/2004	6:00 PM	Warning of Overflows
5/25/2004	6:00 PM	City is required to complete a Long Term Control Plan
6/11/2004	12:00 PM	Warning of Overflows
8/29/2004	6:00 PM & 11:00 PM	Description of new Wastewater Treatment Plant
8/31/2004	6:00 PM	Wastewater Treatment Plant Dedication
1/11/2005	6:00 PM	Pearl River Lift Station upgrade
1/18/2005	6:00 PM	Pearl River Lift Station upgrade
1/27/2005	6:00 PM	Public Notification Program
2/17/2005	6:00 PM	Summary of 2/17/05 Citizen Advisory Committee Meeting
2/18/2005	5:00 AM	Summary of 2/17/05 Citizen Advisory Committee Meeting
4/21/2005	6:00 PM	Summary of 4/21/05 Citizen Advisory Committee Meeting and Senate Bill 620
4/22/2005	5:00 AM	Summary of 4/21/05 Citizen Advisory Committee Meeting and Senate Bill 620
5/5/2005	6:00 PM	Summary of 5/5/05 Citizen Advisory Committee Meeting
5/6/2005	5:00 AM	Summary of 5/5/05 Citizen Advisory Committee Meeting

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**Table 7.2-1  
Citizen Advisory Committee Meeting Summary**

Greeley and Hansen  
May 2005

<i>Meeting</i>	<i>Presentation Topics</i>	<i>Comments</i>
#1 February 27, 2004	<ul style="list-style-type: none"> <li>• Introductions – Why are we here?</li> <li>• What is a CSO?</li> <li>• Lafayette Background Information</li> <li>• CSO Public Notification Program</li> <li>• Role of Citizen Advisory Committee</li> </ul>	<ul style="list-style-type: none"> <li>• City is keeping public informed and involved with the CSO Public Notification Program</li> </ul>
#2 May 13, 2004	<ul style="list-style-type: none"> <li>• Summary of CAC Meeting #1</li> <li>• Public Health and Regulatory Issues with CSOs</li> <li>• Meeting the Regulations                             <ul style="list-style-type: none"> <li>○ What the City has done – Studies and Programs</li> <li>○ What the City has done – Capital Improvement Projects</li> <li>○ What the City is doing</li> </ul> </li> <li>• River Physical Survey                             <ul style="list-style-type: none"> <li>○ Objectives and Proposed Methods</li> </ul> </li> <li>• River Use Survey                             <ul style="list-style-type: none"> <li>○ Objectives and Proposed Methods</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• City has completed and is currently construction several projects around the city to help reduce CSO impacts to the river</li> <li>• River Physical Survey will be used to determine areas along river the encourage public use of rivers</li> <li>• River Use Survey will be used to determine public's Priority Areas</li> </ul>
#3 July 8, 2004	<ul style="list-style-type: none"> <li>• Summary of CAC Meeting #2</li> <li>• River Use Survey                             <ul style="list-style-type: none"> <li>○ Review of Objectives and Proposed Methods</li> <li>○ Draft River Use Survey</li> </ul> </li> <li>• River Physical Survey                             <ul style="list-style-type: none"> <li>○ Review of Objectives and Proposed Methods</li> </ul> </li> <li>• CSO Characteristics</li> <li>• Typical CSO Control Technologies</li> <li>• What's Next</li> </ul>	<ul style="list-style-type: none"> <li>• Primary concern/goal is to reduce bacteria in river</li> <li>• CAC mentioned they wanted a tour of all the facilities being discussed in meetings</li> <li>• Tour of CSOs, WWTP, and collection system was given on July 26<sup>th</sup>, 2004</li> </ul>
#4 October 7, 2004	<ul style="list-style-type: none"> <li>• Summary of CSO Alternatives Workshop #1</li> <li>• Preliminary Alternative Evaluation</li> <li>• Next Step</li> <li>• Next Meeting</li> </ul>	<ul style="list-style-type: none"> <li>• Even if collection system was separated completely, stormwater would exceed WQS</li> <li>• Upstream discharges contribute significantly to bacteria in Wabash in Lafayette</li> <li>• Priority Areas</li> </ul>

<i>Meeting</i>	<i>Presentation Topics</i>	<i>Comments</i>
		<p>established</p> <ul style="list-style-type: none"> <li>• CAC indicated to get schools involved because they are big players</li> <li>• Also, educate the public on how each homeowner affects water quality in river</li> </ul>
#5 December 16, 2004	<ul style="list-style-type: none"> <li>• Summary of CAC Meeting #4</li> <li>• Summary of CSO Alternatives Workshop #2</li> <li>• Summary of CSO Alternatives Workshop #3 <ul style="list-style-type: none"> <li>○ Presentation of Integrated Alternatives</li> </ul> </li> <li>• Description of Evaluation of Integrated Alternatives</li> <li>• Sensitive and Priority Areas Discussion</li> <li>• Preliminary Results of River Use Survey</li> <li>• Preliminary Results of River Physical Survey</li> <li>• Next Step</li> <li>• Next Meetings</li> </ul>	<ul style="list-style-type: none"> <li>• It was agreed that CSO storage tanks, high rate treatment facilities and parallel sewers will be integrated into alternatives</li> </ul>
#6 February 17, 2005	<ul style="list-style-type: none"> <li>• Summary of CAC Meeting #5</li> <li>• Final Results of River Use Survey</li> <li>• Final Results of River Physical Survey for Durkee's Run and Wabash River</li> <li>• Collection System Model Performance of Integrated Alternatives <ul style="list-style-type: none"> <li>○ CSO Volume and Frequency Reduction</li> </ul> </li> <li>• Next Step</li> <li>• Next Meetings</li> </ul>	<ul style="list-style-type: none"> <li>• CAC was concerned about the alternatives that include several CSO storage tanks. CAC thought all tanks would be above ground.</li> <li>• CAC was pleased to find out tanks would be below ground and these alternatives would be helping the river without unsightly tanks in several places around the city.</li> </ul>
#7 March 24, 2005	<ul style="list-style-type: none"> <li>• Summary of CAC Meeting #6</li> <li>• Presentation of Final Integrated Alternatives</li> <li>• Collection System Model Performance of Integrated Alternative <ul style="list-style-type: none"> <li>○ Percent Reduction in Annual CSO Volumes</li> <li>○ Percent Reduction in Annual CSO Frequencies</li> </ul> </li> <li>• Priority Areas</li> <li>• Water Quality Performance of Integrated Alternatives</li> </ul>	<ul style="list-style-type: none"> <li>• Upstream sources contribute greater levels of E.coli than Lafayette CSOs</li> </ul>

<i>Meeting</i>	<i>Presentation Topics</i>	<i>Comments</i>
	<ul style="list-style-type: none"> <li>• Next Step</li> <li>• Next Meeting</li> </ul>	
#8 April 21, 2005	<ul style="list-style-type: none"> <li>• Cost</li> <li>• Knee-of-the-Curve</li> <li>• Priority Area Selection</li> <li>• LTCP Plan Element Construction Priority</li> </ul>	<ul style="list-style-type: none"> <li>• CAC encouraged the City to continue with an expanded public program to educate the community about the water quality issues, to verify the results of the river use survey, and to obtain input regarding the monetary and non-monetary issues of selecting a final plan.</li> </ul>
#9 May 5, 2005	<ul style="list-style-type: none"> <li>• Financial Capability Analysis</li> <li>• Proposed Implementation Schedule</li> <li>• Next Steps</li> </ul>	<ul style="list-style-type: none"> <li>• CAC reiterated the importance of a continued public outreach program and were very supportive of the recommended plan to do so.</li> </ul>



### Keeping You Informed

The City's Water Pollution Control Department is in full compliance with all federal and state regulations regarding the treatment of our city's wastewater. The Department aims to educate about the most important water process issues affecting your environment.

As a result of this brochure, we want you all to be involved with your local government, and help generate the Lafayette Water Wastewater website. It is making the necessary critical effort to reduce the impact of our city's Combined Sewer Overflows on the Wabash River.

For further information, and to receive notifications of any impending sewer overflow events in your area, log on to the City of Lafayette's official website at [citylafayette.in.us](http://citylafayette.in.us), and click the link to CSOs.

Thank you,

*Brad W. Talley*  
 Brad Talley  
 Superintendent  
 Department of Water Pollution Control

### You Can Help

The Wabash River provides enjoyment through fishing, boating and nature watching, and the City of Lafayette is committed to enhancing the quality of the river to support these recreational uses.

You can be part of the solution. By understanding the system and staying informed along the way, you can help your government make the best decisions on this serious and complex issue.

Your participation is vital to ensure that future generations will be able to enjoy clean waterways too.

### 2002 CSO Events

Month	Number of Events
January	17
February	15
March	11
April	16
May	16
June	15
July	5
August	4
September	4
October	6
November	4
December	5
Total	107

For more information:

765.476.4550  
 Fax 765.476.4549  
[city.lafayette.in.us](http://city.lafayette.in.us)

### Water Pollution Control Department



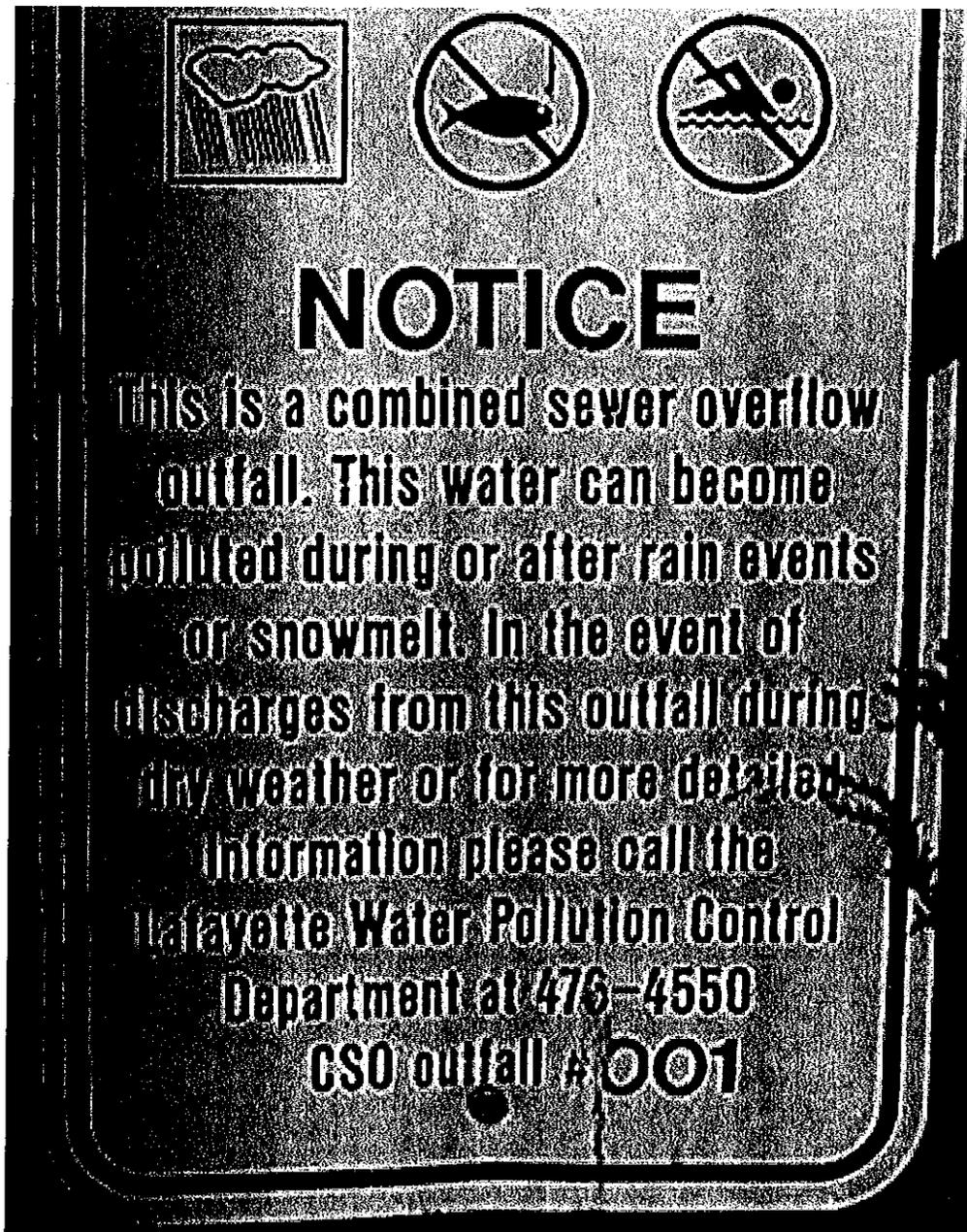
Combined  
 Sewer Overflow

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Figure 7.4-2  
CSO Warning Sign

Greeley and Hansen  
May 2005

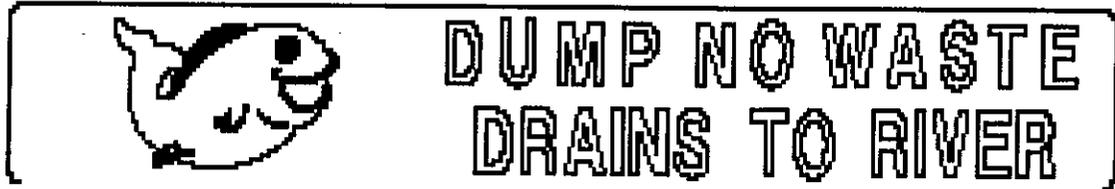


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**Figure 7.5-1  
Catch Basin Stenciling**

Greeley and Hansen  
May 2005



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**Chapter 8  
Recommended Plan**

Greeley and Hansen

**8.1 Introduction**

Based upon the evaluation of level of control and capital and operation and maintenance (O&M) costs, the City of Lafayette, with input from the public, determined the recommended alternative. This chapter discusses the approach of the recommended plan, the implementation schedule and the post-construction compliance monitoring that will be conducted.

**8.2 Recommended Plan**

The recommended plan has two phases. The first phase includes the completion of the construction of all of the Phase I improvements discussed earlier in this report. Once the construction of the Phase I improvements is complete, a period of monitoring will be conducted, prior to moving onto to Phase II of the recommended plan.

The recommended plan was selected based on feasibility and capital cost. The recommended plan was developed by examining the two alternatives, as discussed in Chapter 3 of this report. Alternative A at a level of control of four overflows per year was the selected recommended plan as shown on Figure 8.2-1.

The recommended plan (Alternative A or Phase II) has been divided into four sub-phases , Phases II-A, II-B, II-C, and II-D, to include the implementation of the integrated CSO control alternatives.

Phase II-A consists of:

- The planning, design, construction and post-construction monitoring of the following CSO control projects:
  - Sewer separation in the Earl Avenue area (approximately 103 acres),
  - A 48-inch parallel interceptor along Durkee's Run creek,
  - Storage and conveyance tunnel extension from North Street to the Cincinnati Street CSO,
  - A 36-inch parallel throttle pipe at CSO 010, and
  - A 24-inch parallel throttle pipe at CSO 015.

Phase II-B consists of:

- The planning, design, construction and post-construction monitoring of the following CSO control projects:
  - A 96-inch conveyance sewer along the railroad corridor and
  - A 5.9 MG CSO storage facility near CSO 001. (CSO 002 will be closed)

Phase II-C consists of:

- The planning, design, construction and post-construction monitoring of the following CSO control projects:
  - The wet-weather expansion of 55 MGD of the Pearl River Lift Station,
  - A 5.3 MG CSO storage facility at CSO 006, and
  - A 72-inch conveyance sewer from CSO 007 to CSO 006 storage facility.

Phase II-D consists of:

- The planning, design, construction and post-construction monitoring of the following CSO control projects:
  - 119 MGD High-Rate treatment facility near CSO 009 and
  - A 60-inch force main from the Pearl River Lift Station to the WWTP.

After implementation of Phase II-D of the recommended alternative a post-construction compliance monitoring program will be conducted. The total capital cost for the recommended plan is \$179,091,000. The cost is summarized in Table 8.2-1.

### **8.3 Implementation Schedule**

The proposed LTCP implementation schedule/sequence is shown on Figure 8.3-1. The timeline for the implementation is based on the number of years after the approval of the LTCP report. As shown on Figure 8.3-1, it is proposed that during the planning portion of each phase of the recommended plan that green infrastructure be evaluated for possible inclusion. Two Phase I projects have included green infrastructure. The Parking Lot Lift Station Elimination project included construction of two rain gardens and a blower upgrade project at the WWTP will use a high efficiency blower to reduce energy cost.

#### **8.3.1 Implementation Schedule Justification**

Generally, USEPA guidance indicated that a CSO LTCP should be implemented within a period of up to 20 years. The proposed implementation schedule spans a period of 20 years with Phases II-A through D being completed in 18 years and post-construction compliance monitoring program occurring the following two years. The City of Lafayette believes that the following factors support the proposed schedule and should be considered:

- Program resulted in a financial capability at the High Burden level,
- Level of economic and social impact projected to markedly exceed the level of substantial and widespread impact to qualify for a modified designate use using a UAA,
- Magnitude of construction required will strain available City resources to effectively design, manage, and implement program, and
- Extensive disruptions of streets/neighborhoods/citizens that will occur as collection system components are constructed.

Lafayette believes the above considerations support the proposed implementation schedule. The City believes that the requested schedule facilitates cost-effective implementation of the program.

#### **8.4 Post-Construction Compliance Monitoring Program**

The purpose of City of Lafayette's Post-Construction Compliance Monitoring Program (PCMP) is to determine the effectiveness of the LTCP in meeting the design and performance objectives. The City will carry out monitoring and modeling activities after the completion of the recommended plan, to determine whether its implemented controls are performing as provided in Lafayette's LTCP.

The City of Lafayette will complete the post-construction monitoring and reporting activities and shall document these activities in the following submittals:

- Initial Model Validation Report,
- Model Re-Calibration Report (if necessary), and
- Final Post-Construction Monitoring Report.

The City of Lafayette has divided its LTCP into two major phases. Phase I includes the construction of a 114-inch storage and conveyance tunnel, the elimination of the Parking Lot Lift Station, and the extension of the tunnel. Phase II was further divided into four parts, A thru D, as discussed above. During LTCP implementation localized flow monitoring will be conducted and the collection system model will be updated, as needed, to provide the information required to develop final design criteria and sizing of each program element.

After full implementation of the LTCP CSO controls the City will initiate the PCMP. The PCMP will include:

- Data Collection,
- Post-construction collection system model calibration and validation,
- Evaluation of control measures performance, and
- Post-construction monitoring report

It is important to note that the LTCP level of control is based on the XP-SWMM model typical year simulations and is expected to be achieved on a long-term average basis. The actual annual discharge frequency will vary due to fluctuations in annual rainfall.

#### **8.4.1 Initial Data Collection and Model Validation after LTCP Implementation**

Data collection will include the collection of rainfall, flow monitoring, and CSO activation data for a period of 12 months. In the event that normal, accepted practices related to the proposed data collection have changed (e.g. due to advances in technology) an alternate method will be developed and submitted for approval. Additionally, as collection of the required data is dependent upon prevailing weather conditions at that time, data collection may need to be extended beyond the proposed 12 months in order to gather reliable data for the purpose of the performance evaluation.

During the period that data is being collected, the City will update the collection system model to reflect the LTCP implemented CSO controls and other changes in the collection system that differ from the existing version of the collection system model. At this juncture it is assumed that the accepted engineering practice at the time the PCMP is conducted will still rely on a collection system model similar to those in use today. In the event that the accepted practice at the time the PCMP is conducted has changed the City will submit an alternate method for approval.

The rainfall data collected during the post construction monitoring period will then be run through the updated collection system model and the model results will be compared to the observed overflow frequency and date of overflow occurrence during the same one year period. If the modeled results fall within the accepted range of accuracy for the system model when compared to the observed overflow frequency the model will be considered adequately calibrated and validated. If this condition is met the City will then submit an Initial Model Validation Report.

If the modeled results do not match the observed overflow frequency the model will be recalibrated and verified using the flow monitoring data gathered during the post

construction monitoring period. The City will submit an Initial Model Validation Report with a plan to recalibrate and verify the collection system model. Once IDEM has accepted the approach to model recalibration and verification the City will complete recalibration and submit a model Re-Calibration Report.

A continuous simulation of the typical year period (1968) will be performed using the updated, calibrated and verified collection system model. If the modeled results are equal to or less than the overflow frequency prescribed in the recommended plan the LTCP control measures will be considered to have met the required performance measure.

The City will submit a Final Post Construction Monitoring and Modeling Report documenting the monitoring, modeling and collection system performance analysis. If the LTCP control measures did not meet the performance measure provided under the recommended plan a supplemental CSO control plan, including a schedule, and the proposed additional CSO controls necessary to meet the performance criteria will be submitted. This report will be submitted within the two year post construction monitoring compliance period.

The City will also prepare periodic progress reports for the public containing information on design, construction, and water quality improvements.

CITY OF LAFAYETTE, INDIANA

CSO Long Term Control Plan Update

**Table 8.2-1**  
**Recommended Plan - Preliminary Cost Estimate**  
 September 2009

ENR 8141  
 COP \$249,000

Conveyance							
Location	Diversion Structure Modifications	Diameter (in)	Length (ft)	Depth (ft)	Cost/Ft	Cost	O&M
CSO 012 to CSO 009	\$1,000,000	48	9,825	15	\$491	\$5,825,000	\$14,570
Near CSO 011 to Tank	\$0	36	433	15	\$383	\$166,000	\$420
CSO 010	\$0	36	1,245	15	\$383	\$478,000	\$1,200
Near CSO 015	\$0	24	820	15	\$295	\$242,000	\$610
CSO 007 to CSO 006 Tank	\$0	72	1,835	15	\$786	\$1,442,000	\$3,610
RR Corridor	\$2,118,000	96	3,410	15	\$1,188	\$8,409,000	\$21,030
	\$673,000						
	\$981,000						
	\$585,000						

Pearl River Lift Station						
	Number of Pumps	Capacity (MGD)	Unit Cost (\$)	Cost	O&M	
Pumps	3	18	\$97,000	\$291,000	\$133,230	
	Diameter (in)	Length (ft)	Depth (ft)	Cost/Ft	Cost	
Force Main	60	5,965	10	\$570	\$3,398,000	\$8,500

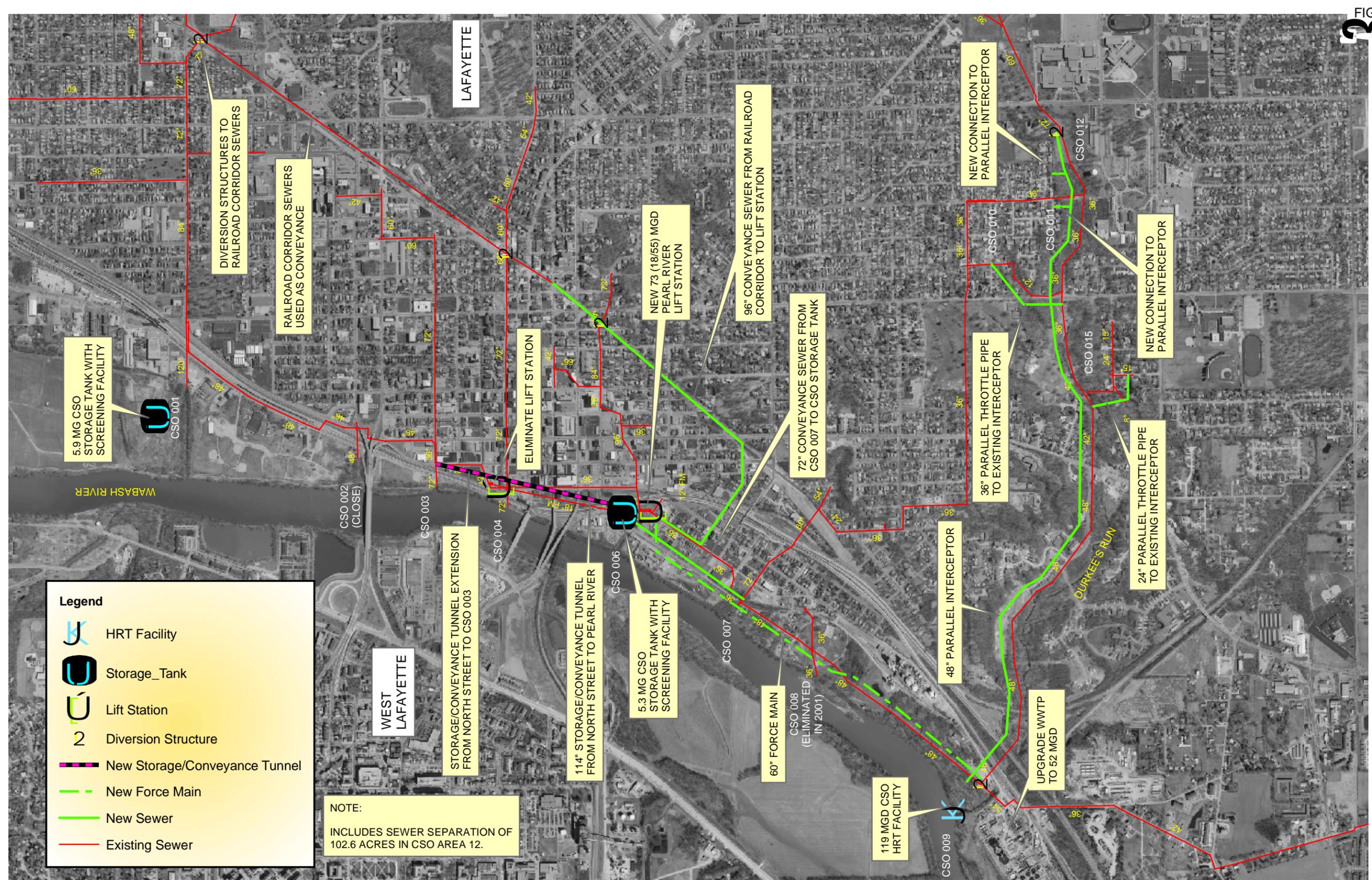
Sewer Separation			
Location	Acres	Cost	O&M
Near CSO 012	102.6	\$2,321,000	\$6,000

Storage Tanks							
Location	Volume (MG)	Peak Flow (MGD)	Covered Basin (\$)	Screening (\$)	Pump Station (\$)	Cost	O&M
CSO 001	5.9	86.2	\$26,650,000	\$1,477,000	\$1,158,000	\$29,285,000	\$1,253,000
CSO 006	5.3	156.2	\$24,391,000	\$2,064,000	\$1,077,000	\$27,532,000	\$1,200,000

High Rate Treatment									
Location	Peak Flow Rate (MGD)	Solids Storage Volume (MG)	HRT Unit (\$)	Chlorine Contact Tank (\$)	Screening (\$)	Chemical Storage Building (\$)	Solids Storage (\$)	Cost	O&M (\$)
CSO 009	119.0	2.8	\$14,333,000	\$4,483,212	\$1,785,000	\$293,000	\$12,751,000	\$33,645,212	\$1,494,000

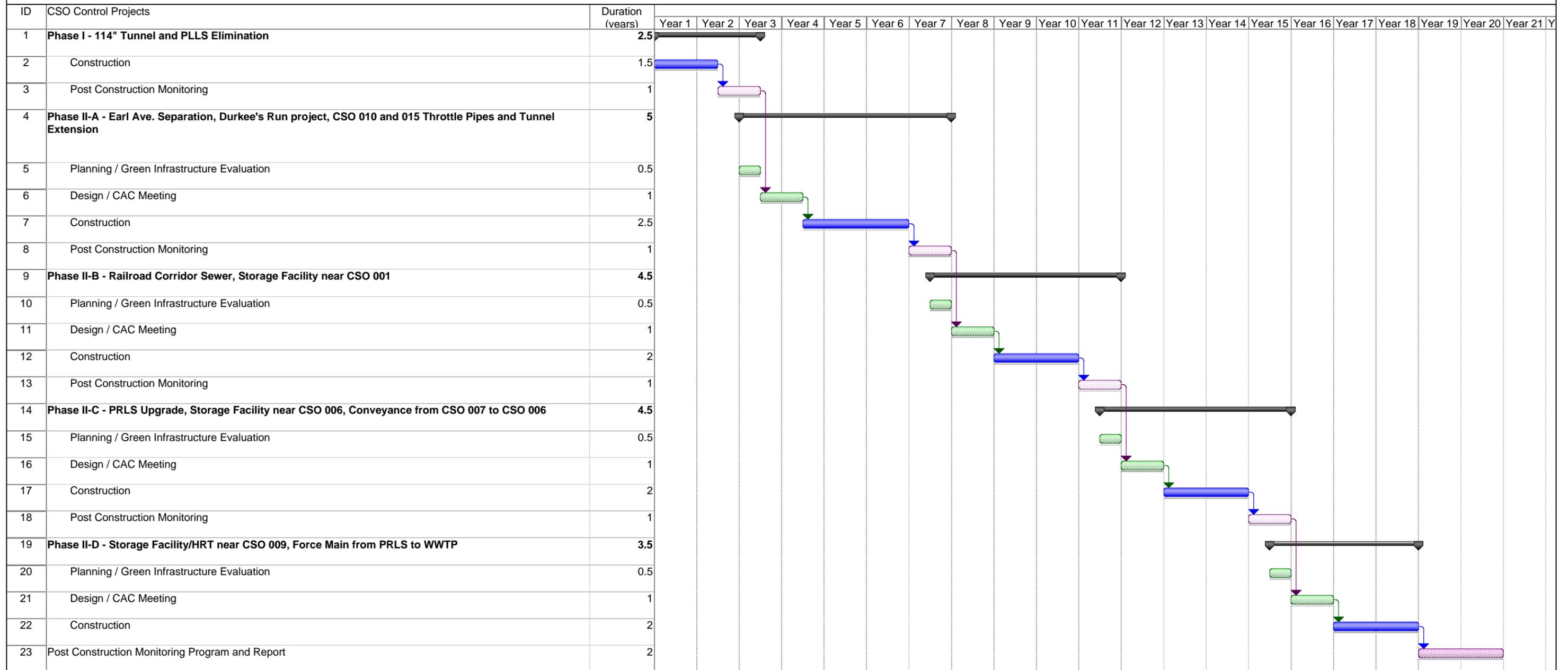
Area 21		
Description	Cost (\$)	O&M (\$)
Sewers/Force Mains	\$3,299,000	\$12,390
Lift Stations	\$3,060,000	\$262,720

Recommended Alternative Cost Summary (\$)	
Alternative Cost	\$119,393,000
Contingencies (25%)	\$29,849,000
Engineering, Administration, Legal and Misc. (20%)	\$29,849,000
Capital Cost	\$179,091,000
Annual O&M Cost	\$6,520,000
Total Present Worth	\$260,346,000



**RECOMMENDED PLAN - 4 OVERFLOWS/YEAR**

J:\Projects\09650\_Lafayette CSO LTCP\06 Studies\CSO LTCP\Final Report\Figures\Chapter 8\Figure 8.2-1.mxd



A CAC meeting will be held during the design phase of each phase of the LTCP.

During the planning portion of each phase of the recommended plan green infrastructure will be evaluated for possible inclusion in that phase.

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Chapter 9  
Use Attainability Analysis**

Greeley and Hansen

**9.1 Use Attainability Analysis**

The proposed LTCP provides that residual CSO discharges will occur during storms that exceed the LTCP design and performance criteria. This will result in limited periods when CSO discharges could combine with other pollutant sources (and issues, such as stream flow/velocity) to make the Wabash River unsuitable for recreational use. To address this reality, federal and state laws provide a process for refining designated uses through a Use Attainability Analysis (UAA). The UAA is an analysis to identify attainable use for receiving waters, including those that are impacted by CSO discharges.

**9.2 Regulatory Requirements for UAA**

Federal regulations specify that a UAA should be “a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological, and economic factors as described in [40 CFR] Sec. 131.10(g).” 40 C.F.R. § 131.10(g) provides that states may establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible because:

- (1) Naturally occurring pollutant concentrations prevent the attainment of the use;  
or
- (2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
- (3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or

- (4) Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in attainment of the use; or
- (5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
- (6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

### **9.3 State Requirements**

Indiana law has developed consistent with EPA's regulation and guidance. During its 2005 session, the Indiana General Assembly approved Senate Enrolled Act (SEA) 620, which was signed into law on April 21, 2005.

Under SEA 620, the requirements for the CSO wet-weather limited use subcategory were based upon the water quality-based requirements in an approved CSO LTCP. The CSO wet weather limited use subcategory and water quality-based requirements may remain in effect for up to four days after the discharge ends. The subcategory is available if: a) the department has approved a community's CSO LTCP, b) the LTCP is incorporated into the NPDES permit or an order of the IDEM commissioner, c) a UAA is performed and approved, and d) the approved LTCP has been implemented. Federal requirements under 40 CFR 131.10, 40 CFR 131.20, and 40 CFR 131.21 also must be met.

### **9.4 Current Recreational Standards and Water Quality Conditions**

The State of Indiana currently applies a single primary contact recreational use designation to all its waters. While appropriate for some waters during certain periods, this designation clearly is not attainable in all waters, all of the time – specifically during and following wet weather events. To support this designated use, Indiana has adopted the following *E. coli* numeric water quality standards, which are in effect from April to October:

- Geometric mean of 125 colony-forming units per 100 milliliters (cfu/100 ml) based upon five equally spaced samples taken in a one-month period and
- Single sample maximum of 235 cfu/100 ml.

These water quality standards were intended to protect full-body immersion bathing (swimming). The State currently applies these criteria to all waters, whether or not they are used as bathing beaches. Many Indiana water bodies have not and do not currently meet the bathing use standard and are considered non-attaining. The receiving stream affected by CSO outfalls from Lafayette (Wabash River) was included in this list of non-attaining waterways for bacteria.

### **9.5 Determination of Existing Use**

The Wabash River was designated “fishable, swimmable” under Indiana Water Quality Standards.

The City of Lafayette consists of approximately 18,000 acres of land and over 320 miles of sewers. The collection system consists of approximately 20% combined sewers and 80% separate sewers. Lafayette has 11 NPDES permitted CSOs and a combined sewer area of 3,800 acres, which is divided into 11 CSO service areas. The Wabash River currently receives the discharges from the 11 CSOs. The Wabash River does not have any designated swimming beaches or other areas of primary contact.

The Wabash River was included on IDEM’s 2008 303 (d) list of impaired waters for bacteria (*E.coli*). It was also included in prior 303 (d) lists as impaired for bacteria. Monitoring data collected during periods of CSO discharge support the conclusion that water quality needed to support primary contact recreation (swimmable) has not been attained during and following wet weather conditions that result in CSO discharge in the Wabash River.

### **9.6 The Wet Weather Limited Use Subcategory**

The refinement of the current designated use to apply the wet weather limited use subcategory pursuant to SEA 620 is both necessary and appropriate for the portions of the

Wabash River that will receive residual CSO discharges after LTCP implementation under the City's SJA agreement. The stream reach that is proposed for the wet weather limited recreation designated use is roughly 30 miles of the Wabash River from river mile 309.00 near the City's WWTP, to approximately 8 miles upstream of Covington, IN. The limited use subcategory should be applied for a duration of up to 2 days, dependent upon the wet weather conditions that result in the specific discharge. These conclusions are based on modeling results performed by Limno-Tech, Inc. and reported on memorandum "*Analysis of Downstream Extent and Duration of Lafayette CSO Impacts on Wabash River Water Quality*" which can be found in **Appendix J**.

Although the wet weather limited use subcategory may be supported based upon several of the six factors provided in 40 CFR Sec. 131.10(g), the City of Lafayette limits the current justification to the following two factors:

- Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place.
- Controls more stringent than those required by sections 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact.

## **9.7 Human-Caused Conditions**

In these urban waters, there are human-caused conditions and sources of pollution that prevent the full attainment of the recreational use during large wet weather events. Some of these conditions cannot be remedied or would cause more environmental damage to correct than to leave in place. The wet weather limited use subcategory is justified due to human-caused conditions for the following reasons:

- Effects of urbanization
- Existence of the combined sewer system

## 9.8 Substantial and Widespread Economic and Social Impact

EPA's March 1995 "Interim Economic Guidance for Water Quality Standards" provides guidance to States and EPA Regional Offices on the economic factors that may be considered, and the types of tests that can be used to determine if a designated use cannot be attained or if a variance can be granted. Page 3 of the guidance states, "The regulatory requirement that must be met is that attaining a designated use or obtaining a variance would result in substantial and widespread economic and social impacts."

IDEM provides the following guidance regarding the consideration of "Substantial and Widespread Economic and Social Impact" as a basis for modifying a designated use:

This factor will be the primary mechanism for suspending a recreational designated use. A key issue in the determination of this test will be the cost for ratepayers of additional controls. There will be a cost per ratepayer that will place an undue economic burden upon that ratepayer and ultimately upon the community in general. This burden to the ratepayer is generally determined by a percentage of the median household income (MHI). Below 1.0% of the MHI would be considered a low burden, 1.0% to 2.0% of the MHI would be considered a mid-range burden, and above 2.0% of the MHI a high burden. EPA has not defined "substantial and widespread economic and social impact."

The proposed LTCP program will result in a cost per household of approximately 2.28% of MHI. The EPA SEIM score of 1.83 in conjunction with a cost per household of approximately 2.28% of MHI will result in a high burden under EPA's guidance. An EPA SEIM score of 1.83 is equivalent to an IDEM SEIM score of 2.17. An IDEM SEIM score of 2.17 results in substantial and widespread economic and social impact when MHI exceeds roughly 1.3%. Thus, the City's current wastewater treatment cost burden of 1.2% is nearly equal to the point of substantial and widespread economic and social impact based upon IDEM guidance. The proposed CSO LTCP program, which will impose a burden of 2.28% of MHI, will exceed the point of IDEM's UAA Substantial/Widespread threshold. Accordingly, the City requests that the designated use for the segment of the Wabash River (30 mile

section of the Wabash River extending from river mile 309.00 to roughly 8 miles upstream of Covington, IN) be modified to the wet weather limited designated use for 2 days.

Further this LTCP was proposed as the long-term method to address CSO discharges from the City's combined sewer system. As discussed, the final program exceeds the point of substantial and widespread burden as defined by IDEM and results in a high burden as defined by EPA. Based upon the level of burden the City believes that the requested period of implementation is appropriate. That proposed schedule is discussed in Chapter 8 of this report.

**APPENDIX A**  
**CITY OF LAFAYETTE RIVER USE SURVEY RESULTS**

# CITY OF LAFAYETTE

1. Please check the appropriate water activities and how frequently you or your household participate in along the Wabash River and Durkees Run Ditch. Check all that apply. The City limits are identified for this purpose as from the US 52 Bridge to the US 231 Bridge. Downstream is identified as from the US 231 Bridge to the Granville Bridge.

Activities	<i>Within City Limits</i>					<i>Downstream</i>					<i>Durkees Run</i>				
	Frequency					Frequency					Frequency				
	Daily	1x week	1x month	1x year	Never	Daily	1x week	1x month	1x year	Never	Daily	1x week	1x month	1x year	Never
Fishing Bank/Boat	3	17	34	46	107	1	11	24	34	137	1	6	6	12	182
Fishing from Wading	0	3	8	22	174	0	2	10	14	181	0	1	2	10	194
Rowing/Canoeing	0	7	14	48	138	0	5	13	45	144	0	1	4	16	186
Motor Boating	4	11	14	19	159	1	8	12	15	171	2	7	1	5	192
Kayaking	0	3	5	10	189	0	2	3	7	195	0	1	0	2	204
Jet Skiing	0	3	1	4	199	0	1	4	3	199	0	2	1	1	203
Water Skiing	0	2	0	7	198	0	0	2	7	200	0	1	0	1	205
Swimming	3	12	13	18	161	0	3	14	9	181	0	1	5	5	196
Wading	3	9	16	23	156	0	3	17	18	181	0	0	5	9	193
Other (Define)	6	4	16	4	0*	3	1	8	7	0*	1	0	1	3	0*

\*If they didn't define an "Other", they never participated in an activity

2. Please check the appropriate time of year you or your household participates in any of the water activities.

Time of Year	River Location (based on Users)		
	<i>Within City Limits</i>	<i>Downstream</i>	<i>Durkees Run</i>
Year Round	38	25	9
April - October	104	81	28
November - March	2	1	1

No response 63 100 169

3. To improve water quality for the Wabash River, would you be willing to accept a sewer fee increase on your sewer bill?

Yes	556
No	1532

If no, explain. 1339 respondents had comments

If yes, please indicate the amount of the sewer fee increase you would accept on your monthly sewer bill.

\$5 increase	353	\$10 increase	63	\$20 increase	12	Other	111
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5. Respondent Profile (please check all that apply)

Married	1178
Single	752

No response 158

Male	895
Female	1022

No response 171

Age less than 18	4
Age 18-64	1443

Age > 64 463  
No response 178

## *Accept a sewer fee increase comments*

We are not contributing to it's poor quality - let's make the persons who are more accountable.

Had the chance to fix the river years ago and you blew it - now you want to start all over again, sorry but NO!

Due to the number of increases on "fees" and "tuition" on the single parent. This one does NOT seem justified. Too much has increased in this city in the past year for the average Joe and the wages are NOT increasing at the same rate.

Can't handle more taxes.

Let the factories that polluted the water clean it up.

I would need a clear explanation why/how increased fees would be spent.

I never use them.

Additional fees are not necessary - just use current fees more wisely. Our family does not use the river. We cannot and do not want more fees etc; imposed on us when we are being taxed and charged way beyond necessary!

What would the improvements be? What are the problems? What would the fee be? How long would it apply? I need this information before I can answer yes.

I already pay enough taxes for items I do not need or use.

We could afford a sewer fee but a great many people could not.

The City has let it get in this state of utter disgrace, along with every city and town on its banks. Quit dumping and clean up the river.

No, please explain first why the water quality is bad. What is the problem with holding the source accountable. We do not need more tax and spend.

Depends on what is done, need more information.

Let people who do all that pay for it. My SS income doesn't permit me luxuries. I'm already in the poverty level. Let rich people pay. They couldn't live on what I have to. Try it.

Tax the people who live on the water, view the water, recreate on the water. Tax the industry that uses/abuses the river.

Since it's to clean up the Wabash. Also clean up companies dumping raw into the Wabash.

We have no extra money right now.

It costs too much already.

Don't see any need.

Why?

Our bills are to high now - for people 80 years and on fixed income.

I would be willing to pay 10% of total water bill for no more than 7 years.

If I knew the water quality, I may be more likely to participate in water activities.

I think City water needs to improve first. I buy water and filter my water because of the chemicals in it. More times than not when I've used tap water without filtering to fix something I dump it because the chemicals ruin the taste.

Don't use the river, find another way to fund water improvements.

We pay enough on combined utilities now.

Shouldn't the money spent improving the sewage plant be sufficient?

Use money from grants or add fishing and boating fees.

Property taxes, trolley tax, library tax, what's next?

Property taxes, trolley tax, library tax, what else do you want the people of Lafayette to support?

Property taxes are high along with all other city taxes ( trolley and library)

I don't use the river.

I am on a fixed income and have already been taxed w/ the stupid trolley tax and the wheel tax.

We pay enough already

We don't partake in river activities. We feel we pay enough as it is.

none of these apply to me

I am 88 years old - my wife is 87 - not active

I am on a fixed income - 90 plus years old.

I'm 65. Keep it as it is. Would you like to pay more?

It should be accomplished by restricting waste materials running into river-also people boating could purchase a license because the gasoline contributed to pollution.

Would it be necessary to have good drinking water.

Sewer bill is high enough.

because I do not use the Wabash River

I never am in the Wabash and it will take a lot of money to improve that.

I do not use the Wabash for anything.

Just got a new water purification facility-what does it do?

How much more is it going to cost to live in Tippecanoe County. (gas, wheel tax, prop tax, now you want more for water! What next?)

because I am a senior citizen on social security and it is difficult to pay for needed water and sewage now. I am an 84 year old widow.

We live on a budget. My bill runs about 30 per month-we can't even water our yard anymore.

No no no - don't you dare.

wading and hiking along Wabash heritage trail.  
In hope of others wanting same increase.

Although we make no use of the above facilities we could manage the increase.

Have no use for the Wabash.

There's no guarantee that my paying more money per month is going to improve the Wabash enough for me to enjoy water activities.

We are retired-our bills go up but our salary doesn't.

Can't afford it.

Retired on fixed income

Let the people who use it pay for it

I don't use the river for anything

We pay too much now.

yes, but only if it's a very small one.

I don't use the river and am 79 years old but still pay extra taxes for free cit bus from downtown to Purdue but pay regular bus fare to get downtown.

We have a flood and it's all for nothing and then I suppose it would be to do all over at more expense.

Too much now. On a fixed income.

I don't need no bill increase.

no interest of active use of the river

use for swimming-can't afford city pools.

I never use it and even if 100% better I still would not use it. It's a little too late for it now I'm 52.

On limited wages. Do well to pay what I'm paying now.

Too dirty for these activities. Fees already higher than other areas.

I don't use the Wabash for any activities. I'd like to keep my utilities to a minimum.

I am retired 6 yr old living in my home alone trying to stay con not take anymore expenses

sell permits to people who wish to fish, boat or swim in the river

drive over bridge look at how high on golf course. My money need to spend on higher sewer rate for water activities those that use the river pay for.

I am 74 years of age and can't use river at all

retired- living on a fixed income only one in my house

bill is high enough

let those who use it, if any pay for it

I am 93 years old and have a hard time paying my taxes and medication

don't use the river !! Neither does family

never use

we do not participate in any water sport or river activities

I don't use it

on a fixed income- too many other increases have been imposed on me

I'm satisfied with water quality

good water quality should be standard without fee increase

physically unable

can't afford it

no- already pay more than can afford. Seniors just can't afford any more for any increase

**Not fair to seniors**

we already pay to much for sewage

all of the above activities are leisurely, not necessary activities

we are both 79 yrs old and live on a limited income

let expense be met with your raises

the amts. Already to high for monthly bills

I don't use the river

sewer fee is too high already

none

I have never used any of the above

self- explanatory. We never use the river

can hardly pay my bills now- they have all increased

if they use it let them that use be taxed- retired cost of living killing us

don't need more bills

the huge amount of taxes we pay should go towards that

city is currently treating my sewage to pass regulations- required by law. My tax dollars and monthly fee is already in budget

can't afford it. On fixed income

on fixed income- don't use any of those things

I feel were being taxed enough now

it is immoral to expect non participants to pay for someone else's recreation

I don't use the river-charge those who do

no

we are on a fixed income and do not use the river

we are on a fixed income

go after the factories and business that are guilty of polluting!! Or at least the people that use the river

we only have are S.S to live on and can't afford any increases

no more taxes !! I don't use the trolley either! Tired of paying for the benefit of a select few

A waste, people wouldn't keep it clean

I'm a senior citizen on a set income. Everything is already out of my reach. Already to high

just one more hand on my pay. I don't get the % increase in my pay check to keep up with everyone wanting more and more

bills run at a reasonable rate right now. Don't need to pay more & can't really afford it

don't use the Wabash services and I don't want to pay for others entertainment

do not want to pay for the slobs who contaminate the river & it's shores. Make them aware of their own responsibility to clean up their own trash

we are disable & unable to do any activities in water or out Please don't raise our bill for this .Thank you

don't use, How about a user fee via boat fee or ski fee

don't want to waste money

sewage fees are high enough already

no I can't afford an increase

The ones using the river should be more aware of helping, not to pollute. I do not use

I likely don't use

I don't use the river for water activities users of the river should pay fees

we do not use the above facilities

only if swimming was a future possibility

it's not fair to have to pay for something you never use

sewer fee high enough 2 times water cost people and towns upstream need to help too

the companies that polluted the water should pay to improve the water quality

I never go near the Wabash river

I believe me being a single homeowner. I pay enough in school taxes to help

we have already been forced to accept a sewer fee increase for this reason

the people that use it should be the ones paying for it. Wether it be added to the licenses or the price of water sports machines

I'm a 77 yr old widow handicapped and struggling to make it on meager income

I'm on fixed income its to hard as it is

water , sewage already to high

as a retired person on fixed income I don't have the extra

don't use it , let the ones who use the river pay to have it cleaned

I just don't have any money for it. The city has everything!

the monthly sewer fee is high enough as it is

don't participate in any thing on river

too high now

this not just a city issue it is statewide

wheel tax , river tax Revolutions are made this way

We have lakes in Monticello for recreation. Have you people taken leave of your senses?

sewer fees are to high now

I think our sewer rates are high enough. When I water the lawn in March, April, Sept. & Oct. my bill is sky high.

I'm 79 and have not used the Wabash and don't intend too. Figure way for boaters & users to pay on limited income

do not use - fixed income& do not need increase

disgusted state put prophets town above river. Would like to see proposal before stating further states priorities were wrong and irresponsible the water way should come first

Irrelevant To Me

I don't participate in water activities and I don't want to pay higher rates so others can !!! This city and state already over charges taxes for peoples pleasures.

Retired limited income

Although I feel very strong about this, I am on a fixed income. A \$5.00 charge is about all I could afford.

A senior on a fixed income.

No because as a retired senior with a fixed income I have no extra money.

Let those who pay (pollute), pay. I pay enough taxes, and this is just another tax.

Those who pollute should bear responsibility for these charges !

Don't use.

I live alone. I am 94 years old and I cant afford an increase.

I thought the government was responsible for water and sewer.

No more fees please ! Its to high now

Just like the trolley taxes I would be paying for something else I don't use.

I am getting tired of the increased mandatory fees that Lafayette imposes. (i.e.) taxes Mandatory sidewalk fixes act. What are my present taxes \$1800/ yr and I don't have kids who attend the schools, use the playgrounds act.

Never use river

Too many increases. Every time you turn around someone wants to increase something. Learn how to live within budget like I have to !

I thought we just upgraded our wastewater treatment facility.

Only if the entire increase goes to improve Wabash River Water quality.

It you want to qualify for clean water you have to start at the beginning of the Wabash in Ohio and clean up all its Tributaries !

already paying for all new additions which shouldn't be applied to older neighborhoods

water is expensive enough as it is plus we're all getting hit with the wheel tax this year

Effluent to the Wabash is controlled by IDEM. Enforce the existing NPDES permits. We are paying for the new treatment plant which is good but we have already seen increases.

I don't fish or boat in the river and do not want to pay for those that do

Our annual water bill is already higher than our gas bill. Sewer has increased over 9% each year over the past 8 years.

I personally never use there facilities

I dont use the river or their trail hikes. We have sidewalks for walking.

my other bills are high enough. it would be nice if the ones who use the water ways pay for it

No more fees

Shame on City Mayors & Commissioners over years for letting this happen. In 1943 my grandfather & I fished and swam in Wea Creek and ate the fish . Alcoa pollutes Elliot ditch and Wea creek- Staley, Fairfield, Lilly pollute daily with the sewer

With ever utility, groceries, properties tax, gas ect. Increasing cant afford more

\$0.00 dollars

I still rather purchase water should have to pay for what God gave us

go to lake

do not use any of the above

I will not go near the Wabash myself or my dogs. Whether it is as disgusting as perceived or not. We'd like too. We go to tippe. Wildcat & sugar creek. The Wabash would be a little more convenient! I'm all for cleaning it up

I have never used the river for any activities And don't plan to. I would not like to pay for something I don't use

NO. sewer fees should not be increased. Very few people use the Wabash river for recreation

unemployed, avoid additional costs

Why? The city just spent millions to improve sewage plant. Clean up the air in Laf. First

no

I don't like the water

we are on a fixed income

not used

Fixed Income

we don't use the Wabash for ant rec. activities Why would we want to pay a fee to improve water quality

we just had a big jump in the last couple of years, work within that budget. Isn't the new plant doing it's job

if the system prevented raw sewage from being dumped during 1" rainfall-I.e overhaul the old combined system & exclude run off from processing, I would support an increase

let's pay off existing bonds first. Lafayette would be better off with home hospital, then spending the proceeds on the river  
WOW what a trade off

Of no benefit- this area is paying now for benefits that are used by but a few--Example the taxes for the trolleys

What is the sewer plant used for?

Because I think it's too high now.

the wabash river is /has always been a very dangerous place for any water activity

No reason for increasing fees!

I don't have the money for an increase Just on an fixed income

How bad is it? Obviously, I don't use it, but I don't want it to become polluted

until the cities of Indiana eleminate storm water overflows of sewage Why bother

cut back a few positions, then you'll have the money, cut your wages

my income is taxes enough I barely make enough money to make ends meet So we don't have money for fun activiteys like boating

we feel that the water bill is already high enough and cannot afford to pay more

we cannot do any of these

I think the bill is too high already

I feel that industry is that major polluter and they should pay the bill not your consumers

already paying for a new sewer plant

have the polluter pay for the clean up

we are over 70 and none of the activities above interest us

sewer fee increase

Government increases all other taxes & bills NO MORE

the bill is currently high enough

we do not use the Wabash river in any way

apply for federal aid

Better management of funds

We don't use any of the other wabash services

if you really use the funds to improve Wabash River quality-I suspect you will add the fee increase to the general sewer budget N never specifically allocate it to the Wabash River water quality

rates have already been raised for improvements

Neither I nor anyone I know engages in any of the water activities above, so I see no reason for an increase. A user fee would be more appropriate in my opinion

don't use any of these, for any activities

the wheel tax (are mayor was for) was the last straw. Can't wait till I can get out of this town of taxes and fees

agricultural siltation is the huge problem w/ water quality. This is an IDEM & county issue more than city sewage issue those days

on a fixed income & can't afford to pay more

I am 78 and don't do any of the activities

no time I'm 73 very bad back

it's water! I just paid 5000.00 for a water filtration system the city is discusting

fix income

we already pay enough-- Stop the polluters

I don't want to pay an increase which is something the city should take care of anyway

it's high enough

I don't use them so why should I pay to improve them

never use it

on a limited income Social sec.

we fill we are already paying to much

I do not do any of the above but viewing different areas and believe in improving the environment

hard to pay the sewer bill now I have very little income

sewer fees are already to high

we are retired on a fixed income. Have a hard time making ends meet now

sewer rates are too high already

fix income retired

charge the people who use the river. Quit taxing people on fixed income to death

in oct. -I love the feast of the hunters moon and the Wabash it the main focus

never use Wabash River- Shouldn't have to pay an increase for something I don't use

pay enough already

retired- fixed income

don't use river

unsure

don't use- bill already to high

high enough- live on a fixed income

is high enough already and I don't use the water activities

I do not wish to substdice water sports and acyivities Below you suggest a \$60.00/yr minimim for all your customer to substdice these activities. This is way out of line

never use

water rates high enough

I don't want to see an increase in my bill

we are retired and living on a fixed income- our water bill I high enough

do not use any of above as I am 85 yr old

I do not use the Wabash river for any purpose

enough already

do not use it

Because I only use water for drinking and laundry

it's not fair to have only the people who have water & sewer bill to pay for this

I pay enough as it is

I feel that I pay enough taxes as it is right now. With the property tax increase- you should have enough\$ to make Wabash river liveable

This is because I do not do any of the activities that you mention.

I feel all utilities are becoming out of hand. The business who messed up the river should be charged!

Never use Wabash or Durkees Run Ditch

Keeping river clean starts with preventing dumping/other abuses. Go upstream, find the guilty parties and prevent it. No need to raise our bills.

I think we pay enough. Sewage is 2 x higher than water now. We don't participate in any of the activities.

The addition of industries has necessitated the expansion/expenses of sanitation treatment. They should pay more-not the long time home owners.

I'm a single female that doesn't even use the basic amount of water. I don't participate in outdoor activities.

I don't use it.

It is high enough. Try user fee.

Too many taxes now. Charge the clean-up to those who pollute.

It's about time. Of course it would have been nice if they did something years ago so it could be a smaller increase.

On social security and too much medicine costs-no money left.

Why is it needed? Why should senior citizens have to pay for something never used?

Church-have no reason to use river.

Primary Industries (water polluters) would find way to avoid their fair share as they have the support and money to avoid these type of obligations (i.e. property tax & abatements)

The cities upstream should pay for their pollution not us.

I do not use water for any activity. My money is better spent on other things.

No.

No.

Unless everyone upstream does their part.

My bill is already too much. I live on a very limited income & do not wish to pay more than what I'm paying

As far as I know there is not a problem with the water quality if I was made aware of one I might change my mind

We don't participate in any of the above activities

limited income

water & sewer is high enough

I don't use recreational water areas and don't feel I should pay for them

I do none of these I am 78 years old

Let the companys that dump that stuff in the water pay to clean it up

pay too much now I am 81 wife 80 and I can not pay for all the wife perscriptions now

don't use now, may want to someday

on limited income

do not use any of the above activites sewer fee at present is 2 to 3 times the water rate

only if it applies to everyone

do not go on the water do not fish do not swim in the water

singal occupant-retired

im not using it

pay plenty now

absolutely not not one penny

limited income

taxes are to high, I don't want to pay anymore

let the users pay for the cost. I don't use it so I don't feel like paying for it

not worth it for the amount of usage

taxes are high enough

don't use the river

don't use the river

it would be helpful if businesses could share in the sewer fee increase

increased in water quality is a goal to work for.however with the increases in sales, property taxes, gas and cigarette taxes in the past year and the wheel tax I co not support ambitios increase in fees .I would like to know what the money is done with the sewer rates we are paying you shouldn't need extra money!! Use the money you have

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no useable boat ramp on the eastside of the river one of your 5' sewers dumps into wabash on the north end of my property , condoms, raw sewage,ect. This should've been fixed yrs ago all I ever get is the run around when I complain

no don't use these needs

before agreeing to any increase we would want to know where the river pollutants are coming from & if an uncue is coming from the residential population

I would like to take part in these activities but can not depends on cleanliness of water.You should have thought about keeping it clean long ago. You companies profited from it, pay to clean it up

I am already taxed beyond belief & my elected officials seem to think that money grows on trees

I don't feel it effects me

Can't afford increase

don't use

too many increases already done

no you can do it without increase look for a way

we don't currently use the river for any activites but would like the river to be clean in the intrest of healthy environment

We do nothing in the Wabash river

sewer fee is high enough

non-use

see activities- don't use the river, not willing to pay for those who do

taxes have gone skyhigh we don't need for the water to go up. If it cont. we may have to sell our home and move. People can not afford to live

lafayette is becoming to expensive to live in

no more sewer fees

im on a fixed income and more increased would be a financial burden as my income doesn't increase enough to keep up with expenses

due to poor water quality

We just finished a new treatment plant. It's time to stop adding more taxes enough is enough

its been cleaned before and didn't last 10 mins.

we don't use any of the wabash for water activities

just another fee to add to the other utility expenses & fees we already have

I don't use the river

I do not use the facilities

taxes are to high on everything now let people that use these things pay for them I should not have to pay for something I will not use

I am an 80 year old widiow and on a limited income. I do wish you well and success on your survey

utility bills are high enough

we don't have money spare

will soon be buying a canoe

never use and utilities are to high now

im a senior citizen with a fixed income. Im 86 years old so I don't use that much water

citizens of our county could not afford the price it will take to clean the river

I don't use the river

I would welcome funding any improvments to the water or facilities which would encourage greater use as the above activities described

4 everyone takes on increase

this should not even be a questuion should never be drained into where humans or pets swim

never use wabash river

we've just had a property tax increase and addition of the wheel tax. let it stop there (I know we are talking about increased sewer bill) lets cool it

I think we pay enough already

my budget is already too high to afford anymore. Water is a necessity & I don't believe we should tack charges on ti it that some can not afford

I don't participate in any of the above activities, but feel clean river is vital to all

our income is going down because of the retirement, so we cannot afford an increase

im a senior citizen, living on social sec. and restricted income

just a minimum because I am an elderly widow

we do not use the wabash river or durkees ditch we should not have to pay for this. When is this going to STOP!

we do not use the any of these activities

already paying too much

I feel more information is needed increase in what

because I don't use the wabash river

I am sorry I don't use the river

Wabash River covers many miles. Lafayette Sewer less than 5 miles. Clean up should be a project of many counties/communities.

my average monthly bill is \$40 is already very high for a working family

The City taxes us hard enough now. Salaries are out of hand.

tax the homes that are polluting

im on a fixed income and cant afford more

I do none of the above activities

I'm on a fixed income

on social security and don't like increases

cant afford now

Age

We do not need another tax. There is enough wastfull spending in the sewage fund that can be cut in order to accommodate this. Isn't there anything you won't tax or regulate.

don't use, doubt if quality would improve

retired on limited income

I don't participate in water activities on the wabash

we already pay double sewage fees can not afford more

1) It is a muddy bottom river you can not change that. 2) I thought we just expanded the waste water plant. 3) That would not improve the water in the Lafayette part of the river. 4) Didn't we just have a substantial sewer rate increase?

if the water quality would improve, we would consider doing the above activities

we are paying too much the way it is. Government should quit wasting our money

we already pay double for sewage than we pay for the water/ also not tax deductible

supporting self need money for my own needs

never use

I am on a fixed income and do not need additional expenses

we don't go to these places and I live on a budget

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I don't use the river for anything. Don't do laundry. Don't have showers. You just spent a big amount of money on sewer plant. What do you think we poor people with no income can do.

sewer bills are high enough now. I do not want to pay more

no fishing, rowing, canoeing, motor boating ,kayaking

we are apartment building owners and do not need additional costs with all of the competition present

Because it wouldn't help and our rates are already too high.

if other people want the water quality to improve for water sports let them pay for it

I am a widow. I live on a low income. I don't go to the river.

Age 90 use very little water. Low income. Loosing sight.

since 1968 I have not fished , swam ,or boated on any body of water in central indiana because of environmental and health warnings I think it is the states problem. Requiring more to restore wateractivities to a safe level lafayette cant solve it

We don't currently participate in these activities, but we would if we felt the water quality was improved.

It depends on the amount of increase.

If you get Eli Lilly, Ross Gear and others, including West Lafayette City to stop polluting the river!

are ours standards not high enough? Why are we not doing this now?

none water is to nasty

Probably would not mind \$1.00, no more.

can't afford

5 times 12 = 60.00, You assume I have extra money. Please stop!

not needed / can't pay more

Limited Income.

because my bills are to high now and I'm a single parent of two

I live on social security and have a lot of medical bills cant afford to pay anymore

we don't use any of the above and live on a very fixed income

don't use it can't afford it

I am on a fixed income due to throat cancer

always asking for money we are on a fixed income

I live on ss and am maxed out

I want to see a study of sources of contamination by contribution. Probably mostly farm and industry related; they should pay

set a user fee

cost is already to high, but I would hope that enough thought & foresight was included in the new 57 million expansion to maximize water quality

as long as it was not much more

I'm a widow. My husband passed away in 2003 & my income has be cut in half so I can't afford anymore increase in anything

I am retired and do not participate

you should have anticipated this cost any way the system you have is adaquit now

no I don't use & I'm on a fixed income

I do not do any of the above & have no idea what the quaiity of the water is or info. Above

unnecessary

personally not used

for health reasons I'm not to be in the sun much. Even with insurance I pay hundreds per month for meds. So I'm on a tight budget as it is

\$ amount below all depends on what you're planning to do

too many increases for retired people

retired and on limited income

why?

the water & sewer bill is high enough as it is. And there is far to much taxes now

we do not use the Wabash River enough to justify increase

Maybe if it is a small increase. We rae on a tight budget. No more than 5.00 preferably less

I'm only billed for water-do not have city sewer service

I don't do any of these activities

You do what you want anyway

although I don't like the idea of bad water in the river- I don't use the river in a recreational way to want to pay for it

very little

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we already had a hefty increase to pay for new water treatment facility

Water & sewer prices are high enough and I don't use durkees run or any of the activities above

don't use it & don't want to pay for it! Add an additional tax on the people who have boats& boat trailers Just like wheel tax

thanks for asking citizen for input  
over 65 don't we count

limited income- very limited let those who use them pay the fee

have not use the Wabash River for any of the above activities

retired on fixed income rates are already high

rates are already high for us retired and on fixed income

I'm 82 and all I can do is barely pay my bills now

you have sufficient cash flow, new plant & equipment Many good employees use these efficiently NO NEW FEES

already to high

we already pay enough as it is. We don't use ? Participate in water activities

sewer rates are high enough Everything is going up in price except wages

I never use these facilities so I feel it wouldn't be in my best instrest as a resident to improve this matter, I feel there are better ways to raise money

just payed a 335.99 sewer bill because some realator turned on a shut off valve to use a stool Dated 8-12 to 9-22 Can't afford it

we are retired in are 80's we cannot pay for the newer sewer of 20 yrs ago

I don't participate in water activities on the Wabash

Several of these activities contribute to the pollution of the river ( bosting, jet sking, ect) seems somewhat contradictory to me

all I use is household water supply

I am not making much. I have to watch so carefully

do none of the above

I'm not a water sport The river appears to need dredged

city needs to be more efficient & have good quality control in place first before increase I don't drink city water

need has not been establishedby this survey or other info.

I don't participate in water activities Water quality is crap from upstream fees are already too high

we live on SS due to illness

sewer rates are already to high

I pay to much taxes now.Let Eli Lily & Corn Plant clean it upAnd I don't ride the trolley eather.And we still have speed bumps on Owen St

paying enough as it is

I am not using h2o for recreation & not willing to pay increase in fees

to old to go to the river

expensive enough

maybe

prefer user fees

I do not use the Wabash for recreation use

do not use any of the ubove

Our costs keep going up! Whea is it going to stop

We are already paying too much

NO to much taxes now an extra 1.00 wouldn't be bad

Be better managers of money not have so many water works personal sitting reading paper& not willing to assist customer

I don't use the river the rates have doubled in the last 5-6 years

only fish for recreation. I don't eat the fish. Water quality doesn't matter for me

Don't participate in any activities never have at age 89

If the increase is accepted I will try to comply but utilities are ao high it will be difficult

The amount has not been specified and taxes are high enough already

Depending on the amount

you already plan on increasing our sewer bill using the environment is just an excuse or attempt to get an even larger increase

I am very ecologically aware when using my drainage system. Encourage citizens

it is high enough now

the river should already be clean

I do not approve of an increase on my bill for a river I do not use

its already very high

Regardless of when or where I use the wabash or any water way, clean waterways is a priority to me

the water bill is high enough now

I live on a very low income s.s.

I don't want to pay for something I don't use

I don't use any of the above & I have a big water bill already

my bill is high enough already

it is high now

I don't use the water ways for enjoyment I feel it is wrong to be assessed higher sewer bills for no benefits

To improve the water for the Wabash will have to be a massive state wide effort. Asif Lafayette's few drops would make a difference. Is it possible to keep laf. Affordable

How would paying more improve quality? The area described has already suffered too much, whats the plan

can't afford it - fixed income

I don't use the river

do not use river

sewer fees are too high now. Trying to sell my house, so I can have money to live on

sewer rates are already too high

if you collect your \$1,000,000 in all areas in collections maybe that would be a good fund to start with

don't do water activities on the wabash

most overloading of Lafayette sewer system comes from Laf. Industry get the \$ from them Doubt any significant improvement in river water quality regardless of \$\$ spent

Willing? No! my understanding is that my water doesn't come from the Wabash, so I shouldn't be forced to subsidize other peoples entertainment . Anyway I already pay for more water than I use and more sewage than I generate

I do not fish or boat on the wabash river

water bill is high enough for everyone and improving the Wabash would take generations after us with no expose to taxes

I feel I pay enough on my waterbill

I think that we pay enough now

none but we would if it were cleaner

I do not use the river for recreation

do not use

limited income-only 1 in household. Let those with higher use- pay more or charge fees for use of rec. water

new waste treatment plant opened earlier this month. Hopes to build new plant have been approved and the new plant better do it's job

won't use

since we don't know where to swim along there we shouldn't have to pay more

I live on a strict budget, my pension check just reaches and that is it

we don't use the Wabash River for any of the above activities listed

no because I am living on a very limited budget already, I am happy that I can pay all of my bills and hope I can cont. to do so!

I pay for & carry drinking water because of flushing . It is disgusting. Why should I pay for river activities I am 79 Pay me for drinking water

don't use the river in anyway so we believe the pollutants should pay to clean it up

sewer fees are double what water fee is

the rates are already to high/ We are constantly being hit by raised rates & new taxes. It has to stop somewhere. Try living on a fixed income with all the increases

no I have no desire to use the wabash river

I already pay 65.00 a month 27 water+38 sewage

we really don't use the river and cant afford an increase in my bill

Isn't there a state standard? Is Lafayette not meeting the standard? Even if Lafayette went over & above the state standard, if no one else did , the water wouldn't change much

Don't we get enough increases if our pay checks went up as much as utilities do maybe

get a grant to help clean up

I would want to receive updates on how the money is spent to improve water quality.

absolutely not! Sewer rates should not be used for areas outside Lafayette

Don't use the Wabash River

will industry also be participating in this effort as well?

No absolutely not. I will move first. IF someone uses those facilities charge a fee to them.

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Government blows our money on trolleys and other junk projects, find the money to do project in existing money

I would really enjoy not being embarrassed about the river. It used to be so beautiful. Thanks and good luck. C & J Bach

retired, can't take medicine & handle all bills that are increasing

I pay enough now

Only a minimal increase

I'll be 70 years old my next birthday. I do not use the river for fishing or recreation. I am on S.S. and pension

Don't use river

Because my sewer bill is to expensive every month so NO

the fees should be charged to the household who participates in these activities. You cant collect delinquent water/wastewater of \$1million how can you expect to add more fees! Not that my opion matters anyway

Don't use

We already pay to much for our sewer bill and we don't use the river much.

I really don't use the river for recreation but would consider helping. I would want this to be the max. amt \$5 not anymore. I reluctantly say yes this added tax usually grows and grows and grows.

we would not use ever. Make it like the Golf Course, pay as you us

fixed income can't afford

I don't use the river for any of these activities

The river isn't a source of entertainment for our family.

in my younger days I did some fishing in the Wabash, but no longer

Most of the people who enjoy these activities don't live in the city limits therefore they don't pay anything extra at all why should I ? The city people usually go out of the town to mainly monticello lakes.

my bill is high enough already and I never use the river. Any of these increases would be to much! I pay a monthly water bill

Senior citizens have not had a raise in funds for 4yrs. Most other venues have gone up like water taxes etc.

We already pay enough taxes surcharges and fees. Get your feet off my back !

low income

Water enhancement is of no concern to me unless it is hazardous to the wild life. In this case I would de willing to contribute \$1 per month to an increase

I never use the rive so why would I want an increase ?

do not participate in water sports

how bad is the water quality? Does today's water treatment meet federal and state guidelines? Why is this not good enough? What is the cost for improving the water quality and the costs and time line.

no activity at all on the wabash

charge those who pollute the waters a fee for factory discharge & ag run off

I think its time for all government to live within their means. I still remember the clean mary!!!

I will not pay.

depends on how much & what the \$ will do I thought most resent upgrade lowered CSOs what else do you need to do

we just never frequent the wabash for any reason only cross when needed

I don't use the river and I am on a fixed income. Charge the people who use it.

retiree

no

Less than \$5.00

I hi anafer now need handicap acese

Let big business clean up there act. I don't pollute the river.

Only if the river was cleaned up enough to swim in.

Limited income and we don't participate in any river activities.

im on a limited incom S.S.

I am a state employee- our raises are few and far between- we are very underpaid and overworked compaired to other states= I cant afford any utilities to keep raising but our pay doesn't and when we do get a raise its not even tocost of living

The sewer rate is already high enough. The money needs to come elsewhere like the polluters.

Water quality is not going to improve until other compaies clean up there act!!! No increase!! High enough!!

I am satisfied with the present situation.

the river quality has nothing to do with my sewage. We would make it better downstream. The Lafayette section of the Wabash is effected by Monticello ect.

No sewage should be going into the river

We don't use the river

I live on a small income can not take on one more thing

The improvement fee will not be worth the gained improvements.

I don't use the river and I don't trash it. I am on a fixed income

no only 2 of us!!

I am only one using water in this house for for 27 days a month and \$51.00 is high for 1 person

No. Retired can't work.

Don't raise fees. Find the money with the city funds

Not unless all cities towns and rurals areas affecting the river were included. Don't do another gold course.

It's already to high !!!

Too expensive !!!

I'm not unhappy at prison

Both of us are 88 years plus older. We don't use any of the above. Everybody wants the river to be cleaned at what cost who knows ?

I don't use any of them

our sewage bill is high enough now. We don't use any of the above activities.

This should come from consevation funds it seems - state ? Or from capital improvements if sewage facilities are in adequate. NONE

on a septic system and havent heard that we will be on a sewer system almost a mile from payless on old 231 S

I am a widower on a fixed income and I cant afford anymore expenses.

I have lived in the area for 85 years, cant see any improvement . As long asthey mix street water and sewage, they can not improve . When I was 5yrs to 13 yr you could read a newspaper under 2 ft of water

I am 86 and don't take part in any of the activities.

I am 84 and retired

fixed income

over whelmed by utility bills now! Single person cant afford to live independently

I am a single parent

don't use the river

both my wife and I are on a fixed income and with health problems. It should be the polluters problem.

we have already accepted a large increse in the past few years

we are on a fixe income and in our 80s we have 13 prescriptions which we have to pay.

don't use I thought the rate was already increased for sewage plant inlargement. NO NO NO !!!!!

to dirty and always will be check upstream. Your rates are high enough don't take anything else you cant handle

human waste is part of the cycle. With all of the other stuff going into the wabash a little bit of bio-degradable substance will not make that much of a diffrence

let industry clean it up

no

no

we don't use the the river. If you need money start a user fee with activities above. Not lik the downstream trolley

Let those who use it pay. Sewer fees are already to high.

im on a limited income and cant afford anymore increases

I believe the swere portion is already mch too high out of line with reality. Let the users pay a user fee like the golfers.

don't have extra money

what we do affects down stream. Longansport and farmers affect us

you should maintain water quality already

sewage fees are 3x that of the water rate

I don't believe I can afford it

those responsible for the poor water quality need to pay for improvement

do we really have a choice?

you waste enough money now why not put a 25 cent tax on trolley riders?

stop the offenders don't penalize innocent populations

theres enough taxes and increase in bills as it is

right now we pay more for sewer than water and our bills is just as high using the same amnt. Of water with ne garbage service as when we livied within the city limits

would like to know what would be benefical to us

can't afford

some years 6 months of water goes on the lawn. Get the alge out by reducing the farm ferterlizer run off, return the flood plan fields back to grass and trees

should not be funded with only local tax payer money

no I don't live at this residence it's a rental

no

No explanation needed. Who likes their bill to increase ?

50 % of our income is going to tazes now. Charge the ones who polluted it.

fortotal environmental improvement

I don't use the river for recreation.

don't use river

don't use river

I live alone and water bill is higher than my friend who lives In another city. This yr I havent been able to water my cedars & plants.

cant afford it

Only if it is a very small amount

don't use river

I don't use the river for any of the listed activities assers and user fees for those who use it

Poluting for lafayette comes from upstream. Funding should be state federal and private.

No, the fee should be charged by the users

I would need to be educated on the benefits/ convinced that an increase would actually improve water quality

Make do with what you already have . We the citizens already pay enough.

I think we pay more than enough for the water and sewage. Sounds like the citys way of easing us into another increase whether we want it or not . Is this the plan you come up with to combat late payments every month ?

our water and sewer rates now

I am on social security.

74 fixed income paying plenty now

no

we pay to much

now to old

pay to much

use the new wheel tax or west lafayettes trolley frees. We already pay enough why should we pay for something we don't use

senior citizen. We already pay enough

no I am a widower and you already got enough of my money

high enough

let the industry who polluted it pay

we barely get by we are on SSI

no

no increase

apply for federal money fees and taxes in this area are already high enough

we are taxed enough. Eliminate one tax and make better of the city budget.

not necessary

The city has ignored the wabash for years and permitted sediment to accumulate making the rive unsuitable for boating.

I am 80 and on a fixed pension

the water quality problems here locally come fromupstreamwhat good would paying a sewer fee be? I don't care about helping up stream cities. I would like more info before I say yes

industries polluting should pay to improve water quality for the wabash river

I don't want a higher bill for services I don't use

water rates were raised recently already with 80-90% of indiana s water ways considered to polluted to safely eat fish or swim. How could you possibly get this area clean enough for these activities?

don't use above and on fixed income

no- go after the ones polluting the river not everyone

the river shouldn't be polluted from sewage anyway, if it is should there be some action taken for negligence?

I don't need another tax. Levy some kind of fee on the users. Fishing licenses ect.

we don't do anything related to the river.

Get the people upstream to clean it up. The water comes into the wabash dirty already.

th last increase was to improve the sewage treatment plant, that being completed, those monies should go into a fund to treat the river, better yet raise the rates on business that directly deposit waste into the wabash. We are a family of 2 and

sewer cost are already double of the water bill

retired and our expenses are increasing all the time. How much longer can we last

bill are already to high. Everytime I get my bill I cant believe the costs.

don't use

I don't use the river for rec. or anything else

my water useage is minimal. I am olanning on retirement in 2005. don't need additional expences

we pay enough sewer fees as it is. Stay out of our wallets remember were already paying extra fees.

make the people that are doing the pollution pay. This money is not to be used for beautification or share line improvements there should be more fines. Lilly and Alcoa who are you fooling

senior citizen any extra would hurt me

first the wabash is not deep/wide enough for boating activities. Second, if I go anywhere it is to a res. Lastly if funding is wanted to clean up the wabash there is a state and fed money in DNR and other funds!!

I pay enough taxes for others to get free trolley rides and now you want more money for people to get free stuff.

we have too many other increases such as insurance, car, life, health, to deal with

water bill is to high. If everybody paid bill (students who move out of town) we wouldn't need a increase

pay enough already

ins is increasing everything going up you can only get so much from a fixed income let those with money and those who us it pay to make it better

not needed

I don't think we have any choice regardless of this questionnaire

don't have enough info to answer

we don't use the wabash

the funds should come from else where. Its hard on retired people to keep exepting increases

do not use. The River belong to the state

let those companies that dirty it, clean it

absolutely not. We are on fixed income-taxed to high

we don't need another added expence, our income is fixed and we are senior citizens, no increase in bills

no government should cut at all levels

hit large companies for dumping, i.e. Eli Lilly before you hit the residents

We live outside of town and already pay too much. Build a Dam make a fishing Lake and Park and charge an entrance fee  
Give us a place to do activities described above

we don't use the river or durkee run ditch ever

retired can't afford anymore fees!!! Still need to eat

we are already paying more for sewer since we get city water/sewer but live outside of city limits

I would want to see the plan for repairing the damage. What's the industry contributing what's the city contributing

the money should come from donations and from the industries polluting the river

there are too many fees and taxes for everything

not until you stop the people/businesses that are dumping into the river system

there have been enough different forced charges. In what you call taxes and don't see a lot for the money I pay. No more

we going to sale the home

83 yrs old if people picked up & cleaned up after their. Wabash River would be like it used to be. Lets clean up people

we are senior citizens and an increase would be hard on our budget

my income is limited, im retired, and these activities do not apply to me or my family

Bills are high enough for us old people. Interest down etc.

fine the people who are the cause of the pollutant, a \$200,000 might make them a little more careful

why???

you can use the money from your building fund increase from when you stop building the building

unless there is a need to meet some designated state/ federal guidelines for basic water quality

we can't pay much more everything is going up but our pay

what is the matter with it now? My life is affected in no way by the wabash river

I thought we just improved our treatment plant for this purpose

limited budget

limited income senior citizen

industrial and city are the most common pollutants not home owners. I am strongly opposed to additional taxes to clean sewer out of the river

not interested in water activities only chlorine pools

I believe the ones that say yes should be charged. I have no reason to use the water ways. I have no family that would use them either. At this point in my life money matters are tight  
the upgrade to the treatment plant should take care of this

senior, no water sports

fixed income

it's a burdin to me as far as paying all utilities, I live on a fixed income

there are people in our area who need more than a clean river for activities

don't use

live outside city limits never use wabash

we pay enough already

only if necessary

how could we be sure the increase would go towards the improvement

I don't participate in any water sport on the wabash

don't use

we are elderly people and can't afford a bigger bill

we do no need fee increase as we are on a fixed income

if the sewage bill is low

sr. citizen will not use the wabash river or durkees run

Bill is high enough and fluctuates a great deal

never use

only drive over

I am already taxed enough on things I don't use

aside from having no intrest in water activities many municipalities discharge intothe wabash . I assem lafayette meets requirements id rather have offending municipalities or industies sudsidize water quality improvement by cleaning their  
we don't do any activities on the river. If you put a gambling boat there then we would

ok as it is

the bill is to high now

im on a fixed income

don't use the waterways

age 84

don't use facilities

don't need anymore rate increases

improving the water quality in the wabash is the respoibility of the federal and state governments/ and should be reqired the whole length of the river.the city should comply with fed and state requirements

the water/sewage bill is high enough without subsidizing yet another pet project. The fact that this would even considered when other infrastructure is obvously needed is absoulutely outrageous

don't use it enough if at all

we do not have extra curricular activities in or around the wabash river

not until every city town and industry north of us along the wabash does the same thing. It would be an impossible task without it

you should be meeting EPA stanards of discharge w/ what you are being paid

we don't fish, water ski swim, wade, boat, row, or kayak. We have to use our money for license plates increases

our family does not have activities on the wabash river

fees are high enough for those on fixed incomes

as a senior citizen 82 I cant afford too many more increases in utilities

I believe that our waterways should be preserved and kept free of pollutants

we don't use it so we don't want to pay more

why?

my wage increase doesn't keep up with all the tax and rate increases

fees are high enough, government agencies need to learn to be more economical stewards of money

I don't ever get in the wabash river and I also don't think if we paid more money would all go toward cleaning it?

not if its not nessesary

manage current monetary resourses more prudently and there would be enough cash to improve water quality from existing income

I am 66 and can barely make it now we pay taxes on top of taxes!

don't think it is a need

taxes are already to high this is just another tax that is unnecessary

sewer bill too high now. City just keeps putting wheel tax, trolley free service. Let the ones who use them pay. Why pay for something that you don't use?

I don't use it

I believe that the persons or company responsible for polluting the river should pay

you need to collect outstanding accounts first and keep current

I would never think of using the river no matter what quality of water. Too dangerous

pay enough for sewage already

we just spent millions to improve the waste disposal plant that should improve the wabash for now

fixed income residents cant afford too many more rate increases

they've already raised mine enough im on a low fixed income and cannot afford anymore

think about it

my S.S. check is already spent with what I already have to pay

I am not involved in any of these things

no unless the improvements can benefit the public for other reasons besides recreation

Decrease

treat the water out of your current profits. Improving water quality of the wabash should have been implemented a long time ago. Every waste water treatment plant should strive to keep the water ways clean

I'm elderly and on a limited income

the river front is not a priority to us

because I have a limited income now or other words can't afford anymore money going out of my paycheck

we are already over taxed

I thought the upgrade & increased sewer fees were preventing any discharge in to the Wabash

no sewer that we were promised

the charge is sufficent, as is

too old for these activities

none of these

retired , fixed income

none

I don't believe that there is any way you'll ever get the local waterways to a safe level of contamination no matter what you do I'm a health care prov. & follow public contaminate level. We go out of county for our water activities

I pay enough now. I can't do water activities because I'm too busy working to pay everyone's fee increases and I haven't gotten a pay raise

sewer rates are high enough

no guarantee of water quality improvement

I have no idea as to how the additional income would be spent

think about it

everything goes up except peoples paycheck

no

no more taxes

already to high

we are struggling to pay our bills right now

We don't use the river and the river is beyond clean up in my opinion

I would be more interested in seeing Lafayette do something about air pollution

our water bill is high enough

why would we need anything else than our 50 million new sewer plant

We pay too much taxes/ fees now charge the user

because I don't use I am 21 yrs old and do not use the Wabash river

I'm retired & on a fixed income I can not afford to pay for everyone's new idea & new taxes & new increases

our current taxes paid for an improvement in sewage treatment plant to improve water quality

I am 87 yrs old and get less than 750 per month

I do not support this effort

we didn't use any of these things we are retired and on a fixed income we are Americans we are paying enough

We would love to see Durkees run cleaned up

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do not use as noted above retired

do not participate in water activities

recent rate increase

last rate increase should do the job

recent rate increase should be adequate

it depends on how the water test now and if it is necessary. All utilities keep going up and I am 70 still having to work to make ends meet

sewer bill is already twice water bill just built new sewage plant

Senior citizen- limited income do not use Wabash river for anything

taxes are way too high already! Why don't you take the shirts off our backs?! Wheel tax was the last straw

not needed

Don't use any of the above and water bill is high enough. It's worth every cent but it's hard to gether all the cents some months

I don't use the river. I am an older retired person

don't think its necessary

funds are already spent foolishly! Rates are to high. City needs to learn to control in spending

I'm 77 do not do any water activities of any kind & wouldn't be happy to pay for something I would never use

we do not create any abnormal pollution

don't want a higher bill

We do not participate in any activities with the river

don't want to pay more \$

We don't use the Wabash & don't want an increase in our bill for those that use it

retired limited income

leave it like it is

fixed income

don't use

I don't use the facilities, so why should I pay

don't use and im getting tired of paying for these things I don't use; trolley, library, welfare, goes mostly to foreigners

the bill is high enough

never used the activities

I shouldn't have to pay for large corp. pollution into the water ways

I don't feel like I should have to pay for something I don't use or my wife

too high now

you need to learn not to spend what you don't have. also have a fixed income

alrigh to improve water quality, don't use the riverbecause it's the right thing to do small rate hike ok if shared by all

I am 82 and live alone on S.S. all I do is take a bathand do laundry

I thought the sewage fee was to eliminate pollution of the river from sewage

1. I feel we pay enough already for sewerand I have enough expences as is 2.im on a fixed income, being a senior citizen so Im already stretching to meet rent and other bills

I don't use the Wabash River

no matter how much my bill increases the factorys and big ag will keep putting run off waste into the river with out paying the penalty

of check marks expl

don't feel I should have to pay for something I don't use

our sewer fee is to high now. Its higher than our water bill

waste from all business including sewer should be within safe limits and if they are not then they need to comply

hard enough to pay bills as it is. Do not participate in any of the water activities

we don't use the river or water-ways for any activities ever not interested in a higher bill

we just spent \$60,000,000 for the sewage dept. there should have been enough left to clean up several rivers

im the only income for our family of six barely make ends meet

I don't use any of these activities or facilities so im not in favor of any increase

don't use no money for increase

due to fixed retirement income this is not a retirement friendly community

because I don't make much money

we do not use the river and also we are on a very fixed income and an increase would be to much  
fixed income have a user fee

I'm poor

city should be meeting federal standards. If not then the city should correct their sudstandard rating. Going above the federal standard would be a waste of time

don't use the wabash river at all

to high now democrats told when it was built it would pay for its self over the years. Just lies!!!

im a senior citizen its hard to budget for everything now im85

not worth it

not without the same commitments from all communities upriver

I moved to lafayette from wisconsin long ago my water bill was \$37 per mon.

I do not use the wabash river for activities

never use any of the water recreation listed

I thought we just finished a new sewer processing area

I thought we just finished a \$50 million sewer project

because we never participate in water activities

don't use the river

Contamination should be paid for by those doing the polluting

don't use it

retired low income

im 89 yrs old and not to well

I am on a limited income and finding it hard to make ends meet. Also don't do anything of the above activities

if I have to pay more taxes ect ill have to sell my house and go on welfare

no we are paying enough as it is. You increase fees all the time

We have subdued the earth. I have learned on questioned it gets added anyway. We will not pay it.

We use the Wabash River for no activities, but any attempt to improve is worth something

not unless the program encompassed the entire length of the river. Local- only action would be futile

It seems to me ' to be an industrial & mismanaged city sewer system that make the Wabash River so disgusting, you fit it!

can't afford

I'm sick of all the increases of everything in this town

We do not use

don't want by bill to increase

depends on the amount of the fee and what fee would be used for and potential benefit

I don't use the river

the cost of living in Lafayette are outrageous as it is no more please

our bill is already 50 to 60 a month

I feel that I am being taxed beyond what is reasonable from federal, state, local govt.

Do not need any more fees. On limited income. Besides it is a state water way let the state support in some way not a local fee

No, we pay enough now

this may only improve quality south of Lafayette It needs to be improved much farther north

We have been taxed to death. Get the money from the GLTPC budget they have too much money

I don't have the money too

Have a cottage on lake freeman

all we do is cross the river on several bridges It's high enough now

No I do not use any of these facilities. Use the fishing & hunting license tax ,the boat tax, the new license tax. Stop charging me for money when you waste so much we give already

we pay enough now

I'm on small fixed income . Husband passed away 9-7-04

just don't think we should be charged to keep it clean

I,m never crazy about increased bills

Do not understand how sewer fee helps determine water quality from h2o coming upstream or as rainfall run off

Our family does not use it now & would not use it ever. Let the people that use it pay for it There is always an increase for something when does it stop

tax hog industry! Our River pollution is mostly from farmers Not city sewers. Tax the polluters now

What for exactly? New sewer facility? Cleaning water ways?

Tax those who are polluting! Stop the pollution! Tax the farmer or industry

since 1989 my water bill has gone up from 8-10 per month to 60-70 per, I can't afford it

my water & sewer bill is too high now

why should I pay more for something I don't use

I am the only person living at this address< my husband passed away 10 months ago and I'm the one to pay the bills

do not use any of these

fixed income

We don't feel the river is very clean in the first place Therefore a higher fee would not help

No I don't want to be charged. I don't use the river. I stay out and away from it

I'm paying enough as it is

we are over taxed now

I'm not aware the water quality needs to be improved; therefore, see no reason to increase residents bills

I don't feel it is in the best interest of the majority of our community

durkees run what's that

already pay to much

water quality will be affected by those upstream not in this county

fixed income

should come from some other source for recreation activities

we ran the clean Mary for years never saw any good from it. What is the plan?

no

I pay enough as it is- that is an extremely large increase for someone else's use

But only if it meant that the Wabash wassuitable for summer

Do not use it. Do not want to pay for it

Because we do not use for recreation

Municipal sewer is not the primary problem

Because things are going up so much anymore

It cost to much anyway. Let those who use it pay for it

sewer bill high enough

emission from our sewer plant meet guidelines, promble exist from sources on the river both up & down stream, this area includes W Laf. Sewer plantwhat about their emissions to dirty to use

as long as it wasn't a hugh increase

It should not be my bill to pay but instead a benefit of living in Lafayette

No new taxes

It's as if we have a choise!!! The elderly are forgotten, but we still give & give

the wildcat & tippecanoe rivers dump in the Wabash and they run thur farms & Homes sections which would not be participants in any clean up

it should come from the federal government

The sewer/ water bills are already diffiiclt for low income people top pay

I never use any area. Should charge then when they come for activities. Make a booth. Sell tickets

I think we pay enough as is

I don't use the water activities

I'm still paying for the new sewage treatment plant. IF funds are not available, don't clean it. City needs to live within its means& stop increasing taxes & fees

I don't do any of the above activities & my sewer bill is high enough

Put a River boat casino on the Wabash - use profits to improve river

it would still be a nasty, muddy river

For the reason, I could barely pay my bill! I already get being a single parent & with all kinds of bills& payments it hard

The city has just improved amount of waste water they can handle, we have spent millions of dallors to do this when will this be enough for you politions

can not afford high bills

we can't even get decent drinking water. Drinking water has to be filtered in our house because of taste & smell. Sewer service is to high in the first place

Why?

Not adequately informed on this issue in order to agree to increase

We are older people who would not benefit from any of these activities

we live on a fixed income and don't need an increase in our bill. We don't use the river for these activities, let those who use it pay for it

I believe city officials are over paid. Not all water goes in sewer. Cost too much now

don't use near what neighbor uses

we do not participate in water activities in Ind.

sewer fees are too high as it is

over taxed already

We don't use Wabash for any of these activities

stream line your expenses as a private business does. DO NOT charge more for extravagant spending

I don't do any water activities I don't pollute the river, I shouldn't have to pay

would swim if there were a park & lifeguard type place. Maybe a boat rental place downstream too

I do not live by Wabash & have never in my life been in it or by it

I would want to know how much could increase quality while factories and others dump toxins in. I wouldn't swim or eat anything out of it. It's a shame if you actually could clean it up I would gladly pay my part

I'm a full time student at PU & it is hard enough for my wife & I to pay for the bills as is

I thought that was what the last increase was for. With all the revamping done at the plant

only if it is a small amount and only if it goes for the clean up & prevention of contamination

I'm 91 and on very limited income. I'm sorry I can't help

don't use it

on limited income. Just charge those who use the water way

is not the new treatment plant that has already raised it doing anything to improve it

I'm in favor of the people that are using the river for recreation to foot the tax bill

like so many other things I am paying for that I never use

I have a low income & I have a struggle keeping up on my current bills

I'm not able to enjoy these activities--old

If the sewage treatment plant is doing its job now why should we have to pay more. I thought it was just upgraded

I am not contributing to the pollution put in the water so why should my sewer bill go up. Why not increase patrols on water and have those responsible pay fines to clean it up

it's high enough

it would depend on what was going to be done with the money

the sewer fee is already high. We are retired and on a fixed income

our water bill is high enough each month- not necessary to add more on- plus we don't use the Wabash

don't want high bills

it's high enough now

cause it's all I can do now to pay my bill

sewage is high enough you don't give breaks in my bill when I fill my pool

It depend on what it entails

feel we are being taxed to death now for some services we can't or do not use ( trolley for exp. river would be another)

I don't participate in any water activities

fixed income

we use none of the above

although let's please attempt this with a majority vote unlike the wheel tax let's not worry who's up for re-election

don't we have enough special/ special interest taxes fees in Laf. / Tippe Co. already ie; trolley tax/ wheele tax. Stop already no more special add-on fees please

my bill was expensive enough- I don't benefit on any recreation above because I'm afraid of water

river cleans itself

I don't use the water , but rather walk along beside/hear it

I'm on mostly small SS for income Water & sewer bill almost to high to pay now

use money aviable grants ect.

retired enough increases

after being hoseed by trolley & wheel tax, Retirers can't afford more tax increases even under the disguise of a sewer user fee

I feel our water & sewage is to high now

Widowed, retired and on SS

We just had an increase! Don't entertain this idea any further

never use

fixed income

don't feel needed

I feel the water rates are already too high

I'm on fixed income Single mom with childern

price is already too high

why?

taxes are high enoughbe creative and use what you have now

I only look at the wabash--recreational users should enjoy the fee increase-not us if absolutly necessary than a low increase

I have enough bills

Because we don't use the river

we pay enough already

I would not like an on going fee that I'd have to keep paying for years I would consider a one time donation

very poor living off small SS take 9 meds. No insurance sorry I can't help

do not use

I don't want to spend more money

we pay enough in taxes, if people using waters charge them more taxes not everyone else

I have enough bills to pay

because as a tax payer I pay to much in taxes and other fees now

I would want more info. On the quality of the river nowect. And how the increase of the tax would benefit me & the community

can't afford to live the way it is now

I think I'm paying quite abit now

The water bill is already too high.

Don't use

we don't use the river

To much now

I do none of thses activities, why should I pay anything

fund through user fees, permits, licenses,ect.

I need to see how and why there is a need for fee increase in this area

I don't use the river enough

sewer fees are already high enough

I don't participate in any of the Wabash River activities

don't use

not applicable

senior citizen can't afford

the money would be spent on upgrading the older sewer system

some of the same old thing. Our pay didn't go up but you want more money.

we are on a fixed income and our medication has just went up.

fixed income

I don't use the river for anything

however we would need to see how these improvement are being made- assurance that work is actually being done to improve water quality

don't go on or participate in any activities along the river

NO !! Cost of living increases but my pay doesn't

no means no

property taxes up, wheel tax added, grocery prices up, everything up. My paycheck isnt up. Im not rich believeme enough added cost. Don't you think?

how?

do not use the Wabash River. Everything in this town cost to much as it is. It's not the pubics fault the city doesn't manage there money well

no I am on a fixed income

most pollution is caused by agriculture and industrial runoff. They should pay.

this does not improve my wate I'm paying for my sewage! Or charge increase by # of people in family

I'm over my head in debt

I pay enough already

no

we don't swim in the Wabash

its too high now no more increases !!!!

too many things increasing at this time. It is a good idea but for me, it's not a good time

retired and on a fixed income

water is already more expensive in the summer. Use some of that

of all the cities we've lived in Lafayette has the highest water/sewer fees

we just don't have any money. I'm all taxed out!! The Wheel tax will get my money . Water or wheel ?

New sewer plant should be able to do the job without any other devices

you & everyone wants/needs a increase- only few dallors/cents time! Where or how do I get my pensions or SS increased?

never use Wabash River

the rate is high enough

the current water quality of the Wabash is not where it's at because of anything the pubic has done, and yet the bills to clean it up are charged to us. This makes no sense

My water stinks & brown

all of your suggestions below are to high. How are you going to control what's upstream

I feel we have piad for any new sweage treatment required

the WWTP was just expanded after years of people in the city limits paying higher sewer bills

I'm on a fixed income. Just can't take many more raises in bills

sewage rates high enough

on fixed income health ins. Takes over 1/2

on fixed income

I think the factories or persons responsible for contaminating the river should pay

never participate in above activities

what needs to be done?

senior, have hard time paying bills and buy all the meds. I need

rates are high enough

improvements must come from the north. The city of Lafayette might improve water quality southward but not on my bill please! In your report: we've made adequate improvements

it would be a never ending task to clean up the water in the river with up stream pollution

multi-million dollar expansion just completed should do it

Why? Wheel tax, gas (river tax )?? No increase!

on fixed income

charge a user fee for boating, most people don't use the Wabash that much

Retired, on fixed income and fed up with increases in everything

the river is a sewer

living on SS and have to dip into savings to make ends meet

no

how much?

I can barely make my bills now I wouldn't want an increase in my own bill I think that people who can afford to should if they want & you can add it onto their bills

I do not use the water

rates are high enough get it done with in current structure

that should be up to the big companies and farmers that pollute our river

never use it

senior have enough of a high water bill

let people who use these services pay. Us seniors pay for things now we don't use

paying for a 60 million dollar sewage plant

do not use in of those activities

on fixed income

we do not use any of facilities We are in our 70's and too old and shouldn't have to pay for such luxuries

don't use any of the above. on fixed income

don't use the river. Charge those who do not fair to charge everyone

on fixed income with everything going up it's hard enough to get by

water high enough on fixed income

let those who use it

absolutely not

on fixed income can't afford more expenses

pay enough for water & sewer don't use these activities so why pay anymore than we do now

we've had enough increases stay In a budget

pay ot much as it is

what next?

No not applicable do not use any of the above

we would like more info. Before making decision

put the increase on all types of boats or other activities by license like hunting

The Wabash water shed is used by many, including those outside Lafayette, This should be a state/dnr thing

we are saving to pay our wheel tax- no more increases needed

what choice will I have?

because don't use

we are retired on a fixed income

we do not use the Wabash River for anything

never use any of activities

What is the purpose of improvement? Where is the pollution coming from? This request is to high

5/4/2005

No not willing or think necessary to increase water service rates to my home to beautify the river area  
don't think the quality of water is that bad!  
I don't use it and can't afford it  
We don't use the Wabash River  
I never go to the Wabash River I would not be willing to accept a increase  
Nature will keep the water clean if compamies and people don't dump in it. Those companies should pay  
no amount of filtering the water will keep people from dumping litter in the Wabash river  
All utility bills keep going up every year & we don't need any more increases  
I do not partake in any of these activities  
on SS to not able to do anything anymore  
no increases  
my sewer bill is high enough. Also the Wabash has a mud bottom & no amount of monies will fix that  
Fees are nothing more or less than an additional tax We are already taxed enough  
Don't have much to live on  
for retired people we do not need a rate increase  
never use these receational facillities  
we pay 17.17 for sewer more than water , Our drinking water taste terrible  
no  
taxes to high the trolley tax is a dumb thinghusband in nursing home I have to pay all house hold bill  
do not use the Wabash  
rather not or maybe 2.00  
we never use the Wabash  
5.00 at most  
I don't have the money  
to high now

too high already

we are senior do not use these facilities

do not do any of the above activities

sewage is high enough. Toilets don't flush properly when water table is high need to remedy these problem first

can't afford it !

sounds like a backhanded way to pay for the sewer plant

I don't use any of them any more

let those who use it pay for it NO NO NO remember the blue boat that rusted away on the Wabash?

we go elsewhere

no!!

this should have been done years ago and didn't they buy the queen mary

do not increase fees on my bill

going to be another tax, we are taxed to death for non-essentials such as free trolley, biking & walking trails, try user fees for all the frills

I do not use the water for activities

on a fixed income

things are costly enough as it is. We also stick to drinking spring water

water quality is presently ok. No increase necessary

no more than 5%

retired on a fixed income

we never use it

we are retired on a fixed income

we are retired on a fixed income

any increase on any bill puts a strain on our pocket book

it's too high now

don't use

5/4/2005

no state tax should pay

I believe the current water quality of the Wabash River is acceptable. Also improvements here have no effect up stream

funds already tight

our sewer bills are high enough as it is- let those who use the Wabash River pay the extra sewage

I'm not made of money Tax payers are already paying far to much

fixed income

sewer bill is already too high

retired to old

no interest in any of these activities- charge user fee and stop raising our taxes and fees!!

we have enough fees, taxes,surcharges, and do gooders the trash comes from upstream

we don't go to these places nor do my family can't afoord the increase

only thing I put in is bathroom usual kitchen

senior on limited imcome

I think improvements can be made with better management of current funds

if reasonable

Haven't got much to spare

don't use the Wabash River

I use none of the above activities

put extreme fines on pollutors not on general public

charge people using these water ways

can't afford anymore. Let big companies that polluted it foot the bill

user should pay

let user pay Sewage to high now

NO until I know amount

on fixed income, Also do not use the river

5/4/2005

Page 50 of 55

my current water/sewer bill is twice that of any place I have lived

on fixed income, senior citizen

retired person

on fixed income

senior citizen

Why should I?

12yrs ago water 20 now 56.77 cut the budget no more spending

checked never on all activities

I do not use these facilities

never use the water for these activities

would like info. Stating what the condition of the water is now

I don't use

I don't use the Wabash river charge those that do

I really never go to the Wabash. It's already filthy

It's too high now

on fixed income

on fixed income, when able will try to help out

our bill is high enough

on fixed income

I don't use it

not a benefit to me

on fixed income

to many increases for my pocket book

collect the 1 million in back payment

don't use river

don' use Wabash River No increases

bill high enough

bill already to high

can't afford increase for others fun

never been near the river

homeowner bearing brunt of everything. Pockets empty

I/We don't use it.

I pay my bill, I can't afford to pay more when other people owe bills and don't pay. Nobody helps me pay any of my bills If I get help it all comes from my children not the government

too old to have more tacked onto my utilities not enough finances to spread further

Those who contaminate the water should pay for cleaning up the water- we are already paying for our sewer clean up with our present sewer bill

I never use the Wabash River for any activities

You just raised the rates for a new sewage plant. I don't use the Wabash River. NO INCREASE

Retired old people

NO Pay enough

I've been paying a sewer levy for 30 yrs , I'd like some return on that

water bill is high enough! We don't participate in activities around the river, So we wouldn't reap the benefits

I do not use the Wabash River or Durkees Run for any activities. I do not pollute the Wabash or stream I recycle all I can

I don't use it can't spend peoples money on stupid stuff. Feed your neighbor instead. Quit raising taxes

What happened to the lottery helping these kinds of things

There have been many tax cuts to my childrens school & I'd rather any increase my household would have go to the school system

limited income, Retired, small SS

Bills to high now the poor people can not live. Lower rates for us Don't send people to the poor farm due to utility costs

We do not participate in the activities

The city needs to find better ways of managing their resources

Find \$\$ within the department prior to a new fee

don't use Wabash & it should be federal responsibility - otherwise a state responsibility or a fee for use should be charged at the river

sewer bill is already 132% of water bill while our rental house is in Lafayette we live outside city

small please

Why should I pay for what industry was allowed to do by lax gov. regs.

no increase

never use the river. Water cost enough

We do not use the Wabash River

the sewer fee is fairly high now and has gone up significantly in the last few years; Our income has not

I do not use the river

No suppose to be ind. Worries

The wabash is gross. Even though I don't use it for recreation others do they should be able to enjoy it w/o fear of contamination

We are 80 plus we do not do any of the above. Our bills are to high now

don't utilize either Wabash or Durkees Run

it depends on how much the increase would be

no one really wants a higher bill

I don't use it

do not participate in any water activities

We pay enough as is

I don't use any of the above activities

I believe this should be cleaned up by the state, not Lafayette.

It's the factories that are ruining the water - why should we pay for that? Make the factories pay all of it. We used to be in the river (city limits) daily.

Do not live in your community

We're paying too much now. I'm an apartment owner. I'm making less not than ever mainly because of this property tax and increase in competition. I've had to lower my standard of living, it's time the government does too.

I don't use it. Why make us pay for things we don't use, like the wheel tax. There are a lot of people exempt but use the roads without paying. Your minds are already made up. You will apply the fee anyway - why send out this survey?

I work and live alone and my income is limited

Improving water quality is entirely irrelevant if the river remains unsafe for any kind of moderately prolonged human contact. The state of the river is entirely unacceptable. Has to do with upstream communities - without their cooperation - no

To clean the system you would have to stop dumping from farmers and factories, then dredge all the system, kill the fish and restock all life. If you want someone to pay, ask prior mayor and board of directors to pay.

Homeowner should only pay for their share which assume is in the monthly waste billing. If we now have a serious problem this should have been corrected before a major increase is required in monthly sewer charges.

Don't do any water activities. I think as it is now, it's already too high. It's half the water cost and I use a lot toward watering the yard, which doesn't get into the sewer.

I am a cripple, 84 years old. I only use water to drink, do laundry and bathe. I have to live on a pension.

I fish Parke Co. and St. Joe Co. four times a week. Fish in the Wabash are trash. The bill is already too high.

Make the factories pay for ALL of the clean-up - they ruined it.

We have lived here since 1954 and never done any of these activities. With all costs rising, this is the least of our concerns.

Do we have a choice? Why should we pay more when supposedly we already had upgrades done a few years ago? Also this should have been addressed all along. We should never be polluting the river.

Enough taxes are being imposed now. Politicians need to stop spending just because they think they have to do something while in office. Try maintaining.

I'm on Social Security and already have to juggle my finances to keep my bills paid. My sewer fee is already high enough. It was \$22.07 this past month, my water was \$12.80, so that's close to twice as much as the water fee.

**APPENDIX B  
TYPICAL YEAR ANALYSIS**



# Limno-Tech, Inc.

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## Memorandum

**DATE:** January 13, 2005  
**PROJECT:** GHLAFA1

**TO:** Gui DeReamer (Greeley and Hansen)

**FROM:** Adrienne Nemura  
Carrie Turner

**CC:**

**SUBJECT:** "Typical" Year Analysis for the City of Lafayette, Indiana

## Summary

The purpose of this memo is to document the selection of 1968 as the “typical” year for evaluating combined sewer overflow (CSO), storm water, and nonpoint source pollutant loads on the Wabash River in the vicinity of Lafayette, Indiana. Rainfall and stream flow data were examined on an annual and summer basis, and compared to historical averages to make this selection. The selected typical year will be used by the City of Lafayette to evaluate the effectiveness of CSO control alternatives on water quality in the Wabash River.

After investigating annual and summer rainfall and stream flow conditions for each year, the calendar year 1968 was selected to represent the “typical” year. This year also has eight back-to-back rainfall events (five that occur during the summer period), which will be important when evaluating storage versus treatment alternatives in CSO facility planning. Table 1 provides the statistics for 1968 and comparisons to the annual and summer historical averages.

*Table 1. Comparison of Criteria for Long-Term Historical Record and Representative Periods.*

Ambient Factor	Criterion	Historical Annual Average <sup>1</sup>	1968 Annual	Historical Summer <sup>1, 2</sup> Average	1968 Summer
Rainfall	Number of Storms > 0.09”	<b>82</b>	92	<b>51</b>	60
	Annual Volume (in)	<b>36.43</b>	37.40	<b>25.01</b>	25.30
	5 <sup>th</sup> Largest Event (in)	<b>1.42</b>	1.70	<b>1.22</b>	1.40
	Number of back-to-back storms <sup>3</sup>	<b>7</b>	8	<b>5</b>	5
Flow	25 <sup>th</sup> Percentile (cfs)	<b>2,200</b>	2,825	<b>1,970</b>	2,395
	50 <sup>th</sup> Percentile (cfs)	<b>4,000</b>	4,040	<b>3,430</b>	3,200
	75 <sup>th</sup> Percentile (cfs)	<b>8,410</b>	7,268	<b>6,820</b>	5,823

Notes:

<sup>1</sup> The historical averages are based on 53 years of data recorded from 1949 through 2001.

<sup>2</sup> Summer is defined as April 1 through October 31.

<sup>3</sup> “Back-to-back” storms are defined as storms occurring within 24 hours of each other, with the first storm having at least 0.5” of total rainfall and the second storm having at least 0.09” of total rainfall.

## **Introduction**

The urban drainage, sewers, and the nearby receiving waters in the City of Lafayette, Indiana comprise a complex interrelated system. Several highly variable natural forces, primarily rainfall and river flow profoundly influence this system. Rainfall over the City, when it occurs in sufficient amount, generates urban storm water, CSO, and increased treated wastewater flow. These events can all contribute bacteria and pollutants to the Wabash River and nearby tributaries.

The effect of these contributors on the Wabash River mainly depends on the magnitude and duration of rainfall events and on the prevailing ambient river conditions controlling dilution and transport of the pollutants. This variability and complexity poses a significant challenge to accurately assessing the performance of wet weather and CSO control alternatives for the City. Rainfall and river flow can vary over a wide range of values, and therefore the range of possible combinations is impossible to adequately define using a set of “design” or “reference” rainfall and river scenarios (e.g. a 6-month design storm).

A design storm approach can result in significant “over-design” of wet weather controls. This is because regulatory and public attention tends to focus on the improbable worst-case combinations without an objective means to put predicted river water quality into proper perspective. When sufficient long-term records are available, continuous simulation avoids these problems by matching rainfall with the actual prevailing river conditions. Therefore, continuous simulation is generally acknowledged as a superior approach for modeling wet weather controls and water quality effects (EPA, 1999).

For these reasons, a continuous simulation approach will be used to evaluate the effectiveness of potential controls of the Lafayette combined sewer collection system. This approach will be used with the collection system model (SWMM) for the City of Lafayette and the Wabash River Model developed for the portion of the river near the City. These models require hourly rainfall and daily average stream flow for a typical year. Several candidate simulation periods were chosen from recent and complete data sets to provide representative and unbiased approximations of expected future conditions in terms of both averages and historical variability. Representativeness was assessed using objective criteria for each of the ambient factors (i.e., river flow and rainfall) for which continuous records are available.

## Data

Hourly rainfall data were obtained from the National Climatic Data Center (NCDC) from a gage located in West Lafayette (COOP ID: 129430) from 1949 to 2001. Hourly rainfall data were also obtained for nearby gages in Chalmers (COOP ID: 121415), which is approximately 12 miles north of the City, and Attica (COOP ID: 120328 and 120331), which is approximately 17 miles west of the City. Data from these gages were used to fill in the gaps in the record from the West Lafayette gage. These data were analyzed for their storm characteristics (e.g. total volume, duration, intensity, inter-event duration) using the U.S. EPA’s Storm Water Management Model (SWMM) with a minimum inter-event period of six hours. The storm volumes associated with particular return periods are shown in Table 2.

Average daily flow in the Wabash River is recorded by the U.S. Geological Survey (USGS) at a gage in the City of Lafayette (gage #03335500). Daily stream flow measurements from this gage are available from 1923 to the present. Data were obtained from 1949 through 2001.

**Table 2. Return Periods and Associated Storm Volumes**

Return Period	Rainfall Volume (inches)
50 years	4.29
25 years	4.05
10 years	3.58
5 year	3.22
2 year	2.82
1 year	2.37
6 months	1.91
3 months	1.38
2 months	1.13
1 month	0.81
2 week	0.48
1 week	0.23

## **Methodology**

The methodology used to select a representative period for Lafayette was to evaluate the rainfall and flow data from 1949 to the 2001 to determine a statistically based “typical” set of characteristics. An Excel-based objective function was developed to identify periods within the data records that most closely resembled these “typical” characteristics. One-year, two-year and three-year intervals of the flow and rainfall data records were analyzed and compared to the criteria characterizing “typical” conditions.

To quantitatively assess different periods for use as a “typical” period, a series of criteria were developed that allow a continuous period of time to be compared to long-term historical averages. The criteria include quantitative measurements and qualitative considerations that ensure the selection of a representative period that meets project needs within the available resources.

Criteria used to assess the representativeness of rainfall were:

1. The number of storms per year greater than 0.09 inches. This is roughly the volume of rainfall needed to trigger overflows in one-third of the City’s CSOs (5 of 13) (City of Lafayette Stream Reach Characterization and Evaluation Report, October 2004). Thus, this criterion is a measure of the number of rainfall events that could trigger overflows under existing conditions.
2. The annual average rainfall depth (total inches of rain). This criterion is routinely used as a fundamental indication of representativeness as compared to the historical period.
3. The number of times per year that a storm with at least 0.5 inches of rain is followed by a storm with at least 0.1 inches within 24 hours of each other (e.g. the number of back-to-back storms). The effectiveness of various CSO controls (e.g. flow-thru treatment vs. storage) may be influenced by the frequency of this combination of storms. This criterion is used to indicate the representativeness of these kinds of extreme events in a particular period.
4. The depth of rainfall associated with the fifth largest storm in a given year. Historically, the fifth largest storm per year is 1.42 inches. Thus, for the purposes of the presumptive approach to CSO control (4 overflows per year), all storms less than 1.41 inches will not result in an overflow.

Criteria used to assess the representativeness of stream flow were:

1. The 25%, 50%, and 75% daily average flow in the Wabash River near Lafayette. The nearness to the 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> quartiles measures the selected period’s nearness to the historical flow distribution in terms of high, average, and low flows.

The criteria were analyzed on an annual and summer (April-October) basis. Consideration of summer is important because it corresponds to the recreation season, as defined in the State of Indiana water quality standards, when full body contact recreation is more likely to occur. The number of events, rainfall volume and median flow criteria are the most descriptive measures of “typical” and so, were weighted twice as much as the other criteria (the number of back-to-back storms, the 5<sup>th</sup> largest event and the quartile flow criteria) in the data assessment.

## **Selected Period**

Several candidate periods were identified as “representative” using the criteria described in the previous section. Candidate periods were limited to three or fewer years of duration to accommodate limitations in computer and project resources. The criteria for four one-year periods, 1968, 1970, 1971, 1984 and 1994, most closely matched the criteria of the historical period on an annual basis. Because the annual rainfall depth for 1971 and 1984 were more than an inch less than the historical average, these years were deemed less desirable than the other years that were identified as good matches. Of these years, 1968 most closely matched the criteria of the historical summer period. Each year was ranked according to their fit to the annual and summer periods as well as to both periods overall. The top 20 years (out of 53) according to their fit overall to both annual and summer periods are presented in Table 2.

The monthly rainfall data for each of the top three years (1968, 1970 and 1994) were compared to the historical average, as shown in Table 3. All of the years had months where their rainfall was much greater (% difference > 50%) or much less (% difference >-50%) than the historical average rainfall. The cumulative difference over the entire year was smallest for 1968, indicating that the differences in monthly rainfall compared to the historical averages tended to equal out in this year better than in 1970 or 1994.

The results of these comparisons served as the basis for recommending 1968 as the “typical” year.

Table 2. Statistics for the Annual and Summer Periods for the Years Ranked in the Top 20<sup>1</sup>

Time Period	Annual							Rec Season							Annual Rank	Rec Season Rank	Overall Rank
	Rainfall			Wabash Flow				Rainfall			Wabash Flow						
	Events >.09 in.	Depth	Back-to-Back	Event #5	25th Pct	50th Pct	75th Pct	Events >.09 in.	Depth	Back-to-Back	Event #5	25th Pct	50th Pct	75th Pct			
1949	73	45.90	7	1.89	2,225	4,090	8,068	41	26.80	4	1.50	1,805	3,510	5,023	10	11	11
1951	69	37.07	4	1.76	2,460	4,660	9,520	43	22.88	4	1.05	1,685	3,780	6,100	17	10	8
1959	69	40.87	7	1.81	1,990	3,650	10,300	43	26.78	5	1.40	1,613	2,500	6,128	21	12	16
1960	67	34.68	5	1.20	1,380	3,360	6,340	43	26.61	5	1.20	1,580	3,875	6,340	31	4	7
1961	66	36.88	2	1.25	2,210	3,220	6,468	41	26.18	1	1.23	2,450	3,220	6,638	23	8	9
1965	79	36.67	5	1.20	1,680	2,500	5,930	47	26.80	3	1.10	1,450	2,170	4,513	9	24	18
1968	92	37.40	8	1.70	2,825	4,040	7,260	60	25.30	5	1.40	2,395	3,200	5,823	4	5	3
1970	78	36.10	9	1.50	2,913	4,485	6,558	56	30.00	9	1.30	2,593	4,240	6,520	3	30	12
1971	84	35.60	7	1.60	2,120	2,880	5,975	51	23.30	5	1.30	1,860	2,555	3,823	2	6	4
1974	102	41.50	6	1.30	2,173	5,090	13,875	55	26.50	3	1.10	1,573	2,660	6,693	34	7	20
1982	109	39.10	8	1.40	2,713	6,220	13,500	52	22.70	3	1.10	1,900	3,320	7,065	37	3	19
1983	91	34.30	4	1.20	1,785	3,770	7,180	53	22.80	2	1.00	1,253	2,780	6,633	7	15	6
1984	95	35.10	5	1.20	2,275	3,920	7,045	59	23.60	5	1.20	1,983	3,355	5,798	5	1	1
1985	100	37.30	8	1.60	2,133	3,400	10,950	54	19.60	4	1.00	1,753	2,620	3,835	11	22	17
1987	88	37.70	10	1.70	2,260	3,220	5,238	56	27.30	8	1.40	2,023	2,695	3,768	13	23	21
1991	87	31.10	8	1.20	2,153	5,445	9,238	51	19.60	5	0.80	1,620	2,460	6,838	12	16	13
1994	81	38.00	4	1.10	2,653	4,090	6,728	51	29.10	4	1.10	2,023	3,215	6,355	6	2	2
1999	84	33.40	5	1.40	1,400	2,290	6,963	54	23.40	3	1.40	1,433	2,305	5,133	13	19	14
2000	84	33.30	9	1.30	1,780	2,740	4,500	59	24.10	8	1.10	1,983	2,795	5,310	23	9	10
2001	94	36.00	7	1.20	3,230	5,150	10,000	60	26.20	7	1.10	2,740	4,195	7,533	15	18	14
Historical Period:	82	36.43	7	1.42	2,200	4,000	8,410	51	25.01	5	1.22	1,970	3,430	6,820			
Wt. Factors:	2	2	1	1	1	2	1	2	2	1	1	1	2	1			

<sup>1</sup>Header Notes:

Events > 0.09 in. = Number of events over specified period (annual or rec. season) where total rainfall is at least 0.09 inches.

Volume = Total rainfall depth over specified period in inches.

Back-to-Back = Number of occurrences in the specified period where the inter-event duration is less than 24 hours and the first storm has a total rainfall of at least 0.5 inches and the second storm has a total rainfall of at least 0.09 inches.

Event #5=Depth associated with the fifth largest storm during specified period, in inches.

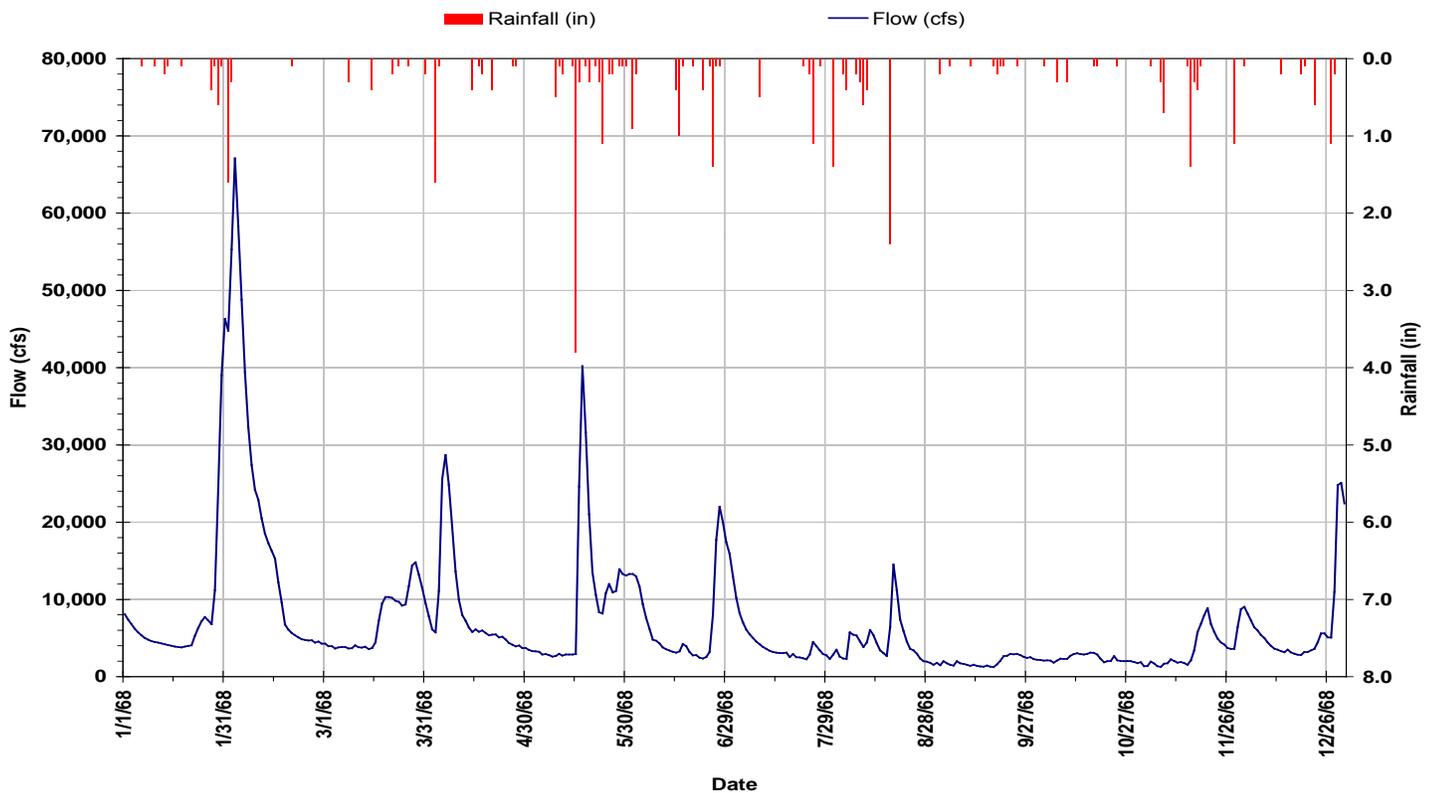
**Table 3. Comparison of Monthly Rainfall Depths to Historical Monthly Average Depths.**

Month	Historical Average Rainfall (in)	1968		1970		1994	
		Actual Rainfall (in)	% Difference from Historical Avg.	Actual Rainfall (in)	% Difference from Historical Avg.	Actual Rainfall (in)	% Difference from Historical Avg.
1	1.91	1.80	-6%	0.20	-90%	1.80	-6%
2	1.73	2.00	16%	0.50	-71%	0.20	-88%
3	2.74	1.30	-53%	2.50	-9%	1.50	-45%
4	3.73	3.00	-20%	7.20	93%	10.00	168%
5	4.01	7.60	90%	4.30	7%	1.20	-70%
6	3.95	4.80	22%	1.80	-54%	5.10	29%
7	4.13	3.40	-18%	6.40	55%	5.00	21%
8	3.45	4.50	30%	1.10	-68%	4.20	22%
9	2.97	1.00	-66%	6.70	126%	2.00	-33%
10	2.82	1.00	-65%	2.50	-11%	1.60	-43%
11	2.76	4.50	63%	2.20	-20%	3.70	34%
12	2.27	2.50	10%	0.70	-69%	1.70	-25%
Annual Total (in)	36.47	37.4		36.10		38.00	
Rec. Season Total (in)	25.06	25.3		30.00		29.10	
Sum of % Differences			4%		-112%		-36%



In addition to most closely matching the criteria for rainfall on both an annual and summer basis, the rainfall for 1968 includes a 1-year storm during the summer period that has a total rainfall of 2.40 inches and occurs in mid-August. This year also has a good distribution of storm sizes, including a very large event of 4.10 inches (~25-year storm) in mid-May, a 6-month storm, and four storms with return frequencies between 3- and 6-months. The 1968 daily rainfall and flow conditions are shown in Figure 1.

**Figure 1. Lafayette Rainfall and Wabash River Hydrograph During 1968.**



## Application

The “typical” year (1968) will be used in the planning and development of the City’s CSO Long Term Control Plan. The rainfall and river flow will provide inputs to the City’s calibrated collection system model (SWMM) and the river water quality model. The hourly rainfall record from 1968 will be input to the SWMM to determine representative collection system overflow characteristics (e.g. number of overflows, total volume) and discharge hydrographs for each of the CSOs. Conditions that will be evaluated include a baseline condition, post-WWTP expansion conditions (completed 05/12/2004), and future CSO control alternatives.

The SWMM results and the 1968 river flow data will then be input to the river water quality model to understand “typical” water quality impacts in the Wabash River due to CSO overflows under current conditions. The river model will also use the 1968 rainfall to estimate CSO and storm water flows generated within the study area (which includes the city of West Lafayette).

The effectiveness of Lafayette’s proposed CSO control alternatives will be evaluated by repeating the SWMM and river model simulations using the 1968 rainfall and flow data with the proposed controls.

## **References**

United States Environmental Protection Agency (EPA). 1999. *Combined Sewer Overflow Guidance for Monitoring and Modeling*. EPA 832-B-99-002.

Greeley and Hansen. 2004. *City of Lafayette, Indiana Stream Reach Characterization and Evaluation Report, Final Report*. Prepared for the City of Lafayette by Greeley and Hansen, Indianapolis In.

**APPENDIX C**  
**BASIS FOR COST ESTIMATES**

## Appendix C

### Basis For Cost Estimates

#### 1. GENERAL

To compare the CSO control alternatives, cost estimates including construction, capital, and operating and maintenance costs were prepared for each alternative. This appendix provides the bases for cost estimates.

In accordance with the **Association for the Advancement of Cost Engineering** definitions (AACE, 1997), cost opinions included in this document are considered to be Class 4: Study or Feasibility level estimates, with an expected accuracy of -15% to +30%. The actual capital cost could be 15% lower than the estimate or 30% higher than the estimates. Cost opinions are of this accuracy because alternatives have been prepared with a minimum of detailed design data for the purposes of relative comparison. This type of analysis is appropriate for comparisons between control programs.

#### 2. CONSTRUCTION COSTS

##### 2.1 Methodology

The following cost bases were used for the preparation of construction cost estimates:

- Construction Cost Index – The Engineering News Record (ENR) Construction Cost Index (CCI) for February 2005 was 7298. An ENR CCI of 7300 was used for the alternatives evaluation.
- Approach to Estimating Construction Costs - costs have been prepared using the following resources:
  - Cost curves from:
    - *Construction Costs for Municipal Wastewater Treatment Plants: 1973-1979* (EPA, 1981)
    - *Manual - Combined Sewer Overflow Control*, (EPA 1993a)
    - *Cost Estimating Manual – Combined Sewer Overflow Storage and Treatment* (EPA, 1976)
    - *Pumping Station Design* (Sanks, 1998).

## Appendix C – Basis for Cost Estimates

- Unit costs in dollars per gallon or cost per linear foot obtained from other projects including Indianapolis and Elkhart. Costs have been adjusted for relative characteristics such as complexity or location using engineering judgment.
- Cost data from similar facilities:
  - Costs from other studies
  - Engineer’s estimates of construction cost
  - Bid tabulations from similar projects.
- Where facilities are unique or customized and cost curve type data does not exist, conceptual layouts of facilities were prepared and costs were estimated by performing takeoffs to estimate quantities.
- Calculation Procedure - the following calculation procedure in Table 1 was used for construction costs:

**Table 1**  
**Calculation Procedure For Construction Cost Opinions**

<i>Line Number</i>	<i>Description</i>	<i>Calculation Procedure</i>
1	Subtotal of Construction Line Items	--
2	Construction Contingencies	25% x Line 1
3	Engineering, Legal and Administrative	15% x Sum of Lines 1 and 2
4	<b>Total Construction Cost</b>	Sum of Lines 1, 2 and 3

### 2.2 Sewer Separation

Data used to estimate separation costs was obtained other cities estimates. Many cities have evaluated separation as part of the preparation of their LTCPs. Estimates or bid costs of separation were available, as shown in Table 2:

## Appendix C – Basis for Cost Estimates

**Table 2**  
**Sewer Separation Construction Cost Data**

<i>City</i>	<i>CSO Drainage Area</i>	<i>Estimated Construction Cost (ENR=7300)</i>	<i>Unit Construction Cost(\$/acre, ENR=7300)</i>	<i>Type of Data</i>
<b>Other Municipalities</b>				
Alexandria, VA	885	\$34,959,146	\$39,502	Estimate
Chicago, IL	240,000	\$20,620,999,368	\$85,921	Estimate
San Francisco, CA	24,995	\$11,168,454,979	\$446,828	Estimate
Peoria, IL	61.3	\$3,332,420	\$54,362	Estimate
Richmond, VA	11,000	\$2,606,196,096	\$236,927	Estimate
Minneapolis, MN	4,000	\$94,439,401	\$23,610	Estimate
Columbus, OH	22	\$1,114,625	\$50,665	Bid
S. Dorchester Bay, Boston, MA	786	\$104,671,275	\$133,170	Bid
Stony Brook, Boston, MA	608	\$55,151,905	\$90,710	Estimate
Cambridge, Boston, MA	250	\$80,056,400	\$320,226	Estimate
Garden City, MI	1,180	\$38,077,245	\$32,269	Bid
Livonia, MI	103	\$1,372,537	\$13,326	Bid
Plymouth Township, MI	138	\$1,194,543	\$8,656	Bid
Wayne, MI	288	\$8,469,135	\$29,407	Bid
Westland, MI	409	\$10,886,472	\$26,617	Bid
Bloomfield Hills, MI	86	\$2,094,534	\$24,355	Bid
Indianapolis, IN	35,405	\$6,201,000,000	\$175,145	Estimate
South Bend, IN	8,872	\$443,600,000	\$50,000	Estimate

The costs of separating the combined sewer area in Lafayette was estimated as follows:

- Zoning maps were obtained from the City. This land use map classified the entire area by development type (single-family, multi-family, commercial, industrial, or open space). For the purposes of calculating separation costs, each development type was assigned a category of low, medium, or high, as shown on Table 3.
- Based on the land use map, the percentages of each combined sewershed according to category were calculated.
- The total cost of separation for each combined sewershed was calculated by multiplying the acreage of each category by the unit cost per acre for each (\$100,000 for high, \$75,000 for medium, and \$50,000 for low). These costs were estimated based on review of the existing data.

**Table 3**  
**Sewer Separation Land Use Data**

<i>Land Use</i>	<i>Density Used for Cost of Sewer Separation</i>
Single Family	medium
Multi Family	high
Commercial	high
Industrial	medium
Open Space	low

### 2.3 Regulator Structures Modifications

Regulator structures control the diversion of CSO flow from outfall sewers to downstream facilities such as interceptors, retention facilities and treatment facilities. A cost of \$50,000 per active regulator was used for modifications to the structure.

### 2.4 Conveyance Pipelines

Gravity sewer costs were developed from actual construction costs including pipe, manholes, bedding, excavation, backfill, pavement restoration, and dewatering. The unit costs were increased by 50% for construction in urban congested areas for traffic control and disruption costs, and utility relocation and replacement cost. The construction cost data are plotted on Figure 1.

Force main costs were developed using bid tabs, manufacturer’s costs for pipes and unit costs in Means and other estimating references. Costs include manholes, sediment and erosion, thrust restraint, and pavement restoration. A pipe depth of 4 feet was assumed. Costs are summarized in Table 2 below.

**Table 4**  
**Unit Construction Costs for Force Mains**

<i>Pipe Diameter</i>	<i>Unit Cost (\$/linear foot)</i>
12"	\$94
16"	\$133
18"	\$146
24"	\$170
30"	\$186
36"	\$229
42"	\$251
48"	\$271
54"	\$305

## 2.5 Pumping Stations

Cost data for pumping stations were obtained from actual facilities, EPA cost curves, and Sanks (see references). The construction cost data are plotted on Figure 2. A best-fit polynomial equation whose values were greater than or equal to most of the plotted values was developed. The equation for construction cost as a function of flow rate (MGD) was determined to be:

*Up to 300 mgd:*

$$Cost = (Current\ ENRCCI/7300) * (0.0351(mgd)^3 - 143.82(mgd)^2 + 244,210(mgd) + 319,291)$$

## 2.6 Sedimentation/Storage Basin

Costs for CSO storage facilities were obtained from actual facilities and from EPA cost curves. Costs are summarized in Table 3 below.

Table 5  
Existing Storage Facility Construction Cost Data

<i>Location</i>	<i>Storage Volume (mg)</i>	<i>Construction Cost (Millions, ENR=7200)</i>	<i>Unit Cost (\$/gallon, ENR=7200)</i>
Mariposa - San Francisco, CA	0.7	\$14.69	\$20.98
Fitzhugh – Saginaw, MI	1.2	\$7.24	\$6.03
Seven Mile – Detroit MI	2	\$18.54	\$9.27
Union Park – Boston, MA	2.5	\$43.04	\$17.22
Eliza Howell – Detroit, MI	2.8	\$22.49	\$8.03
Salt/Frazer – Saginaw MI	2.8	\$16.72	\$5.97
Seneca WWTP – Washington D.C.	3	\$4.08	\$1.36
Chattanooga, TN	3.5	\$7.22	\$2.06
Webber – Saginaw, MI	3.6	\$10.66	\$2.96
Acacia Park , MI	4.5	\$17.18	\$3.82
Narragansett Bay , RI <sup>1</sup>	5	\$32.93	\$6.59
Emerson – Saginaw, MI	5	\$23.82	\$4.76
Birmingham, MI	5.5	\$15.58	\$2.83
WSSC – Rock Creek	6	\$23.90	\$3.98
Sunny Dale - San Francisco, CA	6.2	\$28.73	\$4.63
14 <sup>th</sup> Street – Saginaw, MI	6.5	\$18.78	\$2.89
Weiss Street – Saginaw, MI	9.5	\$32.32	\$3.40
Bloomfield Village, MI	10.2	\$35.72	\$3.50
Edmund – Oakland, CA	11	\$36.51	\$3.32
Yosemite – San Francisco, CA	11.5	\$29.89	\$2.60
Tournament Club, Detroit	22	\$66.77	\$3.03
North Shore, San Francisco, CA	24	\$119.96	\$5.00
Market Ave. Retention Basin, Grand Rapids, MI	30.5	\$43.33	\$1.42
Shockoe basin – Richmond, VA	38	\$58.78	\$1.55

EPA has also produced cost curves for offline covered storage with V=volume in million gallons as follows:

$$\text{Covered Sedimentation/Storage Basin Cost (\$M)} = (\text{Current ENRCCI}/7300) * (5.516 V^{0.826})$$

EPA’s cost curve and the construction cost data from actual facilities are plotted on Figure 3. As shown on the figure, there is a broad range in actual facility costs. This is due to many factors, including site constraints, geology (e.g. piles or rock excavation required), unit processes included with the basin such as screening or disinfection, and the need to mitigate impacts to the surrounding neighborhood such as including odor control. As an example, the Mariposa facility in San Francisco and the Union Park Detention Center in Boston are two facilities with the highest cost per gallon stored (\$20.98 and \$17.22 respectively). In the case of Mariposa, the storage facility is an underground, custom-built storage transfer box with small volume (0.7 MG) and varying width (from 20 to 30 feet

along its length) in a heavily urban setting. The Union Park Detention Center project included retrofits to an existing pumping station in addition to the construction of four underground storage tanks, fine screens, disinfection, and two sewer diversion structures with control gates.

For the purpose of this study, the cost equation for a covered sedimentation/storage basin was used in developing the cost for facilities at satellite locations, and the cost equation for an open sedimentation/storage basin was used for developing cost for sedimentation/storage basins at the wastewater treatment plant.

### 2.7 Enhanced High Rate Clarification

Cost for enhanced high rate clarification facilities were developed by performing quantity take-offs for different sizes of treatment facility. Kruger Actiflo provided equipment costs for the quantity take-off. From the quantity take-offs, the following equation was derived:

$$\text{Cost} = (\text{Current ENRCCI}/7300) * (-0.0309(\text{mgd})^3 + 50.042(\text{mgd})^2 + 75,403(\text{mgd}) + 2,000,000)$$

### 2.8 Vortex Separators

Cost for the vortex separators is obtained from the USEPA cost curves, which is applicable for facility sizes in the range of 3 and 300 mgd. These costs have been compared with local construction cost and have been found to be about 20% lower than actual construction cost. A local factor of 120 percent will be applied in the complete calculation.

$$\text{Cost} = (\text{current ENRCCI}/6635) * 0.243(\text{mgd})^{0.611} * 1,000,000$$

### 2.9 Compressed Media Filter

Costs for the compressed media filters were developed by performing quantity take-offs and obtaining equipment prices for different sizes of facilities. From the quantity take-offs, the following equation was derived:

$$\text{Cost} = (\text{current ENRCCI}/7300) * (2252.4(\text{mgd})^2 + 1657(\text{mgd}) + 2,000,000)$$

### 2.10 Screening Facilities

Costs for screening facilities were developed by performing quantity take-offs for different sizes of screening facility. Waterlink provided equipment costs for the quantity take-off. From the quantity take-offs, the following equation was derived:

$$\text{Cost} = (\text{Current ENRCCI}/7300) * (0.0000004(\text{mgd})^5 - 0.0008(\text{mgd})^4 + 0.5828(\text{mgd})^3 - 166.19(\text{mgd})^2 + 27,591(\text{mgd}) - 161,319)$$

### 2.11 Chlorine Contact Tank

Costs for the disinfection system were developed by performing quantity take-offs for different sizes of facilities. These costs are based on a contact time of 15 minutes. From the quantity take-offs, the following equation was derived:

$$\text{Cost} = (\text{Current ENRCCI}/7300) * (-0.0002(\text{mgd})^4 + 0.2717(\text{mgd})^3 - 120.92(\text{mgd})^2 + 40,534(\text{mgd}) + 436,059)$$

### 2.12 Chemical Storage Building

Costs for the chemical storage were based on a prefabricated building with a cost of \$150 per square foot. The building would be sized to store enough chemicals to treat back-to-back storms with a chlorine dosage of 10 mg/l.

### 2.13 Solids Storage Tank

Costs for solids storage were developed by performing quantity take-offs for different sizes of storage tanks. The tanks are sized to store solids from back to back storms. A TSS concentration of 5000 mg/l and ½% sludge was assumed. From the quantity take-offs, the following equation was derived:

$$\text{Cost} = (\text{Current ENRCCI}/7300) * (4,000,000(\text{mg}) + 324,199)$$

## 3. CAPITAL COSTS

Engineering, legal and administrative fees are added to the Total Estimated Construction Cost by a factor of 15%. This amount is anticipated to cover normal administrative soft costs, exclusive of condemnation, hazardous waste or unique engineering considerations.

### 4. OPERATION AND MAINTENANCE COSTS

Operation and maintenance (O & M) costs were estimated using the following bases:

- Labor – Labor costs and requirements for the various CSO alternatives were based on the average cost of maintaining a single operating post manned by one operator on a 24 hour, year round basis. Operations labor is approximately \$16.50/hour plus 25% for benefits. Thus the average cost of one position was approximately \$60,500. Assuming an eight hour workday, with three shifts per day, for 365 days per year, the average cost for a Continuous Operating Post (COP) would be \$181,000. The number of COPs required for each alternative was determined on a case by case basis.
- Maintenance costs for facilities were taken as a percentage of the construction cost.
- Treatment costs are only for enhanced high rate clarification. This costs includes coagulants, polymers, and sand needed for operation.
- Power – electricity costs were based on the unit cost per kWh.
- Chemicals – chemical requirements were determined for each CSO control alternative based on the particular design requirements of that facility. Unit chemical costs were estimated based on quotes from chemical suppliers.

**Table 6**  
**Operation and Maintenance Cost Basis**

<i>Item</i>	<i>Unit</i>	<i>Cost Basis (per year)</i>
<b>Operation</b>		
Conveyance pipelines	--	Included in maintenance cost, see below
Sedimentation/Storage Basins		
Up to 10 mg	COP	0.5
Over 10 mg	COP	1.0
Pump stations		
Up to 100 mgd	COP	0.5
Over 100 mgd	COP	2.0
Enhanced High Rate Clarification (EHRC)	COP	2.0
Tunnels	COP	2.0
<b>Maintenance</b>		
Conveyance pipelines	% of construction cost	0.25%
Sedimentation/Storage Basins	% of construction cost	3.0%
Pump stations	% of construction cost	3.0%
EHRC	% of construction cost	3.0%
Tunnels	% of construction cost	1.0%
Vortex Separators	% of construction cost	3.0%
<b>Treatment</b>		
EHRC	MG	\$120
<b>Power</b>		
	KW-Hr	\$0.05
<b>Chemicals</b>		
Sodium hypochlorite, 12.5% solution strength	Gallon of chemical	\$0.70
Sodium bisulfite, 38% solution strength	Gallon of chemical	\$0.78

## 5. NET PRESENT WORTH ANALYSIS

All costs were compared on a net present worth (NPW) basis using the following methodology and assumptions:

**Table 7**  
**Net Present Worth Assumptions**

<i>Item</i>	<i>Description</i>
Planning Period	20 years
Salvage Value of Capital Facilities	\$0
Inflation Rate	3%
Interest Rate (i.e. cost of money)	7.0 %

## Appendix C – Basis for Cost Estimates

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For comparison of alternatives, capital expenditures were assumed to occur at year zero. Annual O & M costs were inflated each year at the inflation rate throughout the planning period. The interest rate was then used to bring each year's operation and maintenance cost to year zero to calculate the Net Present Worth of O & M costs.

### 6. REFERENCES

Association for the Advancement of Cost Engineering (AACE). 1997. *Recommended Practice No. 18R-97: Cost Estimate Classification System*. August 12, 1997.

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Sanks, Robert L. 1989. *Pumping Station Design*. Butterworth Publishers, Stonham, MA.

**APPENDIX D**  
**UPSTREAM BOUNDARY CONCENTRATION TIME SERIES**



# Memorandum

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TO: CLT

DATE: January 11, 2005

FROM: JRV

PROJECT: GHLAFA1

COPIES:

SUBJECT: Upstream Boundary Concentration Time Series

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## INTRODUCTION

The purpose of this memorandum is to summarize the approach that was used to specify concentration inputs at the river model's upstream boundary for the typical year. This approach is based on a statistical analysis of IDEM and City of Lafayette *E. coli* sampling data and the corresponding flow conditions in the Wabash River recorded at the USGS gage in the City.

The City of Lafayette conducted in-stream sampling between November 2000 and August 2002. Sampling was conducted to capture the effects from a range of rainfall events on water quality in the Wabash River. Rainfall volume, intensity and duration were considered. The sampling was conducted at three locations in the river, including at river mile 314.14, which corresponds to the upstream boundary of the river model. The City collected 31 *E. coli* concentration data points at this location over 15 separate dates throughout the sampling period. Four events were sampled and are summarized in Table 1. Note that sampling during the first event was suspended because the storm abruptly ended and the event was deemed to be a poor storm for characterizing CSO impacts.

**Table 1. City of Lafayette Storm Characteristics.**

Event No	Rainfall Start Date	Total Rainfall Volume (in)	Maximum Rainfall Intensity (in/hr)	Storm Duration (hours)	Wabash River Flow (cfs)
1	11/6/2000	0.10	0.10	1	2,038
2	10/5/2001	0.94	0.11	29	4,368
3	10/11/2001	1.45	0.40	16	20,129
4	8/13/2002	0.21	0.21	1	1,736

## SUMMARY OF DATA

Upstream concentrations were developed for "wet" and "dry" weather conditions based on measurements taken by the City and IDEM at different locations from 1988 to 2002. Because of the limited data, lognormal distributions were developed for various flow regimes. These distributions will then be used in the river model to characterize upstream sources of *E. coli* for the typical year.

The *E. coli* concentration data collected by the City of Lafayette at RM 314.14 are summarized in Table 2 below. Twenty-six of the 31 samples were deemed wet weather samples based on precipitation data. Precipitation data was taken from the National Weather Service gage at the West Lafayette Airport (WBAN ID 14835). A given day was assigned the “wet” designation if it rained at least 0.1 inches on that day or at least 0.2 inches the day before. If these criteria were not met, the day was considered “dry.”

Table 2 also includes data collected by IDEM, who conducted in-stream sampling for *E. coli* in the Wabash River at river mile 320 between 1988 and 1999. IDEM’s sampling location is approximately 7 miles upstream of the City of Lafayette’s municipal boundary and is also upstream of a major tributary to the Wabash River, Wildcat Creek. Several urban areas along Wildcat Creek have CSOs. The bacteria loads from the wet weather sources in Wildcat Creek likely result in higher concentrations in the Wabash River at river mile 314 than at river mile 320 during wet weather. Therefore, the only data used from river mile 320 were the data collected during dry weather, when the wet weather sources in Wildcat Creek were not active.

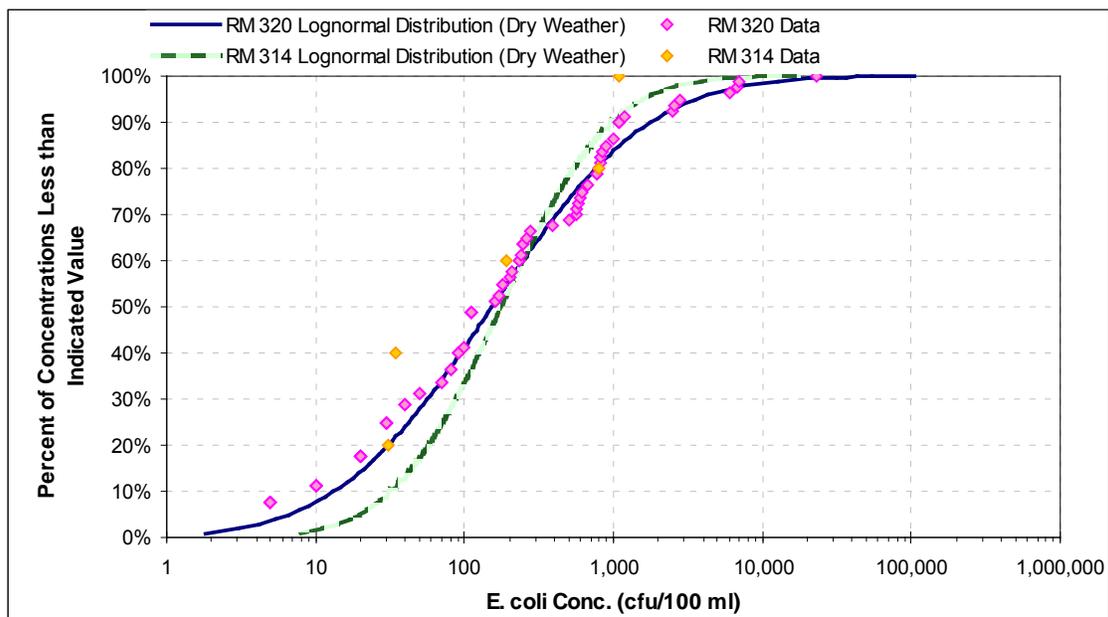
**Table 2: Upstream *E. coli* Concentration (cfu/100 ml) Data Summary.**

River Mile	Precip. Condition	Number of Samples	Minimum Concentration	Maximum Concentration	Average Concentration	Geometric Mean Concentration
314.14	Wet	26	10	7,000	1,281	254
314.14	Dry	5	31	1,080	427	177
320	Dry	80	5	23,000	889	152

## **DRY WEATHER CONCENTRATION EVALUATION**

The dry weather data from river mile 320 were used to verify that the limited dry weather data at river mile 314.14 were representative of dry weather conditions. Figure 1 presents a cumulative frequency distribution of the available data (plotted as points on the figure). Due to the small sample size available, determining statistically significant distribution characteristics the data in each condition is not practical. Therefore, the data from each location were assumed to be lognormally distributed. A comparison of this assumed distribution at each location is also included in Figure 1 (as the solid lines).

**Figure 1. Upstream Dry Weather *E. coli* Data.**



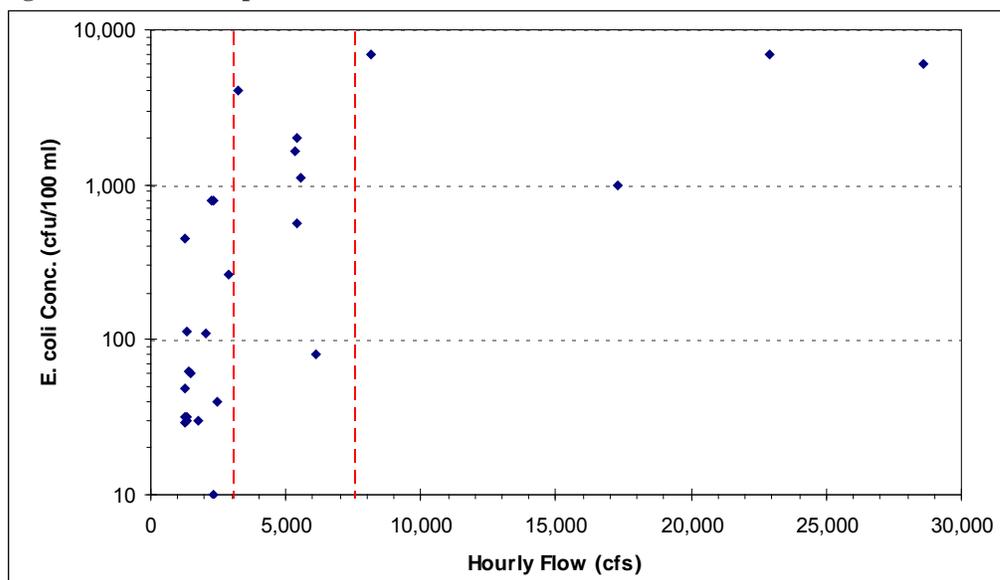
The data, as illustrated in Figure 2, suggest that concentrations measured at each location are comparable statistically.

## WET WEATHER CONCENTRATION EVALUATION

No relationships between concentration and hourly or daily precipitation were evident from the data. However, the small dataset may be insufficient to evaluate this relationship.

Hourly flow data was retrieved from the USGS for the Wabash River gage at Lafayette (gage ID: 03335500). An hourly flow was then assigned to each in stream *E. coli* sample. Sampling times were rounded to the closest hour in order to assign an hourly flow. A graph of the relationship between wet weather *E. coli* concentrations at RM 314.14 and hourly flow is shown in Figure 2. The two dashed lines in this figure, separate the data in to three distinct flow ranges.

**Figure 2. Relationship Between Wet Weather *E. coli* Concentration and Wabash River Flow.**



The wet weather *E. coli* concentrations tend to increase with increasing flow. The *E. coli* data relationship to flow falls roughly into three distinct flow regimes (ranges). In the first group (low flow), at flows below 3,000 cfs, *E. coli* concentrations range from 10 #/100 ml to 800 #/100 ml. In the second group (medium flow), which corresponds to flows between 3,000 cfs and 7,500 cfs, *E. coli* concentrations range from 80 cfu/100 ml to 4,000 cfu/100 ml. In the final group (high flow), at flows greater than 7,500 cfs, *E. coli* concentrations range from 1,000 cfu/100 ml to 7,000 cfu/100 ml.

Due to the small sample size available, determining statistically significant distribution characteristics the data in each condition is not practical. Therefore, as with the dry weather datasets, the wet weather data from each condition were assumed to be lognormally distributed.

## TIME SERIES DEVELOPMENT

The lognormal distribution characteristics of wet weather data during each flow condition and dry weather from river mile 314.14 are presented in Table 3.

**Table 3: Upstream Boundary Concentration Distribution Characteristics (cfu/100 ml)**

Precip Condition	Grouping ID	Flow Range (cfs)	Number of Samples	Geometric Mean Conc.	Mean Conc. $\ln(E. coli)$	Std. Dev. $\ln(E. coli)$	Percent of Available Data
Dry		All	5	177	5.175	1.333	16%
Wet	Low Flow	<3,000	16	78	4.355	1.289	52%
Wet	Medium Flow	3,000-7,500	6	933	6.838	1.367	19%
Wet	High Flow	>7,500	4	4,141	8.329	0.950	13%

Each day of the typical year was characterized as either “wet” or “dry” based on the precipitation data. A day was characterized as “wet” if rainfall was recorded on or the previous day. For “dry” days, concentrations from the lognormal distribution of the dry weather data were randomly chosen and assigned to each hour of the “dry” days.

The hourly flow time series from the USGS Wabash River gage for the wet weather days of the typical year were assigned to one of the three flow conditions. A representative *E. coli* concentration was assigned to each hour by randomly selecting values from the corresponding lognormal *E. coli* concentration distribution.

**APPENDIX E**  
**E. COLI CONCENTRATIONS**

Figure E-1. Total *E. coli* Concentration at RM 314.00 (Note : Upstream of Lafayette CSO Discharges)

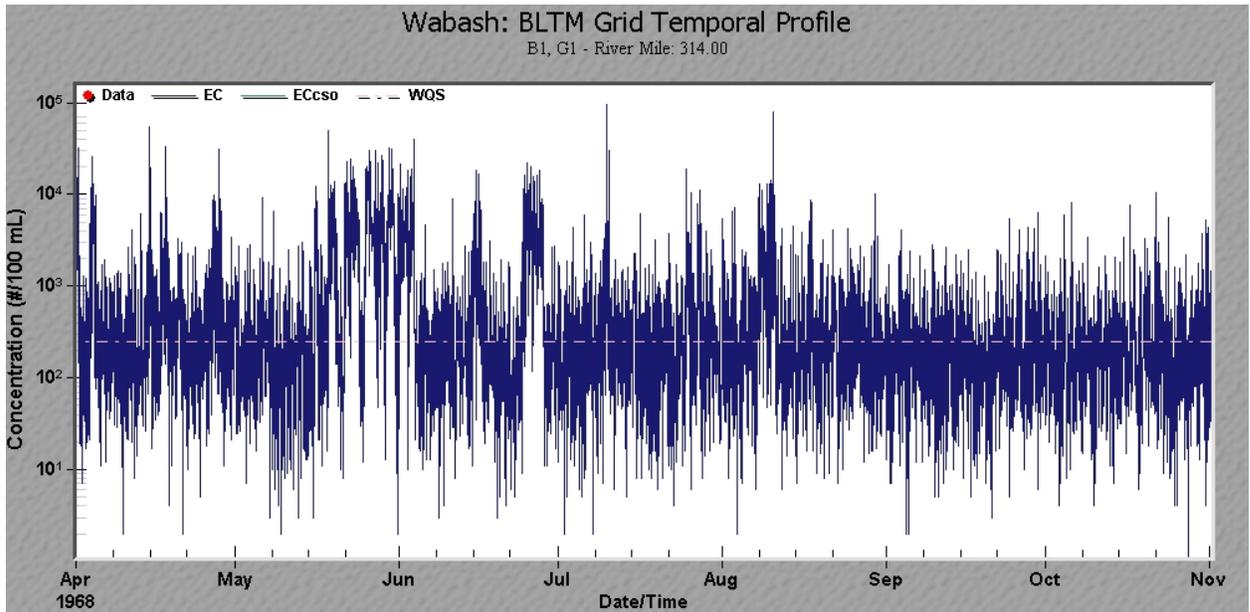
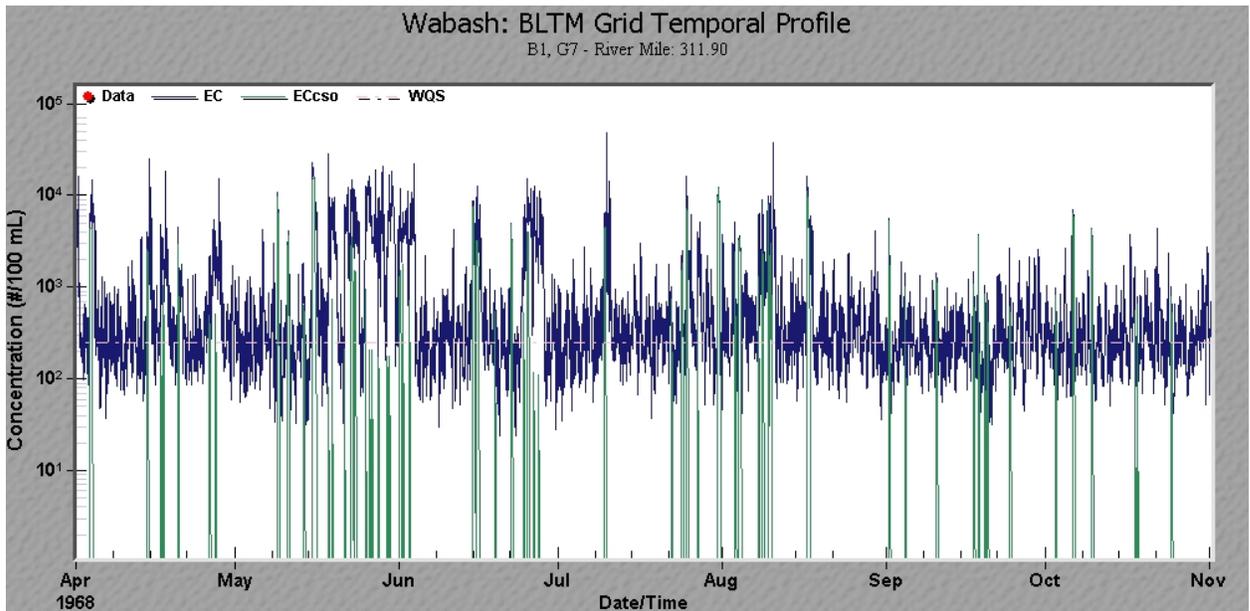
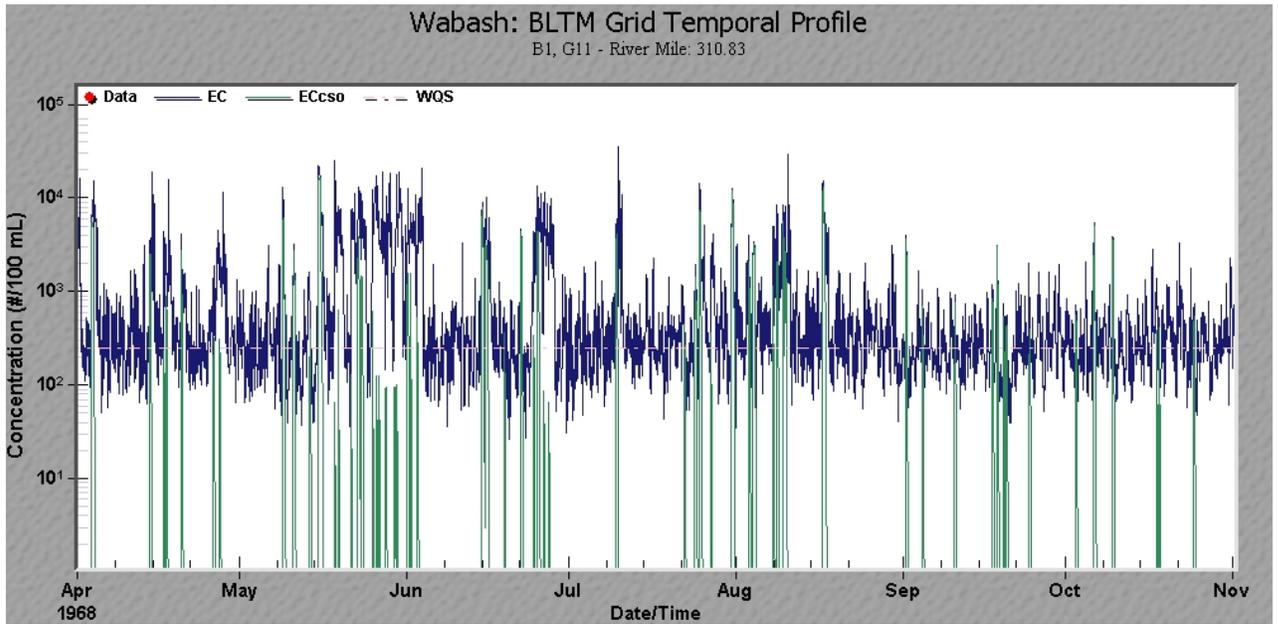


Figure E-2. Total and Lafayette CSO *E. coli* Concentration at RM 311.90 (Riehle Plaza)



**Figure E-3. Total and Lafayette CSO *E. coli* Concentration at RM 310.83 (Shamrock Park)**



**Figure E-4. Total and Lafayette CSO *E. coli* Concentration at RM 309.00 (Downstream of all Lafayette sources)**

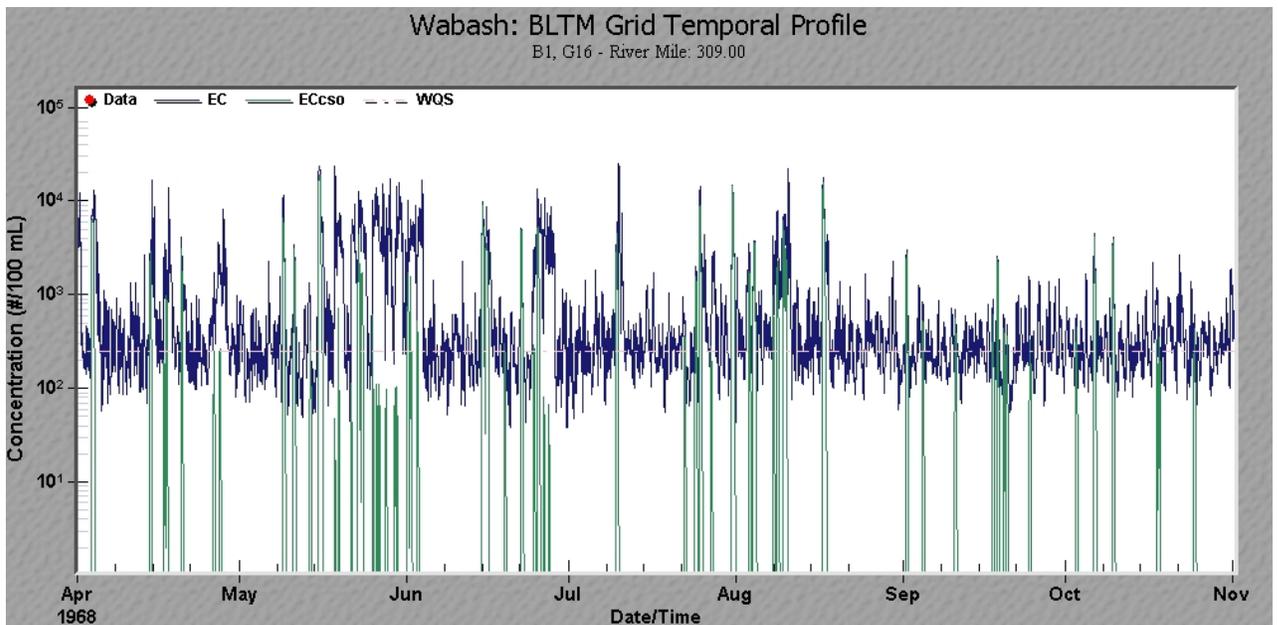
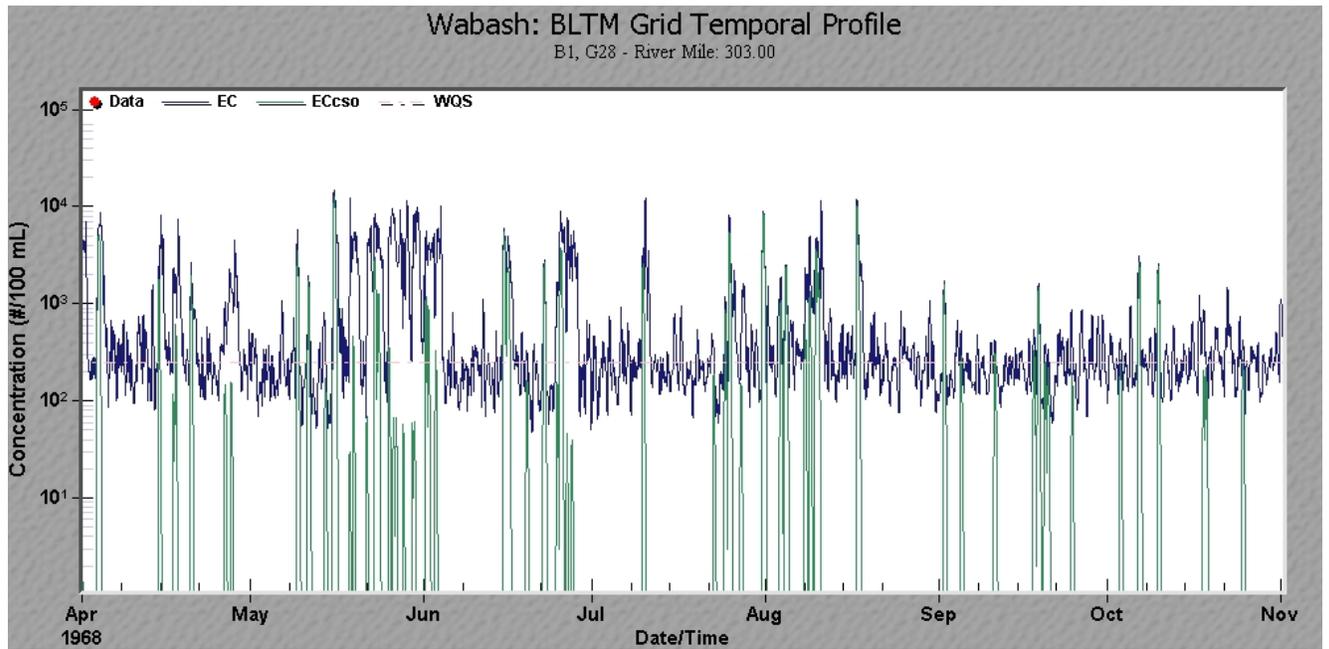


Figure E-5. Total and Lafayette CSO *E. coli* Concentration at RM 303.00 (Near Granville Bridge)



**APPENDIX F**  
**2005 FINANCIAL CAPABILITY ANALYSIS**



Environmental & Technical  
2000 1/2 W. State - 10th Fl.  
Lafayette, IN 47901-1412  
Phone: 773-265-1300  
Fax: 773-265-1300  
Website: www.lafayette.in.gov

May 12, 2005

Board of Public Works and Safety  
and Members of the Common Council  
City of Lafayette  
20 North 6<sup>th</sup> Street  
Lafayette, Indiana 47901-1412

Re: Lafayette (Indiana) Municipal Sewage Works  
Combined Sewer Overflow Long-Term Control Plan

Members of the Board and Council:

In connection with the preparation of the financial capability assessment for the Lafayette Municipal Sewage Works, we have, at your request, prepared this special purpose report and the following schedules for submission to the Indiana Department of Environmental Management regarding the Combined Sewer Overflow Long-Term Control Plan for the City of Lafayette.

<u>Page(s)</u>	
2	Summary of Combined Sewer Overflow ("CSO") Costs and Resulting Monthly Residential Indicator
3 - 4	Calculation of Current Cost Per Household and Current Residential Indicators
5 - 6	Calculation of Cost Per Household and Residential Indicators - Complete Sewer Separation
7 - 8	Calculation of Cost Per Household and Residential Indicators - Alternative 1
9 - 10	Calculation of Cost Per Household and Residential Indicators - Alternative 2
11 - 12	Calculation of Cost Per Household and Residential Indicators - Alternative 3
13	Summary of CSO Financial Capability Indicator
14	Financial Capability Matrix Score

In the preparation of these schedules, assumptions were made as noted regarding certain future events. As is the case with such assumptions regarding future events and transactions, some or all may not occur as expected and the resulting differences could be material. We have not examined the underlying assumptions nor have we audited or reviewed the historical data. Consequently, we express no opinion thereon nor do we have a responsibility to prepare subsequent reports.

**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**

**SUMMARY OF COMBINED SEWER OVERFLOW ("CSO") COSTS  
AND RESULTING MONTHLY RESIDENTIAL INDICATOR**

	Estimated CSO Costs <hr/> (Millions of \$)	Monthly Residential Indicator	Residential Indicator as a Percent of Adjusted Median Household Income
Current Status (Includes Phase I CSO Projects) (pg. 3)	N/A	\$23.67	0.74%
Complete Sewer Separation (pg. 5)	\$342.0	\$62.94	1.98%
Alternative 1 (pg. 7):			
Design Storm D	\$91.1	\$36.25	1.14%
Design Storm E	156.5	45.00	1.41%
Design Storm F	216.7	53.41	1.68%
Design Storm G	263.0	60.03	1.89%
Alternative 2 (pg. 9):			
Design Storm D	\$92.4	\$36.25	1.14%
Design Storm E	163.4	45.94	1.44%
Design Storm F	225.2	54.52	1.71%
Design Storm G	269.8	60.44	1.90%
Design Storm H	342.8	70.33	2.21%
Design Storm J	490.4	90.74	2.85%
Alternative 3 (pg. 11):			
Design Storm D	\$90.5	\$35.75	1.12%
Design Storm E	132.8	42.25	1.33%
Design Storm F	163.0	46.28	1.45%
Design Storm G	185.6	49.23	1.55%
Design Storm H	241.7	56.31	1.77%
Design Storm J	298.3	64.46	2.03%

(The Accountants' Compilation Report and the accompanying  
comments are an integral part of this statement.)

**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**

**CALCULATION OF CURRENT COST PER HOUSEHOLD  
AND CURRENT RESIDENTIAL INDICATORS**

**(Includes Phase I CSO Projects)**

**Current Wastewater Treatment Costs:**

Annual cash operating expenses (excluding depreciation) (1)	\$7,476,300
Annual debt service (principal and interest) (2)	8,469,900
Annual capital replacement (3)	<u>4,349,800</u>
Total current wastewater treatment costs	<u><u>\$20,296,000</u></u>

**Residential Factor Calculation:**

Total annual residential wastewater flow (1,000's of gallons) (4)	1,484,269.3
Divide by total annual wastewater flow (1,000's of gallons) (4)	<u>4,404,500.1</u>
Residential factor	<u><u>33.7%</u></u>
Residential allocation of wastewater treatment costs	\$6,839,752
Total number of households in service area (5)	<u>24,085</u>
Annual wastewater treatment cost per household	283.98
Divide by 12 months	<u>12</u>
Total monthly cost per residential user (6)	<u><u>\$23.67</u></u>

**Calculation of Residential Indicator:**

Adjusted median household income of the City of Lafayette (7)	<u><u>\$38,181</u></u>
Cost per household as a percent of adjusted median household income	<u><u>0.74%</u></u>

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(The Accountants' Compilation Report and the accompanying comments are an integral part of this statement.)

(Cont'd)

**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**

**CALCULATION OF CURRENT COST PER HOUSEHOLD  
AND CURRENT RESIDENTIAL INDICATORS**

**(Includes Phase I CSO Projects)**

- (1) Based on the results of operations for calendar year 2004, adjusted for fixed, known and measurable changes for 2005.
- (2) Average annual combined debt service on the outstanding 2000 Bonds, 2001 Bonds and 2002 Bonds plus the proposed 2005 Bonds to be used to fund the remaining Phase I CSO improvements.
- (3) Estimated annual requirement to provide for ongoing capital replacement.
- (4) Test year flow information per the utility billing records.
- (5) Based on the number of sewer customers at 12/31/2004.
- (6) The monthly cost per residential user is an indicator. It does not present the actual rates and charges billed by the Utility. The average residential customer of the Lafayette Municipal Sewage Works uses approximately 5,135 gallons of water per month. The current monthly bill for the average residential customer using 5,135 gallons per month is \$19.24.
- (7) Adjusted median household income provided by Jeff Rexhausen, Associate Director of Research, Economics Center for Education & Research, University of Cincinnati.

(The Accountants' Compilation Report and the accompanying comments are an integral part of this statement.)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

CALCULATION OF COST PER HOUSEHOLD  
AND RESIDENTIAL INDICATORS  
(Phase II Costs For Complete Sewer Separation)

Current Wastewater Treatment Costs:

Annual cash operating expenses (excluding depreciation) (1)	\$7,476,300
Annual debt service (principal and interest) (2)	8,469,900
Annual capital replacement (3)	<u>4,349,800</u>
Total current wastewater treatment costs	<u>20,296,000</u>

Projected CSO Costs (current dollars):

Estimated annual cash operating expenses (4)	1,397,875
Estimated annual debt service on CSO projects to be funded (5)	<u>32,284,800</u>
Total projected CSO costs (current dollars)	<u>33,682,675</u>
Total current and projected wastewater treatment and CSO costs	<u>\$53,978,675</u>

Residential Factor Calculation:

Total annual residential wastewater flow (1,000's of gallons) (6)	1,484,269.3
Divide by total annual wastewater flow (1,000's of gallons) (6)	<u>4,404,500.1</u>
Residential factor	<u>33.7%</u>
Residential allocation of wastewater treatment costs	\$18,190,813
Total number of households in service area (7)	<u>24,085</u>
Annual wastewater treatment cost per household	755.28
Divide by 12 months	<u>12</u>
Total monthly cost per residential user	<u>\$62.94</u>

Calculation of Residential Indicator:

Adjusted median household income of the City of Lafayette (8)	<u>\$38,181</u>
Cost per household as a percent of adjusted median household income	<u>1.98%</u>

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(The Accountants' Compilation Report and the accompanying comments are an integral part of this statement.)

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**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**

**CALCULATION OF COST PER HOUSEHOLD  
AND RESIDENTIAL INDICATORS**

**(Phase II Costs For Complete Sewer Separation)**

- (1) Based on the results of operations for calendar year 2004, adjusted for fixed, known and measurable changes for 2005.
- (2) Average annual combined debt service on the outstanding 2000 Bonds, 2001 Bonds and 2002 Bonds plus the proposed 2005 Bonds to be used to fund the remaining Phase I CSO improvements.
- (3) Estimated annual requirement to provide for ongoing capital replacement.
- (4) Based upon estimates provided by City Officials and the Consulting Engineers.

Total estimated additional cash operating expenses for CSO projects	\$2,368,275
Less Phase I expenses already being incurred	(1,240,900)
Plus CSO 008 elimination	1,500
Ross Road lift station	147,000
Ross Road force main interceptor	122,000
	<hr/>
Estimated additional Phase II cash operating expenses	<u>\$1,397,875</u>

- (5) Calculated as follows:

Total estimated capital costs, per the consulting engineers	\$450,950,000
Less Phase I projects complete or in process	<u>(108,950,000)</u>
Estimated cost of Phase II CSO projects, per the consulting engineers	342,000,000
Times the amortization factor for 20 years at 7%	<u>0.0944</u>
Estimated annual debt service requirement for CSO projects	<u>\$32,284,800</u>

- (6) Test year flow information per the utility billing records.
- (7) Based on the number of sewer customers at 12/31/2004.
- (8) Adjusted median household income provided by Jeff Rexhausen, Associate Director of Research, Economics Center for Education & Research, University of Cincinnati.

(The Accountants' Compilation Report and the accompanying comments are an integral part of this statement.)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

CALCULATION OF COST PER HOUSEHOLD  
AND RESIDENTIAL INDICATORS  
(Phase II Costs For Alternative I)

	Design Storm				
	D	E	F	G	
<u>Current Wastewater Treatment Costs:</u>					
Annual cash operating expenses (excluding depreciation) (1)	\$7,476,300	\$7,476,300	\$7,476,300	\$7,476,300	\$7,476,300
Annual debt service (principal and interest) (2)	8,469,900	8,469,900	8,469,900	8,469,900	8,469,900
Annual capital replacement (3)	4,349,800	4,349,800	4,349,800	4,349,800	4,349,800
Total current wastewater treatment costs	20,296,000	20,296,000	20,296,000	20,296,000	20,296,000
<u>Projected CSO Costs (current dollars):</u>					
Estimated annual cash operating expenses (4)	2,189,500	3,529,500	5,059,500	6,359,500	6,359,500
Estimated annual debt service on CSO projects to be funded (5)	8,600,784	14,769,824	20,453,648	24,828,144	24,828,144
Total projected CSO costs (current dollars)	10,790,284	18,299,324	25,513,148	31,187,644	31,187,644
Total current and projected wastewater treatment and CSO costs	\$31,086,284	\$38,595,324	\$45,809,148	\$51,483,644	\$51,483,644
<u>Residential Factor Calculation:</u>					
Total annual residential wastewater flow (1,000's of gallons) (6)	1,484,269.3	1,484,269.3	1,484,269.3	1,484,269.3	1,484,269.3
Divide by total annual wastewater flow (1,000's of gallons) (6)	4,404,500.1	4,404,500.1	4,404,500.1	4,404,500.1	4,404,500.1
Residential factor	33.7%	33.7%	33.7%	33.7%	33.7%
Residential allocation of wastewater treatment costs	\$10,476,078	\$13,006,624	\$15,437,683	\$17,349,988	\$17,349,988
Total number of households in service area (7)	24,085	24,085	24,085	24,085	24,085
Annual wastewater treatment cost per household	434.96	540.03	640.97	720.36	720.36
Divide by 12 months	12	12	12	12	12
Total monthly cost per residential user	\$36.25	\$45.00	\$53.41	\$60.03	\$60.03
<u>Calculation of Residential Indicator:</u>					
Adjusted median household income of the City of Lafayette (8)	\$38,181	\$38,181	\$38,181	\$38,181	\$38,181
Cost per household as a percent of adjusted median household income	1.14%	1.41%	1.68%	1.89%	1.89%

(Continued on next page)

(The Accountants' Compilation Report and the accompanying  
comments are an integral part of this statement.)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

CALCULATION OF COST PER HOUSEHOLD AND RESIDENTIAL INDICATORS (Phase II Costs For Alternative I)

- (1) Based on the results of operations for calendar year 2004, adjusted for fixed, known and measurable changes for 2005.
- (2) Average annual combined debt service on the outstanding 2000 Bonds, 2001 Bonds and 2002 Bonds plus the proposed 2005 Bonds to be used to fund the remaining Phase I CSO improvements.

(3) Estimated annual requirement to provide for ongoing capital replacement.

(4) Based upon estimates provided by City Officials and the Consulting Engineers. Calculated as follows:

	D	E	F	G
Total estimated additional cash operating expenses for CSO projects	\$3,159,900	\$4,499,900	\$6,059,900	\$7,359,900
Less Phase I expenses already being incurred	(1,240,900)	(1,240,900)	(1,240,900)	(1,240,900)
Plus CSO 008 elimination	1,500	1,500	1,500	1,500
Ross Road lift station	147,000	147,000	147,000	147,000
Ross Road force main interceptor	122,000	122,000	122,000	122,000
Estimated additional Phase II cash operating expenses	\$2,189,500	\$3,529,500	\$5,059,500	\$6,359,500

(5) Based upon estimates provided by City Officials and the Consulting Engineers. Calculated as follows:

	D	E	F	G
Total estimated capital costs, per the consulting engineers	\$200,060,000	\$265,410,000	\$325,620,000	\$371,960,000
Less Phase I projects complete or in process	(108,950,000)	(108,950,000)	(108,950,000)	(108,950,000)
Estimated cost of Phase II CSO projects, per the consulting engineers	91,110,000	156,460,000	216,670,000	263,010,000
Times the amortization factor for 20 years at 7%	0.0944	0.0944	0.0944	0.0944
Estimated annual debt service requirement for CSO projects	\$8,600,784	\$14,769,824	\$20,453,648	\$24,828,144

(6) Test year flow information per the utility billing records.

(7) Based on the number of sewer customers at 12/31/2004.

(8) Adjusted median household income provided by Jeff Rexhausen, Associate Director of Research, Economics Center for Education & Research, University of Cincinnati.

(The Accountants' Compilation Report and the accompanying comments are an integral part of this statement.)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

**CALCULATION OF COST PER HOUSEHOLD  
AND RESIDENTIAL INDICATORS  
(Phase II Costs For Alternative 2)**

	Design Storm					
	D	E	F	G	H	J
<b>Current Wastewater Treatment Costs:</b>						
Annual cash operating expenses (excluding depreciation) (1)	\$7,476,300	\$7,476,300	\$7,476,300	\$7,476,300	\$7,476,300	\$7,476,300
Annual debt service (principal and interest) (2)	8,469,900	8,469,900	8,469,900	8,469,900	8,469,900	8,469,900
Annual capital replacement (3)	4,349,800	4,349,800	4,349,800	4,349,800	4,349,800	4,349,800
Total current wastewater treatment costs	20,296,000	20,296,000	20,296,000	20,296,000	20,296,000	20,296,000
<b>Projected CSO Costs (current dollars):</b>						
Estimated annual cash operating expenses (4)	2,067,500	3,677,500	5,197,500	6,067,500	7,657,500	11,237,500
Estimated annual debt service on CSO projects to be funded (5)	8,723,504	15,424,016	21,261,712	25,469,120	32,359,376	46,289,040
Total projected CSO costs (current dollars)	10,791,004	19,101,516	26,459,212	31,536,620	40,016,876	57,526,540
Total current and projected wastewater treatment and CSO costs	\$31,087,004	\$39,397,516	\$46,755,212	\$51,832,620	\$60,312,876	\$77,822,540
<b>Residential Factor Calculation:</b>						
Total annual residential wastewater flow (1,000's of gallons) (6)	1,484,269.3	1,484,269.3	1,484,269.3	1,484,269.3	1,484,269.3	1,484,269.3
Divide by total annual wastewater flow (1,000's of gallons) (6)	4,404,500.1	4,404,500.1	4,404,500.1	4,404,500.1	4,404,500.1	4,404,500.1
Residential factor	33.7%	33.7%	33.7%	33.7%	33.7%	33.7%
Residential allocation of wastewater treatment costs	\$10,476,330	\$13,276,963	\$15,756,506	\$17,467,593	\$20,325,439	\$26,226,196
Total number of households in service area (7)	24,085	24,085	24,085	24,085	24,085	24,085
Annual wastewater treatment cost per household	434.97	551.25	654.20	725.25	843.90	1,088.90
Divide by 12 months	12	12	12	12	12	12
Total monthly cost per residential user	\$36.25	\$45.94	\$54.52	\$60.44	\$70.33	\$90.74
<b>Calculation of Residential Indicator:</b>						
Adjusted median household income of the City of Lafayette (8)	\$38,181	\$38,181	\$38,181	\$38,181	\$38,181	\$38,181
Cost per household as a percent of adjusted median household income	1.14%	1.44%	1.71%	1.90%	2.21%	2.85%

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(The Accountants' Compilation Report and the accompanying comments are an integral part of this statement.)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

CALCULATION OF COST PER HOUSEHOLD AND RESIDENTIAL INDICATORS (Phase II Costs For Alternative 2)

- (1) Based on the results of operations for calendar year 2004, adjusted for fixed, known and measurable changes for 2005.
- (2) Average annual combined debt service on the outstanding 2000 Bonds, 2001 Bonds and 2002 Bonds plus the proposed 2005 Bonds to be used to fund the remaining Phase I CSO improvements.

(3) Estimated annual requirement to provide for ongoing capital replacement.

(4) Based upon estimates provided by City Officials and the Consulting Engineers. Calculated as follows:

	D	E	F	G	H	J
Total estimated additional cash operating expenses for CSO projects	\$3,037,900	\$4,647,900	\$6,167,900	\$7,037,900	\$8,627,900	\$12,207,900
Less Phase I expenses already being incurred	(1,240,900)	(1,240,900)	(1,240,900)	(1,240,900)	(1,240,900)	(1,240,900)
Plus CSO 008 elimination	1,500	1,500	1,500	1,500	1,500	1,500
Ross Road lift station	147,000	147,000	147,000	147,000	147,000	147,000
Ross Road force main interceptor	122,000	122,000	122,000	122,000	122,000	122,000
Estimated additional Phase II cash operating expenses	\$2,067,500	\$3,677,500	\$5,197,500	\$6,067,500	\$7,657,500	\$11,237,500

(5) Based upon estimates provided by City Officials and the Consulting Engineers. Calculated as follows:

	D	E	F	G	H	J
Total estimated capital costs, per the consulting engineers	\$201,360,000	\$272,340,000	\$334,180,000	\$378,750,000	\$451,740,000	\$599,300,000
Less Phase I projects complete or in process	(108,950,000)	(108,950,000)	(108,950,000)	(108,950,000)	(108,950,000)	(108,950,000)
Estimated cost of Phase II CSO projects, per the consulting engineers	92,410,000	163,390,000	225,230,000	269,800,000	342,790,000	490,350,000
Times the amortization factor for 20 years at 7%	0.0944	0.0944	0.0944	0.0944	0.0944	0.0944
Estimated annual debt service requirement for CSO projects	\$8,723,504	\$15,424,016	\$21,261,712	\$25,469,120	\$32,359,376	\$46,289,040

(6) Test year flow information per the utility billing records.

(7) Based on the number of sewer customers at 12/31/2004.

(8) Adjusted median household income provided by Jeff Rexhausen, Associate Director of Research, Economics Center for Education & Research, University of Cincinnati.

(The Accountants' Compilation Report and the accompanying comments are an integral part of this statement.)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

CALCULATION OF COST PER HOUSEHOLD  
AND RESIDENTIAL INDICATORS  
(Phase II Costs For Alternative 3)

	Design Storm					
	D	E	F	G	H	J
<u>Current Wastewater Treatment Costs:</u>						
Annual cash operating expenses (excluding depreciation) (1)	\$7,476,300	\$7,476,300	\$7,476,300	\$7,476,300	\$7,476,300	\$7,476,300
Annual debt service (principal and interest) (2)	8,469,900	8,469,900	8,469,900	8,469,900	8,469,900	8,469,900
Annual capital replacement (3)	4,349,800	4,349,800	4,349,800	4,349,800	4,349,800	4,349,800
Total current wastewater treatment costs	20,296,000	20,296,000	20,296,000	20,296,000	20,296,000	20,296,000
<u>Projected CSO Costs (current dollars):</u>						
Estimated annual cash operating expenses (4)	1,818,500	3,409,500	4,010,500	4,401,800	5,182,700	6,828,700
Estimated annual debt service on CSO projects to be funded (5)	8,542,256	12,532,544	15,388,144	17,524,416	22,811,760	28,159,520
Total projected CSO costs (current dollars)	10,360,756	15,942,044	19,398,644	21,926,216	27,994,460	34,988,220
Total current and projected wastewater treatment and CSO costs	\$30,656,756	\$36,238,044	\$39,694,644	\$42,222,216	\$48,290,460	\$55,284,220
<u>Residential Factor Calculation:</u>						
Total annual residential wastewater flow (1,000's of gallons) (6)	1,484,269.3	1,484,269.3	1,484,269.3	1,484,269.3	1,484,269.3	1,484,269.3
Divide by total annual wastewater flow (1,000's of gallons) (6)	4,404,500.1	4,404,500.1	4,404,500.1	4,404,500.1	4,404,500.1	4,404,500.1
Residential factor	33.7%	33.7%	33.7%	33.7%	33.7%	33.7%
Residential allocation of wastewater treatment costs	\$10,331,327	\$12,212,221	\$13,377,095	\$14,228,887	\$16,273,885	\$18,630,782
Total number of households in service area (7)	24,085	24,085	24,085	24,085	24,085	24,085
Annual wastewater treatment cost per household	428.95	507.05	555.41	590.78	675.69	773.54
Divide by 12 months	12	12	12	12	12	12
Total monthly cost per residential user	\$35.75	\$42.25	\$46.28	\$49.23	\$56.31	\$64.46
<u>Calculation of Residential Indicator:</u>						
Adjusted median household income of the City of Lafayette (8)	\$38,181	\$38,181	\$38,181	\$38,181	\$38,181	\$38,181
Cost per household as a percent of adjusted median household income	1.12%	1.33%	1.45%	1.55%	1.77%	2.03%

(Continued on next page)

(The Accountants' Compilation Report and the accompanying comments are an integral part of this statement.)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

CALCULATION OF COST PER HOUSEHOLD AND RESIDENTIAL INDICATORS (Phase II Costs For Alternative 3)

- (1) Based on the results of operations for calendar year 2004, adjusted for fixed, known and measurable changes for 2005.
- (2) Average annual combined debt service on the outstanding 2000 Bonds, 2001 Bonds and 2002 Bonds plus the proposed 2005 Bonds to be used to fund the remaining Phase I CSO improvements.

(3) Estimated annual requirement to provide for ongoing capital replacement.

(4) Based upon estimates provided by City Officials and the Consulting Engineers. Calculated as follows:

	D	E	F	G	H	J
Total estimated additional cash operating expenses for CSO projects	\$2,788,900	\$4,379,900	\$4,980,900	\$5,372,200	\$6,153,100	\$7,799,100
Less Phase I expenses already being incurred	(1,240,900)	(1,240,900)	(1,240,900)	(1,240,900)	(1,240,900)	(1,240,900)
Plus CSO 008 elimination	1,500	1,500	1,500	1,500	1,500	1,500
Ross Road lift station	147,000	147,000	147,000	147,000	147,000	147,000
Ross Road force main interceptor	122,000	122,000	122,000	122,000	122,000	122,000
Estimated additional Phase II cash operating expenses	\$1,818,500	\$3,409,500	\$4,010,500	\$4,401,800	\$5,182,700	\$6,828,700

(5) Based upon estimates provided by City Officials and the Consulting Engineers. Calculated as follows:

	D	E	F	G	H	J
Total estimated capital costs, per the consulting engineers	\$199,440,000	\$241,710,000	\$271,960,000	\$294,590,000	\$350,600,000	\$407,250,000
Less Phase I projects complete or in process	(108,950,000)	(108,950,000)	(108,950,000)	(108,950,000)	(108,950,000)	(108,950,000)
Estimated cost of Phase II CSO projects, per the consulting engineers	90,490,000	132,760,000	163,010,000	185,640,000	241,650,000	298,300,000
Times the amortization factor for 20 years at 7%	0.0944	0.0944	0.0944	0.0944	0.0944	0.0944
Estimated annual debt service requirement for CSO projects	\$8,542,256	\$12,532,544	\$15,388,144	\$17,524,416	\$22,811,760	\$28,159,520

(6) Test year flow information per the utility billing records.

(7) Based on the number of sewer customers at 12/31/2004.

(8) Adjusted median household income provided by Jeff Rexhausen, Associate Director of Research, Economics Center for Education & Research, University of Cincinnati.

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**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**  
**SUMMARY OF CSO FINANCIAL CAPABILITY INDICATOR**

Indicator	Actual Value	Weak, Mid-Range Strong	Score
City's Bond Rating (1)	Standard & Poor's A	Strong	3
Overall Net Debt Per Capita (2)	\$4,147	Weak	1
Unemployment Rate (3)	6.00%	Mid-Range	2
Median Household Income (3)	\$38,181	Mid-Range	2
Property Tax Revenue as a Percent Of Full Market Property Value (4)	2.63%	Mid-Range	2
Property Tax Revenue Collection Rate (5)	99.18%	Strong	3
Permittee Indicators Score			<u>2.17</u>

(1) If the City were to issue debt for CSO improvements, it would likely issue a revenue bond. The City of Lafayette Wastewater Utility last issued open market bonds in 2002 that carried an underlying A rating from Standard & Poor's.

(2) Information available for Lafayette:

Current overall net debt for Lafayette including underlying and overlapping debt (As of 12/22/04)	\$253,886,839
Divide by Per Capita (2003 est.):	<u>61,229</u>
Overall Net Debt Per Capita	<u>\$4,147</u>

(3) Per Jeff Rexhausen, Associate Director of Research, Economics Center for Education & Research, University of Cincinnati.

(4) Information available for Lafayette

Property taxes assessed in Lafayette for collection year 2003	\$80,929,668
Divide by estimated full market property value	<u>3,071,722,765</u>
Property Tax Revenue as a Percent Of Full Market Property Value	<u>2.63%</u>

(5) Per the Tippecanoe County Auditor's Office.

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comments are an integral part of this statement.)

**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**

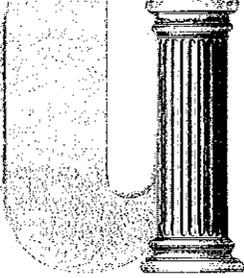
**FINANCIAL CAPABILITY MATRIX SCORE**

Permittee Financial Capability Indicators Score	Residential Indicator (Cost Per Household as a % of MHI)		
	Low (Below 1.0%)	Mid-Range (Between 1.0 and 2.0%)	High (Above 2.0%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (Between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

(The Accountants' Compilation Report and the accompanying  
comments are an integral part of this statement.)

**APPENDIX G**  
**UPDATED 2009 FINANCIAL CAPABILITY ANALYSIS**

UMBAUGH



It's all about experience.

H.J.Umbaugh & Associates  
8365 Keystone Crossing • Suite 300  
P.O. Box 40458  
Indianapolis, IN 46240-0458  
Phone: 317-465-1500  
Fax: 317-465-1550  
Website: www.hju.com

April 13, 2009

Board of Public Works and Safety  
and Members of the Common Council  
City of Lafayette  
20 North 6<sup>th</sup> Street  
Lafayette, Indiana 47901-1412

Re: Lafayette (Indiana) Municipal Sewage Works  
Combined Sewer Overflow Long-Term Control Plan

Dear Members of the Board and Council:

In connection with the preparation of the financial capability assessment for the Lafayette Municipal Sewage Works, we have, at your request, prepared this special purpose report and the following schedules for submission to the Indiana Department of Environmental Management regarding the Combined Sewer Overflow Long-Term Control Plan for the City of Lafayette.

Page

**CURRENT RESIDENTIAL INDICATORS**

- 2 – 3 Calculation of Current Cost Per Household and Current Residential Indicators  
(Current Projects)
- 4 Summary of CSO Financial Capability Indicator

**LONG TERM CONTROL PLAN BUDGET**

- 5 – 6 Calculation of Current Cost Per Household and Current Residential Indicators  
- Long-Term Control Plan Budget
- 7 Financial Capability Matrix Score

We would appreciate your questions or comments on this information and would provide additional information upon request.

A handwritten signature in black ink, appearing to read 'H.J. Umbaugh', is written over a horizontal line.

LAFAYETTE MUNICIPAL SEWAGE WORKS  
Lafayette, Indiana

CURRENT RESIDENTIAL INDICATORS

**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**

**CALCULATION OF CURRENT COST PER HOUSEHOLD**

**AND CURRENT RESIDENTIAL INDICATORS**

**(Current Projects)**

Current Wastewater Treatment Costs:

Annual cash operating expenses (excluding depreciation) (1)	\$9,274,295
Current annual debt service (principal and interest) (2)	9,123,270
Annual capital replacement (3)	<u>4,803,712</u>
Total current wastewater treatment costs	<u>\$23,201,277</u>

Residential Factor Calculation:

Total annual residential wastewater flow (1,000's of gallons) (4)	2,931,346.1
Divide by total annual wastewater flow (1,000's of gallons) (5)	<u>5,876,500.0</u>
Residential factor	<u>49.88%</u>
Residential allocation of wastewater treatment costs	\$11,572,797
Divide by total number of households in service area (6)	<u>23,680</u>
Annual wastewater treatment cost per household	488.72
Divide by 12 months	<u>12</u>
Total monthly cost per residential user (7)	<u>\$40.73</u>

Calculation of Residential Indicator:

Median household income of the City of Lafayette (8)	<u>\$40,785</u>
Cost per household as a percent of median household income	<u>1.20%</u>

(Continued on next page)

(See Accountants' Report)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

(Cont'd)

CALCULATION OF CURRENT COST PER HOUSEHOLD  
AND CURRENT RESIDENTIAL INDICATORS

(Current Projects)

- (1) Equal to the 2009 operating budget, per utility management.
- (2) Average annual debt service on the Utility's outstanding indebtedness.
- (3) Estimated annual replacement cost based upon calendar year 2008 depreciation expense.
- (4) Based on calendar year 2008 billing information provided by utility management. Includes residential homes as well as apartment buildings.

Total calendar year 2008 treatment plant flow, per utility management (1,000's of gallons)	5,876,500.0
Less calendar year 2008 billed flow (1,000's of gallons)	<u>(4,565,753.6)</u>
Total calculated calendar year 2008 infiltration	1,310,746.4
Times residential allocation percentage*	<u>92.10%</u>
Total allocated residential infiltration (1,000's of gallons)	1,207,197.4
Add billed City of Lafayette residential usage, per billing records (1,000's of gallons)	1,690,770.5
Add billed Residential Town of Dayton (wholesale customer), per billing records (1,000's of gallons)	<u>33,378.2</u>
Total residential wastewater flow	<u><u>2,931,346.1</u></u>

\*Allocated based upon percentage of system residential customers (23,680/25,711).

- (5) Total calendar year 2008 treatment plant flow, per utility management (1,000's of gallons).
- (6) Based on calendar year 2008 billing information provided by utility management. Includes residential homes as well as apartment buildings.

Total City of Lafayette residential households	23,150
Plus Town of Dayton residential households	<u>530</u>
Total residential households	<u><u>23,680</u></u>

- (7) The monthly cost per residential user in an indicator. It does not represent the actual rates and charges billed by the Utility.
- (8) Median household income as of 2005 calculated by Mr. Jeff Rexhausen, Associate Director of Research, Economics Center for Education & Research, University of Cincinnati. Adjusted by the Consumer Price Index ("CPI").

Median household income as calculated in 2005	\$38,181
Times one plus percent change in CIP index December, 2005 - December, 2008	<u>1.0682</u>
Adjusted median household income	<u><u>\$40,785</u></u>

(See Accountants' Report)

**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**  
**SUMMARY OF CSO FINANCIAL CAPABILITY INDICATOR**

<u>Indicator</u>	<u>Actual Value</u>	<u>Weak, Mid-Range Strong</u>	<u>Score</u>
City's Bond Rating (1)	S & P "A+"	Strong	3
Overall Net Debt Per Capita (2)	\$4,406	Weak	1
Unemployment Rate (3)	6.20%	Weak	1
Median Household Income (4)	\$40,785	Mid-Range	2
Property Tax Revenue as a Percent Of Full Market Property Value (5)	2.70%	Mid-Range	2
Property Tax Revenue Collection Rate (6)	94.89%	Mid-Range	2
Permittee Indicators Score			<u>1.83</u>

(1) If the City were to issue debt for CSO improvements, it would likely issue a revenue bond. The City of Lafayette Wastewater Utility received an A+ underlying rating from Standard & Poor's Corporation, Inc. in conjunction with the issuance of the utility's sewage works revenue bonds of 2008.

(2) Information available for Lafayette:  
 Current overall net debt for Lafayette including underlying and overlapping debt (As of 2/15/09) \$280,549,281  
 Divide by Per Capita (July 2007 estimate): 63,679  
 Overall Net Debt Per Capita \$4,406

(3) Per the Bureau of Labor Statistics, Indiana Department of Workforce Development (U.S. Avg = 7.20%)

(4) Adjusted median household income, see page 3.

(5) Information available for Lafayette  
 Property taxes assessed in Lafayette for collection year 2008\* \$84,862,621  
 Divide by estimated full market property value (NAV) 3,146,368,210  
 Property Tax Revenue as a  
 Percent Of Full Market Property Value 2.70%

\*Based upon most current information available

(6) Per the Tippecanoe County Auditor's Office.

(See Accountants' Report)

LAFAYETTE MUNICIPAL SEWAGE WORKS  
Lafayette, Indiana

LONG-TERM CONTROL PLAN BUDGET

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

CALCULATION OF CURRENT COST PER HOUSEHOLD AND CURRENT  
RESIDENTIAL INDICATORS - LONG-TERM CONTROL PLAN BUDGET

Current Wastewater Treatment Costs:

Annual cash operating expenses (excluding depreciation) (1)	\$9,274,295
Current annual debt service (principal and interest) (2)	9,123,270
Annual capital replacement (3)	<u>4,803,712</u>
Total current wastewater treatment costs	<u>23,201,277</u>

Projected CSO Costs (current dollars):

Estimated annual debt service on CSO projects to be funded (4)	15,613,969
Estimated additional operation and maintenance expenses (5)	<u>5,372,730</u>
Total projected CSO costs	<u>20,986,699</u>
Total current and projected wastewater treatment and CSO costs	<u>\$44,187,976</u>

Residential Factor Calculation:

Total annual residential wastewater flow (1,000's of gallons) (6)	2,931,346.1
Divide by total annual wastewater flow (1,000's of gallons) (7)	<u>5,876,500.0</u>
Residential factor	<u>49.88%</u>
Residential allocation of wastewater treatment costs	22,040,962
Divide by total number of households in service area (8)	<u>23,680</u>
Annual wastewater treatment cost per household	930.78
Divide by 12 months	<u>12</u>
Total monthly cost per residential user (9)	<u>\$77.57</u>

Calculation of Residential Indicator:

Median household income of the City of Lafayette (10)	<u>\$40,785</u>
Cost per household as a percent of median household income	<u>2.28%</u>

(Continued on next page)

(See Accountants' Report)

LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS

(Cont'd)

CALCULATION OF CURRENT COST PER HOUSEHOLD AND CURRENT  
RESIDENTIAL INDICATORS - LONG-TERM CONTROL PLAN BUDGET

- (1) Equal to the 2009 operating budget, per utility management.
- (2) Average annual debt service on the Utility's outstanding indebtedness.
- (3) Estimated annual replacement cost based upon calendar year 2008 depreciation expense.
- (4) To estimate increase in annual debt service payments at the long-term control plan budget amount. All bond issues are amortized over 20 years at an interest rate of 6%.

Annual Debt  
Service

\$179,091,000 Long-Term Control Plan Budget

\$15,613,969

- (5) To provide an allowance for additional operation and maintenance expenses based upon 3% of long term control plan budget, per consulting engineer.
- (6) See page 3.
- (7) Total calendar year 2008 treatment plant flow, per utility management (1,000's of gallons).
- (8) Based on calendar year 2008 billing information provided by utility management. Includes residential homes as well as apartment buildings.

Total City of Lafayette residential households  
Plus Town of Dayton residential households

23,150  
530

Total residential households

23,680

- (9) The monthly cost per residential user in an indicator. It does not represent the actual rates and charges billed by the Utility.
- (10) Adjusted median household income, see page 3.

(See Accountants' Report)

**LAFAYETTE (INDIANA) MUNICIPAL SEWAGE WORKS**

**FINANCIAL CAPABILITY MATRIX SCORE**

Permittee Financial Capability Indicators Score	Residential Indicator (Cost Per Household as a % of MHI)		
	Low (Below 1.0%)	Mid-Range (Between 1.0 and 2.0%)	High (Above 2.0%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (Between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

	<u>Financial Indicator</u>	<u>Residential Indicator</u>	<u>Burden</u>
Current indicator	1.83	1.20	Medium Burden
\$179,091,000 Long-term control plan budget	1.83	2.28	High Burden

(See Accountants' Report)

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan Update*

**Financial Capability Assessment  
Determination of Residential Allocation Factor**

Umbaugh  
Greeley and Hansen

**Updated March 2009**

The residential allocation factor was recalculated after the July 2008 submission of the Financial Capability Assessment based on infiltration and inflow (I/I) in the system. The method of calculating the updated residential allocation factor is described below. Attached are the calculations supporting the updated residential allocation factor along with the updated Financial Capability Assessment.

The population for Lafayette was 63,679 (based on a July 2007 estimate provided by Umbaugh) and comprised of 25,711 total system-wide customers (connections). An examination of the service connections for Lafayette's Water Pollution Control Department indicated that there were 23,679 residential connections, 19 governmental connections, 71 public authority connections, and 1,942 industrial/commercial connections. The governmental and public authority connections were grouped with the industrial/commercial connections resulting in a total of 2,032 industrial/commercial connections and 23,679 residential connections. Among the industrial/commercial connections is the industry of Tate and Lyle. Tate and Lyle account for approximately 47% of the wastewater flow to the City's wastewater treatment plant.

Based upon wastewater billing flow data for 2008 it was determined that the average daily residential wastewater flow was 4.63 mgd. The total average daily metered residential, commercial, industrial, and the Town of Dayton wastewater flow for that period was 12.51 mgd. During this same period the average daily dry weather flow to the Lafayette wastewater treatment plant (WWTP) was 16.10 mgd, which includes flows from residential, commercial, industrial, the Town of Dayton, plus the I/I that occurs in the collection system. The daily dry weather flow to the WWTP was calculated using the average daily influent flow without any flows influenced by wet weather. Wet weather influences were defined as any days that rain occurred and the three days following the rain event. Winter and wet spring months were also eliminated as the seasonal

wet weather influence and because snow melt could not be isolated and accounted for. Therefore, an average daily I/I flow was calculated by subtracting the metered wastewater flow of 12.51 mgd from the average daily dry weather flow to the WWTP of 16.10 mgd. This results in an average daily flow of I/I of 3.59 mgd.

Based upon guidelines developed by USEPA and as provided in Financing and Charges for Wastewater Treatment Systems (Manual of Practice No. 27, Water Environment Federation) the I/I flow was allocated to residential users in proportion to the number of connections. Of a total of 25,711 connections to Lafayette's Water Pollution Control Department, 23,679 serve residential users (92.10%). Accordingly, of the total average daily I/I flow 3.31 mgd was attributed to residential households. Accordingly, 8.03 mgd of the 16.10 mgd of total average daily flow to the WWTP being attributed to residential users resulting in a residential allocation factor of approximately 49.88%.

CITY OF LAFAYETTE, INDIANA

CSO Long-Term Control Plan Update

Financial Capability Analysis  
 Determination of Residential Allocation Factor  
**Updated March 2009**

Total number of connections	25,711	
Total number of ind/comm connections	2,032	
Total number of residential connections	23,679	
% of residential connections (A)	92.10%	
Total Influent WW Flow	<u>GALLONS</u>	<u>MGD</u>
From 2008 MRO (B)	5,876,500,000	16.10
Total Metered WW Flow (C)		
Residential (D)	1,690,770,500	4.63
Commercial	614,054,047	1.68
Industrial	2,226,160,053	6.10
Dayton	34,769,000	0.10
	<hr/>	<hr/>
	4,565,753,600	12.51
Total I/I [(B) - (C) = (E)]	1,310,746,400	3.59
Total Residential Flow (D)	1,724,148,740	4.72
Residential Allocation of I/I [(A) * (E) = (F)]	1,207,197,434	3.31
Total Residential Flow Including I/I [(D) + (F) = (G)]	2,931,346,174	8.03
Residential Allocation Factor [(G) / (B)]	49.88%	

**APPENDIX H  
CITIZEN ADVISORY COMMITTEE MEETING MINUTES**

**CSO PUBLIC NOTIFICATION**  
**Citizens Advisory Committee**

**February 27, 2004**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Friday, February 27, 2004 at 11:06 a.m. Member present were Don Blackburn, Kathy Clark, William Dixon, Dick Murray and Ed Turner.

Also present were Brad Talley, Water Pollution Control Superintendent, and Mayor Roswarski.

Mr. Talley called the meeting to order.

Introductions were made by members and attending guests.

Mr. Talley stated the first meeting would be educational for the members and a gave brief presentation regarding the history of CSO, state regulations, community effects, committees purpose, plan review and supported the information with visual aids and handouts.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

Mr. Talley stated the next Citizens Advisory Committee meeting would be held sometime in April or early May 2004. Notification will be sent from the Water Pollution Control Department when dates are confirmed.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 11:45 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION  
Citizens Advisory Committee**

**May 13, 2004**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Thursday, May 13, 2004 at 11:05 a.m. Members present were Kathy Clark, William Dixon, Dick Murray and Clem Schroll.

Also present were Brad Talley, Water Pollution Control Superintendent, and Gui DeReamer, Greeley and Hansen.

Mr. Talley called the meeting to order.

Introductions were made by members.

Mr. Talley stated the meeting would be a review of the first meeting and gave a brief presentation regarding the history of CSO, state regulations, community effects, committees purpose, plan review, demonstrated the collection system model, presented the draft River Use Survey form, and supported the information with visual aids and handouts.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

Mr. Talley stated the next Citizens Advisory Committee meeting would be held sometime in July 2004. Notification will be sent from the Water Pollution Control Department when dates are confirmed.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 12:25 pm.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION  
Citizens Advisory Committee**

**July 8, 2004**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Thursday, July 8, 2004 at 10:10 a.m. Members present were Kathy Clark and Clem Schroll.

Also present were Brad Talley, Water Pollution Control Superintendent, Opal Kuhl, Public Utilities Director, and Gui DeReamer, Greeley and Hansen.

Mr. Talley called the meeting to order.

Introductions were made by members.

Mr. Talley stated the meeting would be a review of the first two meetings and gave a brief presentation regarding the Public Health and Regulatory Issues, evaluation of alternatives, CSO Operational plan, community effects, plan review, presented the draft River Use Survey form, presented the draft Combined Sewer Overflow Progress Report 2004, and supported the information with visual aids and handouts.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

Mr. Schroll stated he would like a hands on tour of the items being discussed. Mr. Talley agreed and stated the tour would be held within 2 – 3 weeks. Notification will be sent from the Water Pollution Control Department when the date is confirmed.

Mr. Talley stated the Citizens Advisory Committee would have a tour to be held sometime within the next couple of weeks. The next meeting would be held sometime in August 2004. Notification will be sent from the Water Pollution Control Department when dates are confirmed.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 11:20 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION  
Citizens Advisory Committee**

**July 26, 2004**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Monday, July 26, 2004 at 10:10 a.m. for the CAC member tour. Members present were Don Blackburn, Kathy Clark, Wick Dixon, Dick Murray, Clem Schroll, and Ed Turner.

Also present were Brad Talley, Water Pollution Control Superintendent, Terry Markwith, Water Pollution Control Assistant Superintendent, and Crystal Joshua, Assistant City Engineer.

Mr. Talley started the tour at 10:10 a.m.

The following is a list of places that were viewed:

- Durkees Outfall
- Brief tour of the plant
- Romney Road Lift Station
- Prairie Oaks Lift Station
- Fairgrounds Regulator
- Cincinnati Regulator/Outfall
- Greenbush Street Regulator/Outfall
- Parking Lot Lift Station
- Pearl River Lift Station
- Williams Street Outfall
- Old Shamrock Park Regulator

Committee members asked appropriate questions throughout the tour and discussion ensued.

Mr. Talley stated the next Citizens Advisory Committee meeting would be held sometime in August 2004. Notification will be sent from the Water Pollution Control Department when dates are confirmed.

With there being no further business or questions, Mr. Talley adjourned the tour.

The time being 11:42 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION  
Citizens Advisory Committee**

**October 7, 2004**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Thursday, October 7, 2004 at 10:05 a.m. Members present were Kathy Clark, Wick Dixon, and Clem Schroll.

Also present were Brad Talley, Water Pollution Control Superintendent, Terry Markwith, Water Pollution Control Assistant Superintendent, Gui DeReamer, Greeley and Hansen, and Julie Hanson, Greeley and Hansen.

Mr. Talley called the meeting to order.

Mr. DeReamer stated the meeting would be a review of the City Workshop that was held on controlled technologies and CSO alternatives, summary of preliminary alternatives, researching feasible alternatives, a brief overview of the next meeting, and supported the information with visual aids and handouts.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

Mr. Talley stated the next Citizens Advisory Committee meeting would be held in November 2004. Notification will be sent from the Water Pollution Control Department when dates are confirmed.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 11:40 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION  
Citizens Advisory Committee**

**December 16, 2004**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Thursday, December 16, 2004 at 10:00 a.m. Members present were Don Blackburn, Wick Dixon, Ed Turner, and Clem Schroll.

Also present were Brad Talley, Water Pollution Control Superintendent, Terry Markwith, Water Pollution Control Assistant Superintendent, Gui DeReamer, Greeley and Hansen, and Julie Hanson, Greeley and Hansen.

Mr. Talley called the meeting to order.

Mr. DeReamer stated the meeting would be a review of the previous meeting that was held, description of evaluation of intergrated alternatives, presentation of intergrated alternatives, preliminary results of the river use survey and physical survey, a brief overview of the next meeting, and supported the information with visual aids and handouts.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

Mr. Talley stated the next Citizens Advisory Committee meeting would be held in February 2005. Notification will be sent from the Water Pollution Control Department when dates are confirmed.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 11:13 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION  
Citizens Advisory Committee**

**February 17, 2005**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Thursday, February 17, 2005 at 10:00 a.m. Members present were Kathleen Clark, Wick Dixon, and Clem Schroll.

Also present were Brad Talley, Water Pollution Control Superintendent, Terry Markwith, Water Pollution Control Assistant Superintendent, Gui DeReamer, Greeley and Hansen, and Julie Hanson, Greeley and Hansen.

Mr. Talley called the meeting to order.

Mr. DeReamer stated the meeting would be a review of the previous meeting that was held, final results of the river use survey, final results of the river physical survey for Durkee's Run and the Wabash River, collection system model performance of integrated alternatives, a brief overview of the next meeting, and supported the information with visual aids and handouts.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

Mr. Talley stated the next Citizens Advisory Committee meeting would be held in March 2005. Notification will be sent from the Water Pollution Control Department when dates are confirmed.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 11:15 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION**  
**Citizens Advisory Committee**  
**March 24, 2005**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Thursday, March 24, 2005 at 10:06 a.m. Members present were Dick Murray and Clem Schroll.

Also present were Brad Talley, Water Pollution Control Superintendent, Terry Markwith, Water Pollution Control Assistant Superintendent, Gui DeReamer, Greeley and Hansen, and Julie Hanson, Greeley and Hansen.

Mr. Talley called the meeting to order.

Ms. Hansen stated the meeting would be a review of the previous meeting that was held, presentation of final integrated alternatives, collection system model performance of integrated alternative, priority areas, water quality performance of integrated alternatives, and the next step.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

Mr. Talley stated the next Citizens Advisory Committee meeting would be held April 21, 2005.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 11:17 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION**  
**Citizens Advisory Committee**  
**April 21, 2005**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Thursday, April 21, 2005 at 10:05 a.m. Members present were Kathleen Clark, Wick Dixon, and Ed Turner.

Also present were Brad Talley, Water Pollution Control Superintendent, Terry Markwith, Water Pollution Control Assistant Superintendent, Gui DeReamer, Greeley and Hansen, and Julie Hanson, Greeley and Hansen.

Mr. Talley called the meeting to order.

Ms. Hansen stated the meeting would be a summary of the previous meeting that was held, overview of the Long Term Control Plan process, presentation of the “Knee-of-the-Curve”, and the next step.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

Mr. Talley stated the next Citizens Advisory Committee meeting would be held May 5, 2005 at 10:00am.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 10:59 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**CSO PUBLIC NOTIFICATION**  
**Citizens Advisory Committee**  
**May 5, 2005**

The Combined Sewer Overflow (CSO) Public Notification Committee met on Thursday, May 5, 2005 at 10:04 a.m. Members present were Kathleen Clark, Wick Dixon, Dick Murray, and Clem Schroll,

Also present were Brad Talley, Water Pollution Control Superintendent, Gui DeReamer, Greeley and Hansen, and Julie Hanson, Greeley and Hansen.

Mr. Talley called the meeting to order.

Mr. DeReamer stated the meeting would be a summary of the previous meeting that was held, review of alternatives and potential sites for CSO Control Technologies, "Knee-of-the-Curve", priority areas, financial capability analysis, proposed implementation schedule, and the next step.

Committee members asked appropriate questions throughout the presentation and discussion ensued.

With there being no further business or questions, Mr. Talley adjourned the meeting.

The time being 11:10 a.m.

Minutes prepared by: Julie Blacker, Administrative Coordinator

**APPENDIX I**  
**2008 – 2009 PUBLIC MEETING MATERIAL**



**GREELEY AND HANSEN**

# Public Meeting

Combined Sewer Overflow Long Term Control Plan  
Update Development  
Alternative Review

Meeting No. 1  
November 17, 2008  
7:00 p.m.

# Meeting Agenda

---



- Purpose of Meeting
- Background and Regulatory Requirements
- Meeting the Regulations
- Where Are We Now?
- Updated Combined Sewer Overflow Long Term Control Plan (CSO LTCP)
- Next Steps
- Questions



A wide, calm river flows through a landscape. In the background, a long bridge with several tall, thin supports spans across the river. The right bank is lined with dense, green trees. The sky is overcast and grey. The water has a slight ripple on its surface.

# Purpose of Meeting

# Purpose of Meeting

---



- Inform public of CSO planning activities
- Gather public input about updated long term plan to control raw sewage discharges to the river



A photograph showing a large, dark pipe discharging into a body of water. The pipe is surrounded by a structure of grey rocks. The background is a grassy slope. The text "Background and Regulatory Requirements" is overlaid in white.

# Background and Regulatory Requirements

# Background – We Are Not Alone

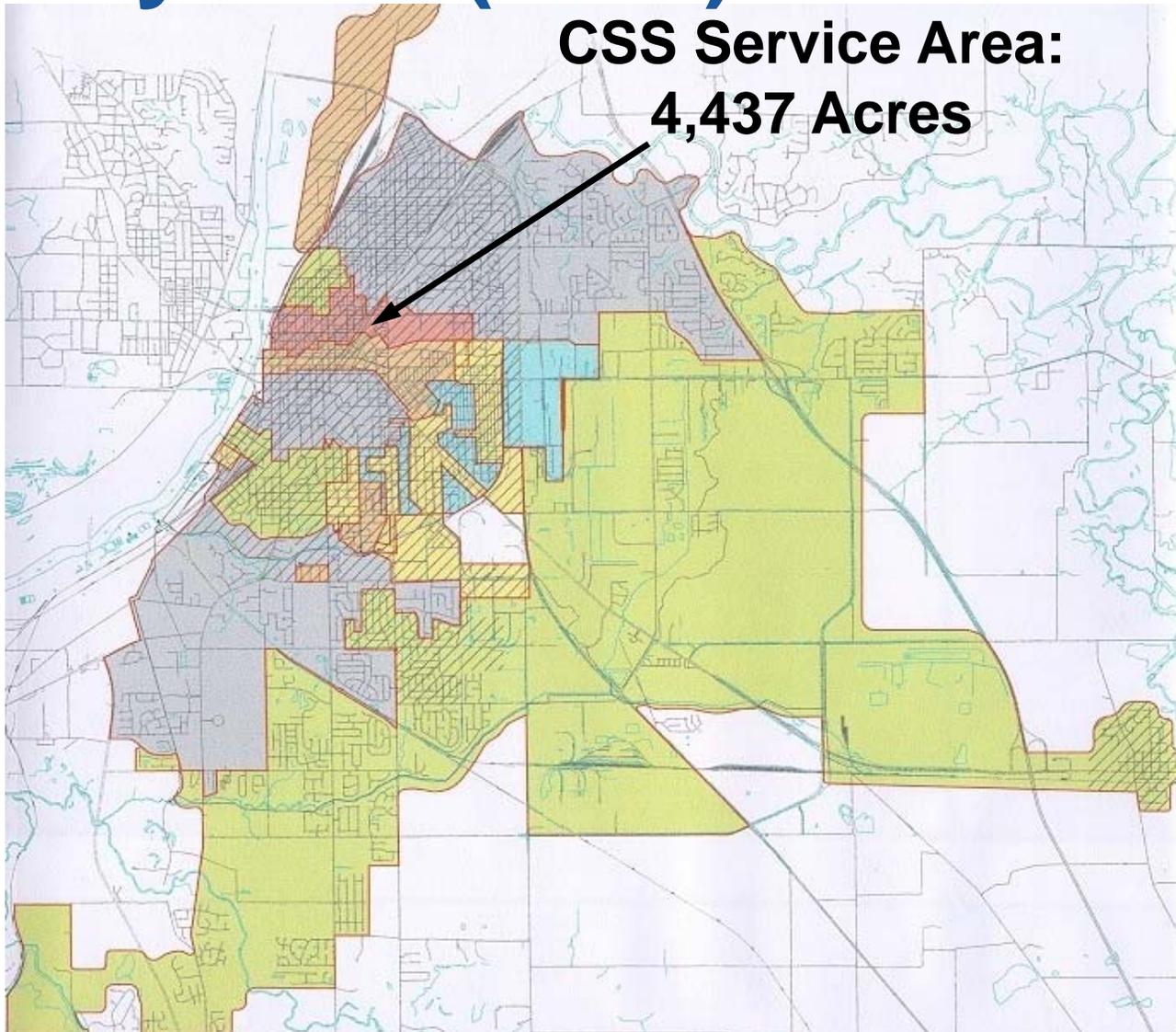
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- Indiana has over 100 CSO communities
  - ± 12.5% of national total
- Indiana, Illinois, and Ohio have 54% of the CSO permits in the nation



# Lafayette Combined Sewer System (CSS) Service Area



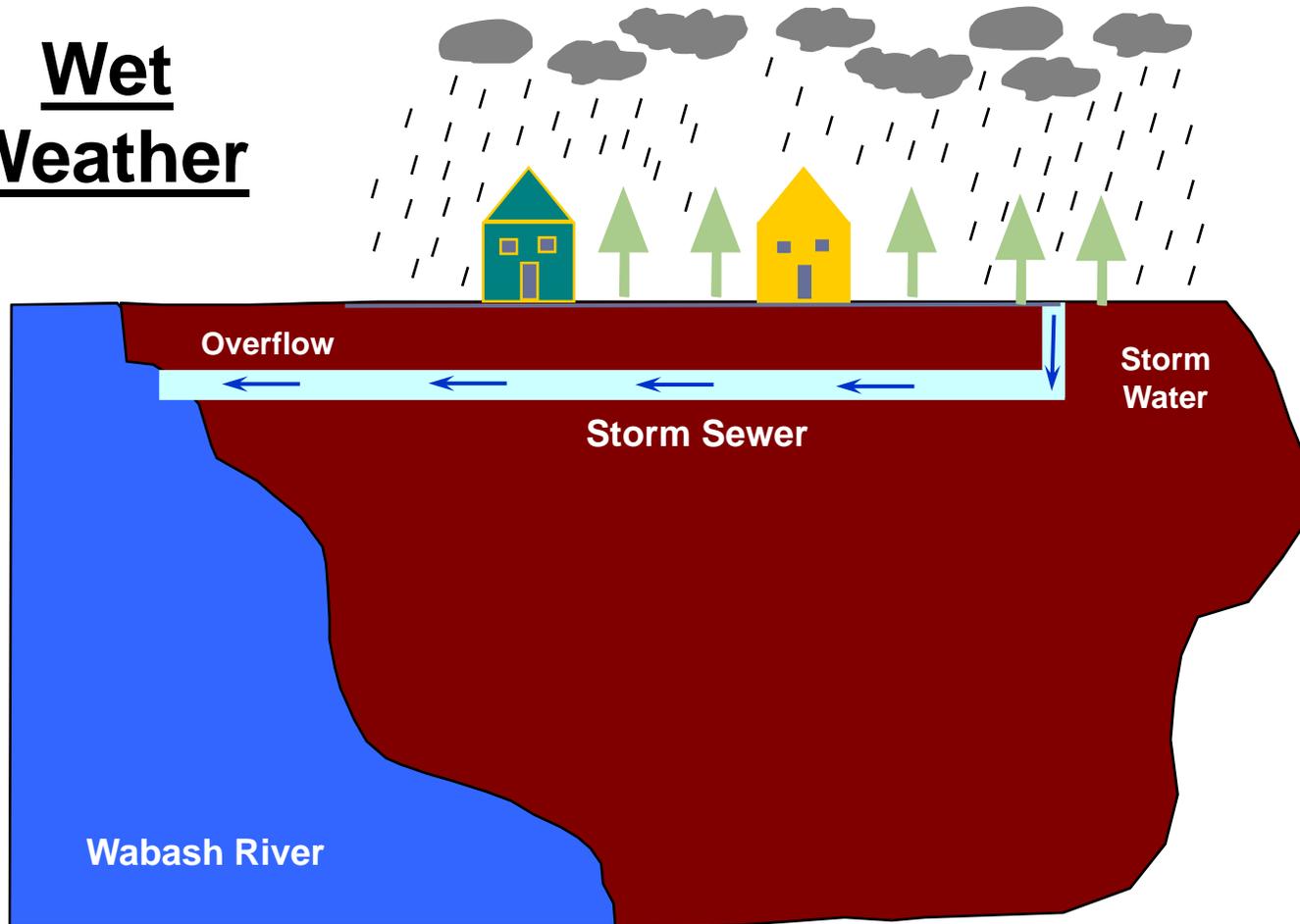
CSO Area (Number)	CSO Area (Name)
001	Greenbush St.
002	Salem St.
003	Cincinnati St.
004	Ferry St.
006	Pearl River
007	Williams St.
008	Shamrock Park
009	WWTP
010	11 <sup>th</sup> St.
011	14 <sup>th</sup> St.
012	Fairgrounds
015	6 <sup>th</sup> and Oaklawn
017	Old Romney Rd.

# How do CSOs Work?

## Late 1800s



Wet  
Weather

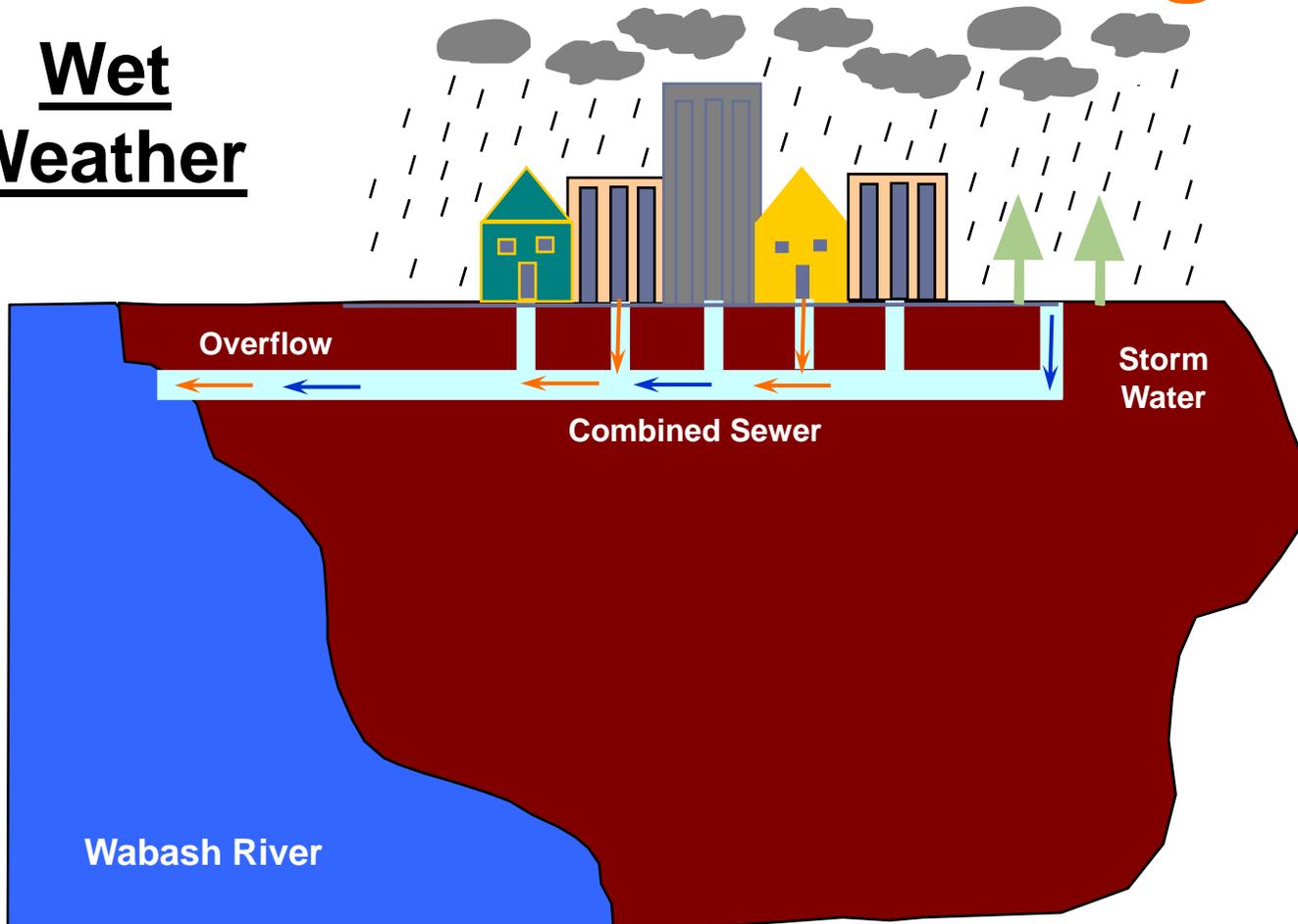


# How do CSOs Work?



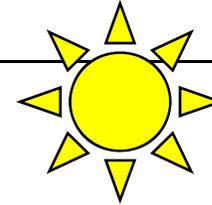
## Before 1954 with Plumbing

Wet  
Weather

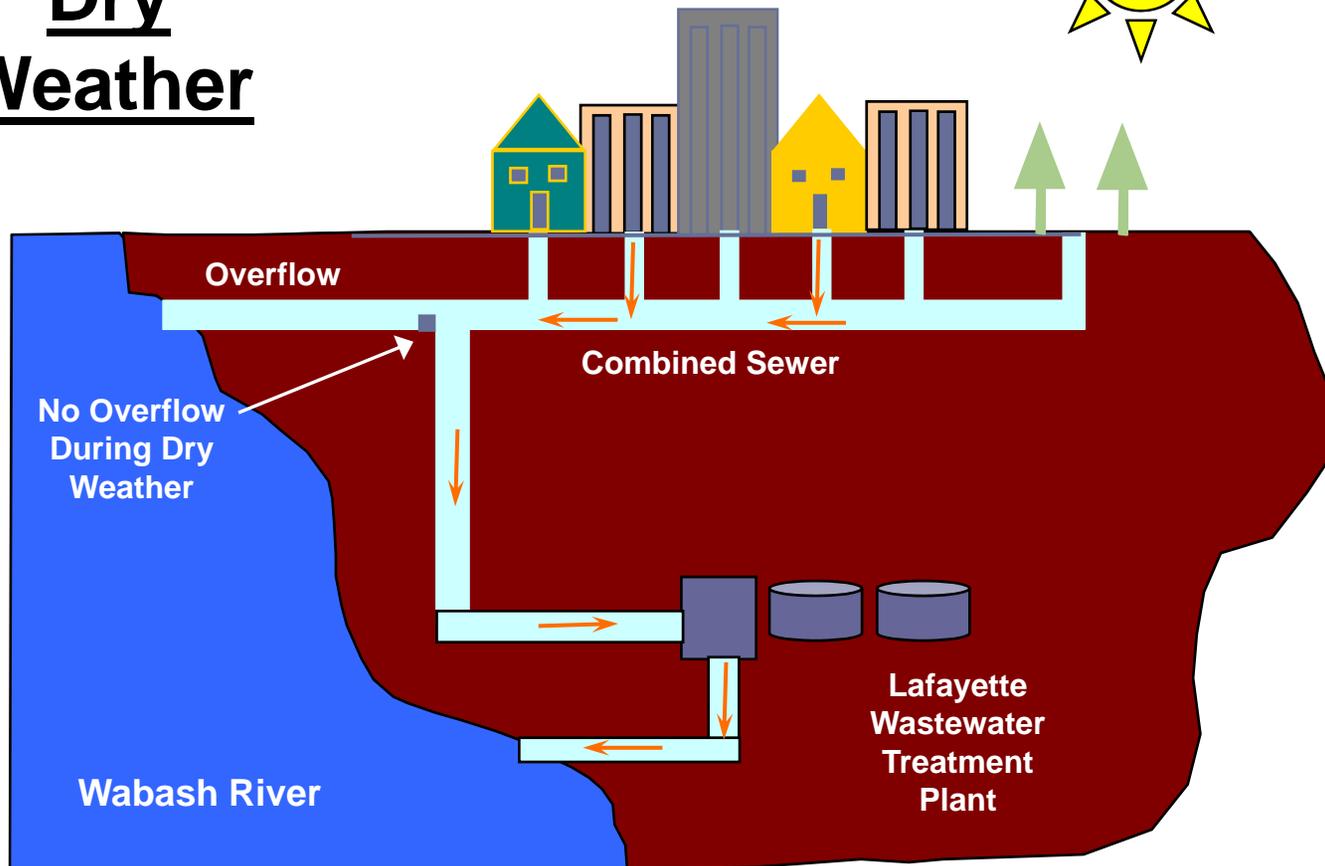


# How do CSOs Work?

## After 1954



### Dry Weather

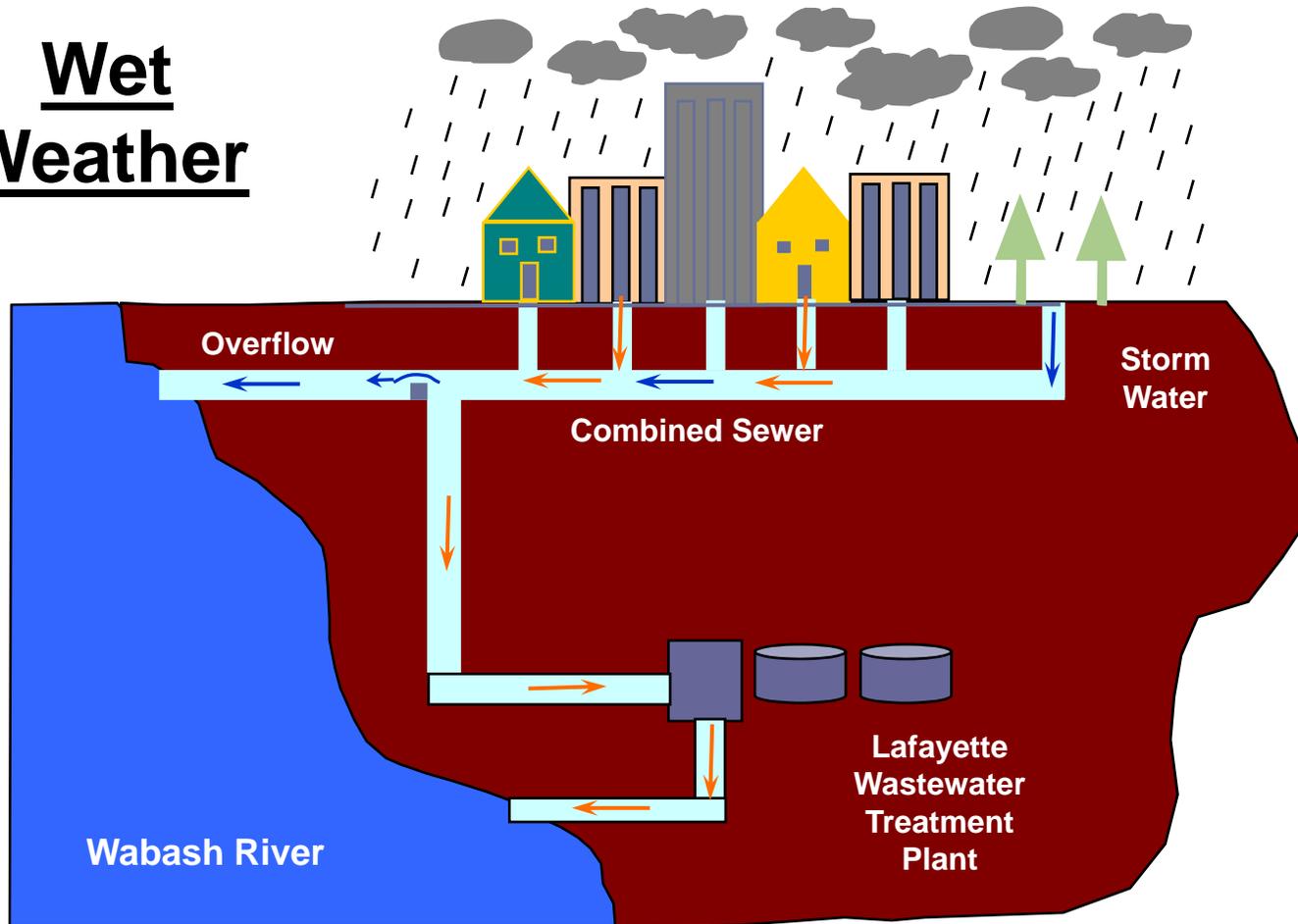


# How do CSOs Work?

## After 1954



Wet  
Weather



# Regulatory Requirements



## ■ 1972 Clean Water Act

- Required states to establish Water Quality Standards (WQS) for their waterways
- Indiana Water Pollution Control Board (WPCB) designated all water bodies in Indiana “fishable and swimmable”

## ■ NPDES Permit

- Regulates Wastewater Treatment Plant (WWTP) and CSOs
- Issued by Indiana Department of Environmental Management (IDEM) under delegation agreement of U.S. Environmental Protection Agency (EPA)
- 1950 – 1980, requirements focused on improvements to WWTP
- Today, requirements focus on CSO controls



# Major Provisions of the 1994 CSO Policy:



**Implement the  
“9 Minimum Controls”**

**Characterize the  
CSS & Receiving Waters**

**Prepare the LTCP**

**Implement the LTCP**

**Post-Construction  
Monitoring**



# Meeting the Regulations

# Meeting the Regulations – Lafayette Has Not Been Idle

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- One of the last Indiana cities to receive CSO permit language – permit effective May 1, 2003 (renewed 2008)
  - Flow Monitoring and Sampling Program completed in 2000 and 2001 as part of the Stream Reach Characterization and Evaluation Report (SRCER)
  - Collection system model complete
  - CSO Operational Plan submitted in April 2004
    - Nine Minimum Controls implemented
  - CSO Public Notification Program implemented
  - Wastewater treatment plant upgrade and expansion complete
  - Other capital improvement projects completed
  - Current tunnel project



# Meeting the Regulations – What the City is Doing

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- Monthly discharge monitoring reports to IDEM
- Continuous flow monitoring
- CSO public notification
- CSO Long Term Control Plan Update
- River survey physical features
- River survey uses
- Completed a 20 Year wastewater treatment facility plan
- Completed the development of a Collection System Management Master Plan (CSMMP)
- Development of Geographic Information System (GIS) in progress
- Early Action Projects



# Early Action Projects

- Replace aging infrastructure
- Handle additional flows



# Early Action Projects Constructed



- Upgraded/Expanded WWTP (2004)
  - Annual Average Flow: 16 MGD to 26 MGD
  - Peak Flow: 22 MGD to 52 MGD
- New Regionalized Lift Stations
  - Prairie Oaks (2005)
  - Ross Road (2008)
  - Pearl River (2008)
- Eliminated two CSOs
  - CSO 008 (Shamrock Park) (2002)
  - CSO 017 (Old Romney Rd.) (2005)



# Early Action Projects

- Under Construction
  - Tunnel

Proposed tunnel extension

Current portion of tunnel under construction



# Early Action Projects – Benefits



Annual Average Overflow (MG)														
Receiving Stream	Wabash River								Durkees Run Ditch					
CSO Number	001	002	003	004	006	007	008	009	010	011	012	015	017	Total
Before projects	248	99	141	77	33	55	11	151	6	10	111	1	7	950
After projects	242	0	0	0	62	28	0	1	6	10	109	1	0	459

- 52% reduction for entire collection system
- 82% reduction from CSOs 002, 003, 004, & 006

# Early Action Projects – Benefits



Annual Average CSO Frequency														
Receiving Stream	Wabash River								Durkees Run Ditch					
CSO Number	001	002	003	004	006	007	008	009	010	011	012	015	017	Max
Before projects	96	96	96	96	96	96	96	96	96	96	96	19	38	96
After projects	96	0	0	0	19	38	0	7	96	96	96	19	0	96

- 59% reduction for all CSOs
- 83% reduction for CSO 006



# CSO LTCP – Submitted in 2005

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- Three alternatives evaluated at 6 levels of control:
  - Alternative 1 – Storage facilities along Wabash River and Durkees Run
  - Alternative 2 – Storage facilities along Wabash River and parallel interceptor along Durkees Run
  - Alternative 3 – Storage facilities along Wabash River with high-rate treatment facilities at CSOs 001 & 009 and parallel interceptor along Durkees Run



# 2005 CSO LTCP continued – Levels of Control



Design Storm	Rainfall (inches)	Duration (hours)	Return Frequency	Overflows/Year
D	0.48	7	2 weeks	26
E	0.81	10	1 month	12
F	1.13	11	2 months	6
G	1.38	13	3 months	4
H	1.85	15	6 months	2
J	2.82	20	2 years	0.5 ~ 0



A photograph of a primitive shelter in a forest. The shelter is a simple rectangular structure with a dark, possibly tarp-like covering. It is situated in a clearing surrounded by dense green trees and foliage. The ground in the foreground is covered with a layer of grey rocks and debris. A large, dark log lies horizontally across the middle ground. The text "Where Are We Now?" is overlaid in white, bold, sans-serif font in the center of the image.

**Where Are We Now?**

# Today

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- September 2007 – City entered into Agreed Judgment with IDEM
- Update 2005 CSO LTCP
  - Additional alternative evaluation – to reflect Early Action Projects
  - Select Final Recommended Plan





**Updated CSO LTCP**

# Sensitive Areas

## From IDEM's Guidance

### ■ Sensitive Area:

“Sensitive Area’ means waters impacted by CSO discharges which must be given the highest priority for CSO discharge elimination, relocation, or control. Examples of sensitive areas include:

- Habitat for threatened and endangered species,
- **Primary Contact Recreational Areas such as beaches and other swimming areas**
- Drinking Water Source Waters
- Outstanding State Resource Waters”

# Sensitive Areas

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- As part of 2005 LTCP, City conducted River Use Survey and River Physical Survey
- River Use Survey – When, Where, and How the public uses the waterways in Lafayette
- River Physical Survey – Documented the physical attributes of the Wabash River and Durkees Run



# Sensitive Areas

- **Predominant Uses:**
  - Fishing/Canoeing
  - Wading
- **Less Frequent Uses:**
  - Water Skiing/Jet Skiing
- **Primary Contact Recreation (swimming)**
  - No designated swimming areas
  - Infrequent use noted in surveys
  - Water quality during wet weather is unsafe for full body contact recreation due to upstream bacteria and raw sewage overflows



# Updated Alternative Evaluation

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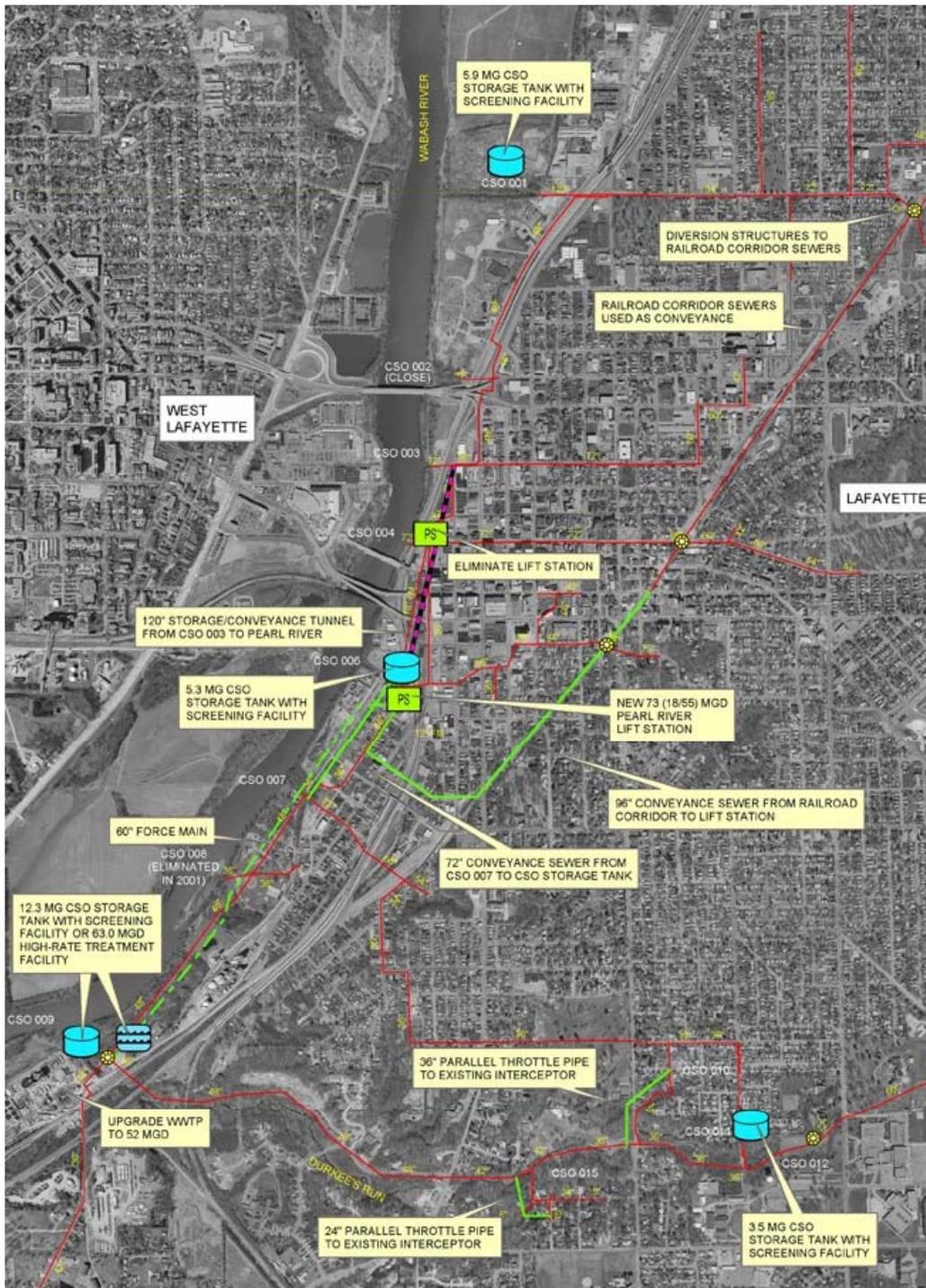
- Alternative A – Storage facilities along Wabash River and parallel interceptor along Durkees Run
- Alternative B – Storage facilities along Wabash River and at the upstream portion of Durkees Run
- Option – High-rate treatment facility at CSO 009 instead of storage



## G Storm Level of Control – Alternative A



## G Storm Level of Control – Alternative B



### Legend

- HRT\_Facility
- Storage Tank
- Lift Station
- Diversion Structure
- New Storage/Conveyance Tunnel
- New Force Main
- New Sewer
- Existing Sewer



# Preliminary Cost Estimates



Design Storm	Alternative A (Parallel interceptor along Durkees Run)		Alternative B (Storage facility along Durkees Run)	
	Capital Cost	Capital Cost with Option	Capital Cost	Capital Cost with Option
G (4 Overflows/year)	\$204,709,000	\$168,509,000	\$216,694,000	\$175,195,000





# Next Steps

# What's Next?

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- Conduct Use Attainability Analysis (UAA)
- Finalize Alternative Evaluation and LTCP
- Public Meeting about UAA
- Public Meeting for Final LTCP



A photograph of a river with a rocky bank and power lines in the background. The water is greenish-brown and reflects the sky and the structures on the bank. The background features several high-voltage power line towers and a utility pole, set against a clear sky. The foreground shows the rippling surface of the water.

**Questions?  
Comments?**



**GREELEY AND HANSEN**

**END OF PRESENTATION**



**City of Lafayette Wet Weather Program**

Date: 11/17/08

Meeting: LTCF Public Mtg. #1

Location: Holiday Inn, Pittman Rm.

Name	Address	City	State	ZIP	Telephone	E-mail Address
Roger Deitzner	220 Perrin Ave	LAF	IN	47901	742-2189	deitzner@verizon.net
Jo Wade	301 Frontage Rd	Laf	IN	47905	447-9999	jwade@HomeOfPurdue.com
JOE KRUSE	2202 TRACE 22	W LAF	IN	47906	743-8853	JKR5182853@AOL.COM
Steve Fischer	7244 Robert Ross Ln.	W Laf	IN	47906	583-2987	
PON EMMERT	1812 TRAXER DR, STE C3	LAF	IN	47909	474-9992 EXT 3	PON.EMMERT@IN.MACONET.NET
Eric Weddle	Southern + Courten				420-5264	eweddle@jconlin.com
Stanton Lambert	201 N. 7nd St.	Laf	IN	47901	420-8505	slambert@lafayettejm.gov
Jenny Bonner	1751 Hemlock Rd	Laf	IN	47905	449-7401	jbonner@lafayettehe.in.gov
Ryan Smith	1000 Wea Ave	Laf	IN	47905	479-4240	rsmith@bfsengr.com
Mike Donald	6505 S. 200 E.	Laf	IN	47909	474-8674	---
Riz Solberg	4030 Sylvania Trail	W. Laf	IN	47904	763-5955	---
George Lewis	406 Main Street	Laf	IN	47901	742-9700	glewis@hmcengineering.com



**City of Lafayette Wet Weather Program**

Date: 11/17/08

Meeting: LTCR Public Mtg. #1

Location: Holiday Inn, Pittman Rm.

Name	Address	City	State	ZIP	Telephone	E-mail Address
Charles Sullivan	3923 S Orchard Ct	Lafayette	IN	47905	765 446-9655	csullivan@lafayette.in.gov
Tilka Treere	310 Winesap Dr	Lafayette	IN	47905	765 449-8341	ttreere@tippecanoe.in.gov
David Little	4025 S River Rd	Lafayette	IN	47906	743 5237	R David Little Ad
MICHAEL O. HUNT	602 N. 5th	Lafayette	IN	47901	742-6704	buntm@purdue.edu
S. BAGCHI	PURDUE ECE	WL	IN	47907	494-3362	sbagchi@purdue.edu
Rick Cornstble		Laf	IN	09		
Dennis Carson	3400 Galkhart St	WL	IN	06	497-2780	dcarsonfamily@yahoo.com
Edward Chose	316 Ferry	Laf	IN	47902		
MIKE JONES	2314 Sioux Pl	LAF	IN	47909	474-9124	M.JONES@LAFAYETTE.IN.GOV
PERRY BROWN	1702 mocton	Laf	IN	47904	742-0383	perryebrown@msn.com





## MEETING MINUTES



Date: November 17, 2008  
To: Jenny Bonner, Brad Talley, Gui DeReamer, Julie Hanson  
From: Andrea Paul (DLZ)  
Subject: LTCP Public Meeting

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Mayor Tony Roswarski opened the meeting and recognized the importance of improving water quality in the City of Lafayette. The mayor spoke briefly about the need for improvement and acknowledged community contributions to enhance local quality of life.

### Background

Combined Sewer Overflows appear to be an issue facing mostly Midwestern communities. Indiana, Illinois, and Ohio hold 54 percent of all CSO permits in the nation. Indiana alone has more than 100 CSO communities, 12.5 percent of the national total.

The City of Lafayette has 13 Combined Sewer System (CSS) Service Areas encompassing 4,437 acres. Of these, Old Romney Road (CSO Area 017) and Shamrock Park (CSO Area 008) have completed sewer separations. A new lift station was constructed at Prairie Oaks in 2005.

Storm sewers of the late 1800s were built to route flow directly into the Wabash River. With the introduction of plumbing, storm and sanitary sewers were combined and continued to route directly to the river until 1954. After 1954, the combined sewer routed all flow to the Lafayette Wastewater Treatment Plant where it was treated before being released into the Wabash River. During dry weather, all flow is directed to the treatment plant. During wet weather, when the combined sewer system reaches capacity, raw sewage and stormwater flow untreated into the Wabash River.

### Regulatory Requirements

The 1972 Clean Water Act required all states to establish Water Quality Standards (WQS) for their waterways. All bodies of water in Indiana were designated as “fishable and swimmable” by the Indiana Water Pollution Control Board (WPCB).

Today, the Indiana Department of Environmental Management (IDEM), under an agreement with the U.S. Environmental Protection Agency (EPA), issues requirements under the National Pollution Discharge Elimination System (NPDES) Permit to regulate discharge from wastewater



*Confidential for deliberative and discussion purposes*



treatment plants and CSOs. In the City of Lafayette, the WWTP has met all current upgrade requirements and the focus has shifted to CSOs.

In 1994 major provisions were implemented to the CSO Policy. “Nine Minimum Controls” were set to maintain the collection system and ensure all requirements were met. Major provisions of the policy also include characterizing the combined sewer system and receiving waters, preparation and implementation of the LTCP, and post-construction monitoring.

#### Meeting the Regulations

The City of Lafayette’s CSO permit became effective May 1, 2003 and was renewed in 2008. To meet regulations, the city has completed and implemented several projects including:

- Collection System Model, 2004
- CSO Operational Plan, 2004
- CSO Public Notification Program\*
- 20 Year Wastewater Treatment Facility Plan
- Collection System Management Master Plan (CSMMP)
- Wastewater Treatment Plant upgrade and expansion
- Other capital improvement projects

\*Brad Talley directed the audience to the Web site to receive notifications of combined sewer overflows during and after wet weather.

The following projects are in progress or ongoing to meet regulations:

- Pearl River Storage and Conveyance Tunnel
- Monthly discharge monitoring reports to IDEM
- Continuous flow monitoring
- CSO LTCP Update
- CSO Public Notification
- River Survey, physical features and uses
- Development of Geographic Information System (GIS)
- Early action projects

Early action projects are being implemented to replace aging infrastructure and handle additional wet weather flows. One such project was the upgrade and expansion of the Lafayette Wastewater Treatment Plant, completed in 2004. The plant was past its useful age and required extensive maintenance. Prior to the upgrade, the plant was at 90 percent of its ability to treat 16 million gallons per day (MGD). Following the upgrade, the plant has the ability to treat additional flow,



up to 52 MGD. The plant also will retain its ability to handle additional (future) flows when upgrades are made.

New, regionalized lift stations also have been completed as early action projects. Excess flow has been eliminated by the Prairie Oaks (2005) and Ross Road (2008) lift stations. The new Pearl River Lift Station can pump more wastewater to the treatment plant, which reduces the amount of untreated water flowing directly into the river.

Two CSOs were also eliminated by early action projects. Shamrock Park (CSO 008) was eliminated in 2002 and Old Romney Road (CSO 017) in 2005.

The Pearl River Storage and Conveyance Tunnel is currently under construction. The tunnel aligns under 2<sup>nd</sup> Street, with future plans to extend the tunnel north of Ferry Street to Cincinnati Street. The tunnel will eliminate the discharges from three CSOs and bring all the flow under the railroad tracks to the Pearl River Lift Station.

Benefits of early action projects include a 52 percent reduction of sewage spilling into the Wabash River. Prior to any early action projects, 950 MGD spilled into the river.

When complete, the early action projects will reduce the average number of combined sewer overflows from 96 to 38 per year.

#### Where Are We Now?

In order to meet regulations, IDEM has also issued guidance on “Sensitive Areas.” These areas are defined as water impacted by CSO discharges, which must be given the highest priority for CSO discharge elimination, relocation or control.

According to IDEM guidance, Sensitive Areas are defined as the following:

- Habitat for threatened and endangered species
- Primary Contact Recreational Areas (beaches or swimming areas)
- Drinking Water Sources Waters
- Outstanding State Resource Waters

Research from the Department of Natural Resources indicated that there are no habitats for threatened and endangered species, no drinking water source waters, and the Wabash River and Durkees Run are not Outstanding State Resource Waters.

In 2005, a survey was conducted as part of the Long Term Control Plan to determine river use. Surveys were sent to residents in billing statements to assess when, where, and how they use



Lafayette waterways. A River Physical Survey was also conducted to identify physical attributes of the Wabash River and Durkees Run.

Results from the 2005 survey found the waterways are predominantly used for fishing, canoeing, and wading. The primary contact recreation was found to be swimming, although there are no designated swimming areas along the waterways and water quality is unsafe during wet weather due to bacteria and raw sewage overflows.

#### Updated Combined Sewer Overflow LTCP

Gui DeReamer of Greeley and Hansen presented Long Term Control Plan alternatives. These alternatives were submitted in draft form in 2005 in anticipation of comments from IDEM. They were evaluated at six levels of control.

- Alternative 1 – Storage facilities along the Wabash and Durkees Run
- Alternative 2 – Storage facilities along the Wabash River and a parallel interceptor along the Durkees Run
- Alternative 3 – Storage facilities along the Wabash River with high-rate treatment facilities at CSOs 001 and 009, with a parallel interceptor along the Durkees Run

In September 2007, the City of Lafayette entered into a state judicial agreement with IDEM. With this agreement the two groups work as a team to finalize the LTCP and alternatives. Updates to the 2005 CSO LTCP should consider additional alternative evaluations in order to reflect improvements to the system as a result of early action projects.

The three initial options for alternatives were narrowed down to Alternatives A and B. Alternative A suggests building a storage facility along the Wabash River and a parallel interceptor along Durkees Run. Alternative B suggests building a storage facility along the Wabash River and another at the upstream portion of the Durkees Run near the fairgrounds.

Alternative A includes addressing the CSO along Greenbush with a storage tank at the combined sewer overflow. The Pearl River Storage and Conveyance Tunnel project will connect CSOs 002, 003, 004 and 006. Sewers along the river corridor that have been abandoned would be tied into the collection system. The wastewater treatment plant would have a storage tank and a parallel sewer that would be built at the fairgrounds to send flow to the treatment plant.

The estimate for capital costs of Alternative A is \$204,709,000, and Alternative B capital costs would be \$216,694,000. Choosing either alternative with the option (high-rate treatment at CSO 009) will reduce cost, but may result in increased operations and maintenance costs.



With the option, the Alternative A estimated capital cost is \$168,509,000, and the Alternative B estimated capital cost is \$175,195,000.

### **Next Steps**

Moving forward, the city will conduct a Use Attainability Analysis (UAA) to determine the city's ability to meet state water quality standards and fund the CSO Long Term Control Plan. The UAA will be used to evaluate the benefits of improving water quality versus the cost to implement the plan.

The city will hold public meetings to present UAA findings and share the final alternative for the LTCP.

Questions and Answers from the Audience:

#### **Q: What is the NPDES permit?**

A: NPDES stands for National Pollution Discharge Elimination System. The permit is issued by IDEM and it helps to regulate the wastewater treatment plant.

#### **Q: What is an interceptor? What is a force main?**

A: The original sewers were combined sewers. During and after wet weather, sewage was sent untreated to the Wabash River. Interceptors were built to divert flow to the Lafayette Wastewater Treatment Plant. A force main is a pipe that uses pressure to send flow from homes and businesses to the interceptor.

#### **Q: Are you sending stormwater to the treatment plant?**

A: Yes, and that's part of the capacity problem at the treatment plant. The stormwater that doesn't go to the treatment plant is not cleaned.

#### **Q: What is Durkees Run?**

A: Durkees Run is a ditch that is dry during most of the year except during and after wet weather. It flows to the Wabash River.

#### **Q: How can other people who aren't here find out about the CSO LTCP?**

A: The Web site is the main place to find information. The public also can contact the wastewater treatment plant for more information. Visit [www.lafayette.in.gov/egov/apps/services/index.egov?path=dept&action=19](http://www.lafayette.in.gov/egov/apps/services/index.egov?path=dept&action=19).



**Q: We have a lot of parking lots. What are the systems we have for managing drainage so it doesn't all enter the collection system?**

A: The majority of the combined system is in the downtown area. A lot of combined sewer overflows are from the stormwater runoff that enters the system. It takes up capacity needed to send wastewater to the treatment plant. Bioretention swales, rain gardens, and stormwater best management practices will help to reduce inflow into the system.

**Q: I know there are attempts at landscaping and green roofs. Will that help with runoff?**

A: The city is looking at green alternatives. Mayor Tony Roswarski commented bioretention swales installed in the downtown area will help with runoff.

**Q: Where are bioretention swales?**

A: Located at 3<sup>rd</sup> and Main Streets, the landscaped swales will collect stormwater and slow it down so it can percolate into the ground.

**Q: Are there storage systems that can help to prevent CSOs?**

A: The Pearl River Storage and Conveyance Tunnel will help prevent raw sewage overflows, and the city is also looking at additional storage options in the LTCP alternatives.

**Q: I'm an engineering student at Purdue University. In our program, there has been a lot of talk about the use of smart valves as part of the Indiana 21<sup>st</sup> Century Project. The project has been going on for two years. Has the city considered the use of smart valves?**

A: The city is familiar with the function of smart valves.

**Q: What kind of input from the public are you looking for? Are there other alternatives that we could be suggesting, or are we too far along in the process to have input on the alternatives?**

A: We could use input on the uses of the river. Responses from the mailer seemed surprising, for example jet skiing and boating.

With regard to the alternatives, the city had a Citizens Advisory Committee that met monthly or, at the least, quarterly. The alternatives presented today were narrowed down based on feedback from that committee. In a sense, the committee provided public input into the alternatives the city has today.

**Q: Along Durkees Run, is there a big difference between the two alternatives?**

A: One alternative is to build a new sewer, Alternative A, that would run from the fairgrounds to the country club and under 4<sup>th</sup> Street, near the YMCA. Alternative B would not install a sewer,



but would instead build a tank near the fairgrounds. The main difference in the alternatives is disruption in the area. Installing a new sewer in Alternative A would cause more disruption in the neighborhood than installing a storage tank.

**Q: The alternatives show four storage tanks in B and three storage tanks in A. Is there a possibility that the fourth tank in B could be expanded?**

A: Yes, one of the Long Term Control Plan requirements is that facilities that are constructed be expandable. With Alternative B, since there is a tank, an overflow point would remain. With Alternative A, the overflow would be eliminated. The city must consider the pros and cons of disrupting the community or leaving combined sewers that will still release raw sewage into the Wabash River.

**Q: At some point, will they increase the regulations so a CSO needs to be eliminated anyway?**

A: It's possible, but everything we build is expandable so we could address those requirements.

**Q: What's the disruption time for alternative A versus B?**

A: A 20-year implementation period would be required for either plan. The disruption for Alternative A for a new sewer would be more extensive than Alternative B.

**Q: In the big picture, we want to support this effort. We care about the water quality in the Wabash River. How can we be supportive to you? We need to get citizens involved and interested in this kind of thing. Is there an opportunity to educate the public in understanding why this is so important? The tunnel is a fascinating project; people want to learn what's going on. We need to explain why rates or the sewage bill will need to go up.**

A: From an education standpoint, there is a lot that individuals can do to help with stormwater. The way we build and manage our own properties can help prevent inflow and infiltration into the sewer system. Examples include installing pervious pavement, so we can divert stormwater from entering the combined sewer. We're getting ready to start a stormwater utility to address these kinds of things.

The city has also purchased a building at 515 Columbia and is seeking LEED certification to put a green roof on it as a demonstration. Also, for the Pearl River tunnel, we will have media on site in the next few weeks so it can be seen and not just talked about. We'll also have Web cams up so residents can see construction. There's a lot more information to come. This is just the start.

**Q: What will the Web cams show online?**





A: The site; Activity during construction.

**Q: What's the condition of the Durkees Run sewer?**

A: It's in fair condition.

**Q: That (condition of Durkees Run sewer) would be a factor in whether to consider Alternative A (new sewer) or B (storage tank).**

A: Good point. We will be evaluating the condition of the sewer during alternative analysis.

It was commented that uses of the river, such as fishing and boating, also should be considered.

**Q: There are 96 CSOs per year, according to your presentation. Do you have a target to reduce CSOs and what are the EPA mandates?**

A: The target is to reduce raw sewage overflows to four per year. It's not definite yet, but we're basing that on the Indianapolis LTCP, which was approved.

**Q: We just completed the Elliott Ditch Interceptor Improvements project. Will we rehabilitate the new Durkees Run lines the way we did for that project?**

A: No, these would be completely new sewers.

**Q: If plan A and B have a 20-year implementation period, when will we start to see the benefits?**

A: We've already seen improvements with the wastewater treatment plant and other early action projects.

**Q: What percentage of the watershed will these projects affect?**

A: There are about 4,000 combined acres. The full watershed is 16,000, so the combined percentage is 4/16 or 25 percent.

**Q: I do a lot of fishing and there are no water lilies, water hyacinths, cattails, etc. When will we get those back?**

A: The plan is to make the water quality good enough that these can grow there, but the lack of vegetation is due, in part, to velocity of the Wabash River.

**Q: How do we measure in terms of progress compared to other cities?**

A: About half of the combined sewer overflow long term control plans in Indiana have been approved. There is a major shift towards progress. Some are eliminating the combined sewer systems altogether. In other states, Indiana has been recognized as setting the pace.



The presenters thanked everyone for coming and encouraged them to sign in at the table.

# Public Meeting

Combined Sewer Overflow Long Term Control Plan  
Update Development  
Use Attainability Analysis

Meeting No. 2

May 12, 2009

6:00 p.m.

# Meeting Agenda

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- Purpose of Meeting
- Summary of Meeting No. 1 (11/17/08)
- Updated Combined Sewer Overflow Long Term Control Plan (CSO LTCP)
- Use Attainability Analysis
- Wabash River Model (presented by LTI)
- Economic/Financial Analysis
- Next Steps/Schedule



A photograph of a person's face and hands looking out from a circular opening in a tunnel. The tunnel walls are made of corrugated metal. The person is wearing a green shirt and has their hands on the edge of the opening. The scene is dimly lit, with light coming from the opening. The text "Purpose of Meeting" is overlaid in white.

# Purpose of Meeting

# Purpose of Meeting

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- Inform public of CSO planning activities
- Introduce the need to change the designated use of the Wabash River
- Present CSO impacts to river
- Present economic/financial impacts



A photograph showing a large, dark, cylindrical pipe or culvert discharging into a body of water. The pipe is surrounded by a structure of grey, angular rocks. The background consists of a grassy bank with some trees. The text "Summary of Meeting No. 1" is overlaid in white on the image.

# Summary of Meeting No. 1

# Summary of Meeting No. 1



## ■ Background

- Indiana CSOs account for  $\pm 12.5\%$  of national total
- Lafayette has 11 active CSOs

## ■ Regulatory Requirements

- 1972 Clean Water Act
- 1995 Federal CSO Policy
- 1999 Indiana CSO Policy
- NPDES Permit

CSO Area (Number)	CSO Area (Name)
001	Greenbush St.
002	Salem St.
003	Cincinnati St.
004	Ferry St.
006	Pearl River
007	Williams St.
008	Shamrock Park
009	WWTP
010	11 <sup>th</sup> St.
011	14 <sup>th</sup> St.
012	Fairgrounds
015	6 <sup>th</sup> and Oaklawn
017	Old Romney Rd.

# Summary of Meeting No. 1



- Meeting the Regulations
  - City very proactive
  - Early Action Projects
    - Upgraded/Expanded WWTP (2004)
    - New Regionalized Lift Stations
    - Eliminated two CSOs
    - Tunnel under construction
    - 52% reduction in CSO volume for entire collection system



# Summary of Meeting No. 1



- Sensitive Areas
- Update CSO LTCP submitted in 2005
  - Updated Alternative Evaluation
    - Alternative A – Storage facilities along Wabash River with parallel interceptor along Durkees Run
    - Alternative B – Storage facilities along Wabash River & at the upstream portion of Durkees Run
    - Option – High-rate treatment facility at CSO 009 instead of storage



A photograph showing a damaged structure, possibly a shed or small building, in a wooded area. The structure has a dark, possibly black, tarp or covering that is partially torn and hanging. The ground in the foreground is covered with a layer of grey gravel or crushed stone. The background is filled with dense green foliage and trees. The text "Updated CSO LTCP" is overlaid in white, bold, sans-serif font across the center of the image.

**Updated CSO LTCP**

# Updated CSO LTCP



- Selected recommended alternative
  - Alternative A
  - Level of Control – 4 overflows/year
- Cost Estimates

Design Storm	Alternative A (Parallel interceptor along Durkees Run)	
	Capital Cost	Capital Cost with Option
G (4 Overflows/year)	\$214,248,000	\$179,091,000



## 4 Overflow Level of Control – Alternative A



### Legend

-  HRT\_Facility
-  Storage Tank
-  Lift Station
-  Diversion Structure
-  New Storage/Conveyance Tunnel
-  New Force Main
-  New Sewer
-  Existing Sewer





**Use Attainability Analysis**

# What is a UAA?

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- Current designated use of Wabash River is Primary Contact Recreation (swimming)
- UAA required to modify designated use during wet weather events
- UAA provides scientific, technical, and economic support that designated use is not attainable based on one or more of the six factors listed in 40 CFR 131.10 (g)



# Use Attainability Analysis



- City required to meet Water Quality Standards (WQS)
- WQS – cannot exceed 235 counts/100 ml *E.coli*
- Nearly every rainfall causes WQS exceedance in Wabash River



# Use Attainability Analysis



- Eliminate CSO impacts on WQS – complete sewer separation is necessary (0 overflows)

Alternative	Capital Cost
Alternative A	\$179,091,000
Sewer Separation	\$391,830,000



# Use Attainability Analysis



- To separate entire collection system – City will have to double what it can afford
- Affordability defined as 2% of Median Household Income (MHI)
- Since sewer separation is unaffordable – City will do a UAA to allow modified designated use that can be attained



# UAA Six Factors

## 1. Naturally occurring pollutant concentrations

- Pollutants associated with geologic conditions that cause background (normal) concentration levels elevated (arsenic associated with shale deposits)



## 2. Low-flow conditions or water levels

- Too low to support aquatic life



# UAA Six Factors

---



## 3. Human caused conditions or pollutant sources

- Pollutant filled runoff from large impervious areas in combined area
- Can be controlled by use of Best Management Practices (BMPs)

## 4. Dams or other hydrologic modifications

- Create unsafe conditions for recreation



# UAA Six Factors



## 5. Natural physical conditions for aquatic life

- Streams need to provide proper habitat for aquatic life



## 6. Substantial and widespread economic and social impact



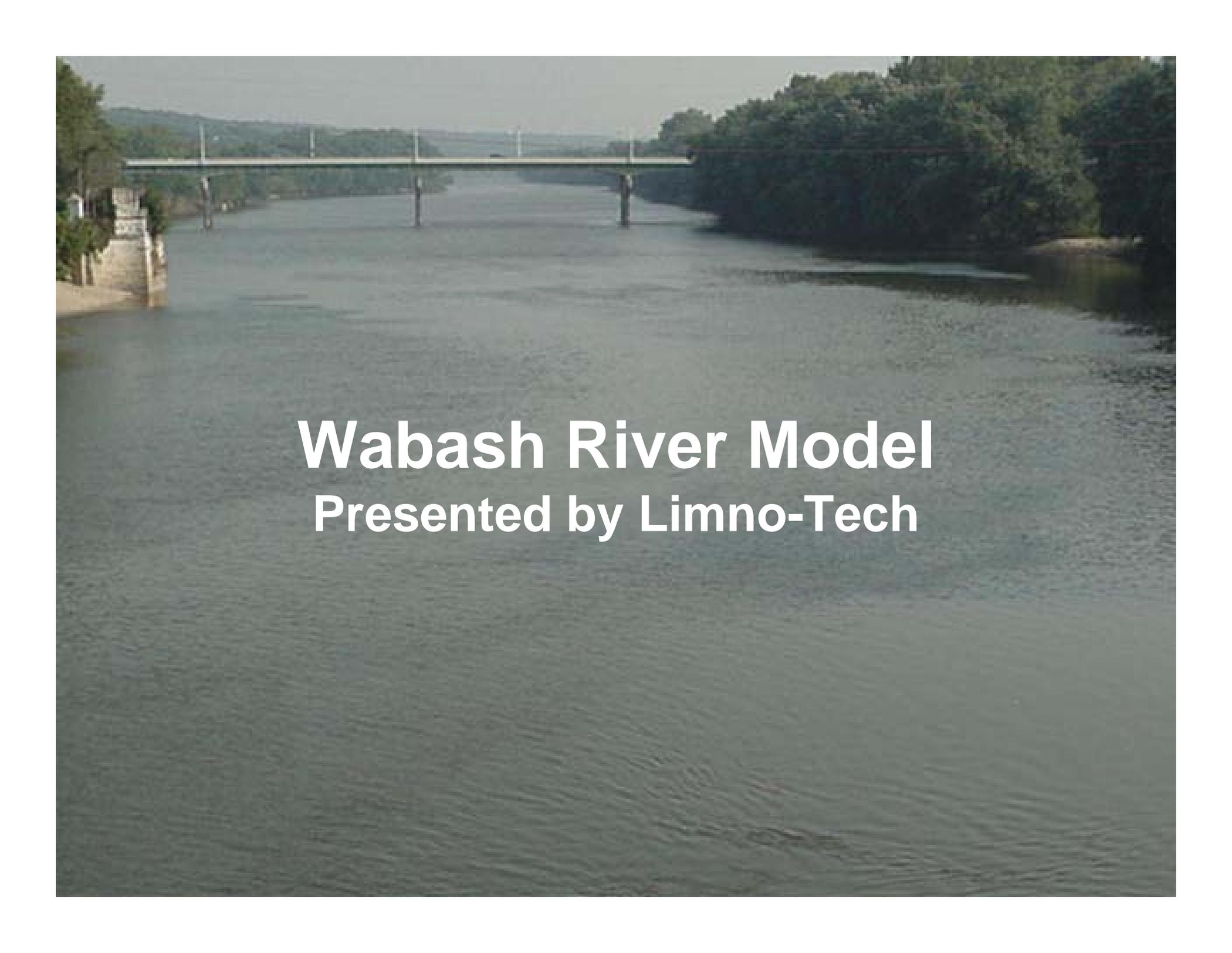
# Lafayette's UAA

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- Focus on 6<sup>th</sup> Factor
- City developed costs for each alternative at various levels of control
- Conduct Water Quality river model of CSO impacts on Wabash River
- Conduct economic and financial analysis



A wide, calm river flows through a landscape. In the background, a long bridge with several tall, thin piers spans across the river. The right bank is densely lined with green trees, and a small, light-colored structure is visible on the left bank. The sky is overcast and grey.

# Wabash River Model

Presented by Limno-Tech

A photograph of a river with a rocky bank and power lines in the background. The water is calm and reflects the surrounding greenery and the sky. The text "Economic/Financial Analysis" is overlaid in the center of the image.

# **Economic/Financial Analysis**

# Financial Capability Analysis

---



- Part of the LTCP
  - Tool used by regulators to incorporate economic considerations into decisions about scope and schedule of program
- Two components
  - Financial indicators – community conditions
  - Residential indicator – cost per household
  - Combined to assess level of burden



# U.S. EPA's Four-Step Process

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- Develop a Cost per Household
- Determine the Residential Indicator Score
  - Based on Cost per Household as a percent of Median Household Income (MHI)
- Develop the Community Financial Indicator Score
  - Based on six factors
- Develop the Overall Financial Capability Indicator Score



# Cost Per Household

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- Calculate current and future annual wastewater treatment and CSO costs
- Calculate residential share based on % of flow from residential customers



# Community Financial Indicators

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## ■ Debt Indicators

- Bond Rating – Current rating is great
- Debt Burden/Level - City's debt is high
  - City's debt level will have to increase to pay for this CSO LTCP



# Community Financial Indicators

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## ■ Socioeconomic Indicators

- Unemployment Rate – higher than national average
- Median Household Income (MHI) – lower than national average



# Community Financial Indicators

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- Financial Management Indicators
  - Property Tax Revenues
    - As % of Property Value
      - Moderately high property tax rates
      - Local income taxes are also imposed
    - Collection Rate – Poor
      - Affected by recession, foreclosures



# Overall Financial Capability Score



Community Financial Indicator Score	Residential Indicator Score (Cost per Household as % of MHI)		
	Low (<1%)	Mid Range (1-2%)	High (>2%)
Weak (below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (1.5-2.5)	Low Burden	Medium Burden	High Burden
Strong (above 2.5)	Low Burden	Low Burden	Medium Burden



# U.S. EPA Scheduling Guidelines

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- Low Burden: Normal engineering/construction schedule
- Medium Burden: Up to 10 years
- High Burden: Up to 15 years, with ability to negotiate up to 20 years
- City has requested a schedule of 20 years





**Next Steps**

# What's Next?

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- Finalize LTCP report and UAA
- Public Meeting for Final LTCP – June
- Submit final report to IDEM – July



# Questions

# Lafayette CSO Long-Term Control Plan: Wabash River Model Results



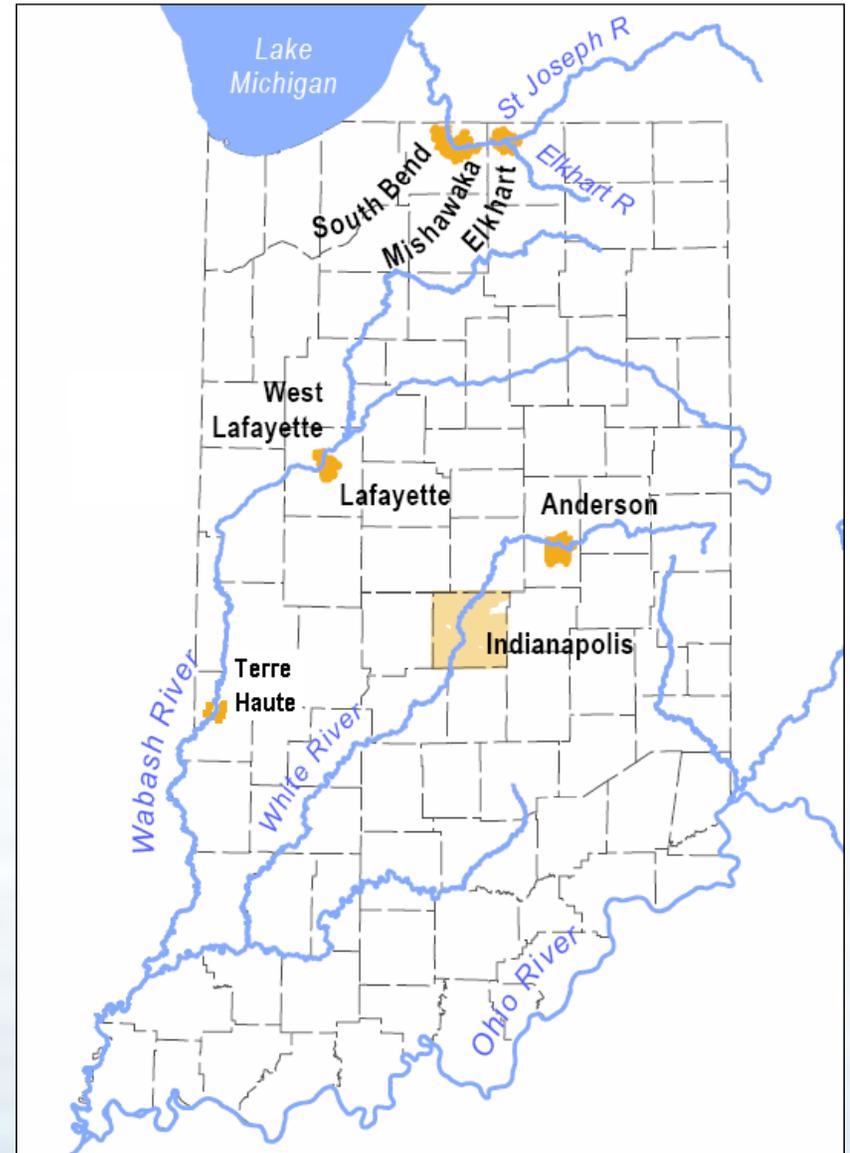
# Introduction

This presentation will provide:

- A brief description of the Wabash River Model
- A summary of E. coli loads from various sources used in the model
- An evaluation of compliance with bacteria (E. coli) water quality standards
- A discussion results of the analysis to determine the extent and timing of downstream impacts

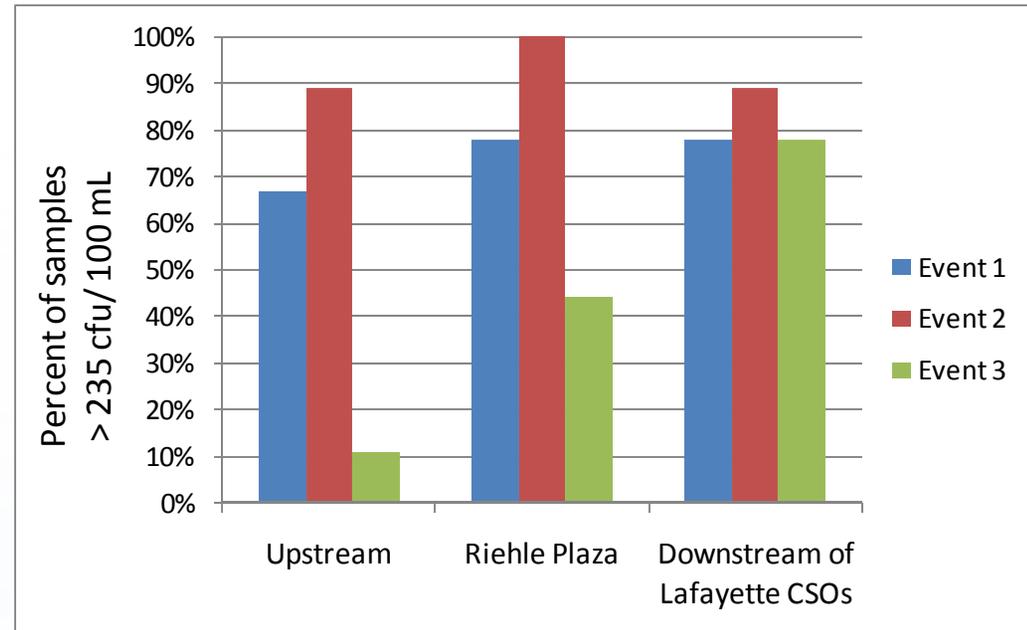
# Wabash River Model

- River model framework:
  - Water-quality modeled using Branched Lagrangian Transport Model (BLTM) developed by USGS.
  - Diffusion-Analogy Flow Model (DAFLOW) used as a companion model to provide flow input to the BLTM model.
- The model can track individual source types as well as total E. coli concentrations.
- The BLTM/DAFLOW modeling tools have also been used for CSO LTCP and watershed planning in several Indiana communities.



# Wabash River Model

- Model was calibrated and validated using monitoring data collected in 2001 and 2002.



- Original model was discussed in Lafayette's 2004 *Stream Reach Characterization and Evaluation Report*.
- The model was also used to evaluate benefits of control alternatives for the previous LTCP, submitted in 2005.

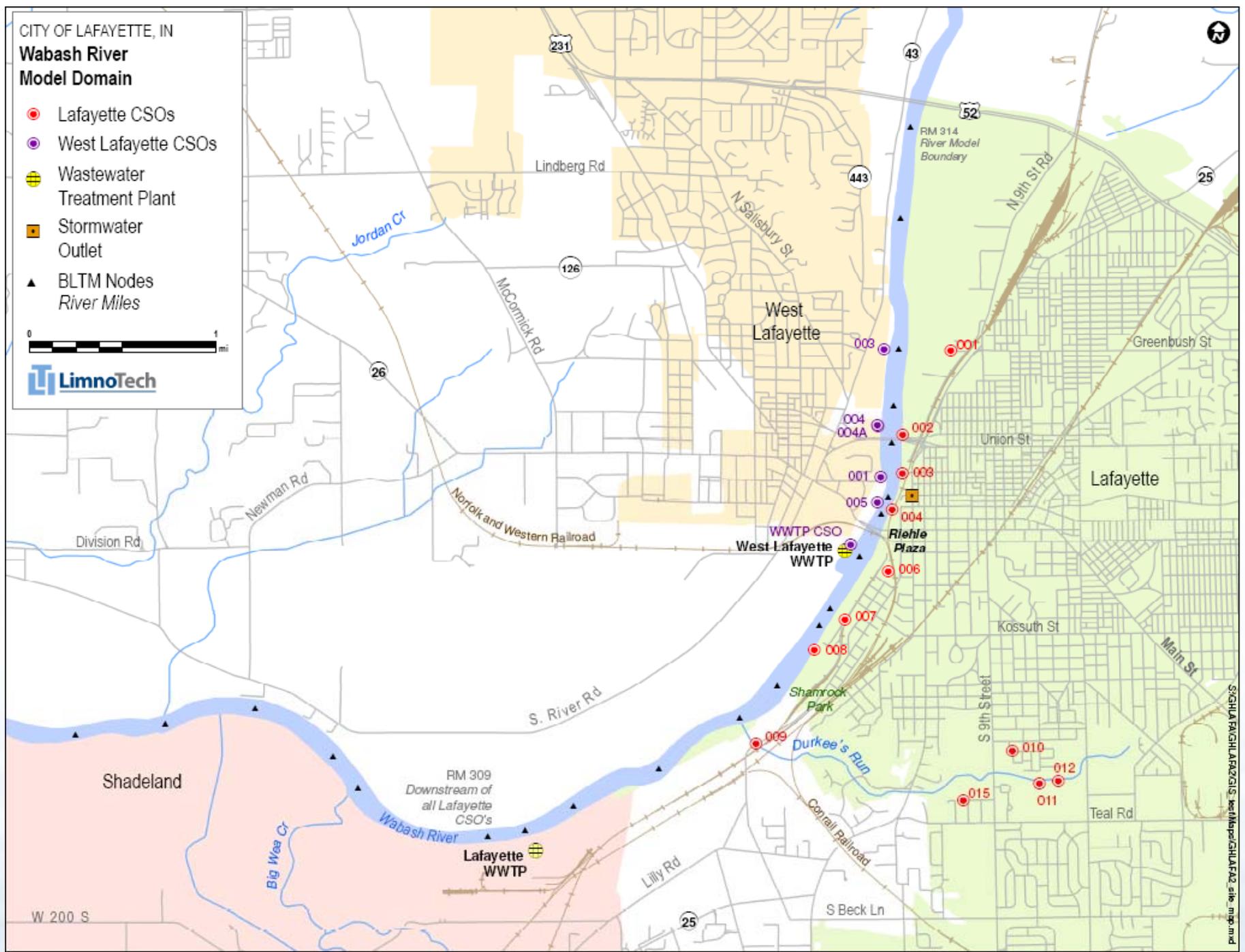
# E. coli Sources

The sources of E. coli included in the river model are:

- Upstream loads
- Wastewater treatment plant loads for Lafayette and West Lafayette
- Stormwater loads for Lafayette and West Lafayette
- Tributary loads (all located downstream of Lafayette)
- CSO loads for Lafayette and West Lafayette

CITY OF LAFAYETTE, IN  
**Wabash River  
 Model Domain**

- Lafayette CSOs
- West Lafayette CSOs
- ⊕ Wastewater Treatment Plant
- Stormwater Outlet
- ▲ BLTM Nodes River Miles



# Run Descriptions

The river model was run using typical flow and precipitation conditions for one year.

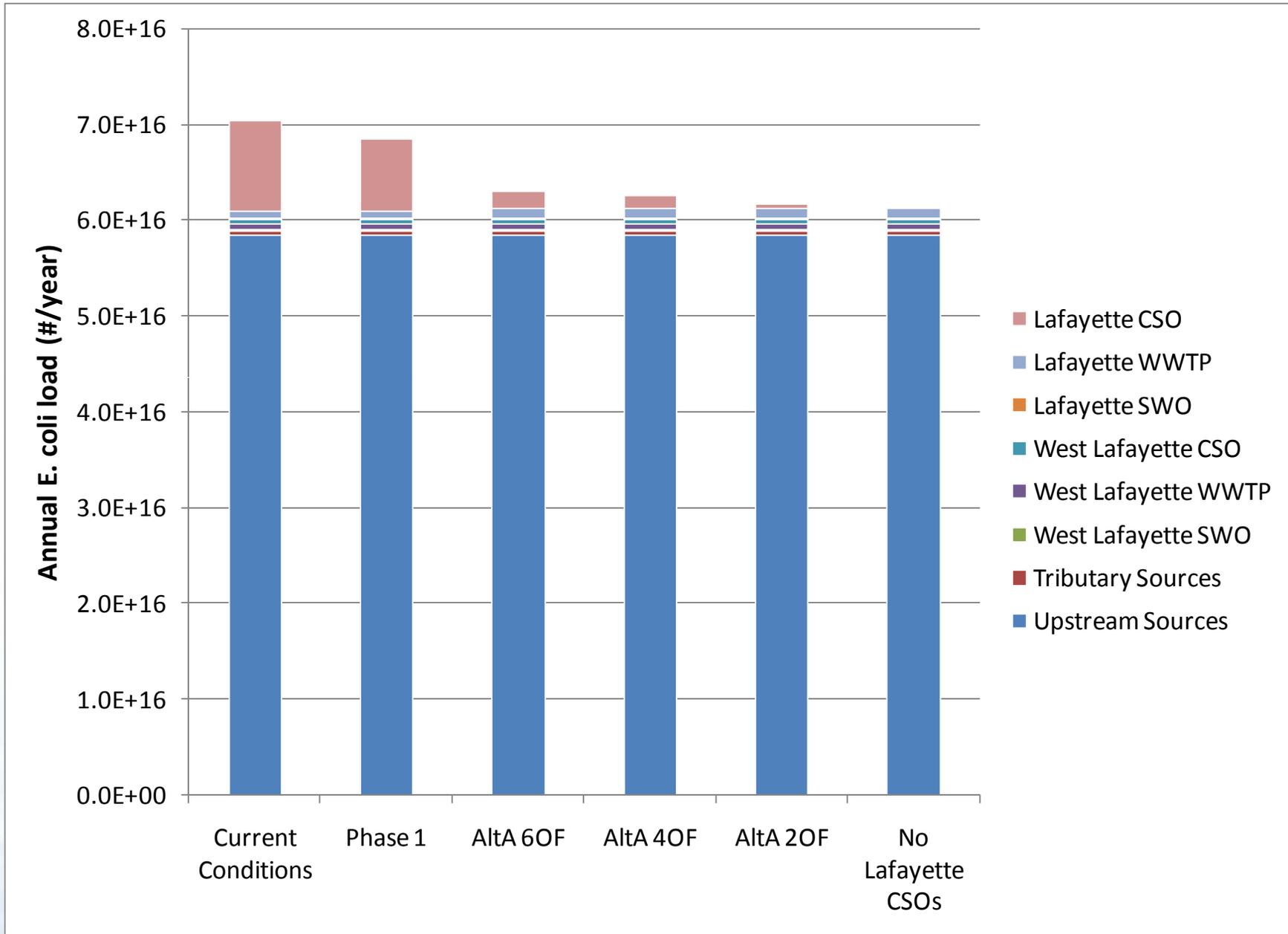
The scenarios that we evaluated were:

- Current conditions - 2005 sewer system configuration (before any improvements)
- Phase 1 – Following implementation of early action controls
- Two CSO Control Alternatives sized at 3 levels of control (6 total control options)
- No Lafayette CSOs - CSO loads from Lafayette assumed to be zero (for comparison only)

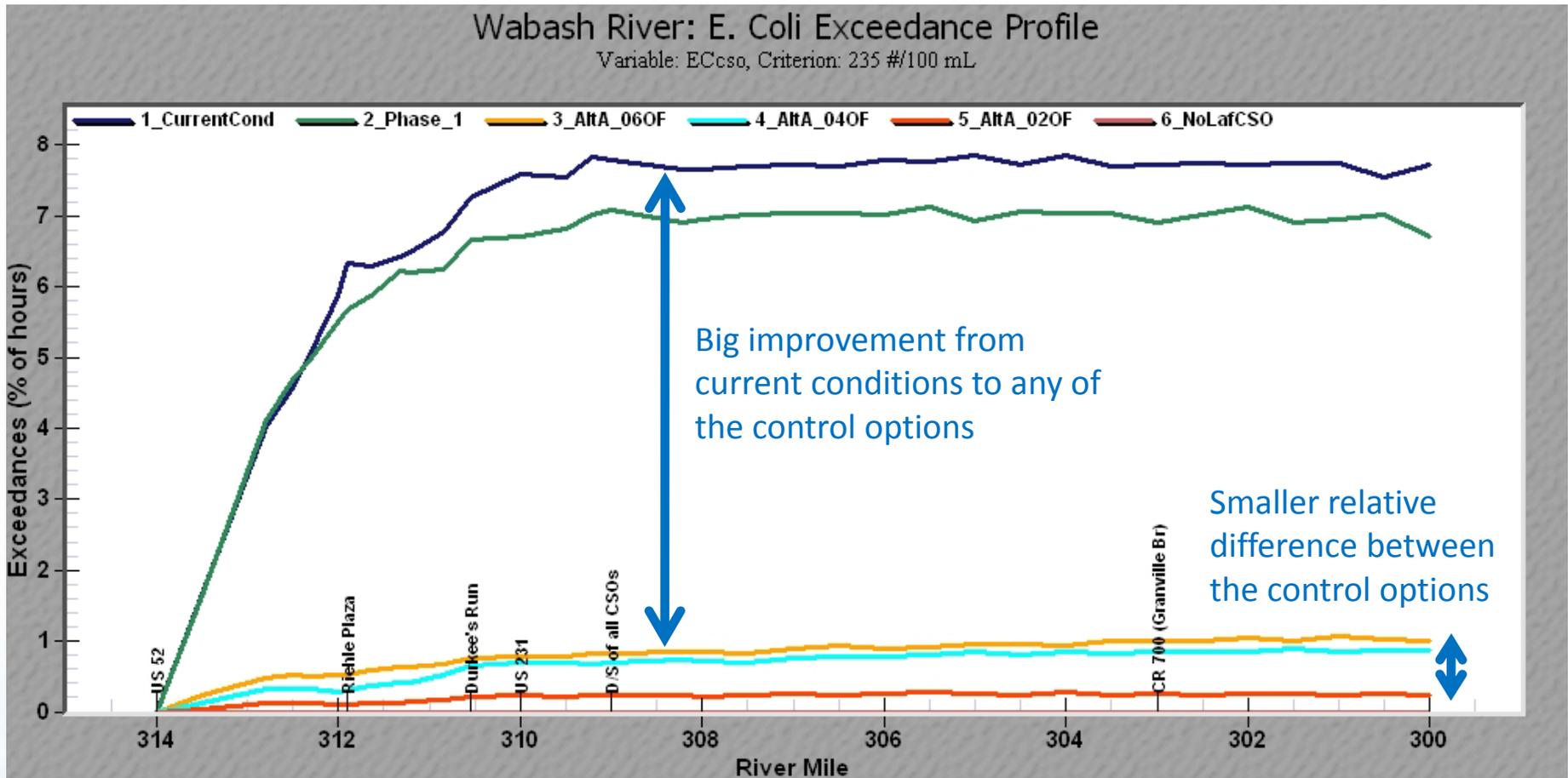
# Results from Wabash River Model

- Upstream *E. coli* source loads are alone sufficient to exceed water quality standards for both single sample and monthly geomean criteria.
- All of the proposed control options provide measurable benefit compared to the current conditions.
- The differences between the six control options are very small in terms of compliance with water-quality criteria.

# Annual *E. coli* Sources



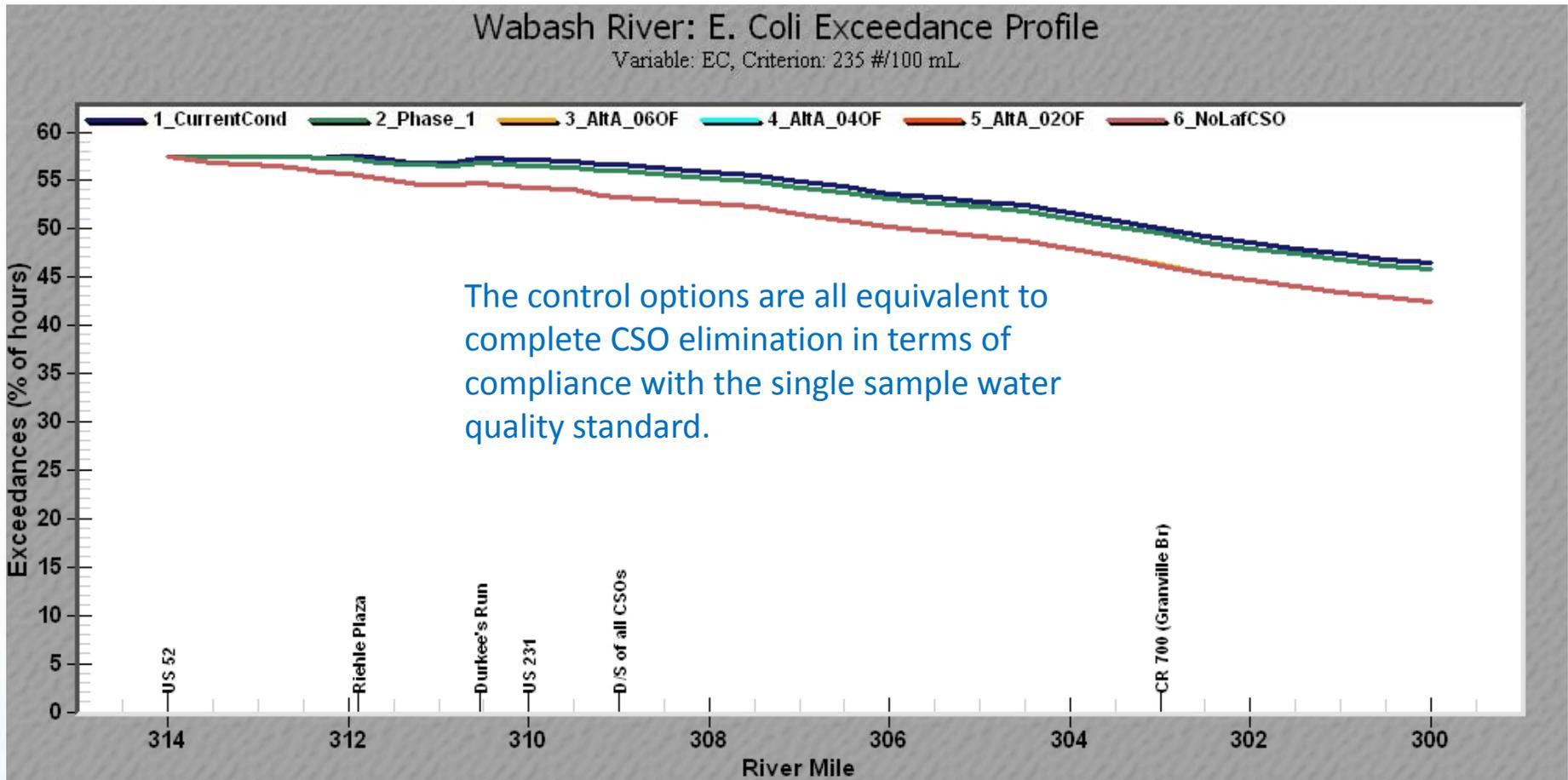
# Exceedance of Indiana Single Sample Criterion During the April – October Recreation Season (Lafayette CSOs only)



**Notes:**

Indiana Recreation Season = April-October (5,136 hours);  
 Single Sample Maximum Criterion = 235 cfu/100 ml

# Exceedance of Indiana Single Sample Criterion During the April – October Recreation Season (all sources)



**Notes:**

Indiana Recreation Season = April-October (5,136 hours);  
Single Sample Maximum Criterion = 235 cfu/100 ml

## Average Concentration Downstream of Lafayette CSOs (all sources) as Geometric Mean

Scenario	Geometric mean in-stream <i>E. coli</i> concentration (cfu/100 mL) by month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Current Conditions	298	233	318	209	324	316	213	245	219	303	622	463
Phase 1	294	233	315	204	316	307	208	239	211	298	610	460
Alternative A - 6 OF/year	296	240	321	188	289	268	189	215	185	280	586	458
Alternative A - 4 OF/year	296	240	321	188	289	267	187	215	185	280	584	458
Alternative A - 2 OF/year	295	240	321	188	289	266	184	212	185	280	582	458
No Lafayette CSOs	292	238	317	188	288	266	184	211	185	280	574	454

### Notes:

Indiana Recreation Season = April-October (185 30-day periods);

30-day Geometric Mean Criterion = 125 cfu/100 ml

Highlighted values exceed Indiana Criteria. Note that there is no 30-day criterion applicable during the months of November through March.

# Determining downstream impacts

- We used the information from the model to evaluate downstream impacts due to Lafayette CSOs for the preferred control alternative. We wanted to know:
  - How far downstream do water quality standard exceedances occur?
  - How long after an overflow event do exceedances occur?
- We evaluated individual CSO events as well as an average overflow event.

<b>CSO Overflow</b>	<b>Downstream distance (miles)</b>	<b>Hours after overflow</b>
Average event	14	10
Maximum event	26	21

Notes:

Downstream distance and hours after overflow represent extent of exceedance of single sample max criteria (235 cfu/100 mL) due to Lafayette CSOs.

The downstream distance is measured from River Mile 309, located just downstream of the Lafayette wastewater treatment plant.

# Conclusions

- The considered CSO control options all offer measurable benefit in terms of compliance with water quality standards.
- Following the implementation of the preferred CSO control alternative, Lafayette CSOs would be expected to:
  - Cause water quality standard exceedances less than 1% of the time in the area of Lafayette; and
  - Impact water quality approximately 14 miles downstream of the Lafayette Wastewater Treatment Plant for an average CSO event.

## Questions?

- Tim Towey, P.E. – [ttowey@limno.com](mailto:ttowey@limno.com)
- Carrie Turner, P.E. – [cturner@limno.com](mailto:cturner@limno.com)



City of Lafayette Wet Weather Program

Date: 5/12/09

Meeting: CSO LTCP Public Mtg. # 2

Location: Holiday Inn

Name	Address	City	State	ZIP	Telephone	E-mail Address
Isaac Whiteaker	1822 Washington	LAF	IN	47905	477-6630	
Kenny McCleary	942 Chepstow Ln.	W.Laf.	IN	47906	477-4006	mccleary_kenny_m@lilly.com
Robert Detzner	220 Perrin Ave	LAF	IN	47901	742-2449	detzner@verizon.net
Clem Schroll	3903 S. Orchard Ct	Laf	IN	47905	447-9231	edschroll@verizon.net
Tony Roswanski	20 N. 6 <sup>th</sup> LAF.	LAF	IND	47701	807-1002	troswanski@lafayette.in.gov
Becky Bright	5500 St. Helms Street	Laf	IN	47905	449-6698	rebecca.bright@subaru-sia.com
Saurabh Bagchi	465 Northwestern Avenue	W. Laf.	IN	47907	494-3362	sbagchi@purdue.edu
Dave Little	4025 S. Riverview Rd	West	IN	47906	743 5737	R David Little @ AOL



**Lafayette, Indiana  
LTCP Public Meeting  
Meeting Notes  
May 12, 2009**

**Purpose of Meeting**

- Inform public of CSO planning activities
- Introduce the need to change the designated use of the Wabash River
- Present CSO impacts to river
- Present economic/financial impacts

**Summary of Meeting No. 1**

- Background
  - Indiana CSOs account for +/- 12.5% of national total
  - Lafayette has 11 active CSOs
- Regulatory Requirements
  - 1972 Clean Water Act
  - 1995 Federal CSO Policy
  - 1999 Indiana CSO Policy
  - NPDES Permit
- Meeting the Regulations
  - City is very proactive
  - Early Action Projects
    - Upgraded/Expanded WWTP (2004)
    - New Regionalized Lift Stations
    - Eliminated two CSOs
    - Tunnel under construction
    - 52% reduction in CSO volume for entire collection system
- Sensitive Areas
- Update CSO LTCP submitted in 2005
  - Updated Alternative Evaluation
    - Alternative A – Storage facilities along Wabash River with parallel interceptor along Durkees Run
    - Alternative B – Storage facilities along Wabash River and at the upstream portion of Durkees Run
    - Option – High-rate treatment facility at CSO 009 instead of storage

**Updated CSO LTCP**

- Selected recommended alternative
  - Alternative A
  - Level of Control – 4 overflows/year
- Cost Estimates
  - Capital Cost = \$214,248,000
  - Capital Cost with option = \$179,091,000

*Added July 2009*

## Use Attainability Analysis

- What is UAA?
  - Current designated use of Wabash River is Primary Contact Recreation (swimming)
  - UAA required to modify designated use during wet weather events
  - UAA provides scientific, technical, and economic support that designated use is not attainable based on one or more of the six factors listed in 40 CFR 13110 (g)
- Lafayette conducting UAA
  - City required to meet Water Quality Standards (WQS)
  - WQS - cannot exceed 235 counts/100 ml *E.coli*
  - Nearly every rainfall causes WQS exceedance in Wabash River
  - To eliminate CSO impacts on WQS – complete sewer separation is necessary (0 overflows/year)
    - Alternative A capital cost = \$179,091,000
    - Sewer Separation = \$391,830,000
  - As shown, to separate entire collection system – City would have to double what it can afford
  - Affordability defined as 2% of Median Household Income (MHI)
  - Since sewer separation is unaffordable – City will do a UAA to allow modified designated use that can be attained
- UAA Six Factors
  - Naturally occurring pollutant concentrations
    - Pollutants associated with geologic conditions that cause background (normal) concentration levels elevated (arsenic associated with shale deposits)
  - Low-flow conditions or water levels
    - Too low to support aquatic life
  - Human caused conditions or pollutant sources
    - Pollutant filled runoff from large impervious areas in combined area
    - Can be controlled by use of Best Management Practices
  - Dams or other hydrologic modifications
    - Create unsafe conditions for recreation
  - Natural physical conditions for aquatic life
    - Streams need to provide proper habitat for aquatic life
  - Substantial and widespread economic and social impact
- Lafayette's UAA
  - Focus on 6<sup>th</sup> Factor – Substantial and widespread economic and social impact
  - City developed cost for each alternative at various levels of control
  - Conduct Water Quality river model of CSO impacts on Wabash River
  - Conduct economic and financial analysis

*Added July 2009*

## **Wabash River Model – presented by Limno-Tech, Inc.**

- Wabash River Model
  - River model framework
    - Water-quality modeling using Branched Lagrangian Transport Model (BLTM) developed by USGS
    - Diffusion-Analogy Flow Model (DAFLOW) used as companion model to provide flow input to the BLTM model
  - The model can track individual source types as well as total *E.coli* concentrations
  - The BLTM/DAFLOW modeling tools have also been used for CSO LTCP and watershed planning in several Indiana communities
  - Model was calibrated and validated using monitoring data collected in 2001 and 2002
  - Original model was discussed in Lafayette's 2004 *Stream Reach Characterization and Evaluation Report*
  - The model was also used to evaluate benefits of control alternative for the previous LTCP, submitted in 2005
- *E.coli* Sources
  - Upstream loads
  - WWTP loads for Lafayette and West Lafayette
  - Stormwater loads for Lafayette and West Lafayette
  - Tributary loads (all located downstream of Lafayette)
  - CSO Loads for Lafayette and West Lafayette
- Run Descriptions
  - The river model was run using typical flow and precipitation conditions for one year
  - The scenarios that were evaluated were:
    - Current conditions – 2005 sewer system configuration (before any improvements)
    - Phase 1 – following implementation of early action projects
    - Two CSO Control Alternatives sized at 3 levels of control (6 total control options)
    - No Lafayette CSOs – CSO loads from Lafayette assumed to be zero (for comparison only)
- Results from the Wabash River Model
  - Upstream *E. coli* source loads are alone sufficient to exceed water quality standards for both single sample and monthly geomean criteria.
  - All of the proposed control options provide measurable benefit compared to the current conditions.
  - The differences between the six control options are very small in terms of compliance with water-quality criteria.
  - Graphs and tables were shown to illustrate the results
- Determining Downstream Impacts

*Added July 2009*

- We used the information from the model to evaluate downstream impacts due to Lafayette CSOs for the preferred control alternative. We wanted to know:
  - How far downstream do water quality standard exceedances occur?
  - How long after an overflow event do exceedances occur?
- We evaluated individual CSO events as well as an average overflow event.
- Conclusions
  - The considered CSO control options all offer measurable benefit in terms of compliance with water quality standards.
  - Following the implementation of the preferred CSO control alternative, Lafayette CSOs would be expected to:
    - Cause water quality standard exceedances less than 1% of the time in the area of Lafayette; and
    - Impact water quality approximately 14 miles downstream of the Lafayette Wastewater Treatment Plant for an average CSO event.

### **Economic/Financial Analysis**

- Financial Capability Analysis
  - It is part of the LTCP
    - It's a tool used by regulators to incorporate economic considerations into decisions about scope and schedule of program
  - Two main components
    - Financial indicators – community conditions
    - Residential indicator – cost per household
    - Combined to assess level of burden
- U.S. EPA's Four-Step Process
  - Develop a cost per household
  - Determine the residential indicator score
    - Based on cost per household as a percent of MHI
  - Develop the community financial indicator score
    - Based on six factors
  - Develop the overall financial capability indicator score
- Cost per Household
  - Calculate current and future annual wastewater treatment and CSO costs
  - Calculate residential share based on % of flow from residential customers
- Community Financial Indicators
  - Debt Indicators
    - Bond Rating – current rating is great
    - Debt Burden/Level – City's debt is high
      - City's debt level will have to increase to pay for this CSO LTCP
  - Socioeconomic Indicators
    - Unemployment Rate – higher than national average
    - MHI – lower than national average
  - Financial Management Indicators

*Added July 2009*

- Property Tax Revenues
      - As % of property value
        - Moderately high property tax rates
        - Local income taxes are also imposed
      - Collection Rate – poor
        - Affected by recession, foreclosures
  - Overall Financial Capability Score
    - High Burden
  - U.S. EPA Scheduling Guidelines
    - Low Burden: Normal engineering/construction schedule
    - Medium Burden: Up to 10 years
    - High Burden: Up to 15 years, with ability to negotiate up to 20 years
    - City has requested a schedule of 20 years

### Next Steps

- Finalize LTCP report and UAA
- Public Meeting for Final LTCP
- Submit final report to IDEM

### Questions

1) Who defined the Wabash River use as primary recreation?

Response: The Indiana Department of Environmental Management (IDEM)

a. How can the City of Lafayette change the designated use of a 300 mile long river?

Response: We will only ask to change the section that Lafayette impacts.

b. Is anybody looking to make whole-sale changes to the designated uses of rivers in Indiana?

Response: No, only the CSO communities that need to make this minor change in use.

2) Are there natural sources of E. coli?

Response: Yes, examples are geese and cows.

a. How can other sources be controlled?

*Added July 2009*

Response: This is very difficult to control, that is why the focus is on point sources.

- b. Can self-cleaning (of the river) be enhanced?

Response: No.

- 3) What is the cost of UV disinfection (asker referenced a UV-treated waste stream in Chicago where salmon were found)?

Response: During the planning for the wastewater treatment plant (WWTP) expansion this was evaluated and chlorine was found to be more cost effective.

- a. You can't use too much chlorine though, correct?

Response: The City is required to dechlorinate.

- 4) What would the fine be for doing nothing?

Response: By law, the agencies can fine on the order of \$20,000 per occurrence. With 11 outfalls overflowing approximately 75 times per year, this could be a big number.

- 5) Why is Lafayette being pro-active when no one else is doing anything?

Response: All other CSO communities are working toward compliance.

- 6) Am I correct that the wastewater treatment plant capacity is insufficient to treat these large volumes?

Response: Yes. The WWTP peak capacity is 52 million gallons per day (MGD). One CSO has peak flows of 100 MGD.

- 7) Question related to viability of using old Wabash and Erie???

Response: They backfilled this in the late 1800's.

*Added July 2009*

- 8) Comment: I think you would be better off separating more and providing stormwater detention.

Response: This alternative was considered, but is not cost-effective.

- 9) Do you have a solution for sensing when treatment plant capacity will be exceeded?

Response: The hydraulics are set up that the WWTP capacity is reached before going to CSO control facilities.

- 10) Can the river model tell us anything about acute risks from the remaining CSO discharges?

- a. Where does the 235 cfu/100 mL come from?

Response: EPA established this as the water quality criteria.

- 11) How will Lafayette come up with the \$200 million to pay for this?

Response: They will eventually have to do a rate increase.

- 12) Is it fair to say that the reason we are asking for 20 years is to lessen the financial impacts?

Response: Yes. This is a major capital improvement project that will have significant impacts to the community.

- 13) Do new subdivisions have to have separate sewers?

Response: Any new sewers installed have to be separate.

- 14) What is the time horizon for the Phase 1 payoff?

Response: 20 years.

- 15) Will we see incremental water-quality benefit over the 20 years?

Response: Yes. The tunnel project alone will result in at least a 30% reduction in overflows and each project will have a benefit to water quality.

*Added July 2009*

16) Comment: Good news is that you can borrow money cheaply now. Bad news is that no one has money to pay.

17) What are the next steps for changing the designated use?

Response: Preparing and submitting a UAA to the State (IDEM).

*Added July 2009*

CITY OF LAFAYETTE, INDIANA

*Combined Sewer Overflow Long Term Control Plan*

**Appendix H  
Public Participation**

Comments on May 12, 2009 Public Meeting Internet Journal & Courier Article

Greeley and Hansen

**Summary**

The commentators in general appear to be concerned about the impact increased rates will have in the current economy, since there are some of them that are out of work. There are those who are educated on the subject and try to explain to the rest of the community about the issues and how the work will be paid for. The educated commentator acknowledges the need of the increase in rates to correct the problems.

**Comments on : “*Proposal to cut sewer overflow has \$179 million price tag*”**

May 13th

**TerribleLie** wrote:

Wouldn't the teabaggers just claim that it's organic so it doesn't matter anyways? :)  
5/14/2009 8:05:43 AM

**lafguy** wrote:

The issue is that this is a problem, not only in Lafayette but in over 100 other Indiana communities as ramblerfan has pointed out, that has been known for over 5 decades. I remember back in the 1950's that our city started a project to separate the storm and sewage. Most of the cities in question chose to ignore the problem because it was "too expensive". Now under the mandate from the EPA they are being forced to face the issue they chose to ignore for years. Just imagine if the various city fathers had had the intestinal fortitude to address these issues 50 or 60 years ago that they would have been completed by now and there would not be talk of sewer rate increases to pay for the ignored problem.

5/13/2009 5:43:37 PM

**Ramblerfan** wrote:

This article is a little misleading in that the CSO project is really an unfunded mandate that local governments across the Country must find ways to fund. There are over 100 CSO communities in Indiana alone. What you may not realize is that during heavy rainfalls, the water from the rain combines with the sewer water and solids and may in some instances, flow directly to the river. This is in no way money that any local government "wants to spend" as the article states. They have been

*Added July 2009*

told by the EPA that they must do it in one way shape of form and don't have much of a choice. Cities are trying hard to make this as easy on the pocket book as possible and still stay in compliance. Remember that your City officials will pay the rate increases the same as you.

5/13/2009 2:31:37 PM

**Indy-Commuter** wrote:

ItsMyIdea:

Okay, I admit my statement was a bit harsh, and I apologize for that. And I get that you have financial obligations, as we all do.

However, your statement of "the damage is already done" is incorrect - it's ongoing, hence the need for this project.

If you truly have no more room to give, then fine, I completely retract my statement and I feel for you.

It just seems like, in general, our society's priorities are:

- 1) survival (food, shelter, etc.)
- 2) luxury (internet, cellphone, dinner out, etc.)
- 3) remediation of problems we contribute to.

In my opinion (hey, we're all entitled to one), being a responsible person means that #2 and #3 should be swapped, such that the cost of #1 and #3 should be taken into account when deciding how much can be spent on #2.

But, like I said, if #1 is taking up all of your income, I apologize for subconsciously assuming otherwise and for my statement.

5/13/2009 2:30:05 PM

**dreamtheater** wrote:

Replying to mazooja:

*When is Lafayette and West Lafayette going to set up there own Windmill Farms to light all our streets and county builds with. There is some extra Money to do what the towns need.*

Yes, because windmills, land to put them on and the distribution and storage hardware would all be free.

5/13/2009 11:01:43 AM

**ItsMyIdea** wrote:

Indy-Commuter: I dont see how waiting until people get jobs again is going to hurt, the damage is already done. I'm glad you can afford more increases in your bills, but considering the fact that prices on everything else have gone up too, I really cant keep giving and giving. Im not saying dont try to fix the problem, I'm saying hold off until the people around here are working and can afford it. Until you know what its like to live paycheck to paycheck and struggle every month, dont "assume" I'm saying anything.

5/13/2009 9:53:02 AM

*Added July 2009*

[want2tan](#) wrote:

I'm just thankful our water/sewer billing is still regulated and the city cannot, at their will, jack the rates like they do in other communities that have been deregulated. All monopolies need oversight like that.

5/13/2009 9:37:53 AM

[Recommend\(1\)](#)

[New post](#)

[Reply to this Post](#) [Report Abuse](#)

[TerribleLie](#) wrote:

We need a sewage rate increase because our sewer system is atrocious.

Interestingly, the last time the wastewater people were at my house they blamed all their problems on the Mexicans and their cooking habits. I guess it always has to be someone else's fault, right?

5/13/2009 9:12:10 AM

[Indy-Commuter](#) wrote:

"ItsMyIdea":

So, basically what you're saying is, "boo hoo, let us continue making a mess without paying to clean it up"? That's a very responsible outlook.

5/13/2009 9:06:52 AM

[ItsMyIdea](#) wrote:

As if everybody around here can afford for another bill to increase.....I sure as heck can't! Stop thinking of ways to spend money that the people in this community dont have. Local & Federal government are going to make bankruptcy lawyers REALLY wealthy.....just watch.

5/13/2009 8:26:37 AM

[mazooja](#) wrote:

Big Money.. Thats all we hear about these days. Big Money.

My Money keeps on shrinking.

When is Lafayette and West Lafayette going to set up there own Windmill Farms to light all our streets and county builds with. There is some extra Money to do what the towns need.

*Added July 2009*



GREELEY AND HANSEN

# Public Meeting

Combined Sewer Overflow Long Term Control Plan  
Update

September 17, 2009

6:00 p.m.

# Meeting Agenda

---



- What is a CSO?
- How do CSOs apply to Lafayette?
- State Judicial Agreement (SJA)
- LTCP Update
- Next Steps
- Questions



A photograph showing a large, dark pipe discharging into a body of water. The pipe is surrounded by a structure of grey rocks. The water is murky and brown. The background is a grassy bank.

**What is a CSO?**

# What is a Combined Sewer Overflow (CSO)?

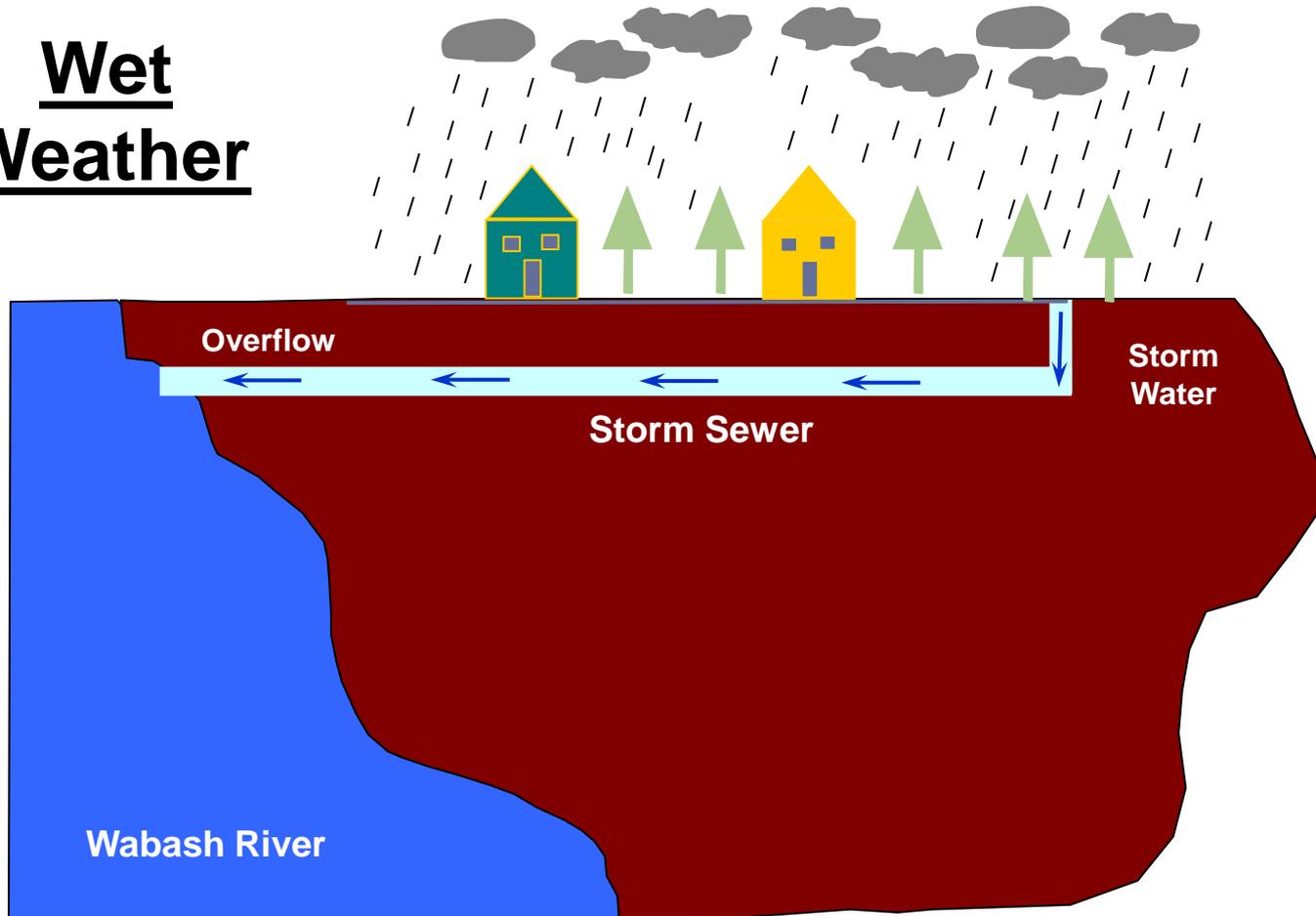
- A CSO is a discharge point of a mixture of storm water and raw sewage when the flow capacity of a sewer system or wastewater treatment plant is exceeded during rainstorms.



# How do CSOs Work?

## Late 1800s

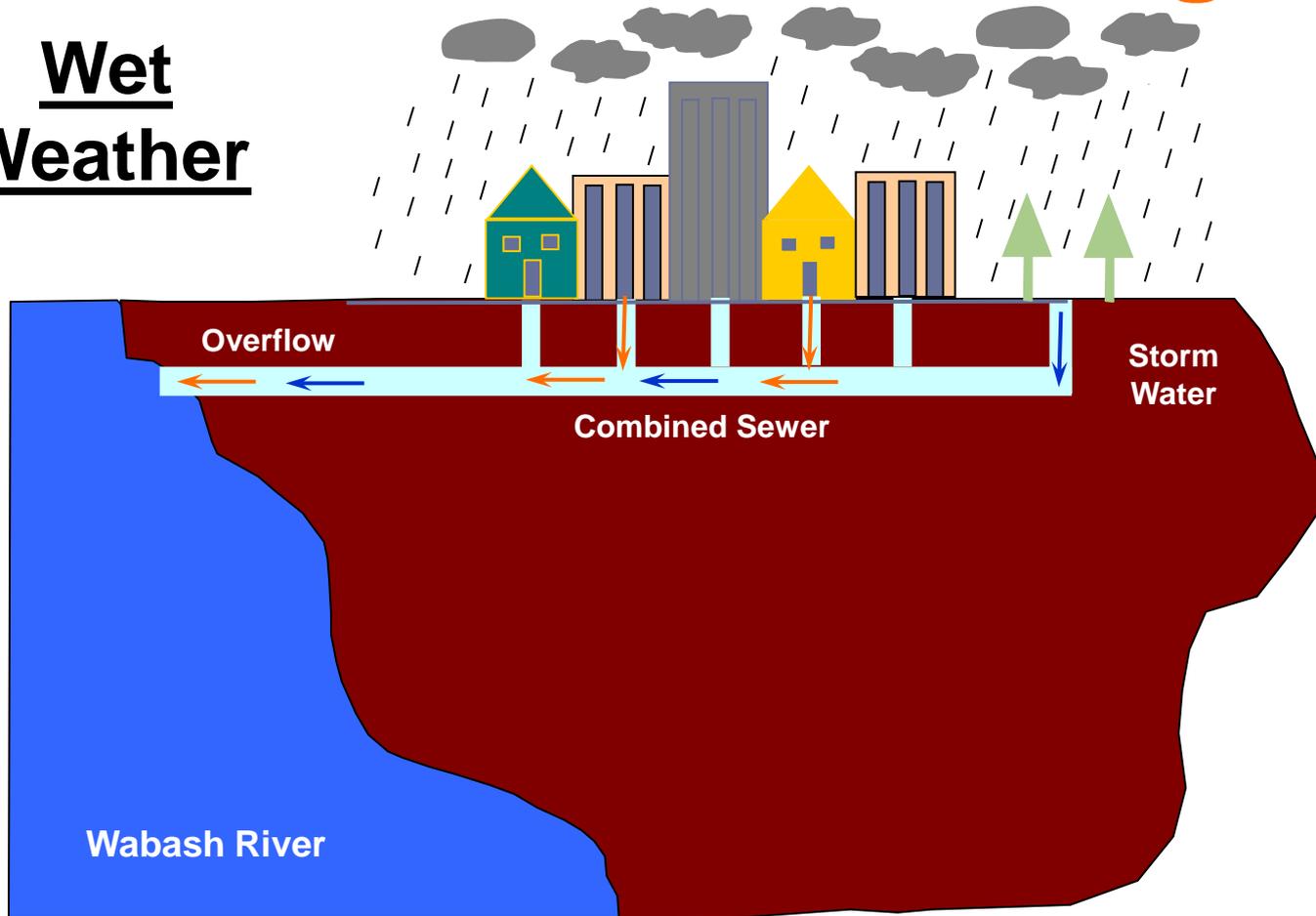
Wet  
Weather



# How do CSOs Work?

## Before 1954 with Plumbing

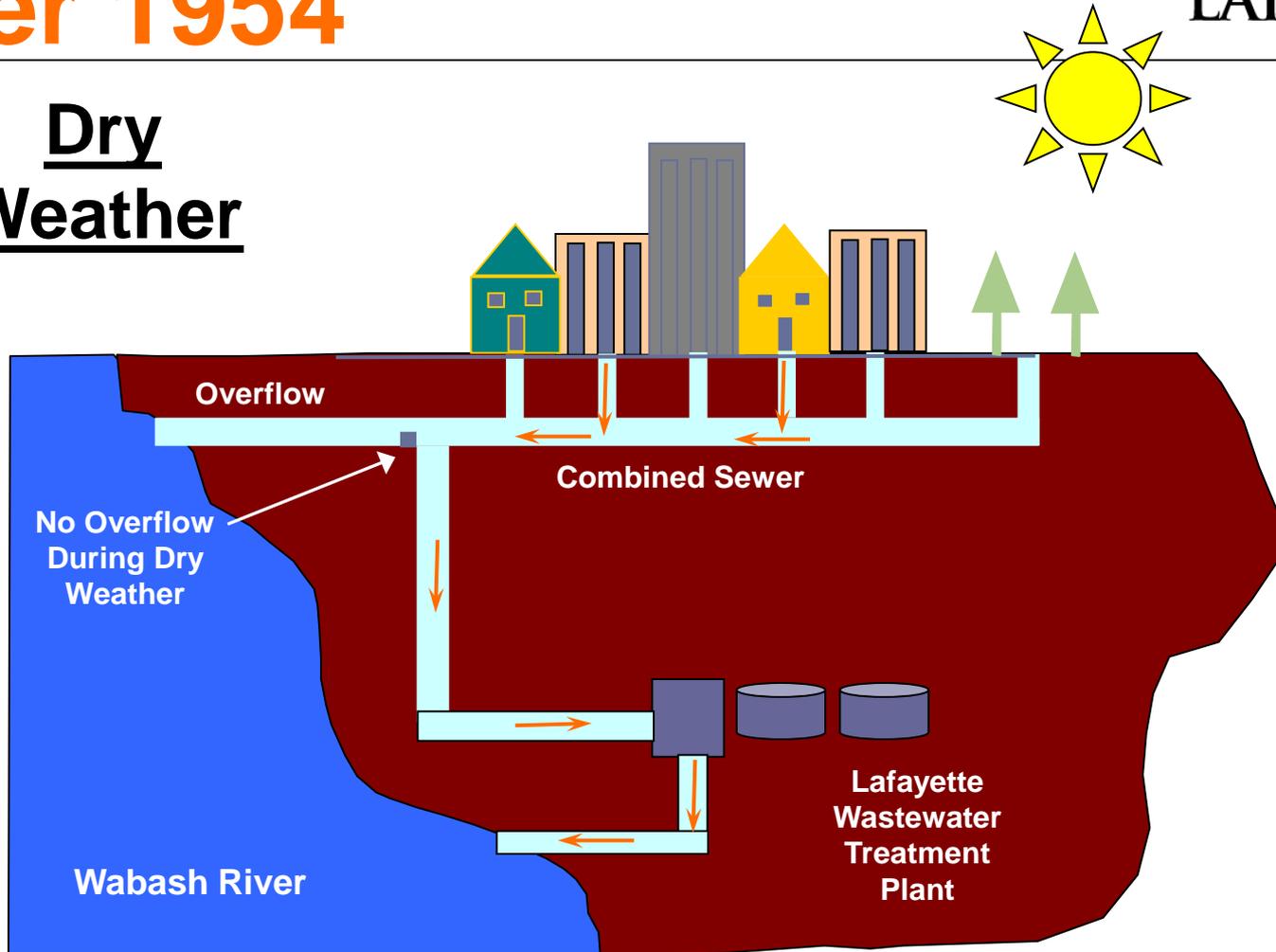
Wet  
Weather



# How do CSOs Work?

## After 1954

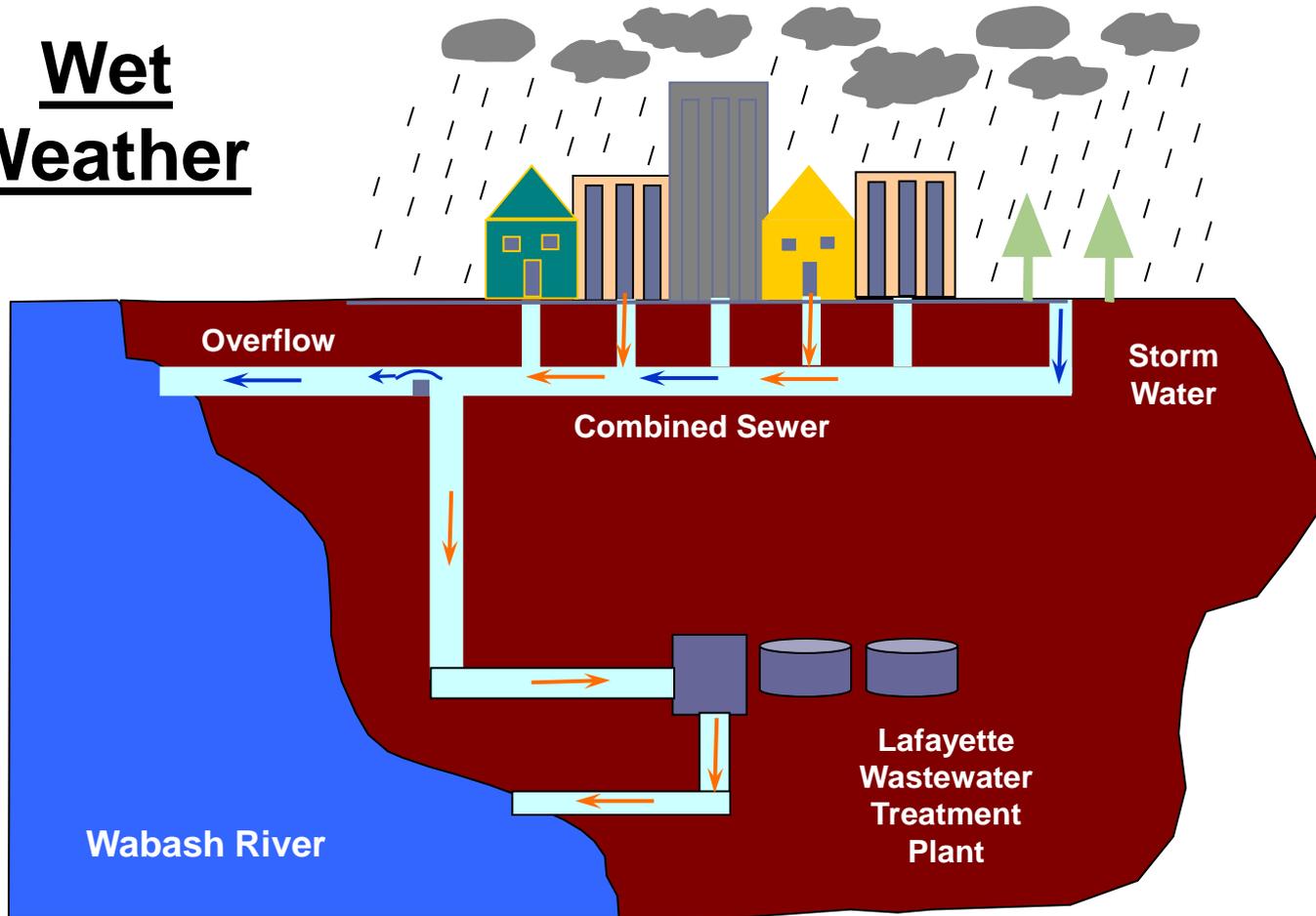
Dry  
Weather



# How do CSOs Work?

## After 1954

Wet  
Weather



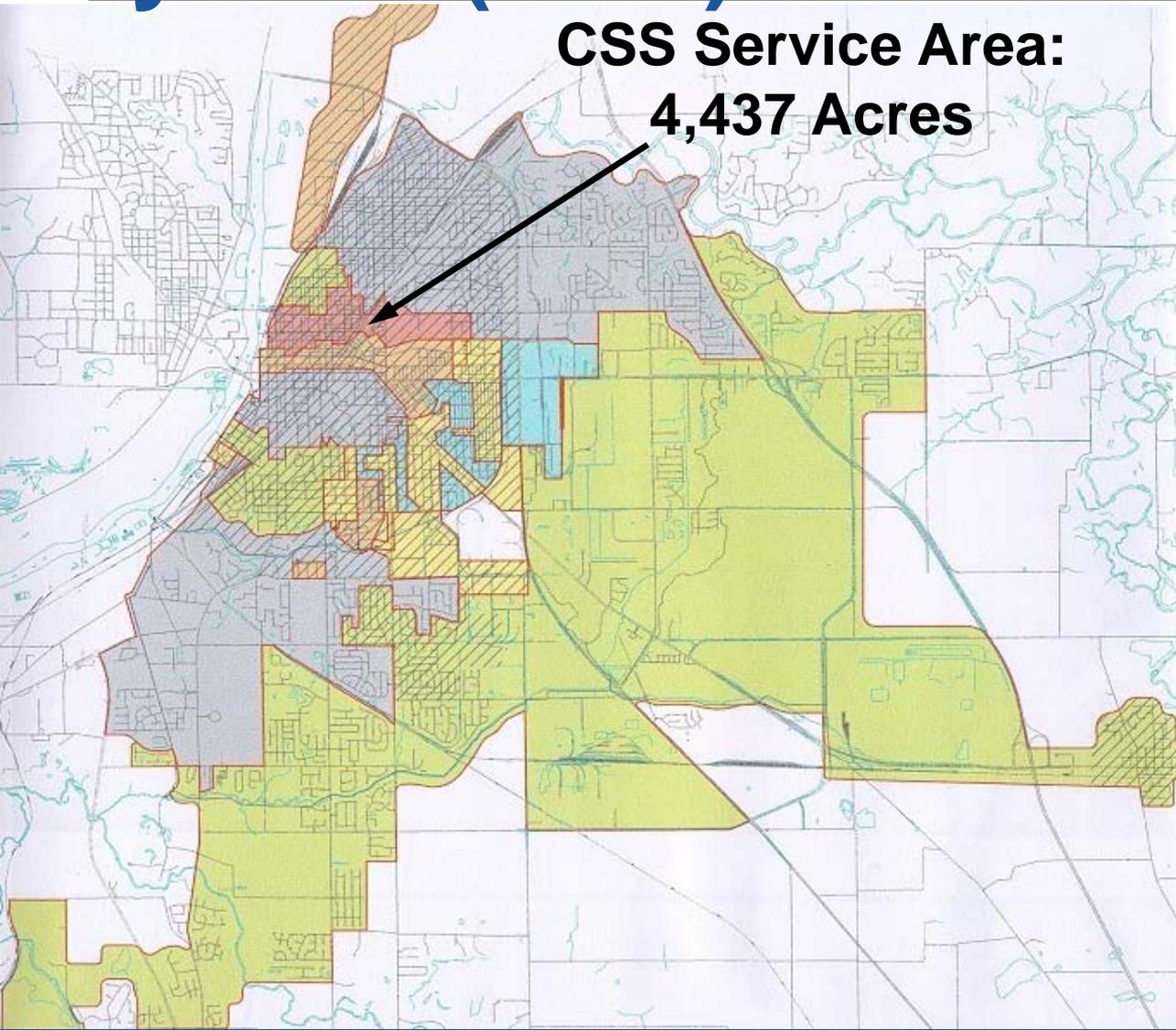
A black bear is lying on a large, fallen log in a forest. The bear is positioned in the middle ground, partially obscured by the log. The forest floor is covered in dark, damp earth and scattered leaves. The background is filled with trees and dense foliage, creating a natural, wooded environment.

**How do CSOs Apply  
to Lafayette?**

# Lafayette Combined Sewer System (CSS) Service Area



**CSS Service Area:  
4,437 Acres**



CSO Area (Number)	CSO Area (Name)
001	Greenbush St.
002	Salem St.
003	Cincinnati St.
004	Ferry St.
006	Pearl River
007	Williams St.
008	Shamrock Park
009	WWTP
010	11 <sup>th</sup> St.
011	14 <sup>th</sup> St.
012	Fairgrounds
015	6 <sup>th</sup> and Oaklawn
017	Old Romney Rd.

# Current CSO Facts

- 0.25-inches of Rain = CSO Event
- CSOs overflow 96 times per typical year
- All of City's CSOs combine for over 1100 overflow events per typical year
- In a typical year a total of 950 MG of combined sewage discharge into the Wabash River



# Background – We Are Not Alone

---



- Indiana has over 100 CSO communities
  - ± 12.5% of national total
- Indiana, Illinois, and Ohio have 54% of the CSO permits in the nation



# Indiana CSO Communities and Overflow Volumes



Community		Annual Overflow Volume (MG)
1.	Indianapolis	6000 – 7000
2.	Evansville	5172
3.	Washington	3110
4.	Fort Wayne	2392
5.	Muncie	1358
6.	Hammond	1319
7.	South Bend	1109

Community		Annual Overflow Volume (MG)
8.	Anderson	850
9.	Peru	807
10.	Lafayette	762
11.	Terre Haute	733
12.	Gary	639
13.	Sullivan	592
14.	Kokomo	562

**Notes: Based on 9/2007 – 8/2008 Data reported to IDEM.**





# State Judicial Agreement (SJA)

# CSO LTCP Timeline



- 2003 – NPDES permit requires action on CSOs
- 2005 – Original LTCP submitted
- 2005 – Senate Bill 621
- 2007 – City enters SJA
  - Requires submittal of revised LTCP
- 2009 – Submission of revised LTCP



# Meeting the Regulations – Lafayette Has Not Been Idle



- One of the last Indiana cities to receive CSO permit language – permit effective May 1, 2003 (renewed 2008)
  - Flow Monitoring and Sampling Program completed in 2000 and 2001 as part of the Stream Reach Characterization and Evaluation Report (SRCER)
  - Collection system model complete
  - CSO Operational Plan submitted in April 2004
    - Nine Minimum Controls implemented
  - CSO Public Notification Program implemented
  - Wastewater treatment plant upgrade and expansion complete
  - Other capital improvement projects completed
  - Current tunnel project



# Meeting the Regulations – What the City is Doing



- Monthly discharge monitoring reports to IDEM
- Continuous flow monitoring
- CSO public notification
- CSO Long Term Control Plan Update
- River survey physical features
- River survey uses
- Completed a 20 Year wastewater treatment facility plan
- Completed the development of a Collection System Management Master Plan (CSMMP)
- Development of Geographic Information System (GIS) in progress
- Early Action Projects





# Long Term Control Plan Update

# Early Action Projects Constructed (Phase I)

- Upgraded/Expanded WWTP (2004)
  - Annual Average Flow: 16 MGD to 26 MGD
  - Peak Flow: 22 MGD to 52 MGD
- New Regionalized Lift Stations
  - Prairie Oaks (2005)
  - Ross Road (2008)
  - Pearl River (2008)
- Eliminated two CSOs
  - CSO 008 (Shamrock Park) (2002)
  - CSO 017 (Old Romney Rd.) (2005)



Expanded WWTP



Pearl River Lift Station



# Early Action Projects

## Under Construction

- Tunnel
- Parking Lot Lift Station Elimination

Proposed tunnel extension

Current portion of tunnel under construction



# CSO Controls – Phase II-A



- Design and Construction – 2011 - 2015
- Sewer separation in the Earl Avenue area (approximately 103 acres),
- A 48-inch parallel interceptor along Durkee's Run creek,
- A 36-inch parallel throttle pipe at CSO 010, and
- A 24-inch parallel throttle pipe at CSO 015.



# CSO Controls – Phase II-B



- Design and Construction – 2015 – 2019
- A 96-inch conveyance sewer along the railroad corridor and
- A 5.9 MG CSO storage facility near CSO 001.



# CSO Controls – Phase II-C



- Design and Construction – 2019 – 2023
- The wet-weather expansion of 55 MGD of the Pearl River Lift Station,
- A 5.3 MG CSO storage facility at CSO 006, and
- A 72-inch conveyance sewer from CSO 007 to CSO 006 storage facility.



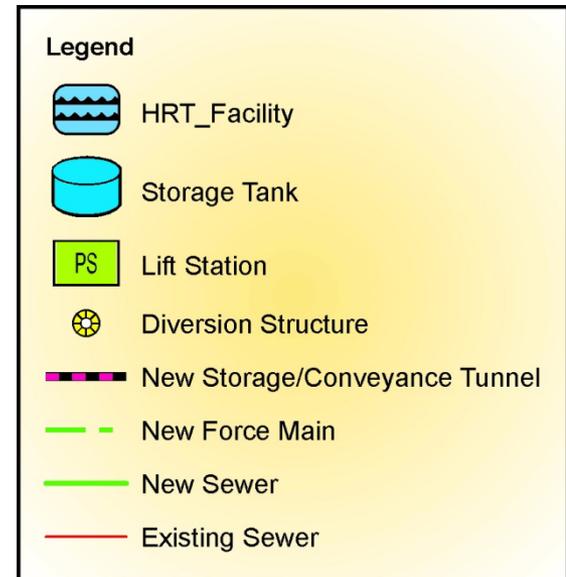
# CSO Controls – Phase II-D



- Design and Construction – 2023 – 2026
- High-Rate treatment facility near CSO 009 and
- A 60-inch force main from the Pearl River Lift Station to the WWTP.
- Phase II-D followed by 2 year Monitoring Program



# Recommended Plan



# Project Details

- Plan reduces overflow frequency from 96 overflows per year to 4 overflows per year
- 20 Year Implementation Schedule
- Remaining overflows must be eliminated or designated use of river must be changed (UAA)



# Financial Capability Analysis



- **Required by Agencies**
  - Mechanism for communities to calculate the “maximum” that can be spent in order to meet water quality standards
- **Based upon “Burden”**
  - Measured by percentage of median household income
- **Indices used in Calculation**
  - Median household income
  - Unemployment rate
  - Bond rating
  - Property tax collections
  - Number of households



# CSO LTCP Cost Estimate



- Selected recommended alternative
  - Alternative A
  - Level of Control – 4 overflows/year
- Cost Estimates

Design Storm	Alternative A (Parallel interceptor along Durkees Run)	
	Capital Cost	Capital Cost with Option
G (4 Overflows/year)	\$214,248,000	\$179,091,000





**Next Steps**

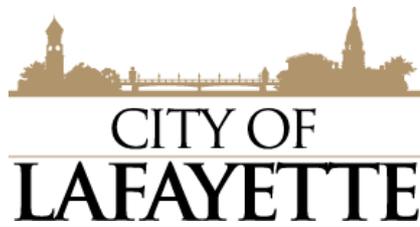
# Next Steps

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- Submit Final LTCP to Regulatory Agencies September 23, 2009
- Obtain IDEM & EPA Approval
- Implement Plan





**GREELEY AND HANSEN**

# Questions

**Lafayette, IN**  
**Public Meeting**  
**Combined Sewer Overflow Long Term Control Plan Update**  
**September 17, 2009**  
**6:00 p.m.**

**Meeting Notes**

**Purpose of Meeting**

- Update the public on current and future CSO planning activities

**Meeting Agenda**

- What is a CSO?
- How do CSOs apply to Lafayette?
- State Judicial Agreement (SJA)
- LTCP Update
- Next Steps
- Questions

**What is a Combined Sewer Overflow (CSO)?**

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Late 1800s
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  - Measured by percentage of median household income
- Indices used in Calculation
  - Median household income
  - Unemployment rate
  - Bond rating
  - Property tax collections
  - Number of households

### **CSO LTCP Cost Estimate**

- Selected recommended alternative
  - Alternative A
  - Level of Control – 4 overflows/year
- Cost Estimates: for the selected level of control of 4 overflows per year, with the construction of a parallel interceptor along Durkee’s Run the capital cost of the project is \$214,480,000 (with option \$179,091,000).

### **Next Steps**

- Submit Final LTCP to Regulatory Agencies September 23, 2009
- Obtain IDEM & EPA Approval
- Implement Plan

### **Questions:**

1. What is the size and location of the CSO storage and Conveyance Tunnel?

Response: The CSO storage Tunnel is 9.5 to 10 feet in diameter and extends from North Street along 2<sup>nd</sup> street in Downtown Lafayette, to 500 feet south of the Social Security Building.

2. How far underground is the tunnel? How does the depth of the tunnel relate to the Wabash River?

Response: The Tunnel is 20 feet below grade, which places it at about the current level of the Wabash River.

3. Is the current WWTP large enough to accept these new flows?

Response: the Lafayette WWTP was expanded in 2004 to meet the maximum peak flow expected from these upgrades (52 MGD).

4. Why does the City not completely separate the storm water pipes from the CSO?

Response: Completely separating the sewer and storm water systems would place an extreme financial burden on the City and its citizens. It was estimated that complete separation of the systems would cost approximate \$ 400M dollars which is almost double the cost of the selected alternative for the LTCP.

5. Are the sewers being replaced?

Response: No. sewer repair has already been performed.

6. Why does the City not wait and try to obtain more of the unclaimed Stimulus Fund money?

Response: The state of Indiana was allotted a significant sum of the stimulus package which had to be used in a given time period. The City of Lafayette was awarded part of these funds. If the State receives more stimulus funds then the City will try to obtain some of these funds for future work.

September 18, 2009

## City finalizing sewage cleanup plan

By *JUSTIN L. MACK*

*jmack@jconline.com*

The City of Lafayette is putting the finishing touches on a 20-year, \$179 million plan to reduce the amount of raw sewage that flows into the Wabash River during periods of heavy rain.

The project is an effort to update the city's combined sewer overflow long-term control plan. An update on the control plan was presented at a public meeting Thursday night.

"The benefit to the Wabash River will be huge" said Gui (pronounced Guy) DeReamer, an engineer with the firm Greeley and Hansen in Indianapolis who is designing the project. "We have not heard many complaints from the public during construction, and that's what's so great about working in this community. Everyone is environmentally conscious."

The four-phase plan includes an expansion of the Pearl River Lift Station, two new sewer projects and the sewer conveyance tunnel already being built.

The proposal will be submitted to the Indiana Department of Environmental Management and the U.S. Environmental Protection Agency for approval next week.

Brad Talley, the city's wastewater superintendent, said the city will try to fund the various projects with federal money, grants and any other sources they can find, in addition to sewage fees.

Talley added that there is a 20-year implementation period set of the current proposal.

"I anticipate there being sewage rate increases but at this time I'm not sure of when they will be or how much they will be," he said. "As the project progresses, we are going to go after every grant and federal dollar available to fund the project."

According to Talley, Lafayette has 11 active combined sewer overflow outlets that send untreated sewage into the Wabash River 96 times a year, on average.

The new plan reduces those overflows to four events a year and cuts the amount of sewage dumped into the Wabash by 95 percent, Talley said.

Lafayette resident Richard Littleton said while he is glad the plan will clean up the Wabash, he is worried about the cost.

"They raised our bill once and it looks like it's going to happen again," he said. "I don't know if I can agree to paying more for the next 20 years."

Lafayette has increased sewer rates a total of 33 percent since April 2006 to generate the money needed to pay for the tunnel, lift station and other work related to CSO reduction. That's \$84 a year in additional sewage fees for the average household.

The work was required following a 1994 update to the Federal Clean Water Act, which ordered communities across the country to find ways to reduce sewage overflows.

## Additional Facts

What's next?

Brad Talley, Lafayette wastewater superintendent, said the final version of long-term control plan will be submitted to IDEM and the EPA on Sept. 23. After obtaining approval, Talley said the city will begin to implement the plan.

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**APPENDIX J**  
**ANALYSIS OF DOWNSTREAM EXTENT AND DURATION OF**  
**LAFAYETTE CSO IMPACTS ON WABASH RIVER WATER QUALITY**

DATE: September 16, 2009  
FROM: Justin Ibershoff, Tim Towey, P.E.  
PROJECT: GHLAFA2  
TO: Tim Healy – Greeley and Hansen  
Gui DeReamer – Greeley and Hansen

## TECHNICAL MEMORANDUM

CC:

SUBJECT: Analysis of Downstream Extent and Duration of Lafayette CSO Impacts on Wabash River Water Quality

---

As part of a State Judicial Agreement with the Indiana Department of Environment (IDEM), the City of Lafayette must develop a long-term control plan (LTCP) for its combined sewer overflows (CSOs). Because the City's preferred CSO control solution will not eliminate overflows completely, the City will need to pursue a Wet Weather Limited Use designation for a portion of the Wabash River (promulgated in Indiana's Water Quality Standards in 2005). This memorandum describes a spreadsheet-based modeling analysis of *Escherichia coliform* (*E. coli*) to estimate the downstream extent and duration needed for the Wet Weather Limited Use designation in the Wabash River due to the remaining CSO overflows in Lafayette's LTCP.

The spreadsheet model accounts for the effects of decay and longitudinal mixing (i.e., dispersion) to effectively extend the existing Wabash River model downstream of the City of Lafayette. The City's LTCP will result in up to five CSO events in a typical year, though the maximum times any individual CSO overflows is four times. The spreadsheet model was applied for each event to create a range of impacted distances and durations. Additionally, to ensure that the model application was sufficiently conservative, the load from the largest CSO event was also applied using the Wabash River conditions from each of the overflow events. A downstream distance of approximately 30 miles over a duration of 2 days will ensure that the safety of recreational users is protected. This distance extends from river mile 309.00 near the City's wastewater treatment plant to approximately 8 miles upstream of Covington, IN.

### Theoretical Basis of Model

In-stream concentration of *E. coli* is subject to several hydraulic, physical, and chemical processes during downstream transport. Hydraulic processes include dilution from incoming tributary volume and dispersion that arises from differences in velocity in the river. The effect of dispersion is commonly represented in mathematical models as a dispersion coefficient. The longitudinal dispersion coefficient ( $E$ ) is estimated using Equation 1 (Fischer, 1979):

$$E = 0.011 \frac{u^2 W^2}{HU^*} \quad (1)$$

where

$E$  = Longitudinal dispersion coefficient, ft<sup>2</sup>/s

$u$  = River velocity, ft/s

$W$  = River width, ft

H = River depth, ft

$U^*$  = Shear velocity, ft/s ( $U^* = (gHS)^{0.5}$ , where S = channel slope, g = gravitational acceleration = 32.2 ft/s<sup>2</sup>)

Physical and chemical processes include die-off, predation, settling, and resuspension. The net effect of the physical and chemical processes is commonly represented as a first-order loss or decay constant (K). The longitudinal dispersion coefficient and decay constant are incorporated into the analytical solution to describe the effects of advection, dispersion, and decay (Thomann, 1972) as shown in Equation 2:

$$C(x, t)_{dsp-dec} = \frac{m_p}{2\sqrt{\pi Et}} e^{-\frac{(x-ut)^2}{4Et} - Kt} \quad (2)$$

where

$C(x, t)_{dsp-dec}$  = *E. coli* concentration at distance x and time t due to advection, dispersion, and decay, cfu

$m_p$  = Planar mass ( $m_p = m/A$  where m = mass, A = cross sectional area), cfu/ ft<sup>2</sup>

E = Longitudinal dispersion coefficient, ft<sup>2</sup>/s

u = River velocity, ft/s

K = *E. coli* decay rate, day<sup>-1</sup>

t = time, days

x = distance, ft

This analytical solution can be used to solve for in-stream *E. coli* concentrations at any distance or time downstream of a pulse loading. The effect of Equation 2 on in-stream concentration is displayed generally in Figure 1 below.

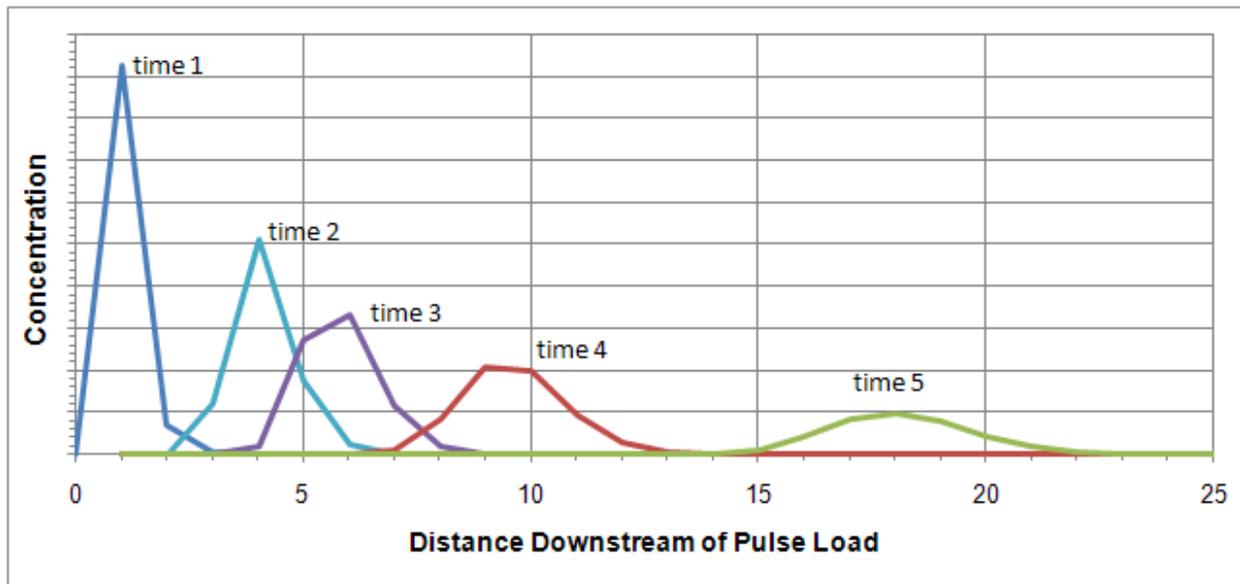


Figure 1. Effect of advection, dispersion, and decay on in-stream concentration following an instantaneous pulse load.

By utilizing a spreadsheet modeling approach, the peak concentration at each distance and time can be tracked until it falls below a given threshold.

## Spreadsheet Model Inputs

A total of 6 different CSO events, including a hypothetical typical event, were examined using the spreadsheet model. These events were originally generated using a typical year application of the recommended control alternative. River conditions during each CSO event were obtained from the existing Wabash River model by averaging parameters from the downstream reach (RM 300.00 to RM 307.00) during each event. River parameters used included river flow, velocity, width, area and depth. These representative river parameters were then held constant in the spreadsheet model to create the conditions needed for the analytical solution.

Concurrent CSO flows were summed from the 4 potential outfalls and averaged by event. The mass (cfu) generated by this flow rate at an event mean concentration of 272,000 cfu/100 ml (the data-derived concentration used in the Wabash River Model) was summed over a one hour period and applied as a pulse load at RM 309.00. Upstream and tributary *E. coli* (background) concentrations were excluded from analysis in order to isolate the impact of CSO sources. A summary of the inputs used in the spreadsheet model are shown in Table 1 below. The typical event was created by averaging the model inputs from each of the 5 CSO events.

**Table 1. River and CSO Inputs for Spreadsheet Model.**

Event	Rainfall (in)	In-stream Flow (cfs)	In-stream Vel (ft/s)	Area (ft <sup>2</sup> )	Width (ft)	Depth (ft)	CSO Flow (cfs)
Typical		8,168	1.70	4258	542	8	96
1	4.10	18,321	2.28	7289	612	11	205
2	1.40	8,224	1.82	4529	561	8	41
3	1.10	4,807	1.50	3209	517	6	8
4	1.40	3,154	1.28	2458	485	5	36
5	2.40	6,333	1.64	3803	537	7	190

The decay rate of 1.00 d<sup>-1</sup> used in the spreadsheet model was consistent with the existing Wabash River model. This rate was originally determined during the Wabash River model calibration based on guidance from EPA (USEPA, 1985) and is consistent with values used in other modeling studies (City of Elkhart, 2006, Metropolitan Sewer District of Greater Cincinnati, 2006; City of Indianapolis, 2003). The in-stream temperature was set to 19.4 degrees Celsius by averaging the existing Wabash River model's in-stream temperatures during the recreation season. Consistent with the existing Wabash River model, the decay rate was adjusted for temperature using a correction factor, theta, of 1.047. Channel slope was estimated to be 0.00012 ft/ft by comparing USGS gage datums at Lafayette and Montezuma, IN. The gages were determined to be separated by a distance along the river of approximately 73.5 miles by calculating length along the Wabash River from the USGS National Hydrography Dataset. Impacts from downstream tributaries and downstream dischargers, such as Eli Lilly, were not included.

The spreadsheet model was applied from downstream of the Lafayette WWTP (RM 309.00), which is located downstream of all Lafayette CSOs, for a distance of 90 miles. Concentrations were calculated at half-mile intervals at a 1/10<sup>th</sup> hourly frequency for 2 hours after an event and then at an hourly frequency until 96 hours. A snapshot of the spreadsheet model is shown in Figure 2.

Model Results Summary								
Downstream Distance:		13.5 miles						
Time Elapsed:		10 hrs						
Peak Concentration (cfu/100 ml)	3,704	2,591	1,566	1,183	979	846	749	661
Distance Downstream (mi)	0	0.5	1	1.5	2	2.5	3	3.5
Time to Peak Concentration (hrs)	0.1	0.1	0.4	0.8	1.1	1.5	1.9	2.0

Model Computations		River Mile							
Time (Hr)	309	308.5	308	307.5	307	306.5	306	305.5	
0.1	3,704	2,591	477	23	0	0	0	0	
0.2	2,516	2,457	1,231	316	42	3	0	0	
0.3	1,974	2,154	1,507	675	194	36	4	0	
0.4	1,642	1,895	1,566	927	393	119	26	4	
0.5	1,411	1,684	1,538	1,076	576	236	74	18	
0.6	1,238	1,510	1,474	1,153	721	361	145	47	
0.7	1,101	1,365	1,398	1,183	827	478	228	90	
0.8	989	1,241	1,317	1,183	900	579	315	145	
0.9	896	1,135	1,238	1,165	945	661	399	207	
1	817	1,042	1,163	1,135	970	725	475	272	
1.1	748	960	1,091	1,098	979	773	541	335	
1.2	688	888	1,024	1,057	977	807	597	395	
1.3	635	823	962	1,014	965	829	643	450	
1.4	588	765	904	971	948	841	679	498	
1.5	546	712	849	927	926	846	707	540	
1.6	508	664	799	884	900	843	727	576	
1.7	473	621	752	843	873	836	740	605	
1.8	442	581	708	802	844	824	747	629	
1.9	413	544	668	764	814	809	749	647	
2	387	510	630	726	784	792	748	661	

Figure 2. Spreadsheet Model.

The analytical solution from Equation 2 is used to solve for in-stream E. coli concentrations at many downstream distances and times under the *Model Computations* section of Figure 2. The *Model Results Summary* section of Figure 2 is used to track the peak concentrations through the downstream reach.

## Results

Peak concentrations from a CSO pulse load applied at RM 309.00 were tracked downstream using the spreadsheet model until the concentration fell below Indiana’s single sample maximum water quality standard of 235 cfu/100 ml as shown in Figure 3 below.

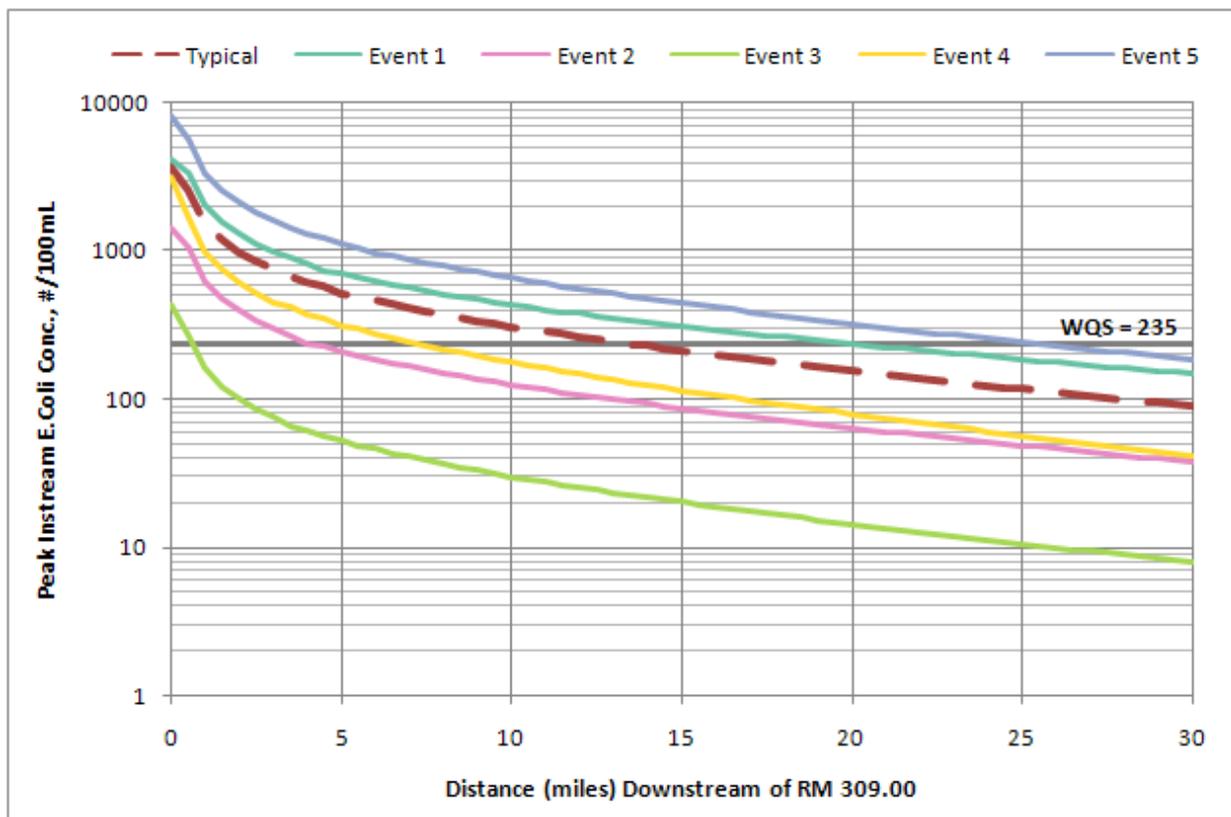


Figure 3. Peak Downstream Concentrations by CSO Event.

The distance and travel time to the location meeting water quality standards represents the distance and duration needed for the Wet Weather Limited Use designation. These values were computed for each of the five CSO events remaining after the LTCP is implemented as well as the typical overflow event as shown in Table 2 below.

Table 2. Extent and Duration of CSO Impacts (Typical Year events)

Event	Distance Downstream of RM 309.00 (mi)	Duration (hrs)	Duration (days)
Typical	13.5	10	1
1	20.5	12	1
2	4.5	3	1
3	1.0	0	0
4	7.5	7	1
5	26.0	21	1

The largest precipitation event (Event 1) did not produce the greatest downstream impacts in terms of either distance or duration. This is due to the high flow and large assimilative capacity of the Wabash River during that event. To ensure that the Wet Weather Limited Use designation would be sufficient to protect recreational users, a more conservative analysis was performed by applying CSO load from Event 1, which has a return period of approximately 15 years, to the

flow conditions during all of storm events large enough to produce a modeled overflow. The results of this analysis are presented in Table 3.

**Table 3. Extent and Duration of CSO Impacts**  
**(Event 1 CSO load applied to river conditions for all overflow events)**

Event	Distance Downstream of RM 309.00 (mi)	Duration (hrs)	Duration (days)
Typical	26	21	1
1	20.5	12	1
2	26	19	1
3	28.5	25	2
4	30	31	2
5	27.5	23	1

This more conservative approach indicates that downstream impacts could be slightly greater for a large storm in which the flow in the Wabash River is less than it was during Event 1. These results provide a reasonable basis for applying the Wet Weather Limited Use designation for the 30 miles downstream of RM 309.00 for a duration of two days after a CSO event, following the implementation of the Lafayette CSO controls described in the LTCP.

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