UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF INDIANA
HAMMOND DIVISION

UNITED STATES OF AMERICA, *et al.*, Plaintiffs, v. CITY OF ELKHART, INDIANA, Defendant.	))))))))	CAUSE NO.: 2:11-CV-328-JVB-APR

AMENDMENT OF THE CONSENT DECREE

WHEREAS, Paragraph 10 of the Consent Decree entered by the Court on November 30, 2011 as Docket No. 5 (Consent Decree) requires the City of Elkhart to comply with the requirements of Appendix A, Long Term Control Plan, which is attached to and incorporated into the Consent Decree.

WHEREAS, Paragraph 11 of the Consent Decree requires the City of Elkhart to complete all Long Term Control Plan (LTCP) construction projects in Table 1-3 of Appendix A on or before December 31, 2029.

WHEREAS, the LTCP featured a combination of Combined Sewer Overflow controls, including wastewater treatment plant improvements.

WHEREAS, the City of Elkhart requested a modification of the Appendix A to the Consent Decree to allow for a change to the technology used at the wastewater treatment plant (WWTP) to treat the increase in sewage that follows wet weather events.

WHEREAS, at the time of Entry of the Consent Decree, the WWTP had the capacity to treat a peak flow of 44 million gallons per day (MGD). The City of Elkhart is required by the LTCP to make modifications to the WWTP in order to treat a peak sustained flow rate of 60 MGD.

WHEREAS, the City of Elkhart has determined that changes to the WWTP, above-and-beyond what was contemplated in the LTCP, will be required to treat a peak sustained flow rate of 60 MGD. The additional changes include additional return activated sludge pumping capacity and final clarification capacity. To build the necessary clarification capacity, given the land-locked nature of the WWTP's location, the City of Elkhart would have to condemn a public housing complex to the east of the WWTP.

WHEREAS, the City of Elkhart proposes as an alternative to constructing additional clarification capacity the use of Cloth Media Disk Filtration (CMDF) technology, which will not require the acquisition of land.

WHEREAS, the Parties agree the CMDF technology is preferable.

WHEREAS, the CSO Control Measures in the LTCP are designed to result in a level of control of no more than nine Overflow Events during a Typical Year. The level of control remains unchanged.

WHEREAS, the deadline for implementing all CSO Control Measures required in Appendix A to the Consent Decree is December 31, 2029. The deadline remains unchanged.

WHEREAS, Paragraph 68 of the Consent Decree requires that this material Amendment be approved by the Court before it is effective.

WHEREAS, for the convenience of the Court, attached as Exhibit A to this Amendment is a copy of the amended Appendix A, in redline/strikeout format, highlighting the revisions to the language reflecting the changes listed below.

WHEREAS, the following sections of Appendix A are amended: 1.1, 1.1.3, 1.1.8, 1.2.1, and 2.3.1.4.

WHEREAS, the following tables of Appendix A are amended: 1-1 and 1-3.

WHEREAS, the following schematic of Appendix A is amended: #2 (label only).

WHEREAS the Parties recognize, and the Court by entering this Amendment finds, that this Amendment was negotiated at arms-length and in good faith, and that this Amendment is fair, reasonable, and in the public interest.

NOW THEREFORE, the Parties agreed that the amended Appendix A attached as Exhibit B to this Amendment is a material modification of the Consent Decree.

Upon consent and agreement of the Parties, subject to the notice and comment provisions of 28 C.F.R. § 50.7, it is **ORDERED** that this Amendment of the Consent Decree is approved and entered as a Final Order of the Court.

SO ORDERED on April 26, 2022.

s/Joseph S. Van Bokkelen
JOSEPH S. VAN BOKKELEN, JUDGE
UNITED STATES DISTRICT COURT

EXHIBIT A

Appendix A: Section 1:

Long Term Control Plan

1.1 CSO Control Measures

The selected plan features a combination of the following CSO controls:

- Continuing the City's ongoing program of partial or complete sewer separation in several CSO Basins;
- Sewer flow redirection, which will send some flows to the wastewater treatment plant via a route that avoids the combined sewer area;
- Regional storage tanks to capture and store sewage overflows during wet weather;
- Sewer system conveyance improvements; and
- Wastewater treatment plant improvements.

Elkhart shall complete implementing these controls at a total estimated cost of $155.6 million in 2007 dollars on or before December 31, 2029, unless a different schedule is approved by the United States and Indiana or ordered by the Court for the Remaining LTCP Projects pursuant to the procedures in Section XIX, Schedule Reconsideration Based on Financial Circumstances of the Decree. Estimated costs for each major plan component are shown in Table 1-1. Estimated costs include the present worth costs of operating and maintaining the new facilities over a 20-year period.

Table -1-1 LTCP Component Costs by Watershed[1]

[1] **Notes:** Capital cost estimates include construction and engineering/legal contingencies. Costs are expressed in 2007 dollars. (Engineering News Record Construction Cost Index: 8000 (Aug. 2007)).
[2] To sustain peak sustained flow rate up to 60 MGD. Up to 30 MGD through cloth media disks. Does not include design costs, which are above and beyond a proposed increased spending commitment.

	CSO Number	Description	Capital Cost Estimate	Actual Cost (Completed Projects Only)
Christiana Creek CSO Control				
	CSO 14	High Dive Park 1 MG Storage & Pump	$ 10,650,000	
	CSO 14	High Dive Park Pump Station	$ 975,000	$ 7,194,571
	CSO 14	Force Main: High Dive Park Pump Station to North Interceptor	$ 3,255,000	
		Christiana Creek Subtotal	**$ 14,880,000**	**$ 7,194,571**
Upper Elkhart River CSO Control				
	CSO 30	Separation	$ 6,150,000	$ 3,802,792
	CSO 4	Separation - Partial	$ 2,400,000	
	CSO 33	Separation - Partial	$ 8,760,000	$ 1,767,539
	CSO 31	EEC 80,000-Gal. Storage & Pump	$ 2,970,000	$ 4,601,869
		Upper Elkhart River Subtotal	**$ 20,280,000**	**$ 10,172,199**
WWTP Plant Upgrades				
	~~WWTP~~	~~Preliminary and Primary Improvements for 60 MGD~~	~~$ 11,100,000~~	
	~~WWTP~~	~~PE Pumping for 60 MGD and plc for step feed mode~~	~~$ 14,160,000~~	
	~~WWTP~~	~~Additional disinfection for 60 MGD~~	~~$ 4,785,000~~	
	WWTP	Preliminary and Additional Disinfection for 60 MGD (complete)	$ 13,618,000	$ 12,538,590
	WWTP	Cloth Media Disks and Piping[2]	$ 9,564,000	
	WWTP	Aeration Process Improvements[2]	$ 4,967,000	
	WWTP	RAS System Replacement and Pump Capacity Improvements[2]	$ 774,000	
	WWTP	Primpary Clarification System Improvements[2]	$ 2,708,000	
		Wet Weather Treatment Subtotal	~~$ 30,045,000~~	
			$ 31,631,000	
Lower Elkhart River Control				
	CSOs 6&7	Direct East Waterfall Dr to Jackson Blvd. Storage Facility	$ 495,000	
	CSOs 6&7	Jackson Street 1.0 MG storage facility	$ 10,665,000	$ 8,990,273
	CSOs 6&7	Jackson Street Storage Facility Lift Station	$ 2,145,000	
		Lower Elkhart River Subtotal	**$ 13,305,000**	**$ 8,990,273**
Oakland Avenue Control				
	CSOs 24 & 37	Force Main from Oakland Ave. LS to WWTP	$ 3,060,000	
	CSOs 24 & 37	Interceptor of CSO 37 Overflow (CSO 37.0)	$ 840,000	
	CSOs 24 & 37	Interceptor of CSO 37 Overflow (CSO 37.02)	$ 630,000	
	CSOs 24 & 37	Interceptor of CSO 37 Overflow (CSO 37.03)	$ 555,000	
	CSOs 24 & 37	Interceptor of CSO 37 Overflow + Jackson LS	$ 1,140,000	
	CSOs 24 & 37	Interceptor of Flow to CSO#24 L-TUFF 1	$ 405,000	
	CSOs 24 & 37	Interceptor of Flow to CSO#24 L-TUFF 1B	$ 1,350,000	
	CSOs 24 & 37	LS 8 Force Main To Oakland Ave. Storage facility	$ 3,255,000	
	CSOs 24 & 37	CSO 24 LS 1.1 MG Storage and Pump	$ 16,080,000	
		Oakland Avenue Subtotal	**$ 27,315,000**	
Upper St Joe River CSO Control				
	CSO 13	Separation - Partial	$ 5,010,000	
	CSO 25	Effluent Line Upgrade: CSO 25 to Interceptor	$ 405,000	
	CSO 29	Plug Overflow (Jefferson)	$ 1,500	
	CSO 28	Plug Overflow (Washington)	$ 1,500	
	CSO 39	Separation	$ 960,000	
		Upper St. Joe River Subtotal	**$ 6,378,000**	
Lower St Joe River CSO Control				
	CSO 18	Plug Overflow (McNaughton Park)	$ 1,500	
	CSO 27	Plug Overflow (Navajo)	$ 1,500	
	CSOs 17 & 18	Redirect Flow to North Interceptor	$ 390,000	
	CSO 21	Separation	$ 1,695,000	$ 380,832
	CSO 23	Effluent Line Upgrade CSO#23 to LS#4	$ 165,000	
	CSO 23	LS 4 Force Main	$ 405,000	
	CSO 23	LS 4 (8th & Franklin) Improvements	$ 1,545,000	
	CSO 23	Separation - Partial	$ 3,870,000	
		Lower St. Joe River Subtotal	**$ 8,073,000**	
Riverside Drive Control				
	CSO 15	AACOA Redirection	$ 300,000	$ 72,643
	CSO 15	Riverside Dr. 0.43 MG Storage & Pump	$ 6,000,000	
	CSO 15	Separation - Partial	$ 7,575,000	
		Riverside Drive Subtotal	**$ 13,875,000**	
Total Estimated Capital Cost (Includes contingencies)			~~$ 134,151,000~~	
			$ 135,737,000	
Systemwide Estimated Present Worth Operation & Maintenance Costs			**$ 21,449,000**	
Total Estimated Present Worth Cost (2007 Dollars)			~~$ 155,600,000~~	
			$ 157,186,000	

1.1.1 Christiana Creek CSO Control Measure

Christiana Creek enters the St. Joseph River downstream from High Dive Park and upstream from a number of city parks and downtown Elkhart. This control measure will control CSO 14 in High Dive Park and will reduce overflows to Priority Areas I, II and III (depicted in Figure 1-2 and Figure 1-3). This control measure includes the following elements:

- One-million-gallon storage facility to capture wet-weather flow from CSO 14 and release it to the existing sewer system after the storm event.
- Redirection of most flows from the CSO 14 basin to the North Interceptor system using a bypass force main.

The City initially planned to redirect only the flow from the Grant Street Lift Station to the North Interceptor. During the preliminary design process underway in late 2008, the City determined that all dry-weather and wet-weather flow during a Typical Year could be redirected to the North Interceptor system and away from the combined sewer system.

The plan for Christiana Creek is illustrated in Figure 1-1. Some of the priority areas that will benefit from this control measure are also shown on the map.

1.1.2 Upper St. Joseph River CSO Control Measure

The Upper St. Joseph River extends from the AEP Dam to the Lexington Avenue Bridge. This control measure will control overflows from CSOs 13 and 25 and reduce overflows affecting Priority Areas I, II and III. This control measure includes the following elements:

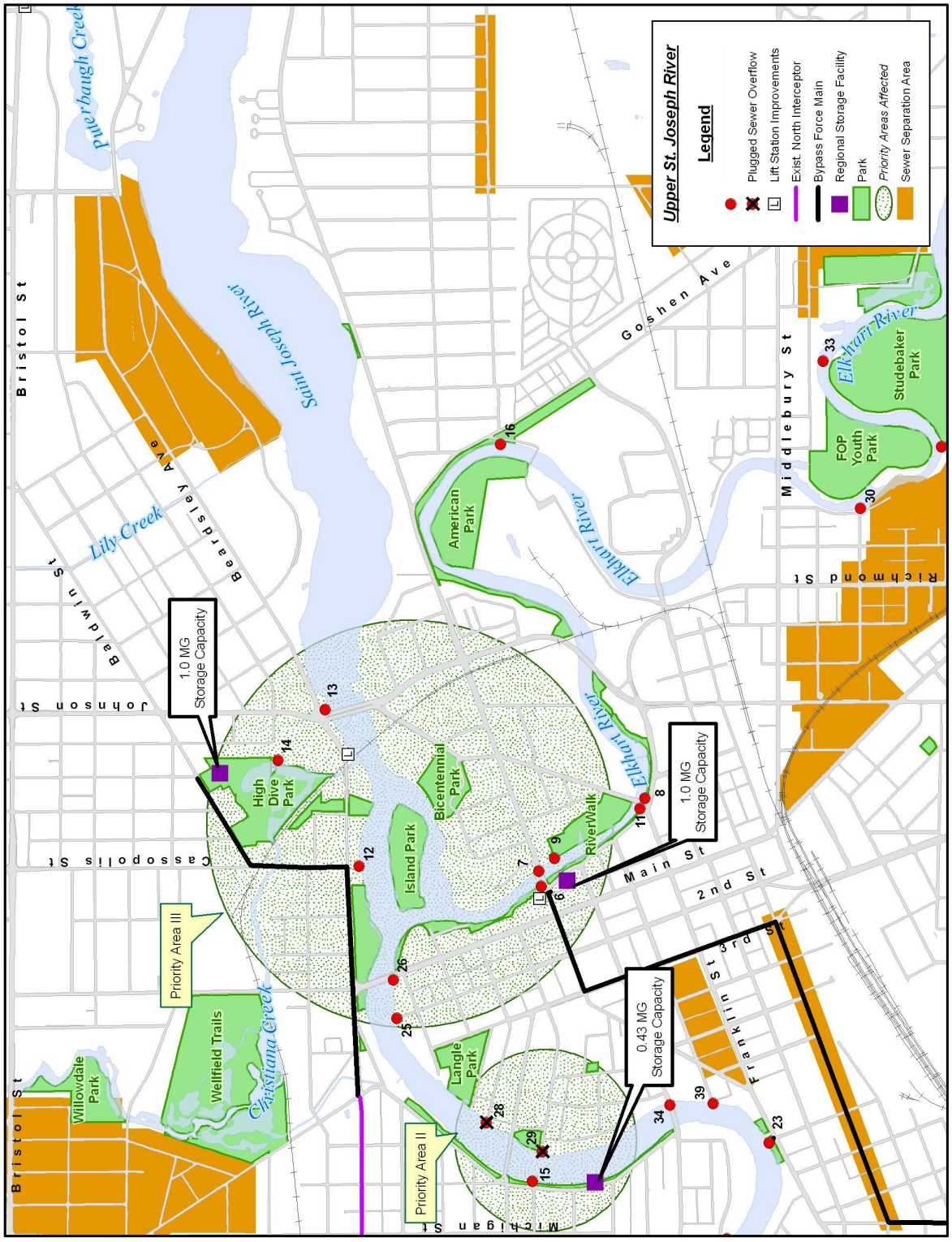
- Sewer separation in a portion of the basins that drain to CSO 13.
- Structural changes to the diversion chamber at CSO 25.

Overflows at CSO 26 will be reduced in this area as a result of separate CSO controls on the Elkhart River that will redirect flow away from the interceptor that services the Upper St. Joseph River. CSOs 12, 28, and 29 are located in the Upper St. Joseph River but already discharge very infrequently (zero times in a Typical Year) and do not require system changes as part of the selected plan.

CSOs 28 and 29 are expected to be eliminated. They first will be monitored during LTCP implementation to determine whether plugging the overflows would have any harmful effects during large storm events, as described in Appendix A, Section 2 – Post-Construction Monitoring Plan. Assuming that monitoring confirms the lack of adverse system effects, these outfalls will be permanently sealed.

The plan for the Upper St. Joseph River is illustrated in Figure 1-1. Some of the priority areas that will benefit from this control measure are also shown on the map.

Figure 1-1 Christiana Creek and Upper St. Joseph River Control Measures



1.1.3 Upper Elkhart River CSO Control Measure

The Upper Elkhart River includes the areas upstream of the Elkhart River Dam. It is the furthest upstream location in the City's combined sewer area. This control measure will control CSOs 4, 5, 16, 30, 31 and 33 and reduce overflows to all Priority Areas. This measure also will address two of the top eight overflow frequency locations (CSOs 4 and 30). This control measure includes the following elements:

- At CSO 31 near Lusher Avenue, Elkhart shall store overflows during wet weather using an 80,000-gallon regional storage tank and convey the captured flows to the wastewater treatment plant through existing sewers after the storm event;
- At CSOs 4, 30, and 33 near FOP Youth Park, Studebaker Park and Baker Park, the City will partially separate sewers in surrounding neighborhoods; and
- CSOs 5 and 16 already discharge less than 10 times in the Typical Year without basin changes.

The plan for the Upper Elkhart River is illustrated in Figure 1-2. Some of the priority areas that will benefit from this control measure are also shown on the map.

1.1.4 Lower Elkhart River CSO Control Measure

The Lower Elkhart River covers the areas downstream of Gracelawn Cemetery to the river's confluence with the St. Joseph River. This control measure will control CSOs 6, 7, 8, 9, and 11 and reduce overflows in Priority Areas I, II and III. CSO 6 is the sixth highest location for annual overflow volume, according to modeled estimates. This control measure includes the following elements:

- At CSOs 6 and 7 near Jackson Boulevard, the City will store and convey the overflows using a 1.02-million-gallon regional storage tank, conveyance upgrades and flow redirections. Upgrades to the system will allow the redirection of flow from the storage tank to the Oakland Avenue Control Measure when it is completed.
- CSOs 8, 9, and 11 do not require any system changes because they overflow infrequently under Typical Year conditions.

The plan for the Lower Elkhart River is illustrated in Figure 1-2. Some of the priority areas that will benefit from this control measure are also shown on the map.

1.1.5 Riverside Drive CSO Control Measure

The Riverside Drive CSO control measure will reduce overflows at CSO 15, located along Riverside Drive Park. CSO 15 is estimated to be the fourth highest volume location for sewage overflows in a Typical Year. These controls will reduce overflows in Priority Areas I and II. This control measure includes the following elements:

- A 430,000-gallon regional storage tank to store overflows during wet weather;
- Sewer separation of a portion of the basin near Willowdale Park and Wellfield Trails;
- Redirection of sanitary sewers from the AACOA Sewer Interceptor to the North Interceptor system, away from the combined sewer system.

The plan for Riverside Drive is illustrated in Figure 1-3, Lower St. Joseph River Control Measures. The priority areas that will benefit from this control measure are also shown on the map.

Figure 1-2 Elkhart River Control Measures

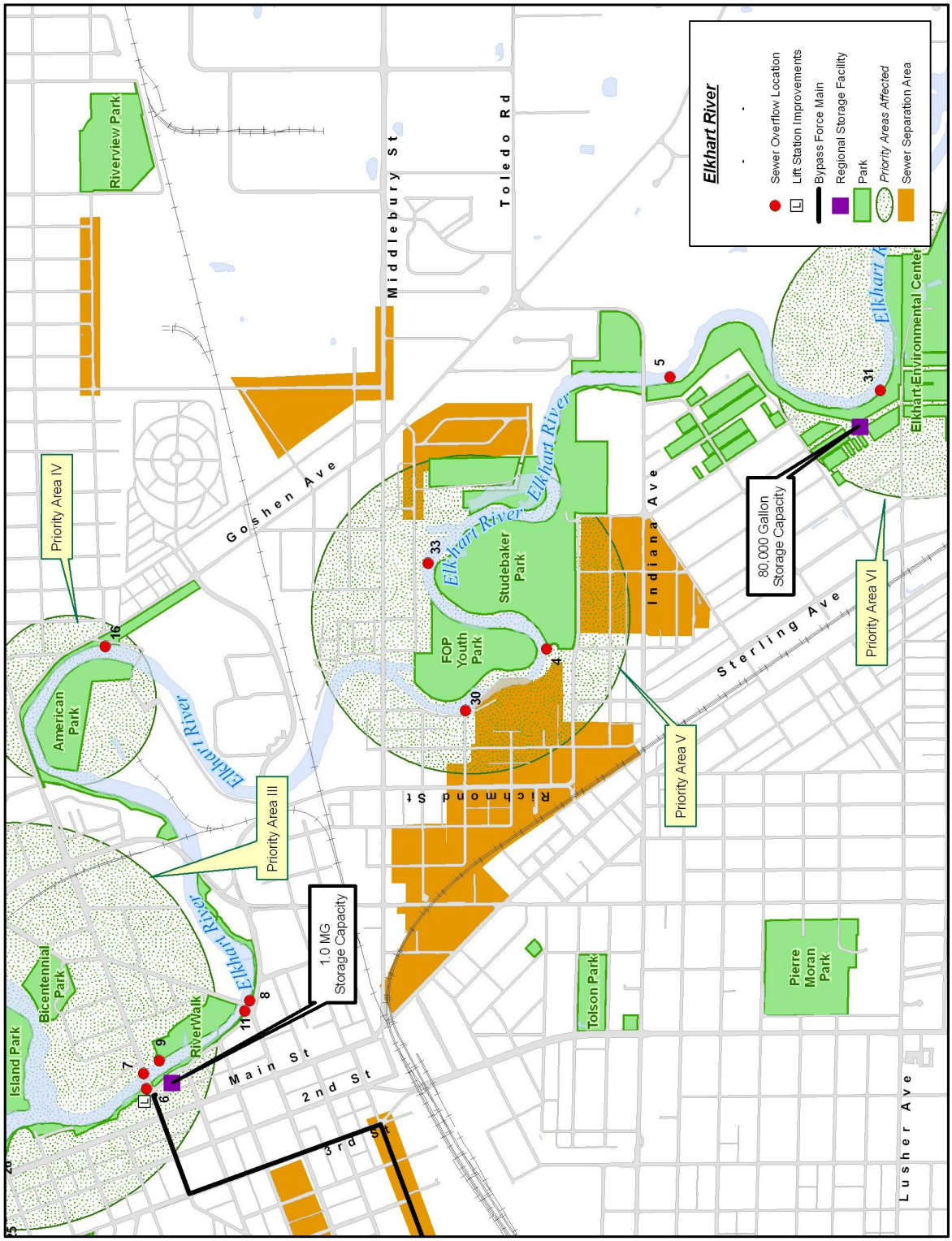
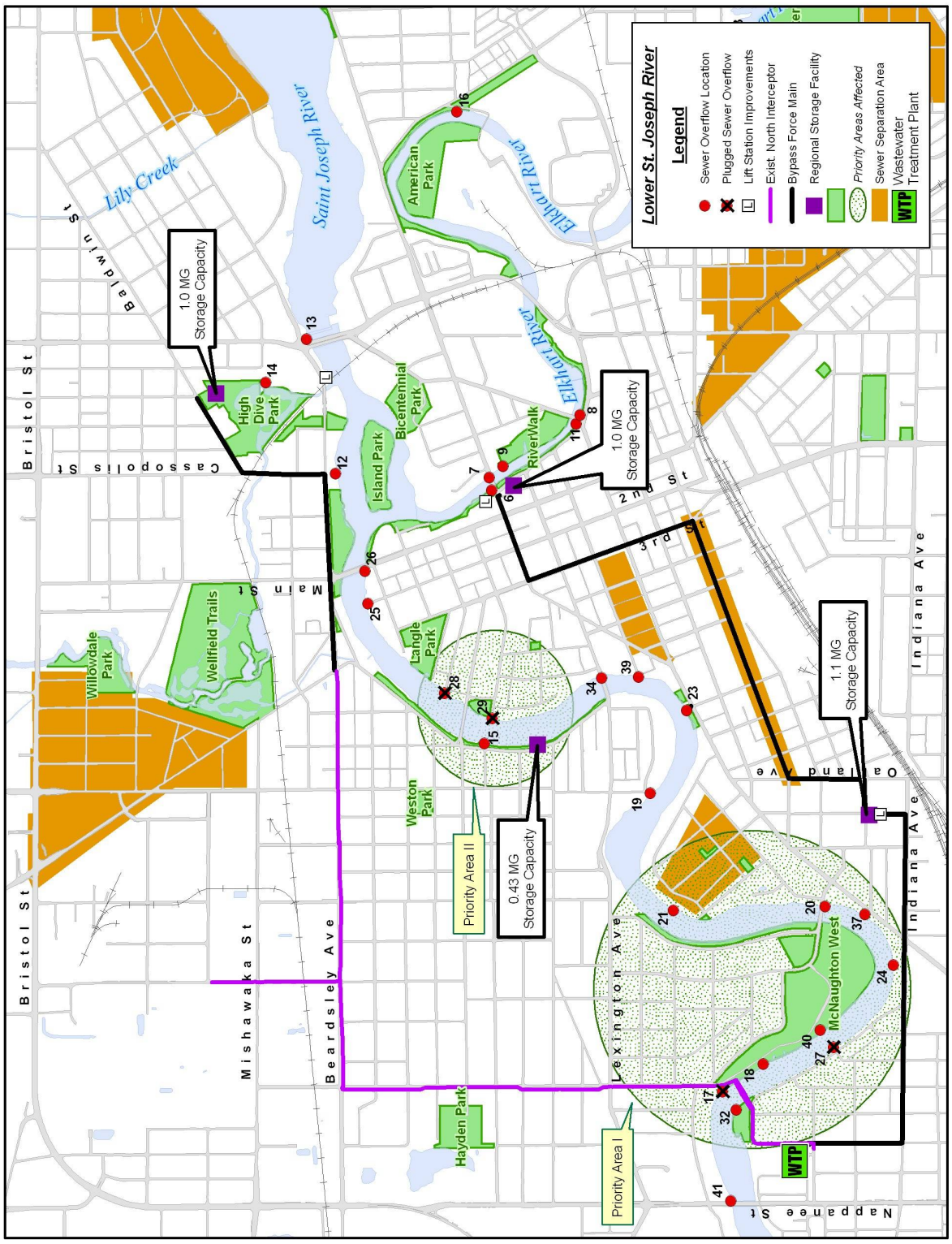


Figure 1-3 Lower St. Joseph River Control Measures



1.1.6 Oakland Avenue CSO Control Measure

The Oakland Avenue CSO control measure will reduce overflows at CSOs 24 and 37, the first and second highest overflow volume locations in the City's combined sewer system. These controls also will reduce overflows affecting Priority Area I. This control measure includes the following elements:

- A 1.1-million-gallon regional storage tank to store overflows during wet weather;
- Lift station, force main, conveyance upgrades and redirection of sewers;

When this control measure is completed, flows from CSOs 6 and 7 on the Elkhart River will be routed to the Oakland Avenue storage facility to redirect those flows away from a large portion of the combined sewer system serving the downtown area.

The elements of the Oakland Avenue control measure are illustrated in Figure 1-3, Lower St. Joseph River Control Measures. The priority area that will benefit from this control measure is also shown on the map.

1.1.7 Lower St. Joseph River CSO Control Measure

The Lower St. Joseph River stretches from the Lexington Avenue Bridge to the Nappanee Street Bridge. This control measure will reduce overflows at CSOs 17, 18, 19, 20, 21, 23, and 32 and affect Priority Area I. This control measure includes the following elements:

- Redirection of some flow from CSOs 17 & 18 to the North Interceptor system.
- Sewer separation in a portion of the sewer basins that feed into CSOs 21, 23 and 39.

Overflow frequencies and volume at CSO 19 will benefit from the redirection of Elkhart River overflows and storage and sewer separation projects related to CSO 15 on Riverside Drive. These projects are expected to reduce incoming flows at CSO 19 such that overflows occur infrequently or not at all under Typical Year conditions.

CSOs 20, 27, 32, 34, 40 and 41 do not require basin or system changes under the selected plan because they overflow infrequently under Typical Year conditions.

CSOs 17 and 27 are expected to be eliminated. They will be monitored during LTCP implementation to determine whether plugging the overflows would have any harmful effects during large storm events, as described in Appendix A, Section 2 – Post-Construction Monitoring Plan.

The elements of the Lower St. Joseph River control measure are illustrated in Figure 7-3. The priority area that will benefit from this control measure is also shown on the map.

1.1.8 Wastewater Treatment Plant Upgrades Control Measure

The Elkhart Wastewater Treatment Plant (WWTP) currently has a peak capacity of approximately 44 MGD. In combination, a number of plant components limit the current WWTP capacity. These components are preliminary treatment (screening), hydraulic components (various channels and pipes), step-feed aeration capabilities, and effluent disinfection.

The Oakland Avenue Control Measure in the selected plan will add a force main from Oakland Avenue to capture and reduce overflows from CSOs 24 and 37. The additional force main will

require WWTP system improvements to provide a peak sustained flow rate of up to 60 MGD. This is the peak sustained flow rate that is expected to be delivered to the WWTP, based upon the SWMM model at the selected LTCP level of control. The WWTP projects will include modifications to the influent pumping and, preliminary treatment. Additionally, improvements to the primary influent channels, aeration diffuser replacement, aeration blower replacement, RAS system replacement, and cloth media disk filtration installation will allow the plant to process a peak sustained flow rate of 60 MGD through full secondary treatment. Finally, the WWTP improvements will include construction of a UV disinfection system to accommodate a flow rate up to 60 MGD. We anticipate no plant bypasses in a Typical Year, assuming normal plant operations. Figure 1-4 illustrates the planned improvements to the WWTP in red.

Elkhart shall first bring on-line the 30 MGD capacity Cloth Media Disk Filtration (CMDF) process when WWTP flow rates through the existing Influent Parshall Flume (located downstream of headworks) reach an adjustable setpoint approaching 30 MGD. At that time, a CMDF Diversion Structure (consisting of an electric actuated knife gate for isolation and pinch valve for throttling control) will begin to open allowing flow upstream of the Influent Parshall Flume (downstream of headworks) to be diverted to the CMDF process. Initially, Elkhart will only bring 1 filter on-line via its electric actuated influent gate. Once the filter chamber fills, CMDF effluent will be measured by a CMDF effluent magnetic flow meter. Elkhart will continue to control diversion to CMDF (by modulating the Diversion Structure pinch valve) to maintain a minimum of 30 MGD flow through the Influent Parshall Flume for full treatment through the six Primary Clarifiers and complete activated sludge process.

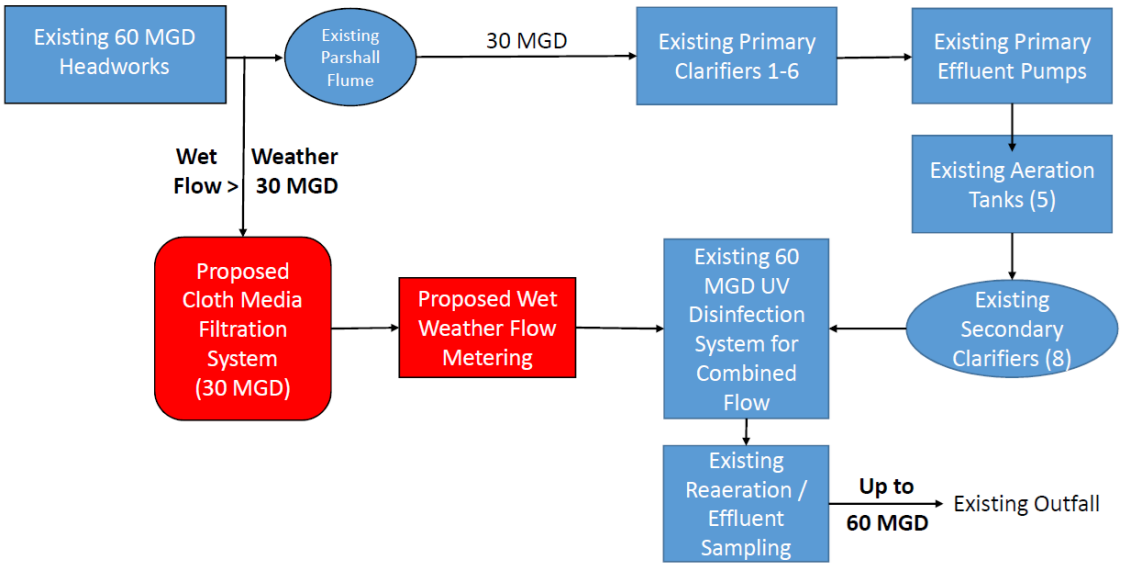
When CMDF effluent flow approaches an adjustable setpoint (currently anticipated to be 12 MGD) and is increasing, then Elkhart shall bring online the second CMDF unit of 15 MGD. At 60 MGD sustained flow into the WWTP, CMDF effluent will be up to 30 MGD and existing Primary Clarifier effluent will be a minimum of 30 MGD (including the ultimate maximum 2.6 MGD of solids/backwash flow from the CMDF Process that will be directed to the Primary Clarifier influent for settling and solids removal with primary sludge). After peak flow events have subsided, Elkhart shall isolate, clean, and drain the CMDF facilities including draining of effluent piping toward UV Disinfection, and Elkhart shall place the CMDF facilities on stand-by to await the next peak flow event. Elkhart shall fully control the CMDF process, including startup and shut down, by means of programmable logic controller (PLC), including the following processes: flow diversion, gate operations, backwash, solids/scum wasting, influent/effluent sampling, influent/effluent turbidity trending, isolation, and draining.

Elkhart will continue to evaluate optimizing the plant's wet weather treatment capacity and performance, so as to maximize both secondary and CMDF capacity, and will update the CMDF standard operating procedures accordingly as better performance conditions are discovered.

Please refer to the 2 included schematics. Schematic #1 is a block flow diagram of WWTP improvements reflecting, amount other things, the CMDF System and the use of 6 remaining Primary Clarifiers. Schematic #2 is a Flow Sheet showing the CMDF Diversion, CMDF Process, and CMDF Effluent flow measurement prior to combining with WWTP Final Clarifier Effluent for combined UV Disinfection. Not shown on Schematic #2 is CMDF influent and effluent probes, that are planned for both process control trending and coagulant feed control.

Elkhart shall install refrigerated samplers for flow paced sampling of both the CMDF Influent Channel and CMDF Effluent Channel. Elkhart shall take composite or discrete influent/effluent samples for laboratory analysis, as needed based on IDEM or EPA requirements. Additionally, Elkhart shall install turbidity probes to monitor and trend both CMDF influent and CMDF effluent in real-time during all events.

Schematic #1: Block Flow Diagram of WWTP Improvements



Schematic #2: CMDF Process Flow Sheet

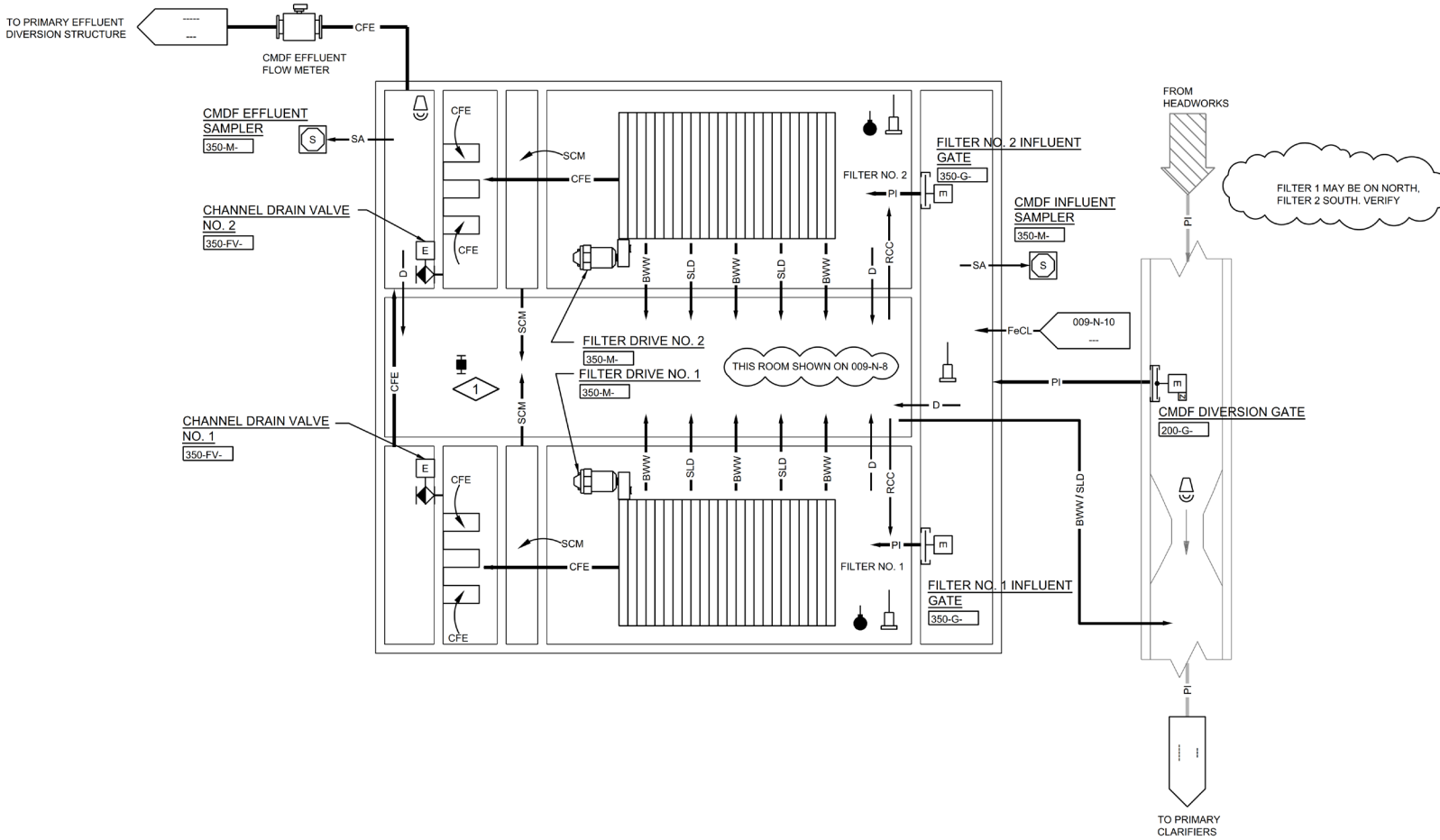
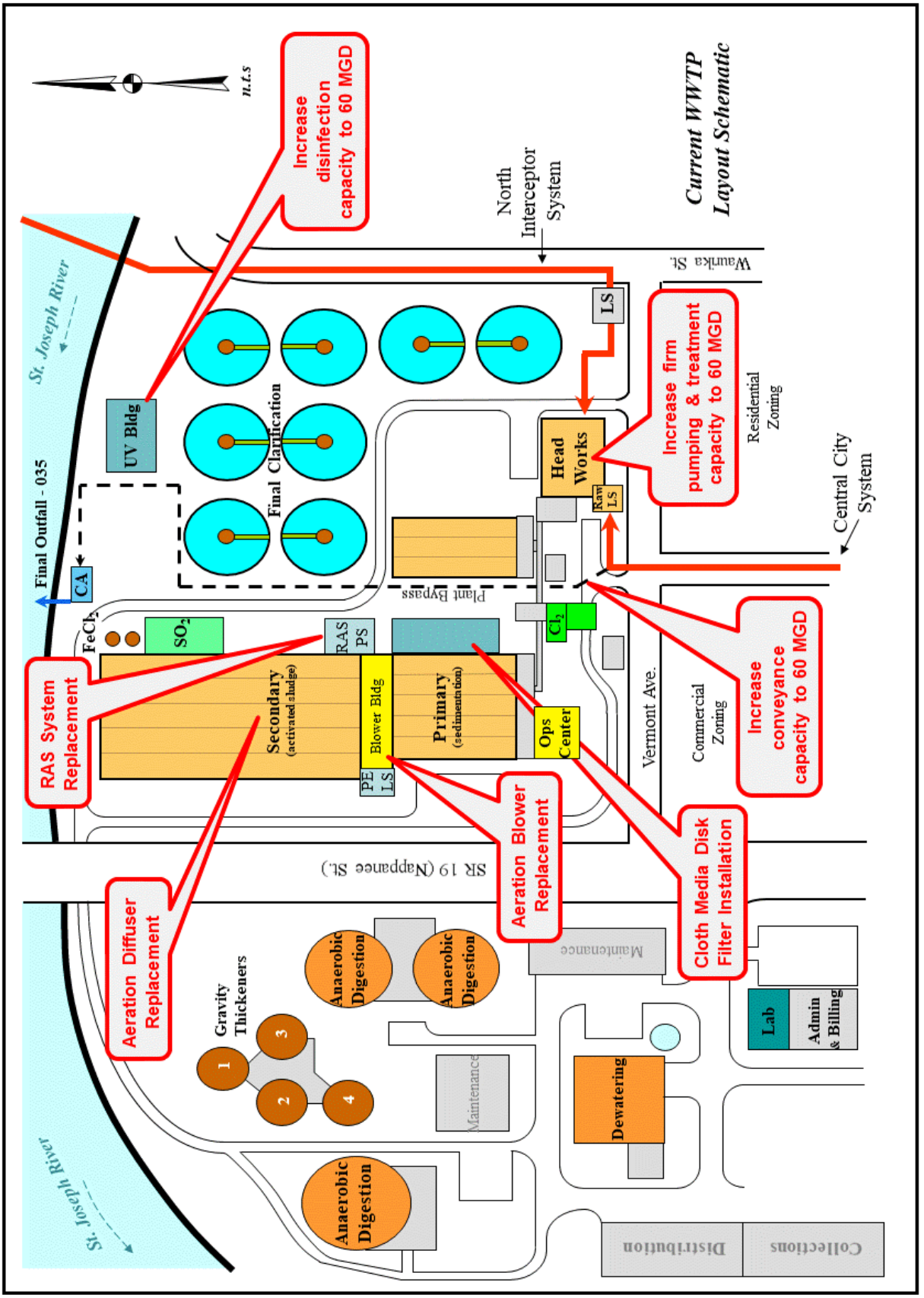
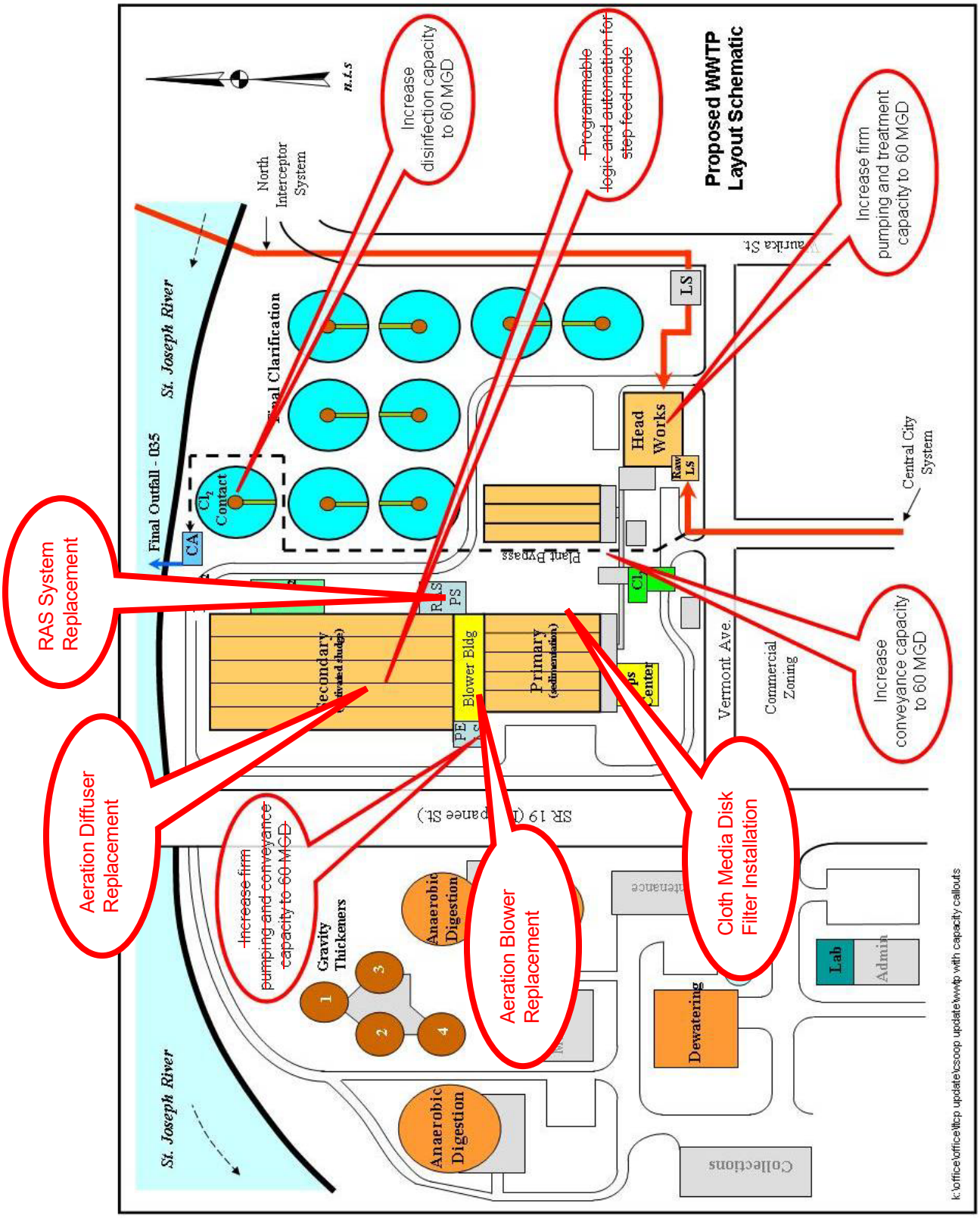


Figure 1-4 Schematic of Proposed Wastewater Treatment Plant Layout




Proposed WWTP
Layout Schematic
n.t.s
North
Interceptor
System
St. Joseph River
Final Outfall - 035
Final Clarification
Cl2
Contact
CA
Head
Works
Raw
Ls
LS
Plant Bypass
Central City
System
Aurika St.
Vermont Ave.
Commercial
Zoning
Blower Bldg
Primary
(sedimentation)
Secondary
(activated sludge)
RAS
PS
PE
Gravity
Thickeners
Anaerobic
Digestion
Anaerobic
Digestion
Dewatering
Lab
Admin
Collections
SR 19 (
pane St.)
Increase
disinfection capacity
to 60 MGD
Programmable
logic and automation for
step feed mode
Increase firm
pumping and treatment
capacity to 60 MGD
RAS System
Replacement
Increase
conveyance capacity
to 60 MGD
Aeration Diffuser
Replacement
Increase firm
pumping and conveyance
capacity to 60 MGD
Aeration Blower
Replacement
Cloth Media Disk
Filter Installation
k:\office\office\wtcp update\cscop update\wwtp with capacity callouts

1.2 LTCP Benefits

This section describes how the selected plan is expected to benefit the St. Joseph River and Elkhart River. The City used the river model to predict environmental benefits and the collection system model to predict overflow volume and frequency under the selected plan.

1.2.1 Annual Average Rainfall Statistics

Predictions in Section 7.5 are based upon average annual rainfall statistics, using the historical record from 1960 through 2000 at the airport in South Bend, Indiana. Average annual statistics were used to select a Typical Year (1992) under the WISE analysis, part of the cooperative effort among the cities of South Bend, Mishawaka, and Elkhart. Table 1-2 below displays the average annual rainfall and St. Joseph River stream flow averages based upon the WISE Typical Year analysis:

Table 1-2 Annual Average Rainfall and Stream Flow Statistics

Ambient Factor	Criterion	Historical Annual Average[1]	Historical Summer[1,2] Average
Rainfall	Number of Storms > 0.11"	**70**	**30**
	Annual Volume (inches)	**38.3**	**18.3**
	5th Largest Event (inches)	**1.41**	**1.07**
	Number of back-to-back Storms[3]	**2.5**	**1.8**
Stream Flow	25th Percentile (cfs)	**1,900**	**1,650**
	50th Percentile (cfs)	**2,890**	**2,350**
	75th Percentile (cfs)	**4,220**	**3,500**

Notes:

[1] The historical averages are based on 41 years of data recorded from 1960 through 2000.

[2] Summer is defined as May 1 through September 30.

[3] "Back-to-back" storms are defined as storms occurring within 24 hours of each other and each storm having at least 0.5" of total rainfall.

Actual performance following LTCP implementation will be compared to results that would be expected during a Typical Year.

1.2.2 CSO Volume and Overflow Reduction

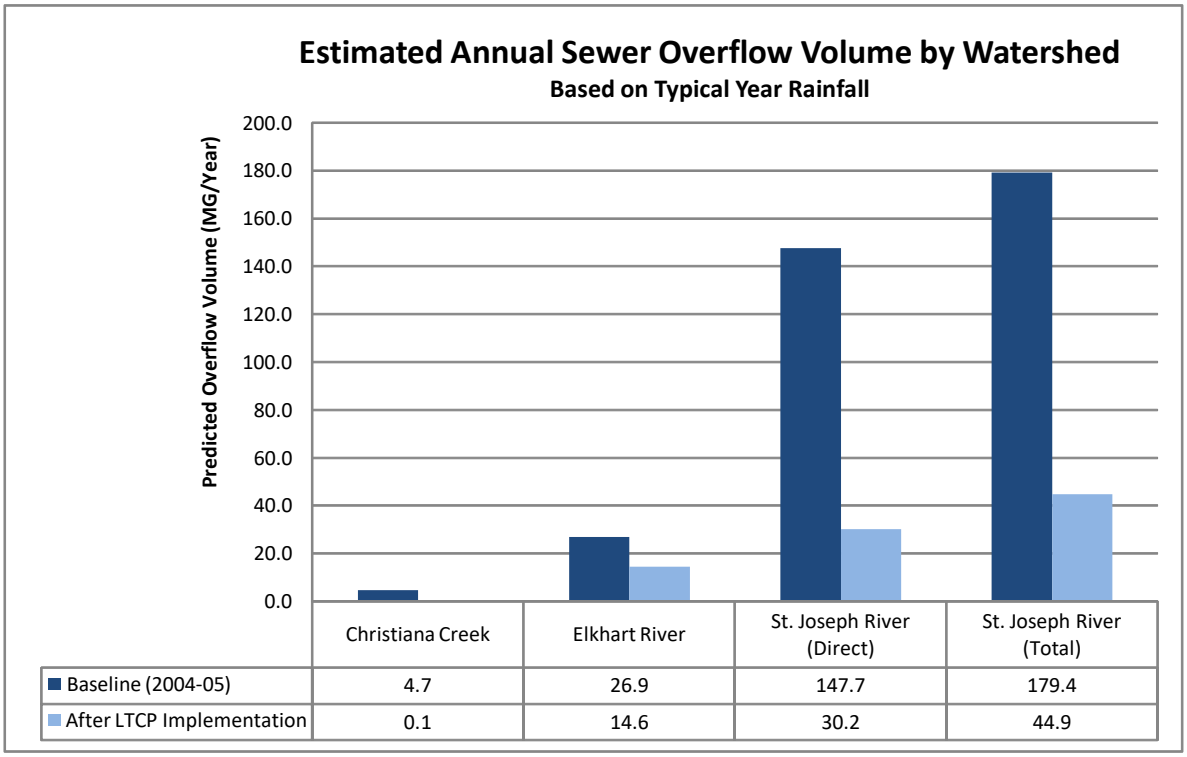
Elkhart's LTCP will significantly reduce remaining combined sewer overflow volume and frequency to CSO-impacted waterways. While the following description estimates overflow volume and percent capture under the selected plan, Elkhart's performance measure for compliance with LTCP requirements is a system-wide overflow frequency of no more than nine Overflow Events during a Typical Year. Performance Criteria and Design Criteria are further described in Section 1.3and Appendix A, Section 2 – Post-Construction Monitoring Plan.

Estimated annual overflow volumes and frequency for baseline and future system conditions were generated using Elkhart's planning-level XP-SWMM model of the existing collection system. These estimates assume the occurrence of average rainfall for a Typical Year rainfall applied uniformly throughout the Elkhart service area. With Elkhart's selected control measures in place, model simulations predict a maximum of nine Overflow Events occurring during a Typical Year.

Figure 1-5 illustrates estimated annual overflow volume during a Typical Year, by watershed. The graph compares baseline conditions in 2004-05 to expected conditions after LTCP implementation. The 2004-05 "baseline" year already reflects significant CSO control efforts to that point. The "St. Joseph River (Direct)" statistics represent outfalls that overflow directly into the St. Joseph River. The "St. Joseph River (Total)" statistics represent volume from all Elkhart overflow locations, since the Elkhart and Christiana Creek overflows eventually impact the St. Joseph River.

Notably, average annual overflow volume is expected to be reduced by approximately 75 percent when compared to 2004-05 baseline conditions. When combined with progress to date, this represents approximately 96 percent capture and treatment of wet-weather flows into the sewer system in a Typical Year. Elkhart calculates the plan's percent capture as the volume captured and treated during wet-weather conditions divided by the total volume of flow in the combined sewer system during wet-weather conditions. The total volume of flow is the sum of the volume captured and treated and the overflow volume. When this calculation is applied, the selected plan should achieve approximately 96 percent capture system-wide.

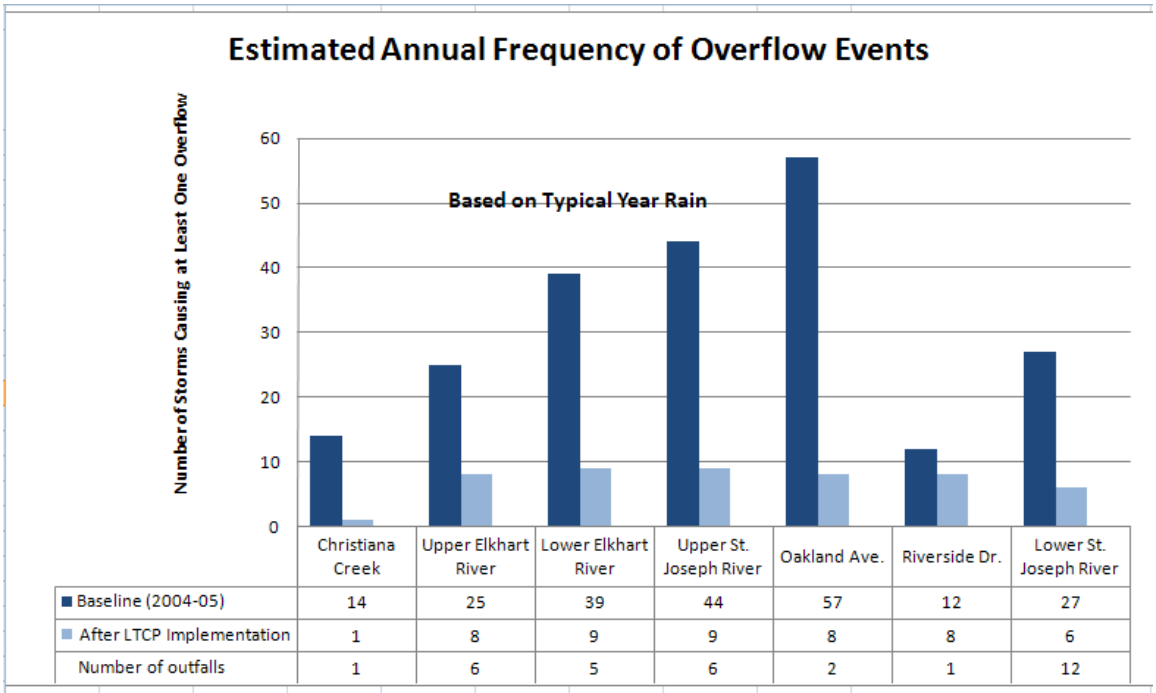
Figure 1-5 Estimated Annual Sewer Overflow Volume by Watershed



Note: Based upon estimates of baseline and future system conditions using Elkhart's XP-SWMM model of the existing collection system and typical year rainfall inputs.

Figure 1-6 estimates the annual frequency of Overflow Events during a Typical Year by geographic area. Nevertheless, Elkhart commits to eliminating all but 9 Overflow Events during a Typical Year.

Figure 1-6 Estimated Annual Frequency of Overflow Events



	Christiana Creek	Upper Elkhart River	Lower Elkhart River	Upper St. Joseph River	Oakland Ave.	Riverside Dr.	Lower St. Joseph River
Baseline (2004-05)	14	25	39	44	57	12	27
After LTCP Implementation	1	8	9	9	8	8	6
Number of outfalls	1	6	5	6	2	1	12

Note: Based upon estimates of baseline and future system conditions using Elkhart's XP-SWMM model of the existing collection system and typical year rainfall inputs.

1.3 Implementation Schedule

This section describes how the City developed its implementation schedule.

1.3.1 Prioritization and Scheduling Criteria

The City used the following criteria to develop the LTCP implementation schedule:

Sensitive and Priority Areas: Projects to reduce overflows to sensitive or priority areas were given a higher priority in the schedule. Reducing overflows to Christiana Creek were given the highest priority and placed first in the implementation schedule under this criterion. Projects in the Elkhart River Watershed also were given priority because they impact multiple parks and priority areas.

Financial Impact on Ratepayers: The City sought to develop a schedule that would phase in the project over time in an affordable manner to local ratepayers.

Logical Construction Sequencing: The city also reviewed all projects from a logical engineering and construction perspective to determine the relationship between projects. Interdependent projects were sequenced in order of their logical completion so that completed projects would have maximum utility at the earliest possible stage.

1.3.2 Implementation Schedule

Elkhart shall complete implementing the LTCP on or before December 31, 2029 unless a different schedule is approved by the United States and Indiana or ordered by the Court for the Remaining LTCP Projects pursuant to the procedures in Section XIX Schedule Reconsideration Based on

Financial Circumstances of the Decree. Table 1-3 lists the CSO Control Measures chronologically, and also includes Design Criteria, Performance Criteria, and Critical Milestone dates for each project or group of projects.

The LTCP consists of the following commitments by the City of Elkhart:

- Implementing the CSO control measures listed in Table 1-3 according to the Design Criteria and Performance Criteria specified; and

- Meeting the schedule for Critical Milestones established in Table 1-3.

Following implementation of the LTCP, one or more CSO outfalls are expected to discharge during large storm events during up to 9 separate Overflow Events during a Typical Year. After Elkhart has demonstrated compliance with all Performance Criteria, to the extent that post-construction monitoring shows that the residual overflows interfere with designated uses, Elkhart may conduct a use attainability analysis to determine whether the designated uses are attainable.

Table 1-3 CSO Control Measures, Design Criteria, Performance Criteria, and Critical Milestones

Table 1-3 CSO Control Measures, Design Criteria, Performance Criteria, and Critical Milestones							
CSO Control Measure	**CSO Number**	**Priority Areas Affected**	**CSO Control Measure Elements**	**Description**	**Design Criteria [1]**	**Performance Criteria**	**Critical Milestones**
Christiana Creek CSO Control							
1	14	Areas III, II, and I	High Dive Park- 1.0 MG facility for storage and pumping and redirection of CSO 14 basin flow from Northeast Elkhart to the North Interceptor System	Construction of a 1 MG off-line storage tank to reduce overflows at CSO 14 and construct a LS to redirect flow to the North Interceptor System	Provide storage capacity of 1 MG and lift station designed per Ten State Standards	When incorporated with the rest of the Christiana Creek Watershed, achieve no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2010 Bid Date- Nov 15, 2011 Date of Full Operation - Nov 15, 2014
Upper Elkhart River CSO Control							
2	4, 30, 31 & 33	All Areas. Two of the top 8 overflow frequency locations	EEC- 80,000 gal. storage and pump at CSO 31 and various levels of separations at CSO's 4, 30 & 33	Construction of a 80,000 gallon off-line storage tank to reduce overflows at CSO 31 and separation and rehabilitation of sewers to reduce stormwater flow and minimize CSO's 4, 30 & 33	Provide storage capacity of 80,000 gal. and sanitary and storm sewers designed per Ten State Standards	When incorporated with the rest of the system upgrades, no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2013 Bid Date- Nov 15, 2014 Date of Full Operation - Nov 15, 2018
WWTP Plant Upgrades							
3	WWTP		WWTP system improvements provide a peak capacity of 60 MGD through ~~full~~ secondary or CMDF treatment and disinfection	Modifications to the influent pumping, preliminary treatment, improvements to primary influent channels, diffuser replacement, aeration blower replacement, RAS system replacement, and cloth media disk filtration installation with a capacity of 30MGD.	System improvement designed per Ten State Standards CMDF Filter Area: 5,164.8SF Max. Hydraulic Loading: 4.4gpm/SF Max. Solids Loading: 15.8lbs/d/SF Average TSS Removal: >85%	Provide peak capacity of 60 MGD - a minimum of 30 MGD through ~~full~~ secondary, and up to 30 MGD through CDMF treatment, and 60 MGD disinfection. WWTP Outfall shall meet NPDES permit effluent limits.	Design Date- Nov 15, 2015 Bid Date- Nov 15, 2017 Date of Full Operation - ~~Nov 15, 2023~~ Nov 15, 2024
Lower Elkhart River CSO Control							
4	6&7	Areas III, II, and I. Sixth highest overflow volume location (CSO 6)	Jackson St- 1.0 MG storage and pumping facility and redirection of system flows to Oakland Avenue Control Facility	Construction of a 1 MG off-line storage tank to reduce overflow at CSOs 6 &7 with upgrades to the system to allow the redirection of flow to Oakland Avenue Control Measure when it is complete [3]	Provide storage capacity of 1 MG with lift station and system improvements designed per Ten State Standards	When incorporated wih the rest of the system upgrades, achieve no more than 9 Overflow Events on a systemwide basis	Design Date- Nov 15, 2016 Bid Date- Nov 15, 2018 Date of Full Operation - Nov 15, 2021
Oakland Avenue Control							
5	24 & 37	Area I. 1st and 2nd highest overflow volume locations	CSO 24 - LS 1.1 MG Storage and Pump Force Main from CSO 24 LS to WWTP	Construction of a 1.1 MG off-line storage and pump tank with system additions to allow the redirection of flow to CSO 24 & 37 LS and then to the WWTP to reduce overflows at CSOs 24 & 37	Provide storage capacity of 1.1 MG with lift station and system improvements designed per Ten State Standards	When incorporated with the rest of the system upgrades, no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2021 Bid Date- Nov 15, 2023 Date of Full Operation - Nov 15, 2028
Upper St Joseph River CSO Control							
6	13, 25, 29 & 39	Areas III, II, and I	Basin Separations, Lift Station Improvements, system improvements and CSO eliminations	Separation, flow redirection and rehabilitation of sewers to reduce stormwater flow and minimize or eliminate CSOs	System modifications designed per Ten State Standards	When incorporated with the rest of the system upgrades, no more than 9 Overflow Events on a systemwide basis	Design Date- Nov 15, 2022 Bid Date- Nov 15, 2023 Date of Full Operation - Nov 15, 2026
Lower Elkhart River CSO Control							
7	17, 18, 21, & 23	Area I	Basin Separations, Lift Station Impovements, system improvements, CSO eliminations and system redirections	Separation, flow redirection and rehabilitation of sewers to reduce stormwater flow and minimize or eliminate CSOs	System modifications designed per Ten State Standards	When incorporated with the rest of the system upgrades, no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2023 Bid Date- Nov 15, 2024 Date of Full Operation - Dec 31, 2029
Riverside Drive Control							
8	15	Areas I and II. 4th highest overflow volume location	Riverside Dr. - 0.43 MG Storage & Pump with sewer separations and system redirection	Construction of a 0.43 MG off-line storage tank with Northwest Elkhart sewer system redirection and partial basin separation to reduce overflows at CSO 15	Provide storage capacity of 0.43 MG and system improvements designed per Ten State Standards	When incorporated with the other work in CSO 15 basin and downstream improvements, achieve no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2024 Bid Date- Nov 15, 2025 Date of Full Operation - Dec 31, 2029

[1] Elkhart shall design each CSO Control Measure in accordance with standard engineering practices to ensure that Elhart will achieve corresponding facility- specific or systemwide Performance Criteria.

The following definitions were used in developing Table 1-3:

"Bid Date" shall mean the date by which: (1) Elkhart has appropriately allocated funds for a specific CSO Control Measure (or portion thereof); (2) the bid for the specific CSO Measure has been accepted and awarded by Elkhart's Board of Public Works for the construction of the CSO Control Measure; and (3) Elkhart has issued a notice to proceed to the contractor who will perform the work. Several CSO Control Measures in Table 1-3 of the Appendix consist of separate components. For those CSO Control Measures, Completion of Bidding Process shall be achieved when the first project in the construction sequence has met the above definition.

"Critical Milestone" shall mean significant dates by which progress in implementing the LTCP will be tracked. For each major CSO Control Measure shown in Table 1-3 of the Appendix, the Critical Milestones tracked will be Design Date, Bid Date, and Date of Full Operation.

"CSO Control Measures**"** shall mean structural measures designed to eliminate, reduce, or mitigate the volume, frequency or pollutant levels in CSOs.

"Date of Full Operation" shall mean the completion of construction and installation such that the relevant system has been placed in full operation, and is expected to both function and perform as designed, including all control systems and instrumentation necessary for normal operations and all residual handling systems. Elkhart shall verify the Date of Full Operations in a memorandum to Elkhart's Board of Public Works. Several CSO Control Measures in Table 1-3 of the Appendix consist of separate components. For those CSO Control Measures, the Date of Full Operations shall be the date that the last component is completed. "Design Criteria" shall mean and specify how the selected CSO control measures shall be designed to achieve the required level of control. All selected LTCP projects will be designed in accordance with standard engineering practices to ensure that corresponding facility-specific and system-wide Performance Criteria will be achieved.

"Design Criteria" shall mean and specify how the selected CSO Control Measures shall be designed to achieve the required level of control. All selected LTCP projects shall be designed in accordance with standard engineering practices to ensure that corresponding facility-specific and system-wide Performance Criteria will be achieved.

"Design Date**"** shall mean the date on which the design has officially begun. The design process may include preliminary sizing, modeling, final sizing, and preparation of final plans and specifications. Elkhart shall verify the Design Date by a memorandum to Elkhart's Board of Public Works that design has begun. Several CSO Control Measures in Table 1-3 of the Appendix consist of separate components. For those CSO Control Measures, the Design Date shall be achieved when the first project in the construction sequence has met the above definition.

"Performance Criteria" shall mean and include any of the following: completing the CSO Control Measures so that they operate as designed; not exceeding the Typical Year Overflow Event frequency described in Table1-3 of Appendix A; conveying the design flow rates; and meeting any and all applicable LTCP requirements and permit requirements.

1.4 Summary

The CSO Control Measures in Elkhart's Long Term Control Plan are designed to result in no more than nine Overflow Events during a Typical Year. The CSO Control Measures in Elkhart's LTCP are designed to result in zero overflow events at many outfalls during a Typical Year and no more than 9 overflow events at one or more of the remaining outfalls

Elkhart's LTCP features a combination of the following CSO Control Measures:

- Continuing Elkhart's ongoing program of partial or complete sewer separation in several CSO Basins;
- Redirecting Elkhart's sewer system to send some flows to the wastewater treatment plant on a route that moves the flows out of the combined sewer area;
- Regional storage tanks to capture and store sewage overflows during wet weather;
- Sewer system conveyance improvements; and
- Wastewater treatment plant improvements.

Elkhart shall complete implementing the LTCP on or before December 31, 2029 unless a different schedule is approved by the United States and Indiana or ordered by the Court for the Remaining LTCP Projects pursuant to the procedures in Section XIX Schedule Reconsideration Based on Financial Circumstances of the Decree.

Elkhart's LTCP will significantly reduce combined sewer overflow volume and frequency to CSO-impacted waterways.

The City considered sensitive and priority areas and logical construction sequencing to develop the implementation schedule. Reducing overflows to Christiana Creek was given the highest priority and placed first in the implementation schedule. Projects in the Elkhart River watershed also were given high priority because those projects will impact multiple City parks and priority areas.

Appendix A: Section 2:

Post-Construction Monitoring Plan

2.1 Introduction

This section describes Elkhart's plans to monitor the implementation and effectiveness of the long-term control plan in meeting the City's goals and Clean Water Act requirements. When implemented, the City's CSO controls are expected to improve water quality in Christiana Creek, the Elkhart River and the St. Joseph River. The City will track progress by individual watersheds where controls are implemented using the monitoring program described below.

The post-construction monitoring program includes the following elements:

- Actions to document that Elkhart has built the CSO control measures required under the LTCP and that they are meeting the Design Criteria;
- Actions to determine whether the control measures have achieved the Performance Criteria that CSO controls must achieve nine or fewer CSO events on a system-wide basis during a Typical Year;
- Actions to monitor the benefits of the CSO control measures, such as in-stream water quality improvements and reductions in CSO volume, frequency and duration when compared to baseline conditions; and,
- Progress reporting to U.S. EPA, IDEM, the Elkhart City Council, Elkhart Board of Public Works and the general public.

After Elkhart has demonstrated compliance with all Performance Criteria, to the extent that post-construction monitoring shows that the residual overflows interfere with designated uses, Elkhart may conduct a use attainability analysis to determine whether the designated uses are attainable.

2.2 General Requirements

U.S. EPA and IDEM require CSO communities to monitor their progress in reducing CSOs during and after LTCP implementation. "Monitoring during LTCP implementation should include data collection to measure the overall effects of the program on water quality and to determine the effectiveness of CSO controls. … A monitoring plan to assess water quality conditions during and after program implementation will allow evaluation of the improvements through comparison to baseline conditions." [2]

Elkhart shall use existing monitoring stations to collect long-term data for comparisons. Elkhart shall describe monitoring plan components, such as a map of monitoring stations, a record of the

[2] Combined Sewer Overflows: Guidance for Long Term Control Plans, U.S. Environmental Protection Agency, September 1995, Section 4.6 Post-Construction Compliance Monitoring, page 4-15.

frequency of sampling at each station, a parameter list, and a plan for maintaining quality assurance and quality control.

2.3 Monitoring, Data Collection and Analysis

2.3.1 Monitoring Plans

2.3.1.1 In-stream Monitoring

Elkhart's monitoring strategy described in this plan is focused primarily on evaluating CSO control performance and associated benefits on in-stream water quality for *E. coli*.

Elkhart's post-construction monitoring program will utilize the in-stream monitoring locations and parameters identified in Table 2-1 below. All locations will be monitored as indicated with the exception of when the river is frozen at select locations during winter months. The parameter list includes constituents that will allow the City to evaluate attainment of recreational (*E. coli*) and aquatic life (dissolved oxygen, temperature and pH) uses. As noted in Table 2-1, Elkhart also will document observations of floatables, odor, color, and extent of algae to describe river conditions related to narrative water quality standard criteria.

Table 2-1 Stream Monitoring Locations

Site ID	Location	Receiving Stream	Rationale	Frequency	Parameters[2]
1	Christiana Creek - Footbridge Upstream of Confluence with St. Joe River	Christiana Creek	Characterize Christiana Creek basin; Includes loads from all watershed sources, including 1 City CSO	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
2	6-Span Bridge (County Road 17)	St. Joe River	Characterize Upstream St. Joe River basin; Includes loads in St. Joseph River basin from sources upstream of the City	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
3	Lexington Avenue	St. Joe River	Upper St. Joe River basin; Include loads from Elkhart River, 2 City CSOs, and four tributaries (Christiana, Pine, Puterbaugh, Osolo)	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
4	Ash Rd	St. Joe River	Characterize Lower St. Joe River basin; Includes loads from 5 City CSOs, WWTP, two tributaries (Baugo and Cobus)	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
5	Elkhart River - County Road 18	Elkhart River	Characterize Upstream Elkhart River basin; Includes loads from sources upstream of the City, including Rock Run Creek	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
6	Elkhart River - Footbridge Upstream of Confluence with St. Joe River	Elkhart River	Characterize Elkhart River basin; Includes loads from 7 City CSOs, Yellow Creek	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli

LEGEND:

[1] The City will collect data for a minimum of 3 wet weather events in a recreational season and with a goal of monitoring 1 wet event/month

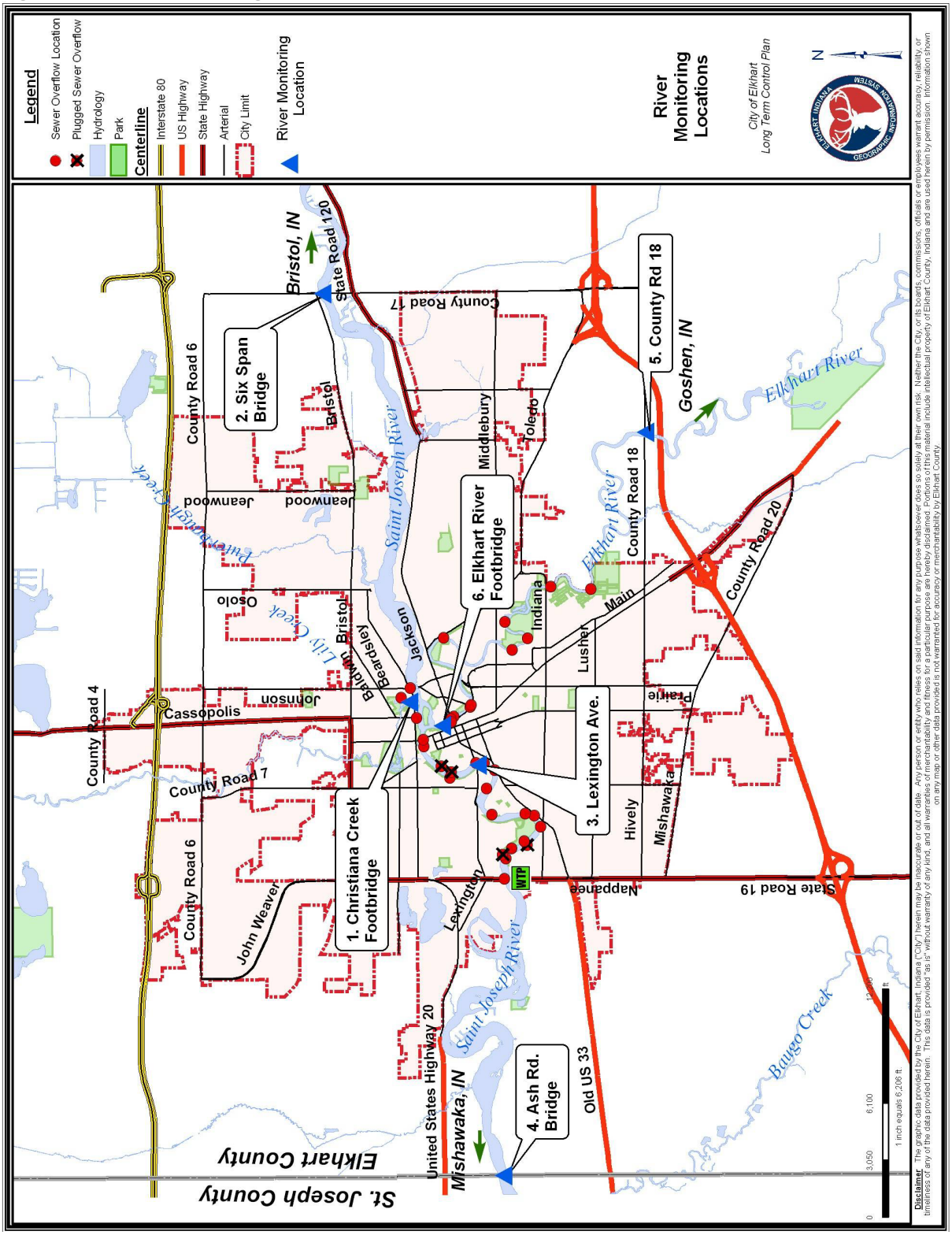
[2] The City will note observations regarding floatables, color, odor and extent of algae at each sampling location

Analytical Parameter Abbreviations:
DO – dissolved oxygen, mg/L
pH – pH, s.u.
Temp – water temperature, deg C
Wthr – weather (1)
Wa – water appearance (2)
E. Coli – E. Coli, cfu

Additional notes to document weather and water conditions:
1 – Weather conditions: 1 = clear / sunny, 2 = partly sunny, 3 = cloudy, 4 = lt rain, 5 = rain, 6 = lt snow, 7 = snow, 8 – windy
2 – Water appearance: 1 = clear, 2 = cloudy, 3 = murky, 4 = muddy

Figure 8-1 illustrates the stream monitoring locations described above.

Figure 2-1 River Monitoring Locations



2.3.1.2 CSO Outfall Monitoring

Elkhart shall continue to monitor active CSO outfalls using its CSO activation monitoring system. The monitoring system, which currently uses a combination of daily site visits and continuous monitors, will be modified during the first five years of the LTCP implementation plan to include continuous monitoring of depth of flow and activations at all active CSOs while limiting site visits to twice a month for maintenance and calibration. CSO activation monitoring system changes will be updated in the CSO Operation Plan as they occur.

2.3.1.3 Precipitation Monitoring

Elkhart has three active rain gauge monitoring stations across the service area. Elkhart shall continue to monitor rainfall at those stations. Elkhart shall monitor rainfall during each storm event during the post-construction monitoring period to record each storm event.

2.3.1.4 CMDF Treatment Process Monitoring

CMDF influent and effluent turbidity probes will be installed for real-time trending of CMDF process performance throughout each wet weather event. Refrigerated samplers will also be installed on both the CMDF influent and effluent channels for flow-paced composite or discreet sampling and laboratory analysis.

2.3.2 Data Management and Analysis

2.3.2.1 Collection System Data Analysis

Elkhart shall use sound engineering judgment and best industry practices to use the collection system model to determine whether the City has achieved compliance with the Performance Criteria set forth in Table 1-3. Elkhart shall update and calibrate the model by performing the following steps:

1. Collect flow monitoring, rainfall, and CSO activation data sufficient to re-calibrate the collection system and water quality models during a 12-month post-construction monitoring period after Achievement of Full Operations of all CSO Control Measures in the LTCP.

2. Perform quality assurance and quality control of the data collected in Step 1, as described in the City's Quality Assurance Project Plan (QAPP)[3].

3. Update the collection system model to incorporate all completed projects and any other system improvements completed since the LTCP calibration effort. Utilize the updated collection system model and the rainfall data collected during the monitoring period to run a continuous simulation of CSO discharges for the 12-month post-construction monitoring period.

4. Compare CSO activation frequency and annual average system-wide CSO volume in the continuous simulation outputs to the CSO monitoring data for the 12-month post-construction monitoring period to determine whether re-calibration of the collection system model is needed. The model-predicted activations shall be no more than one activation less than monitored activations for CSOs with more than five monitored activations during a Typical Year. (That is, to be considered calibrated, for an outfall that is predicted to have six overflows during a Typical Year and which

[3] St. Joseph River Watershed Initiative for a Safer Environment (WISE) Quality Assurance Project Plan (205(j) Grant A305-2-01-399-0), October 25, 2002, and revised on April 29, 2003.

experienced 8 overflows during post-construction monitoring, the model must predict 7 or more overflows for that outfall for that same post-construction monitoring period). Additionally, no individual outfall shall have more than nine model-predicted activations or monitored activations during a Typical Year. Moreover, for CSO numbers 6, 25, and 37, the model-predicted activations shall be no less than the number of monitored activations during a Typical Year. Finally, the model also shall predict the system-wide annual average overflow volume within +/- 20 percent. Model re-calibration will not be needed if the model achieves the aforementioned criteria. If these criteria are not met, Elkhart shall recalibrate the model in accordance with Steps 5-6. At the conclusion of Step 4, Elkhart shall prepare an Initial Model Validation Report and present it to EPA and IDEM for authorization to proceed to the next step.

5. If re-calibration is needed, Elkhart shall select two or more appropriate rainfall events from the12-month post-construction monitoring period for model recalibration.6. After Elkhart re-calibrates the model using sound engineering judgment in accordance with standard industry practices, Elkhart shall run another continuous simulation for the entire monitoring period to verify the re-calibrated model. Thereafter, Elkhart shall compare the continuous simulation outputs to the CSO monitoring data as described in Step 4, to determine whether additional re-calibration is needed. If so, Elkhart shall conduct re-calibration in accordance with Steps 5-6 until the model achieves the criteria described in Step 4, above.

If EPA and IDEM agree that Elkhart has adequately calibrated and validated the model, based on recalibration efforts, Elkhart shall prepare a Model Re-Calibration Report documenting the recalibration and validation. After receiving authorization from EPA and IDEM, Elkhart then may proceed to the Performance Criteria analysis described in Section 2.4.1.

2.3.2.2 Receiving Water Data Analysis

Elkhart shall use its river model to evaluate in-stream water quality with appropriate analyses including the same analyses presented in Section 1 of this Appendix. These analyses include compliance with current water quality standards at key locations (including the State line), evaluating compliance with all sources and isolating the potential impact of any remaining Elkhart CSOs on in-stream water quality. These analyses will provide a before-and-after characterization of water quality, allowing Elkhart to quantify benefits and improvements to the river from the implementation of Elkhart's LTCP.

Elkhart shall use sound engineering judgment and best industry practices to use the monitoring data and river model to determine how often the river attains the designated uses (recreation and aquatic life). The river model is configured to evaluate recreation use by simulating *E. coli* fate and transport and is applied for the Typical Year. Like all computer models, the river model inevitably carries with it some inherent variability and calibration relies on reproducing the magnitude and timing of in-stream concentrations. Elkhart shall perform the following steps to update the collection system model calibration:

1. Collect data during dry and wet weather over a 12-month post-construction monitoring period after Achievement of Full Operations of all CSO Control Measures in the LTCP.

2. Perform quality assurance and quality control of the data collected in Step 1.

3. After Elkhart updates the collection system model calibration, Elkhart shall use the river model in its previously-calibrated state with collection system model results and the rainfall data collected during the monitoring period to run a continuous simulation of the Elkhart and St. Joseph Rivers for the 12-month post-construction monitoring period.

4. Compare the continuous simulation river model outputs to the in-stream *E. coli* monitoring data for the 12-month post-construction monitoring period to determine whether re-calibration of the

river model is needed. Model re-calibration will be not be needed if the model achieves at least the same degree of calibration as was achieved during the LTCP development process, and there is a high degree of agreement between the range of concentrations in the model output and monitoring data for the monitoring period. Otherwise, model re-calibration will be needed in accordance with Steps 5-6.

5. If re-calibration is needed, the Elkhart shall select one rainfall event from the 12-month post-construction monitoring period for model recalibration.

6. After Elkhart has recalibrated the river model using sound engineering judgment in accordance with standard industry practices, Elkhart shall verify the re-calibrated model by running another continuous simulation for the monitoring period. The continuous simulation period shall include at least two additional wet weather events. Thereafter, Elkhart shall again compare the continuous simulation outputs to the in-stream monitoring data as described in Step 4, to determine whether additional re-calibration is needed. Re-calibration will be conducted in accordance with Steps 5-6 until the model achieves at least the same degree of calibration as was achieved during the LTCP development process, and there is a high degree of agreement between the range of concentrations in the model output and monitoring data for the monitoring period.

This re-calibration procedure will result in model-data comparisons for at least three rainfall events. Standard modeling practice (Chapra, 1997) is to calibrate the model to a single dataset and then to confirm or validate the model's calibration by simulating at least one different dataset and comparing model predictions to monitoring data. In Elkhart's re-calibration approach, a single rainfall event will serve as the calibration dataset (Step 5). Elkhart then shall validate the model by running it for two other rainfall events (Step 6).

After Elkhart has adequately calibrated and validated the water quality model, based on re-calibration efforts, Elkhart shall prepare a Model Re-Calibration Report documenting the re-calibration and validation. With authorization from EPA and IDEM, Elkhart then may proceed to the Water Quality Standards Assessment described in Section 2.4.2.

2.4 Achievement of Performance Criteria

Following re-calibration (if necessary) of the collection system model using the criteria described in section 2.3.2.1 of this Appendix A, Elkhart shall use the validated collection system model to run a continuous simulation for the Typical Year to determine whether Elkhart has achieved the Performance Criteria set forth in Table 1-3. Elkhart shall be deemed to have achieved the Performance Criteria if the simulation shows nine or fewer Overflow Events system-wide and only one overflow into Christiana Creek, based on Typical Year rainfall.

Elkhart expects that Elkhart's LTCP, when fully-implemented, will result in fully capturing all but nine storm events in a Typical Year along the Elkhart and St. Joseph Rivers, and all but one storm event in a Typical Year along Christiana Creek. Actual overflow frequency, however, will vary from year to year, depending on rainfall conditions. Nevertheless, the CSO control measures will capture for treatment the first part of each storm, known as the first flush, which carries the largest concentration of pollutants.

In Section 1 of this Appendix, Elkhart identified several outfalls that may be sealed if post-construction monitoring shows that closing the overflows would have no harmful effects during large storm events. This will be evaluated by reviewing peak hydraulic grade lines and flooding under large storm conditions. Assuming that monitoring confirms the absence of basement flooding or other adverse system effects, these outfalls will be permanently sealed. If monitoring and/or

modeling do not confirm the lack of adverse system effects, the outfalls will need to remain open as system relief points during extreme storm events.

If model results show that Elkhart's LTCP did not meet the Performance Criteria in Table 1.3, Elkhart shall identify deficiencies or performance-limiting factors in system design process, operations, and maintenance that may have limiter the ability of the CSO Control Measures to achieve their intended performance. If necessary, Elkhart shall document corrective measures. If alternative operating strategies, structural modifications, or additional facilities and processes are needed to meet applicable requirements, Elkhart shall identify them in the final Post-Construction Monitoring Report. If necessary, Elkhart shall submit to EPA and IDEM for review and approval a plan and schedule for the implementation of additional CSO controls necessary to allow the comb9ined sewer to meet the Performance Criteria in Table 1-3.

2.4.2 Water Quality Standards Assessment

After implementing the LTCP, Elkhart shall use the water quality model to evaluate whether or not residual CSO Discharges interfere with designated uses. Elkhart then shall submit to the United States and Indiana a Post-Construction Water Quality Assessment Report documenting Elkhart's analysis based on Typical Year performance.

2.5 Progress Reporting

This section describes the Semi-Annual Reports and the Post-Construction Monitoring Report that Elkhart is required to prepare to document progress in implementing Elkhart's LTCP, meeting milestone dates, and achieving the Design Criteria and Performance Criteria required in Section 1 of this Appendix. Elkhart shall submit all reports to the United States and Indiana for their review and approval.

2.5.1 Semi-Annual Reports

Elkhart is required to submit a Semi-Annual Report by July 31 of each year for the preceding six months between January 1 and June 30; and by January 31 of each year for the preceding six months between July 1 and December 31; that shall include:

1. a statement of all deadlines that the Consent Decree required Elkhart to meet during the six-month period, whether and to what extent Elkhart met those requirements, and the reasons for any noncompliance. Notification to the United States and Indiana of any anticipated delay shall not, by itself, excuse the delay;

2. a general description of the work completed within the six-month period, and a projection of work to be performed pursuant to the Consent Decree during the next six month period;

3. information generated pursuant to the requirements of the Long Term Control and any Supplemental Compliance Plan required by the Decree; and

4. copies of all Monthly Monitoring Reports and other reports pertaining to CSO discharges and bypassing that Elkhart submitted to IDEM in accordance with Elkhart's Current Permits during the six-month period.

If Elkhart violates, or has reason to believe it may violate, any requirement of the Consent Decree, Elkhart is required notify the United States and Indiana of such violation and its likely duration in writing within ten working days of the day Elkhart first became aware of the violation or potential violation, with an explanation of the violation's likely cause and of the remedial steps taken, or

planned, to prevent or minimize the violation. If the cause of the violation cannot be fully explained at the time the report is due, Elkhart shall include a statement to that effect in the report. Elkhart shall investigate to determine the cause of the violation and then shall submit an amendment to the report, including a full explanation of the cause of the violation, within 30 Days of the day Elkhart becomes aware of the cause of the violation.

2.5.2 Final Post-Construction Monitoring Report

Within three years following Achievement of Full Operations of all CSO Control Measures in Table 1-3 of this Appendix, Elkhart shall submit a final Post-Construction Monitoring Report to the United States and Indiana. Pursuant to the Consent Decree, the final Post Construction Monitoring Report shall:

a. demonstrate that Elkhart implemented the Post-Construction Monitoring Plan in compliance with the schedule and terms set forth therein;

b. evaluate whether or not the Facility improvements and other remedial measures required by the Long Term Control Plan, as constructed, operated, or otherwise implemented, meet the Design Criteria and Performance Criteria required by the Long Term Control Plan;

c. summarize the data collected during the entirety of the Post-Construction Monitoring Plan and include any new data relevant to the evaluation that Elkhart did not previously submit to EPA or IDEM;

d. evaluate whether or not Elkhart has any Unlisted Discharges;

e. evaluate whether or not Elkhart's remaining CSO Discharges, if any, comply with all applicable requirements in the Long Term Control Plan and Elkhart's Current Permits; and

f. evaluate whether or not Elkhart has eliminated Bypasses, or to the extent that Elkhart has not eliminated Bypasses, evaluates whether or not Elkhart's remaining Bypasses meet the conditions governing Bypass in Elkhart's Current Permits.

The purpose of the Final Post-Construction Monitoring Report shall be to document how well Elkhart's entire Facility is performing as a whole, following completion of all CSO Control Measures, and shall include an assessment of whether the Facility is meeting the Performance Criteria regarding system-wide Overflow Event frequency. Elkhart also shall report overflow volume measured during the monitoring period and estimated based on collection system modeling of Typical Year performance. After completing construction of all CSO Control Measures, Elkhart shall monitor a series of rainfall events for at least 12 months or longer if needed to obtain data regarding a sufficient number of rainfall events consistent with Design Criteria have occurred so that Elkhart can obtain sufficient sampling data. Elkhart may, however, request that EPA and IDEM allow a monitoring period shorter than 12 months if Elkhart believes that it has collected sufficient monitoring data. A request for a monitoring period shorter than 12 months, however, is subject to the unreviewable discretion of EPA and IDEM and Elkhart may not invoke dispute resolution procedures in this Consent Decree for any denial of such a request by either EPA or IDEM.

The Final Post-Construction Monitoring Report shall evaluate whether CSO Control Measures were constructed as designed and are performing as designed and expected. Elkhart shall use the collection system model to evaluate Typical Year performance and whether Elkhart achieved Performance Criteria. In the Final Post-Construction Monitoring Report, Elkhart also shall assess water quality conditions in CSO receiving streams to compare to baseline conditions, using the water quality model. As described earlier in Section 2.4, if necessary, Elkhart shall include in the Final Post-Construction Monitoring Report a description of additional facilities, processes or

operating strategies necessary to meet the Performance Criteria regarding Overflow Event frequency in Table 1-3. Table 2-2 summarizes some of the data, analysis, and information that will be included in the Final Post-Construction Monitoring Report.

Table 2-2 Final Post-Construction Monitoring Report Contents

Watershed	CSO Outfalls	12 Month Monitoring Data[1]		Modeled Typical Year Performance[2]		Performance Criteria Met?[3]		Critical Milestones Met?		Comments
		CSO Volume	Overflow Frequency	CSO Volume	Overflow Frequency	Yes	No	Yes	No	
Christiana Creek CSO Control Measure 1										
Christiana	CSO 14									
Upper Elkhart River CSO Control Measure 2										
Elkhart	CSO 4									
Elkhart	CSO 16									
Elkhart	CSO 30									
Elkhart	CSO 31									
Elkhart	CSO 33									
Lower Elkhart River CSO Control Measure 4										
Elkhart	CSO 6									
Elkhart	CSO 7									
Elkhart	CSO 8									
Elkhart	CSO 11									
Oakland Avenue CSO Control Measure 5										
St. Joseph	CSO 24									
St. Joseph	CSO 37									
Upper St. Joseph River (Direct) Control Measure 6										
St. Joseph	CSO 13									
St. Joseph	CSO 25									
St. Joseph	CSO 26									
St. Joseph	CSO 29									
St. Joseph	CSO 39									
Lower St. Joseph River CSO Control Measure 7										
St. Joseph	CSO 17									
St. Joseph	CSO 18									
St. Joseph	CSO 19									
St. Joseph	CSO 20									
St. Joseph	CSO 21									
St. Joseph	CSO 23									
St. Joseph	CSO 32									
Riverside Drive CSO Control Measure 8										
St. Joseph	CSO 15									
Previously Controlled CSO Locations										
Elkhart	CSO 5							NA	NA	
Elkhart	CSO 9							NA	NA	
St. Joseph	CSO 12							NA	NA	
St. Joseph	CSO 27							NA	NA	
St. Joseph	CSO 28							NA	NA	
St. Joseph	CSO 34							NA	NA	
St. Joseph	CSO 40							NA	NA	
St. Joseph	CSO 41							NA	NA	
St. Joseph River - Systemwide Performance[3]										
	All									

Notes:
NA = Not applicable

[1] After completing construction of all CSO Control Measures, Elkhart shall monitor a series of rainfall event for at least 12 months or longer if needed to obtain data regarding a sufficient number of rainfall events consistent with design criteria so that Elkhart can obtain sufficient sampling data. Elkhart may, however, request that EPA and IDEM allow a monitoring period shorter than 12 months if Elkhart believes that it has collected sufficient monitoring data. A request for a monitoring period shorter than 12 months, however, is subject to the unreviewable discretion of EPA and IDEM and Elkhart may not invoke dispute resolution procedures in this Consent Decree for any denial of such a request by either EPA or IDEM.

[2] Typical Year Performance Criteria of no more than 9 Overflow Events system-wide (and no more than 1 overflow event on Christiana Creek) are based on using the collection system model to evaluate the efficacy of the CSO Control Measures using the rainfall data for a Typical Year. Elkhart shall assess Typical Year performance again after completing construction of all CSO Control Measures with this post-construction simulation after first confirming the sewer collection system model is adequately calibrated and validated, as described in Section 2.3.2.

[3] Performance Criteria regarding Overflow Event frequency will be met if there are no more than 1 overflow events in a typical year to Christiana Creek and no more than 9 Overflow Events system-wide during a Typical Year.

As noted earlier, Elkhart also will monitor and report on water quality improvements in CSO receiving streams. Water quality improvements and attainment of designated uses will be evaluated using monitoring data and river model results. Elkhart shall evaluate the attainment of aquatic life uses using the post-construction monitoring data for dissolved oxygen, temperature and pH. Elkhart

shall use the post-construction monitoring data for *E. coli* to update the river model calibration if needed.

2.6 Summary

Elkhart shall monitor its sewer system and area waterways during and after construction to determine the effectiveness of the CSO Control Measures. Elkhart's Post-Construction Monitoring Program shall include:

- Semi-Annual Reports that document whether Elkhart has built the CSO Control Measures required in Table 1-3 of this Appendix and that they are meeting the Design Criteria;
- A Final Post-Construction Monitoring Report to document whether the CSO Control Measures have achieved their Performance Criteria; and
- Monitoring and reporting of in-stream water quality improvements and reductions in CSO volume, frequency and duration when compared to baseline conditions and a determination of whether residual CSOs continue to impair the designated uses.

EXHIBIT B

Appendix A: Section 1:

Long Term Control Plan

1.1 CSO Control Measures

The selected plan features a combination of the following CSO controls:

- Continuing the City's ongoing program of partial or complete sewer separation in several CSO Basins;
- Sewer flow redirection, which will send some flows to the wastewater treatment plant via a route that avoids the combined sewer area;
- Regional storage tanks to capture and store sewage overflows during wet weather;
- Sewer system conveyance improvements; and
- Wastewater treatment plant improvements.

Elkhart shall complete implementing these controls at a total estimated cost of $155.6 million in 2007 dollars on or before December 31, 2029 unless a different schedule is approved by the United States and Indiana or ordered by the Court for the Remaining LTCP Projects pursuant to the procedures in Section XIX, Schedule Reconsideration Based on Financial Circumstances of the Decree. Estimated costs for each major plan component are shown in Table 1-1. Estimated costs include the present worth costs of operating and maintaining the new facilities over a 20-year period.

Table -1-1 LTCP Component Costs by Watershed[1]

	CSO Number	Description	Capital Cost Estimate	Actual Cost (Completed Projects Only)
Christiana Creek CSO Control				
	CSO 14	High Dive Park 1 MG Storage & Pump	$ 10,650,000	
	CSO 14	High Dive Park Pump Station	$ 975,000	$ 7,194,571
	CSO 14	Force Main: High Dive Park Pump Station to North Interceptor	$ 3,255,000	
		Christiana Creek Subtotal	**$ 14,880,000**	**$ 7,194,571**
Upper Elkhart River CSO Control				
	CSO 30	Separation	$ 6,150,000	$ 3,802,792
	CSO 4	Separation - Partial	$ 2,400,000	
	CSO 33	Separation - Partial	$ 8,760,000	$ 1,767,539
	CSO 31	EEC 80,000-Gal. Storage & Pump	$ 2,970,000	$ 4,601,869
		Upper Elkhart River Subtotal	**$ 20,280,000**	**$ 10,172,199**
WWTP Plant Upgrades				
	WWTP	Preliminary and Additional Disinfection for 60 MGD (complete)	$ 13,618,000	$ 12,538,590
	WWTP	Cloth Media Disks and Piping[2]	$ 9,564,000	
	WWTP	Aeration Process Improvements[2]	$ 4,967,000	
	WWTP	RAS System Replacement and Pump Capacity Improvements[2]	$ 774,000	
	WWTP	Primpary Clarification System Improvements[2]	$ 2,708,000	
		Wet Weather Treatment Subtotal	**$ 31,631,000**	
Lower Elkhart River Control				
	CSOs 6&7	Direct East Waterfall Dr to Jackson Blvd. Storage Facility	$ 495,000	
	CSOs 6&7	Jackson Street 1.0 MG storage facility	$ 10,665,000	$ 8,990,273
	CSOs 6&7	Jackson Street Storage Facility Lift Station	$ 2,145,000	
		Lower Elkhart River Subtotal	**$ 13,305,000**	**$ 8,990,273**
Oakland Avenue Control				
	CSOs 24 & 37	Force Main from Oakland Ave. LS to WWTP	$ 3,060,000	
	CSOs 24 & 37	Interceptor of CSO 37 Overflow (CSO 37.0)	$ 840,000	
	CSOs 24 & 37	Interceptor of CSO 37 Overflow (CSO 37.02)	$ 630,000	
	CSOs 24 & 37	Interceptor of CSO 37 Overflow (CSO 37.03)	$ 555,000	
	CSOs 24 & 37	Interceptor of CSO 37 Overflow + Jackson LS	$ 1,140,000	
	CSOs 24 & 37	Interceptor of Flow to CSO#24 L-TUFF 1	$ 405,000	
	CSOs 24 & 37	Interceptor of Flow to CSO#24 L-TUFF 1B	$ 1,350,000	
	CSOs 24 & 37	LS 8 Force Main To Oakland Ave. Storage facility	$ 3,255,000	
	CSOs 24 & 37	CSO 24 LS 1.1 MG Storage and Pump	$ 16,080,000	
		Oakland Avenue Subtotal	**$ 27,315,000**	
Upper St Joe River CSO Control				
	CSO 13	Separation - Partial	$ 5,010,000	
	CSO 25	Effluent Line Upgrade: CSO 25 to Interceptor	$ 405,000	
	CSO 29	Plug Overflow (Jefferson)	$ 1,500	
	CSO 28	Plug Overflow (Washington)	$ 1,500	
	CSO 39	Separation	$ 960,000	
		Upper St. Joe River Subtotal	**$ 6,378,000**	
Lower St Joe River CSO Control				
	CSO 18	Plug Overflow (McNaughton Park)	$ 1,500	
	CSO 27	Plug Overflow (Navajo)	$ 1,500	
	CSOs 17 & 18	Redirect Flow to North Interceptor	$ 390,000	
	CSO 21	Separation	$ 1,695,000	$ 380,832
	CSO 23	Effluent Line Upgrade CSO#23 to LS#4	$ 165,000	
	CSO 23	LS 4 Force Main	$ 405,000	
	CSO 23	LS 4 (8th & Franklin) Improvements	$ 1,545,000	
	CSO 23	Separation - Partial	$ 3,870,000	
		Lower St. Joe River Subtotal	**$ 8,073,000**	
Riverside Drive Control				
	CSO 15	AACOA Redirection	$ 300,000	$ 72,643
	CSO 15	Riverside Dr. 0.43 MG Storage & Pump	$ 6,000,000	
	CSO 15	Separation - Partial	$ 7,575,000	
		Riverside Drive Subtotal	**$ 13,875,000**	
Total Estimated Capital Cost (Includes contingencies)			**$ 135,737,000**	
Systemwide Estimated Present Worth Operation & Maintenance Costs			**$ 21,449,000**	
Total Estimated Present Worth Cost (2007 Dollars)			**$ 157,186,000**	

[1] **Notes:** Capital cost estimates include construction and engineering/legal contingencies. Costs are expressed in 2007 dollars. (Engineering News Record Construction Cost Index: 8000 (Aug. 2007)).

[2] To sustain peak sustained flow rate up to 60 MGD. Up to 30 MGD through cloth media disks. Does not include design costs, which are above and beyond a proposed increased spending commitment.

1.1.1 Christiana Creek CSO Control Measure

Christiana Creek enters the St. Joseph River downstream from High Dive Park and upstream from a number of city parks and downtown Elkhart. This control measure will control CSO 14 in High Dive Park and will reduce overflows to Priority Areas I, II and III (depicted in Figure 1-2 and Figure 1-3). This control measure includes the following elements:

- One-million-gallon storage facility to capture wet-weather flow from CSO 14 and release it to the existing sewer system after the storm event.
- Redirection of most flows from the CSO 14 basin to the North Interceptor system using a bypass force main.

The City initially planned to redirect only the flow from the Grant Street Lift Station to the North Interceptor. During the preliminary design process underway in late 2008, the City determined that all dry-weather and wet-weather flow during a Typical Year could be redirected to the North Interceptor system and away from the combined sewer system.

The plan for Christiana Creek is illustrated in Figure 1-1. Some of the priority areas that will benefit from this control measure are also shown on the map.

1.1.2 Upper St. Joseph River CSO Control Measure

The Upper St. Joseph River extends from the AEP Dam to the Lexington Avenue Bridge. This control measure will control overflows from CSOs 13 and 25 and reduce overflows affecting Priority Areas I, II and III. This control measure includes the following elements:

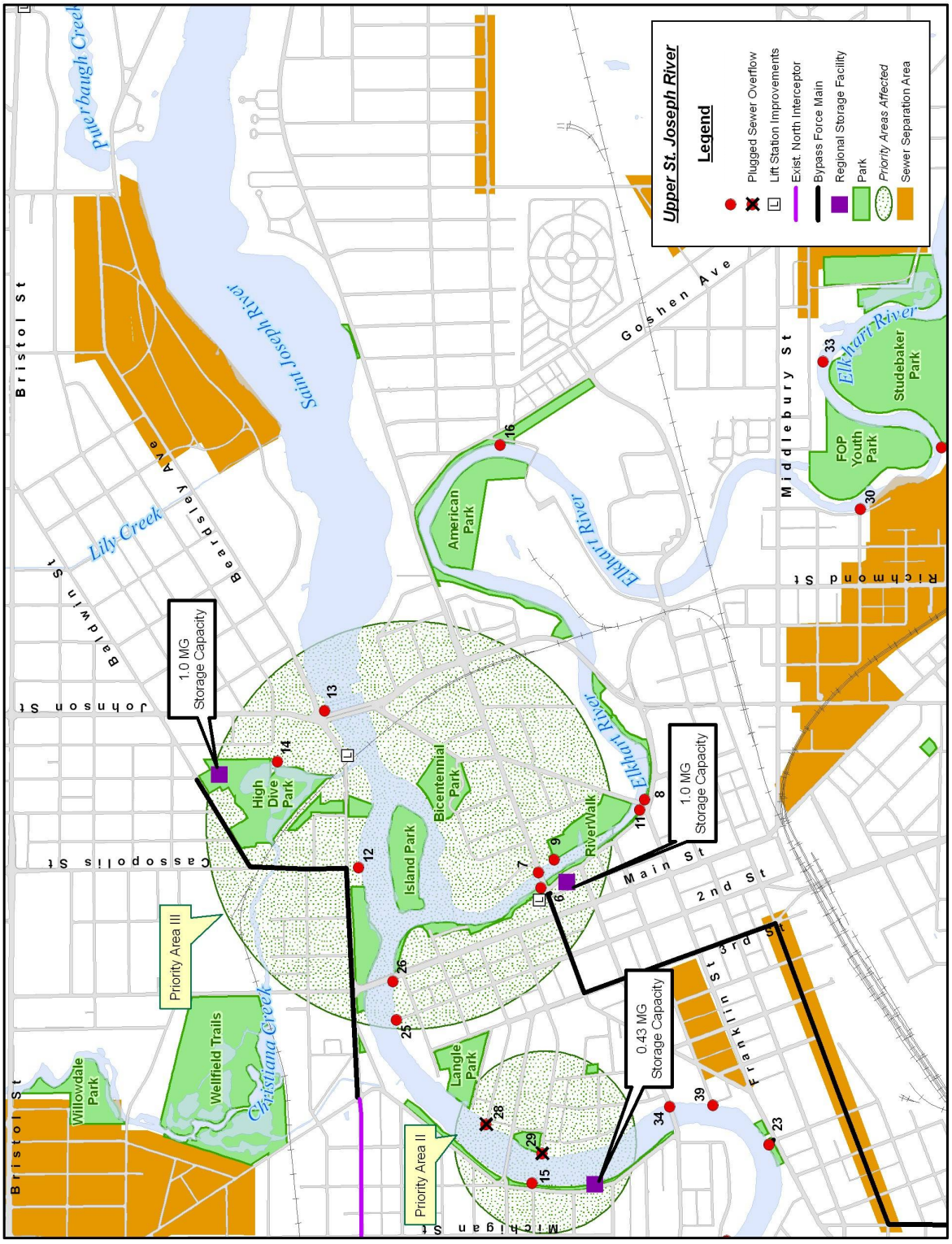
- Sewer separation in a portion of the basins that drain to CSO 13.
- Structural changes to the diversion chamber at CSO 25.

Overflows at CSO 26 will be reduced in this area as a result of separate CSO controls on the Elkhart River that will redirect flow away from the interceptor that services the Upper St. Joseph River. CSOs 12, 28, and 29 are located in the Upper St. Joseph River but already discharge very infrequently (zero times in a Typical Year) and do not require system changes as part of the selected plan.

CSOs 28 and 29 are expected to be eliminated. They first will be monitored during LTCP implementation to determine whether plugging the overflows would have any harmful effects during large storm events, as described in Appendix A, Section 2 – Post-Construction Monitoring Plan. Assuming that monitoring confirms the lack of adverse system effects, these outfalls will be permanently sealed.

The plan for the Upper St. Joseph River is illustrated in Figure 1-1. Some of the priority areas that will benefit from this control measure are also shown on the map.

Figure 1-1 Christiana Creek and Upper St. Joseph River Control Measures



1.1.3 Upper Elkhart River CSO Control Measure

The Upper Elkhart River includes the areas upstream of the Elkhart River Dam. It is the most upstream location in the City's combined sewer area. This control measure will control CSOs 4, 5, 16, 30, 31 and 33 and reduce overflows to all Priority Areas. This measure also will address two of the top eight overflow frequency locations (CSOs 4 and 30). This control measure includes the following elements:

- At CSO 31 near Lusher Avenue, Elkhart shall store overflows during wet weather using an 80,000-gallon regional storage tank and convey the captured flows to the wastewater treatment plant through existing sewers after the storm event;
- At CSOs 4, 30, and 33 near FOP Youth Park, Studebaker Park and Baker Park, the City will partially separate sewers in surrounding neighborhoods; and
- CSOs 5 and 16 already discharge less than 10 times in the Typical Year without basin changes.

The plan for the Upper Elkhart River is illustrated in Figure 1-2. Some of the priority areas that will benefit from this control measure are also shown on the map.

1.1.4 Lower Elkhart River CSO Control Measure

The Lower Elkhart River covers the areas downstream of Gracelawn Cemetery to the river's confluence with the St. Joseph River. This control measure will control CSOs 6, 7, 8, 9, and 11 and reduce overflows in Priority Areas I, II and III. CSO 6 is the sixth highest location for annual overflow volume, according to modeled estimates. This control measure includes the following elements:

- At CSOs 6 and 7 near Jackson Boulevard, the City will store and convey the overflows using a 1.02-million-gallon regional storage tank, conveyance upgrades and flow redirections. Upgrades to the system will allow the redirection of flow from the storage tank to the Oakland Avenue Control Measure when it is completed.
- CSOs 8, 9, and 11 do not require any system changes because they overflow infrequently under Typical Year conditions.

The plan for the Lower Elkhart River is illustrated in Figure 1-2. Some of the priority areas that will benefit from this control measure are also shown on the map.

1.1.5 Riverside Drive CSO Control Measure

The Riverside Drive CSO control measure will reduce overflows at CSO 15, located along Riverside Drive Park. CSO 15 is estimated to be the fourth highest volume location for sewage overflows in a Typical Year. These controls will reduce overflows in Priority Areas I and II. This control measure includes the following elements:

- A 430,000-gallon regional storage tank to store overflows during wet weather;
- Sewer separation of a portion of the basin near Willowdale Park and Wellfield Trails;
- Redirection of sanitary sewers from the AACOA Sewer Interceptor to the North Interceptor system, away from the combined sewer system.

The plan for Riverside Drive is illustrated in Figure 1-3, Lower St. Joseph River Control Measures. The priority areas that will benefit from this control measure are also shown on the map.

Figure 1-2 Elkhart River Control Measures

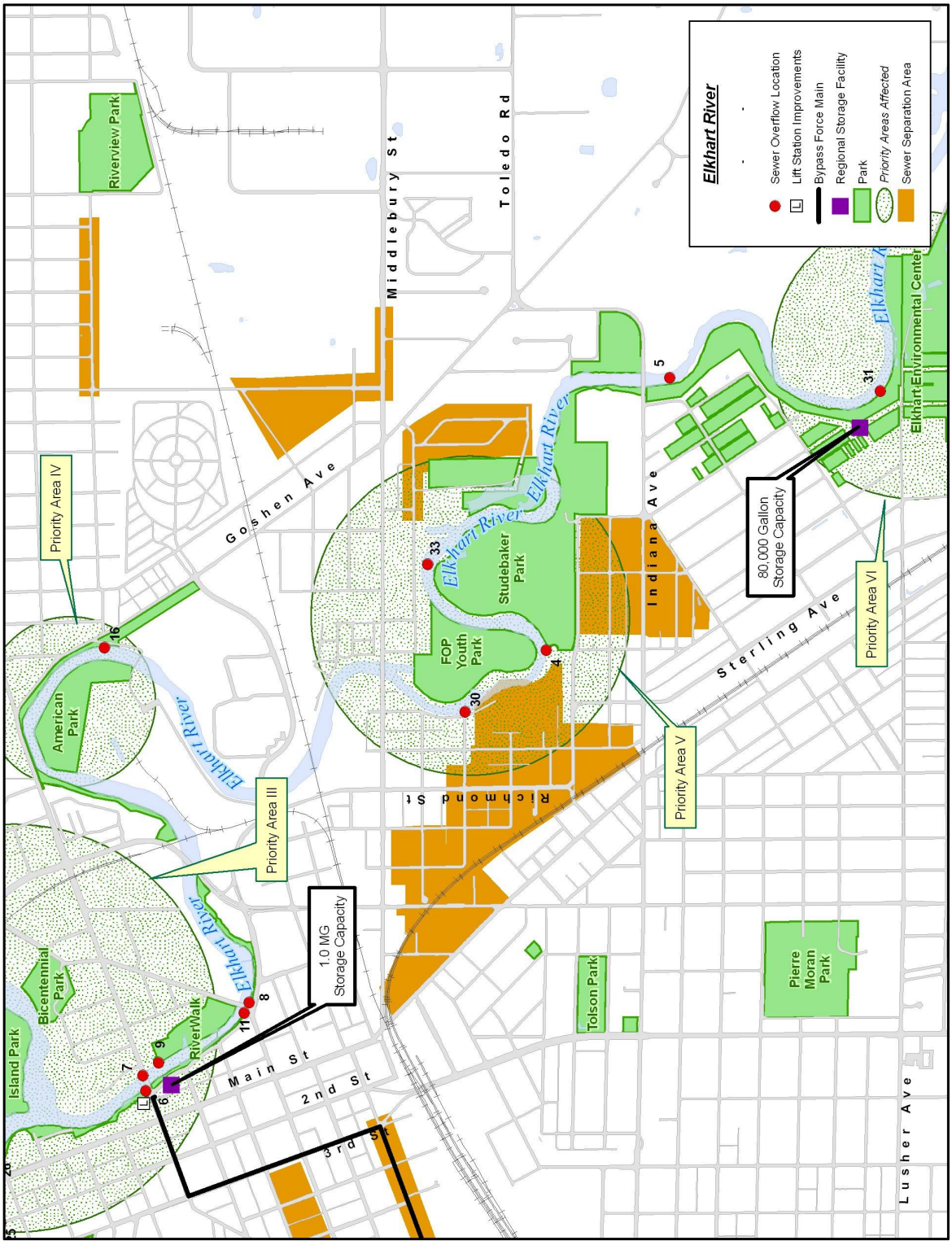
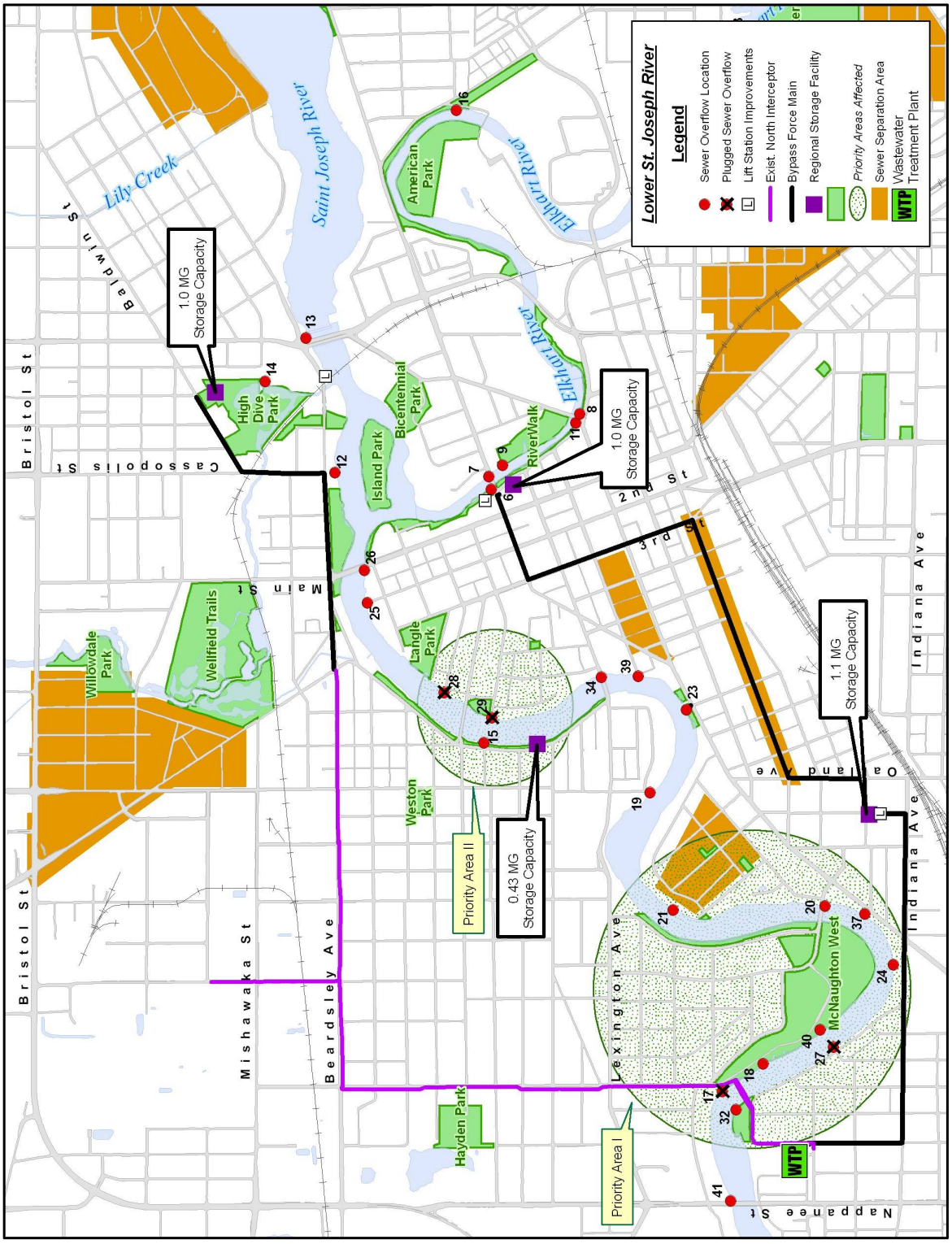


Figure 1-3 Lower St. Joseph River Control Measures



1.1.6 Oakland Avenue CSO Control Measure

The Oakland Avenue CSO control measure will reduce overflows at CSOs 24 and 37, the first and second highest overflow volume locations in the City's combined sewer system. These controls also will reduce overflows affecting Priority Area I. This control measure includes the following elements:

- A 1.1-million-gallon regional storage tank to store overflows during wet weather;
- Lift station, force main, conveyance upgrades and redirection of sewers;

When this control measure is completed, flows from CSOs 6 and 7 on the Elkhart River will be routed to the Oakland Avenue storage facility to redirect those flows away from a large portion of the combined sewer system serving the downtown area.

The elements of the Oakland Avenue control measure are illustrated in Figure 1-3, Lower St. Joseph River Control Measures. The priority area that will benefit from this control measure is also shown on the map.

1.1.7 Lower St. Joseph River CSO Control Measure

The Lower St. Joseph River stretches from the Lexington Avenue Bridge to the Nappanee Street Bridge. This control measure will reduce overflows at CSOs 17, 18, 19, 20, 21, 23, and 32 and affect Priority Area I. This control measure includes the following elements:

- Redirection of some flow from CSOs 17 & 18 to the North Interceptor system.
- Sewer separation in a portion of the sewer basins that feed into CSOs 21, 23 and 39.

Overflow frequencies and volume at CSO 19 will benefit from the redirection of Elkhart River overflows and storage and sewer separation projects related to CSO 15 on Riverside Drive. These projects are expected to reduce incoming flows at CSO 19 such that overflows occur infrequently or not at all under Typical Year conditions.

CSOs 20, 27, 32, 34, 40 and 41 do not require basin or system changes under the selected plan because they overflow infrequently under Typical Year conditions.

CSOs 17 and 27 are expected to be eliminated. They will be monitored during LTCP implementation to determine whether plugging the overflows would have any harmful effects during large storm events, as described in Appendix A, Section 2 – Post-Construction Monitoring Plan.

The elements of the Lower St. Joseph River control measure are illustrated in Figure 7-3. The priority area that will benefit from this control measure is also shown on the map.

1.1.8 Wastewater Treatment Plant Upgrades Control Measure

The Elkhart Wastewater Treatment Plant (WWTP) currently has a peak capacity of approximately 44 MGD. In combination, a number of plant components limit the current WWTP capacity. These components are preliminary treatment (screening), hydraulic components (various channels and pipes), step-feed aeration capabilities, and effluent disinfection.

The Oakland Avenue Control Measure in the selected plan will add a force main from Oakland Avenue to capture and reduce overflows from CSOs 24 and 37. The additional force main will

require WWTP system improvements to provide a peak sustained flow rate of up to 60 MGD. This is the peak sustained flow rate that is expected to be delivered to the WWTP, based upon the SWMM model at the selected LTCP level of control. The WWTP projects will include modifications to the influent pumping and, preliminary treatment. Additionally, improvements to the primary influent channels, aeration diffuser replacement, aeration blower replacement, RAS system replacement, and cloth media disk filtration installation will allow the plant to process a peak sustained flow rate of 60 MGD through full secondary treatment. Finally, the WWTP improvements will include construction of a UV disinfection system to accommodate a flow rate up to 60 MGD. We anticipate no plant bypasses in a Typical Year, assuming normal plant operations. Figure 1-4 illustrates the planned improvements to the WWTP in red.

Elkhart shall first bring on-line the 30 MGD capacity Cloth Media Disk Filtration (CMDF) process when WWTP flow rates through the existing Influent Parshall Flume (located downstream of headworks) reach an adjustable setpoint approaching 30 MGD. At that time, a CMDF Diversion Structure (consisting of an electric actuated knife gate for isolation and pinch valve for throttling control) will begin to open allowing flow upstream of the Influent Parshall Flume (downstream of headworks) to be diverted to the CMDF process. Initially, Elkhart will only bring 1 filter on-line via its electric actuated influent gate. Once the filter chamber fills, CMDF effluent will be measured by a CMDF effluent magnetic flow meter. Elkhart will continue to control diversion to CMDF (by modulating the Diversion Structure pinch valve) to maintain a minimum of 30 MGD flow through the Influent Parshall Flume for full treatment through the six Primary Clarifiers and complete activated sludge process.

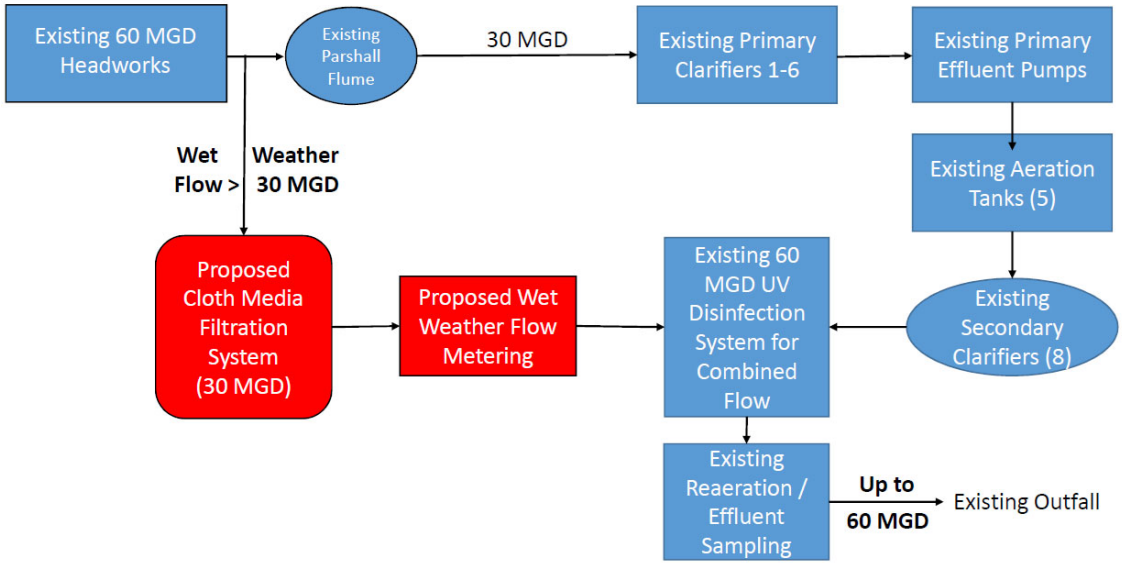
When CMDF effluent flow approaches an adjustable setpoint (currently anticipated to be 12 MGD) and is increasing, then Elkhart shall bring online the second CMDF unit of 15 MGD. At 60 MGD sustained flow into the WWTP, CMDF effluent will be up to 30 MGD and existing Primary Clarifier effluent will be a minimum of 30 MGD (including the ultimate maximum 2.6 MGD of solids/backwash flow from the CMDF Process that will be directed to the Primary Clarifier influent for settling and solids removal with primary sludge). After peak flow events have subsided, Elkhart shall isolate, clean, and drain the CMDF facilities including draining of effluent piping toward UV Disinfection, and Elkhart shall place the CMDF facilities on stand-by to await the next peak flow event. Elkhart shall fully control the CMDF process, including startup and shut down, by means of programmable logic controller (PLC), including the following processes: flow diversion, gate operations, backwash, solids/scum wasting, influent/effluent sampling, influent/effluent turbidity trending, isolation, and draining.

Elkhart will continue to evaluate optimizing the plant's wet weather treatment capacity and performance, so as to maximize both secondary and CMDF capacity, and will update the CMDF standard operating procedures accordingly as better performance conditions are discovered.

Please refer to the 2 included schematics. Schematic #1 is a block flow diagram of WWTP improvements reflecting, amount other things, the CMDF System and the use of 6 remaining Primary Clarifiers. Schematic #2 is a Flow Sheet showing the CMDF Diversion, CMDF Process, and CMDF Effluent flow measurement prior to combining with WWTP Final Clarifier Effluent for combined UV Disinfection. Not shown on Schematic #2 is CMDF influent and effluent probes, that are planned for both process control trending and coagulant feed control.

Elkhart shall install refrigerated samplers for flow paced sampling of both the CMDF Influent Channel and CMDF Effluent Channel. Elkhart shall take composite or discrete influent/effluent samples for laboratory analysis, as needed based on IDEM or EPA requirements. Additionally, Elkhart shall install turbidity probes to monitor and trend both CMDF influent and CMDF effluent in real-time during all events.

Schematic #1: Block Flow Diagram of WWTP Improvements



Schematic #2: CMDF Process Flow Sheet

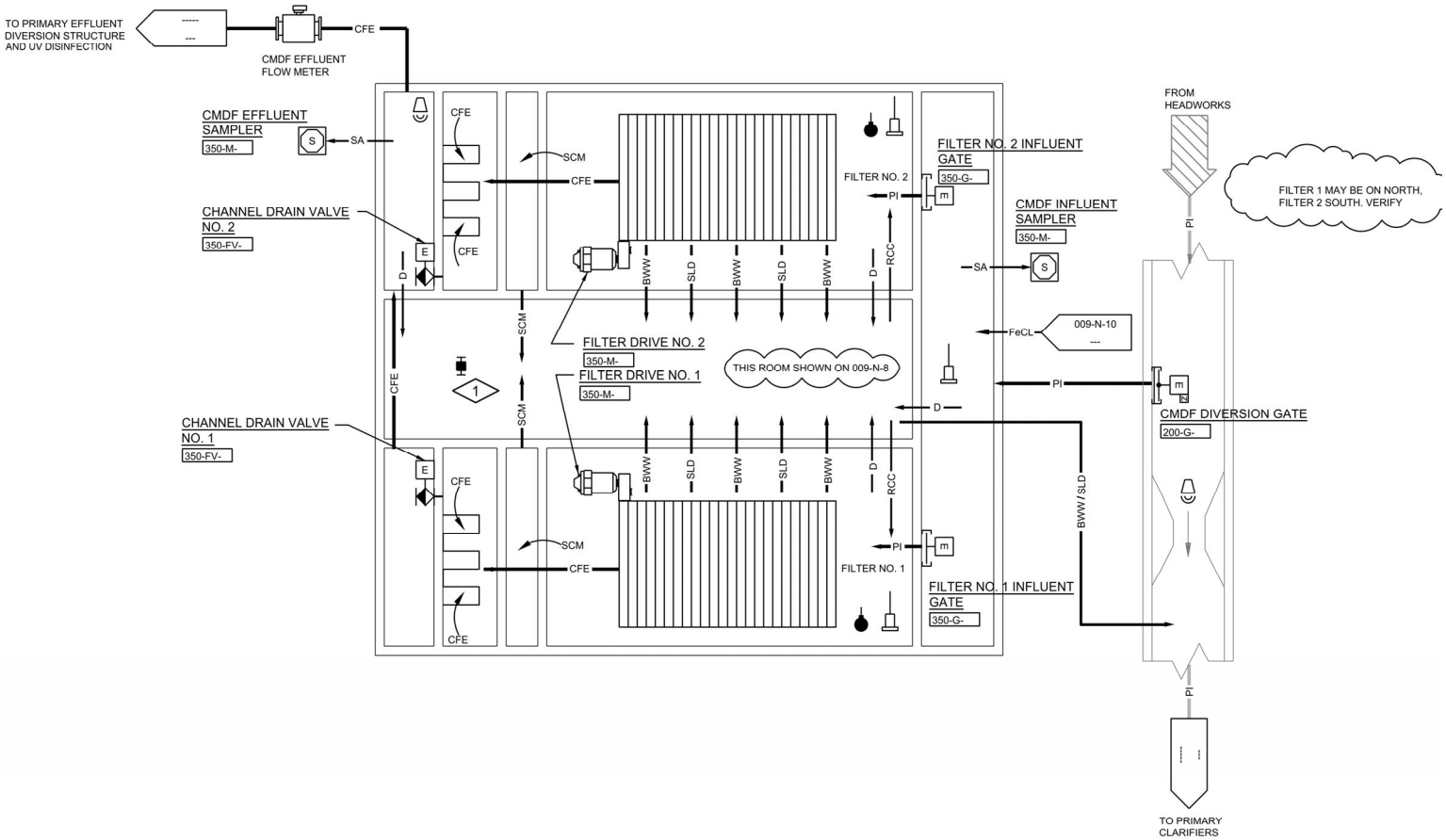
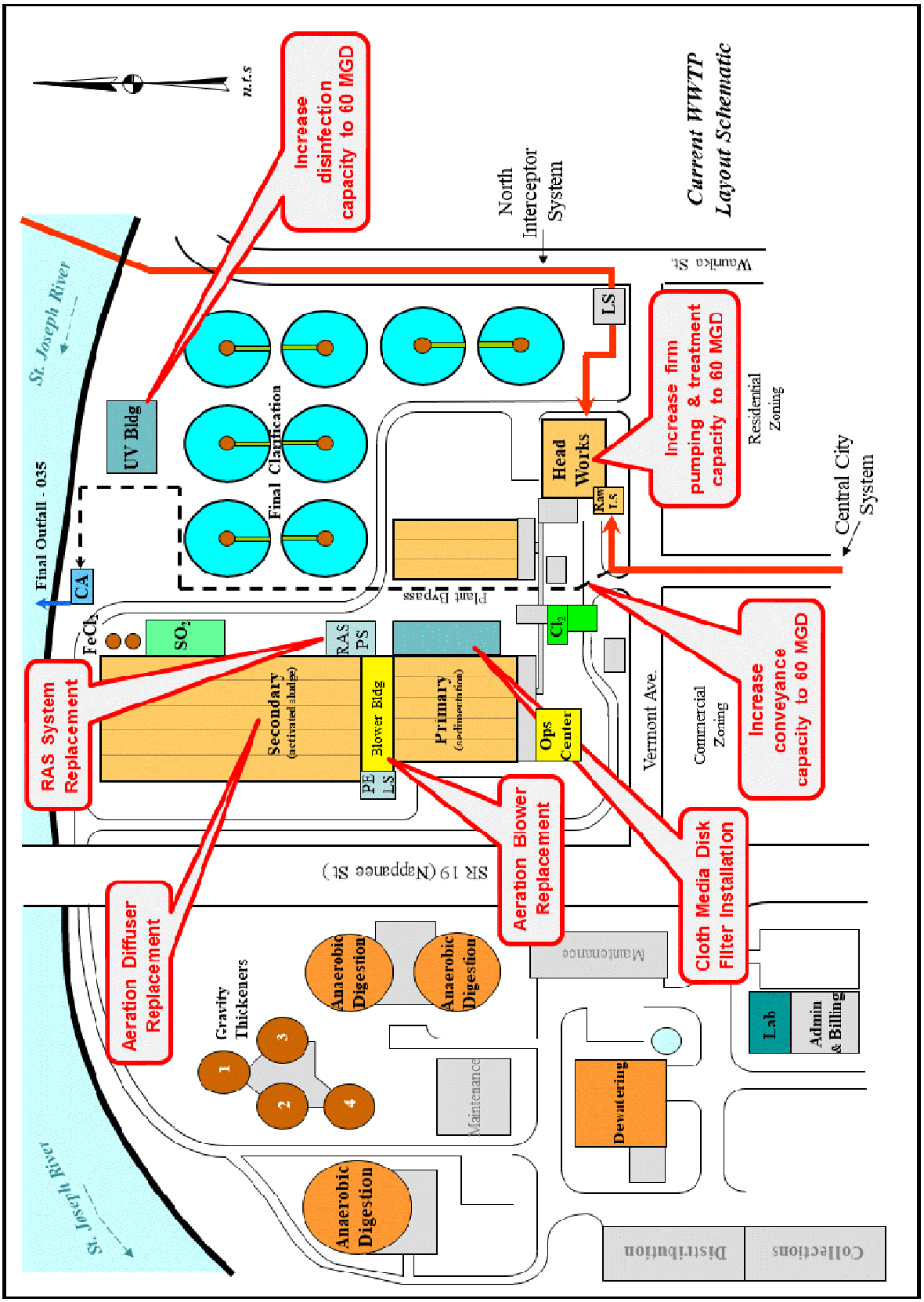


Figure 1-4 Schematic of Proposed Wastewater Treatment Plant Layout



1.2 LTCP Benefits

This section describes how the selected plan is expected to benefit the St. Joseph River and Elkhart River. The City used the river model to predict environmental benefits and the collection system model to predict overflow volume and frequency under the selected plan.

1.2.1 Annual Average Rainfall Statistics

Predictions in Section 7.5 are based upon average annual rainfall statistics, using the historical record from 1960 through 2000 at the airport in South Bend, Indiana. Average annual statistics were used to select a Typical Year (1992) under the WISE analysis, part of the cooperative effort among the cities of South Bend, Mishawaka, and Elkhart. Table 1-2 below displays the average annual rainfall and St. Joseph River stream flow averages based upon the WISE Typical Year analysis:

Table 1-2 Annual Average Rainfall and Stream Flow Statistics

Ambient Factor	Criterion	Historical Annual Average[1]	Historical Summer[1,2] Average
Rainfall	Number of Storms > 0.11"	**70**	**30**
	Annual Volume (inches)	**38.3**	**18.3**
	5th Largest Event (inches)	**1.41**	**1.07**
	Number of back-to-back Storms[3]	**2.5**	**1.8**
Stream Flow	25th Percentile (cfs)	**1,900**	**1,650**
	50th Percentile (cfs)	**2,890**	**2,350**
	75th Percentile (cfs)	**4,220**	**3,500**

Notes:
[1] The historical averages are based on 41 years of data recorded from 1960 through 2000.
[2] Summer is defined as May 1 through September 30.
[3] "Back-to-back" storms are defined as storms occurring within 24 hours of each other and each storm having at least 0.5" of total rainfall.

Actual performance following LTCP implementation will be compared to results that would be expected during a Typical Year.

1.2.2 CSO Volume and Overflow Reduction

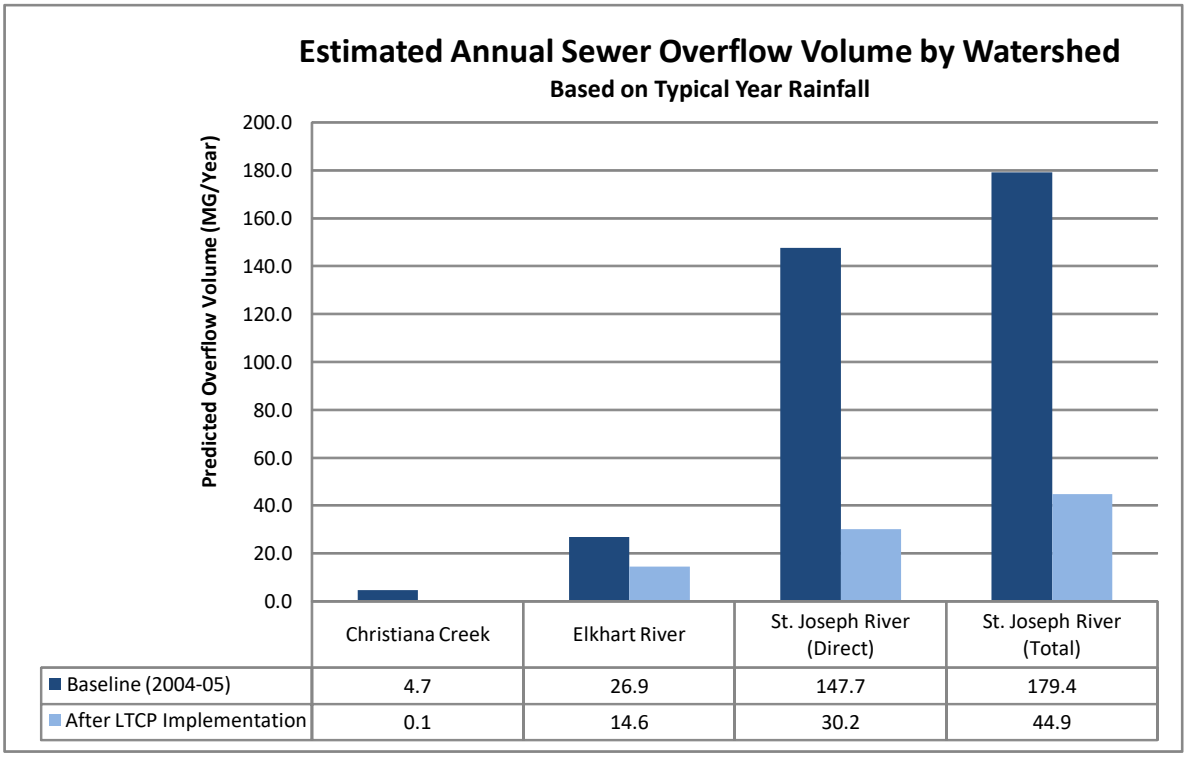
Elkhart's LTCP will significantly reduce remaining combined sewer overflow volume and frequency to CSO-impacted waterways. While the following description estimates overflow volume and percent capture under the selected plan, Elkhart's performance measure for compliance with LTCP requirements is a system-wide overflow frequency of no more than nine Overflow Events during a Typical Year. Performance Criteria and Design Criteria are further described in Section 1.3and Appendix A, Section 2 – Post-Construction Monitoring Plan.

Estimated annual overflow volumes and frequency for baseline and future system conditions were generated using Elkhart's planning-level XP-SWMM model of the existing collection system. These estimates assume the occurrence of average rainfall for a Typical Year rainfall applied uniformly throughout the Elkhart service area. With Elkhart's selected control measures in place, model simulations predict a maximum of nine Overflow Events occurring during a Typical Year.

Figure 1-5 illustrates estimated annual overflow volume during a Typical Year, by watershed. The graph compares baseline conditions in 2004-05 to expected conditions after LTCP implementation. The 2004-05 "baseline" year already reflects significant CSO control efforts to that point. The "St. Joseph River (Direct)" statistics represent outfalls that overflow directly into the St. Joseph River. The "St. Joseph River (Total)" statistics represent volume from all Elkhart overflow locations, since the Elkhart and Christiana Creek overflows eventually impact the St. Joseph River.

Notably, average annual overflow volume is expected to be reduced by approximately 75 percent when compared to 2004-05 baseline conditions. When combined with progress to date, this represents approximately 96 percent capture and treatment of wet-weather flows into the sewer system in a Typical Year. Elkhart calculates the plan's percent capture as the volume captured and treated during wet-weather conditions divided by the total volume of flow in the combined sewer system during wet-weather conditions. The total volume of flow is the sum of the volume captured and treated and the overflow volume. When this calculation is applied, the selected plan should achieve approximately 96 percent capture system-wide.

Figure 1-5 Estimated Annual Sewer Overflow Volume by Watershed

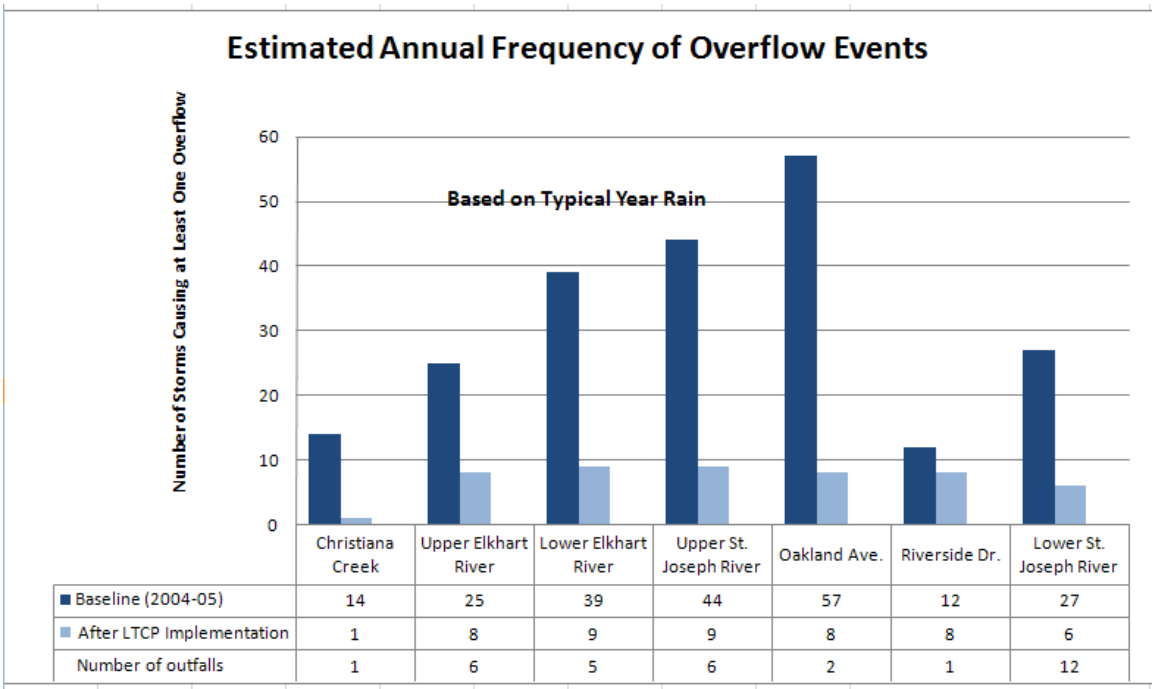


	Christiana Creek	Elkhart River	St. Joseph River (Direct)	St. Joseph River (Total)
Baseline (2004-05)	4.7	26.9	147.7	179.4
After LTCP Implementation	0.1	14.6	30.2	44.9

Note: Based upon estimates of baseline and future system conditions using Elkhart's XP-SWMM model of the existing collection system and typical year rainfall inputs.

Figure 1-6 estimates the annual frequency of Overflow Events during a Typical Year by geographic area. Nevertheless, Elkhart commits to eliminating all but 9 Overflow Events during a Typical Year.

Figure 1-6 Estimated Annual Frequency of Overflow Events



	Christiana Creek	Upper Elkhart River	Lower Elkhart River	Upper St. Joseph River	Oakland Ave.	Riverside Dr.	Lower St. Joseph River
Baseline (2004-05)	14	25	39	44	57	12	27
After LTCP Implementation	1	8	9	9	8	8	6
Number of outfalls	1	6	5	6	2	1	12

Note: Based upon estimates of baseline and future system conditions using Elkhart's XP-SWMM model of the existing collection system and typical year rainfall inputs.

1.3 Implementation Schedule

This section describes how the City developed its implementation schedule.

1.3.1 Prioritization and Scheduling Criteria

The City used the following criteria to develop the LTCP implementation schedule:

Sensitive and Priority Areas: Projects to reduce overflows to sensitive or priority areas were given a higher priority in the schedule. Reducing overflows to Christiana Creek were given the highest priority and placed first in the implementation schedule under this criterion. Projects in the Elkhart River Watershed also were given priority because they impact multiple parks and priority areas.

Financial Impact on Ratepayers: The City sought to develop a schedule that would phase in the project over time in an affordable manner to local ratepayers.

Logical Construction Sequencing: The city also reviewed all projects from a logical engineering and construction perspective to determine the relationship between projects. Interdependent projects were sequenced in order of their logical completion so that completed projects would have maximum utility at the earliest possible stage.

1.3.2 Implementation Schedule

Elkhart shall complete implementing the LTCP on or before December 31, 2029 unless a different schedule is approved by the United States and Indiana or ordered by the Court for the Remaining LTCP Projects pursuant to the procedures in Section XIX Schedule Reconsideration Based on

Financial Circumstances of the Decree. Table 1-3 lists the CSO Control Measures chronologically, and also includes Design Criteria, Performance Criteria, and Critical Milestone dates for each project or group of projects.

The LTCP consists of the following commitments by the City of Elkhart:

- Implementing the CSO control measures listed in Table 1-3 according to the Design Criteria and Performance Criteria specified; and

- Meeting the schedule for Critical Milestones established in Table 1-3.

Following implementation of the LTCP, one or more CSO outfalls are expected to discharge during large storm events during up to 9 separate Overflow Events during a Typical Year. After Elkhart has demonstrated compliance with all Performance Criteria, to the extent that post-construction monitoring shows that the residual overflows interfere with designated uses, Elkhart may conduct a use attainability analysis to determine whether the designated uses are attainable.

Table 1-3 CSO Control Measures, Design Criteria, Performance Criteria, and Critical Milestones

Table 1-3 CSO Control Measures, Design Criteria, Performance Criteria, and Critical Milestones							
CSO Control Measure	**CSO Number**	**Priority Areas Affected**	**CSO Control Measure Elements**	**Description**	**Design Criteria [1]**	**Performance Criteria**	**Critical Milestones**
Christiana Creek CSO Control							
1	14	Areas III, II, and I	High Dive Park- 1.0 MG facility for storage and pumping and redirection of CSO 14 basin flow from Northeast Elkhart to the North Interceptor System	Construction of a 1 MG off-line storage tank to reduce overflows at CSO 14 and construct a LS to redirect flow to the North Interceptor System	Provide storage capacity of 1 MG and lift station designed per Ten State Standards	When incorporated with the rest of the Christiana Creek Watershed, achieve no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2010 Bid Date- Nov 15, 2011 Date of Full Operation - Nov 15, 2014
Upper Elkhart River CSO Control							
2	4, 30, 31 & 33	All Areas. Two of the top 8 overflow frequency locations	EEC- 80,000 gal. storage and pump at CSO 31 and various levels of separations at CSO's 4, 30 & 33	Construction of a 80,000 gallon off-line storage tank to reduce overflows at CSO 31 and separation and rehabilitation of sewers to reduce stormwater flow and minimize CSO's 4, 30 & 33	Provide storage capacity of 80,000 gal. and sanitary and storm sewers designed per Ten State Standards	When incorporated with the rest of the system upgrades, no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2013 Bid Date- Nov 15, 2014 Date of Full Operation - Nov 15, 2018
WWTP Plant Upgrades							
3	WWTP		WWTP system improvements provide a peak capacity of 60 MGD through secondary or CMDF treatment and disinfection	Modifications to the influent pumping, preliminary treatment, improvements to primary influent channels, diffuser replacement, aeration blower replacement, RAS system replacement, and cloth media disk filtration installation with a capacity of 30MGD.	System improvement designed per Ten State Standards CMDF Filter Area: 5,164.8SF Max. Hydraulic Loading: 4.4gpm/SF Max. Solids Loading: 15.8lbs/d/SF Average TSS Removal: >85%	Provide peak capacity of 60 MGD - a minimum of 30 MGD through secondary, and up to 30 MGD through CDMF treatment, and 60 MGD disinfection. WWTP Outfall shall meet NPDES permit effluent limits.	Design Date- Nov 15, 2015 Bid Date- Nov 15, 2017 Date of Full Operation - Nov 15, 2024
Lower Elkhart River CSO Control							
4	6&7	Areas III, II, and I. Sixth highest overflow volume location (CSO 6)	Jackson St- 1.0 MG storage and pumping facility and redirection of system flows to Oakland Avenue Control Facility	Construction of a 1 MG off-line storage tank to reduce overflow at CSOs 6 &7 with upgrades to the system to allow the redirection of flow to Oakland Avenue Control Measure when it is complete [3]	Provide storage capacity of 1 MG with lift station and system improvements designed per Ten State Standards	When incorporated wih the rest of the system upgrades, achieve no more than 9 Overflow Events on a systemwide basis	Design Date- Nov 15, 2016 Bid Date- Nov 15, 2018 Date of Full Operation - Nov 15, 2021
Oakland Avenue Control							
5	24 & 37	Area I. 1st and 2nd highest overflow volume locations	CSO 24 - LS 1.1 MG Storage and Pump Force Main from CSO 24 LS to WWTP	Construction of a 1.1 MG off-line storage and pump tank with system additions to allow the redirection of flow to CSO 24 & 37 LS and then to the WWTP to reduce overflows at CSOs 24 & 37	Provide storage capacity of 1.1 MG with lift station and system improvements designed per Ten State Standards	When incorporated with the rest of the system upgrades, no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2021 Bid Date- Nov 15, 2023 Date of Full Operation - Nov 15, 2028
Upper St Joseph River CSO Control							
6	13, 25, 29 & 39	Areas III, II, and I	Basin Separations, Lift Station Improvements, system improvements and CSO eliminations	Separation, flow redirection and rehabilitation of sewers to reduce stormwater flow and minimize or eliminate CSOs	System modifications designed per Ten State Standards	When incorporated with the rest of the system upgrades, no more than 9 Overflow Events on a systemwide basis	Design Date- Nov 15, 2022 Bid Date- Nov 15, 2023 Date of Full Operation - Nov 15, 2026
Lower Elkhart River CSO Control							
7	17, 18, 21, & 23	Area I	Basin Separations, Lift Station Impovements, system improvements, CSO eliminations and system redirections	Separation, flow redirection and rehabilitation of sewers to reduce stormwater flow and minimize or eliminate CSOs	System modifications designed per Ten State Standards	When incorporated with the rest of the system upgrades, no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2023 Bid Date- Nov 15, 2024 Date of Full Operation - Dec 31, 2029
Riverside Drive Control							
8	15	Areas I and II. 4th highest overflow volume location	Riverside Dr. - 0.43 MG Storage & Pump with sewer separations and system redirection	Construction of a 0.43 MG off-line storage tank with Northwest Elkhart sewer system redirection and partial basin separation to reduce overflows at CSO 15	Provide storage capacity of 0.43 MG and system improvements designed per Ten State Standards	When incorporated with the other work in CSO 15 basin and downstream improvements, achieve no more than 9 overflow events on a systemwide basis	Design Date- Nov 15, 2024 Bid Date- Nov 15, 2025 Date of Full Operation - Dec 31, 2029

[1] Elkhart shall design each CSO Control Measure in accordance with standard engineering practices to ensure that Elhart will achieve corresponding facility- specific or systemwide Performance Criteria.

The following definitions were used in developing Table 1-3:

"Bid Date" shall mean the date by which: (1) Elkhart has appropriately allocated funds for a specific CSO Control Measure (or portion thereof); (2) the bid for the specific CSO Measure has been accepted and awarded by Elkhart's Board of Public Works for the construction of the CSO Control Measure; and (3) Elkhart has issued a notice to proceed to the contractor who will perform the work. Several CSO Control Measures in Table 1-3 of the Appendix consist of separate components. For those CSO Control Measures, Completion of Bidding Process shall be achieved when the first project in the construction sequence has met the above definition.

"Critical Milestone" shall mean significant dates by which progress in implementing the LTCP will be tracked. For each major CSO Control Measure shown in Table 1-3 of the Appendix, the Critical Milestones tracked will be Design Date, Bid Date, and Date of Full Operation.

"CSO Control Measures**"** shall mean structural measures designed to eliminate, reduce, or mitigate the volume, frequency or pollutant levels in CSOs.

"Date of Full Operation" shall mean the completion of construction and installation such that the relevant system has been placed in full operation, and is expected to both function and perform as designed, including all control systems and instrumentation necessary for normal operations and all residual handling systems. Elkhart shall verify the Date of Full Operations in a memorandum to Elkhart's Board of Public Works. Several CSO Control Measures in Table 1-3 of the Appendix consist of separate components. For those CSO Control Measures, the Date of Full Operations shall be the date that the last component is completed. "Design Criteria" shall mean and specify how the selected CSO control measures shall be designed to achieve the required level of control. All selected LTCP projects will be designed in accordance with standard engineering practices to ensure that corresponding facility-specific and system-wide Performance Criteria will be achieved.

"Design Criteria" shall mean and specify how the selected CSO Control Measures shall be designed to achieve the required level of control. All selected LTCP projects shall be designed in accordance with standard engineering practices to ensure that corresponding facility-specific and system-wide Performance Criteria will be achieved.

"Design Date**"** shall mean the date on which the design has officially begun. The design process may include preliminary sizing, modeling, final sizing, and preparation of final plans and specifications. Elkhart shall verify the Design Date by a memorandum to Elkhart's Board of Public Works that design has begun. Several CSO Control Measures in Table 1-3 of the Appendix consist of separate components. For those CSO Control Measures, the Design Date shall be achieved when the first project in the construction sequence has met the above definition.

"Performance Criteria" shall mean and include any of the following: completing the CSO Control Measures so that they operate as designed; not exceeding the Typical Year Overflow Event frequency described in Table1-3 of Appendix A; conveying the design flow rates; and meeting any and all applicable LTCP requirements and permit requirements.

1.4 Summary

The CSO Control Measures in Elkhart's Long Term Control Plan are designed to result in no more than nine Overflow Events during a Typical Year. The CSO Control Measures in Elkhart's LTCP are designed to result in zero overflow events at many outfalls during a Typical Year and no more than 9 overflow events at one or more of the remaining outfalls

Elkhart's LTCP features a combination of the following CSO Control Measures:

- Continuing Elkhart's ongoing program of partial or complete sewer separation in several CSO Basins;
- Redirecting Elkhart's sewer system to send some flows to the wastewater treatment plant on a route that moves the flows out of the combined sewer area;
- Regional storage tanks to capture and store sewage overflows during wet weather;
- Sewer system conveyance improvements; and
- Wastewater treatment plant improvements.

Elkhart shall complete implementing the LTCP on or before December 31, 2029 unless a different schedule is approved by the United States and Indiana or ordered by the Court for the Remaining LTCP Projects pursuant to the procedures in Section XIX Schedule Reconsideration Based on Financial Circumstances of the Decree.

Elkhart's LTCP will significantly reduce combined sewer overflow volume and frequency to CSO-impacted waterways.

The City considered sensitive and priority areas and logical construction sequencing to develop the implementation schedule. Reducing overflows to Christiana Creek was given the highest priority and placed first in the implementation schedule. Projects in the Elkhart River watershed also were given high priority because those projects will impact multiple City parks and priority areas.

Appendix A: Section 2:

Post-Construction Monitoring Plan

2.1 Introduction

This section describes Elkhart's plans to monitor the implementation and effectiveness of the long-term control plan in meeting the City's goals and Clean Water Act requirements. When implemented, the City's CSO controls are expected to improve water quality in Christiana Creek, the Elkhart River and the St. Joseph River. The City will track progress by individual watersheds where controls are implemented using the monitoring program described below.

The post-construction monitoring program includes the following elements:

- Actions to document that Elkhart has built the CSO control measures required under the LTCP and that they are meeting the Design Criteria;
- Actions to determine whether the control measures have achieved the Performance Criteria that CSO controls must achieve nine or fewer CSO events on a system-wide basis during a Typical Year;
- Actions to monitor the benefits of the CSO control measures, such as in-stream water quality improvements and reductions in CSO volume, frequency and duration when compared to baseline conditions; and,
- Progress reporting to U.S. EPA, IDEM, the Elkhart City Council, Elkhart Board of Public Works and the general public.

After Elkhart has demonstrated compliance with all Performance Criteria, to the extent that post-construction monitoring shows that the residual overflows interfere with designated uses, Elkhart may conduct a use attainability analysis to determine whether the designated uses are attainable.

2.2 General Requirements

U.S. EPA and IDEM require CSO communities to monitor their progress in reducing CSOs during and after LTCP implementation. "Monitoring during LTCP implementation should include data collection to measure the overall effects of the program on water quality and to determine the effectiveness of CSO controls. … A monitoring plan to assess water quality conditions during and after program implementation will allow evaluation of the improvements through comparison to baseline conditions." [2]

Elkhart shall use existing monitoring stations to collect long-term data for comparisons. Elkhart shall describe monitoring plan components, such as a map of monitoring stations, a record of the

[2] Combined Sewer Overflows: Guidance for Long Term Control Plans, U.S. Environmental Protection Agency, September 1995, Section 4.6 Post-Construction Compliance Monitoring, page 4-15.

frequency of sampling at each station, a parameter list, and a plan for maintaining quality assurance and quality control.

2.3 Monitoring, Data Collection and Analysis

2.3.1 Monitoring Plans

2.3.1.1 In-stream Monitoring

Elkhart's monitoring strategy described in this plan is focused primarily on evaluating CSO control performance and associated benefits on in-stream water quality for *E. coli*.

Elkhart's post-construction monitoring program will utilize the in-stream monitoring locations and parameters identified in Table 2-1 below. All locations will be monitored as indicated with the exception of when the river is frozen at select locations during winter months. The parameter list includes constituents that will allow the City to evaluate attainment of recreational (*E. coli*) and aquatic life (dissolved oxygen, temperature and pH) uses. As noted in Table 2-1, Elkhart also will document observations of floatables, odor, color, and extent of algae to describe river conditions related to narrative water quality standard criteria.

Table 2-1 Stream Monitoring Locations

Site ID	Location	Receiving Stream	Rationale	Frequency	Parameters[2]
1	Christiana Creek - Footbridge Upstream of Confluence with St. Joe River	Christiana Creek	Characterize Christiana Creek basin; Includes loads from all watershed sources, including 1 City CSO	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
2	6-Span Bridge (County Road 17)	St. Joe River	Characterize Upstream St. Joe River basin; Includes loads in St. Joseph River basin from sources upstream of the City	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
3	Lexington Avenue	St. Joe River	Upper St. Joe River basin; Include loads from Elkhart River, 2 City CSOs, and four tributaries (Christiana, Pine, Puterbaugh, Osolo)	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
4	Ash Rd	St. Joe River	Characterize Lower St. Joe River basin; Includes loads from 5 City CSOs, WWTP, two tributaries (Baugo and Cobus)	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
5	Elkhart River - County Road 18	Elkhart River	Characterize Upstream Elkhart River basin; Includes loads from sources upstream of the City, including Rock Run Creek	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli
6	Elkhart River - Footbridge Upstream of Confluence with St. Joe River	Elkhart River	Characterize Elkhart River basin; Includes loads from 7 City CSOs, Yellow Creek	- 1 dry event / mo. - 3 wet events following >/= 0.8" rain event[1]	DO, pH, Temp, Wthr, Wa, E. Coli

LEGEND:

[1] The City will collect data for a minimum of 3 wet weather events in a recreational season and with a goal of monitoring 1 wet event/month

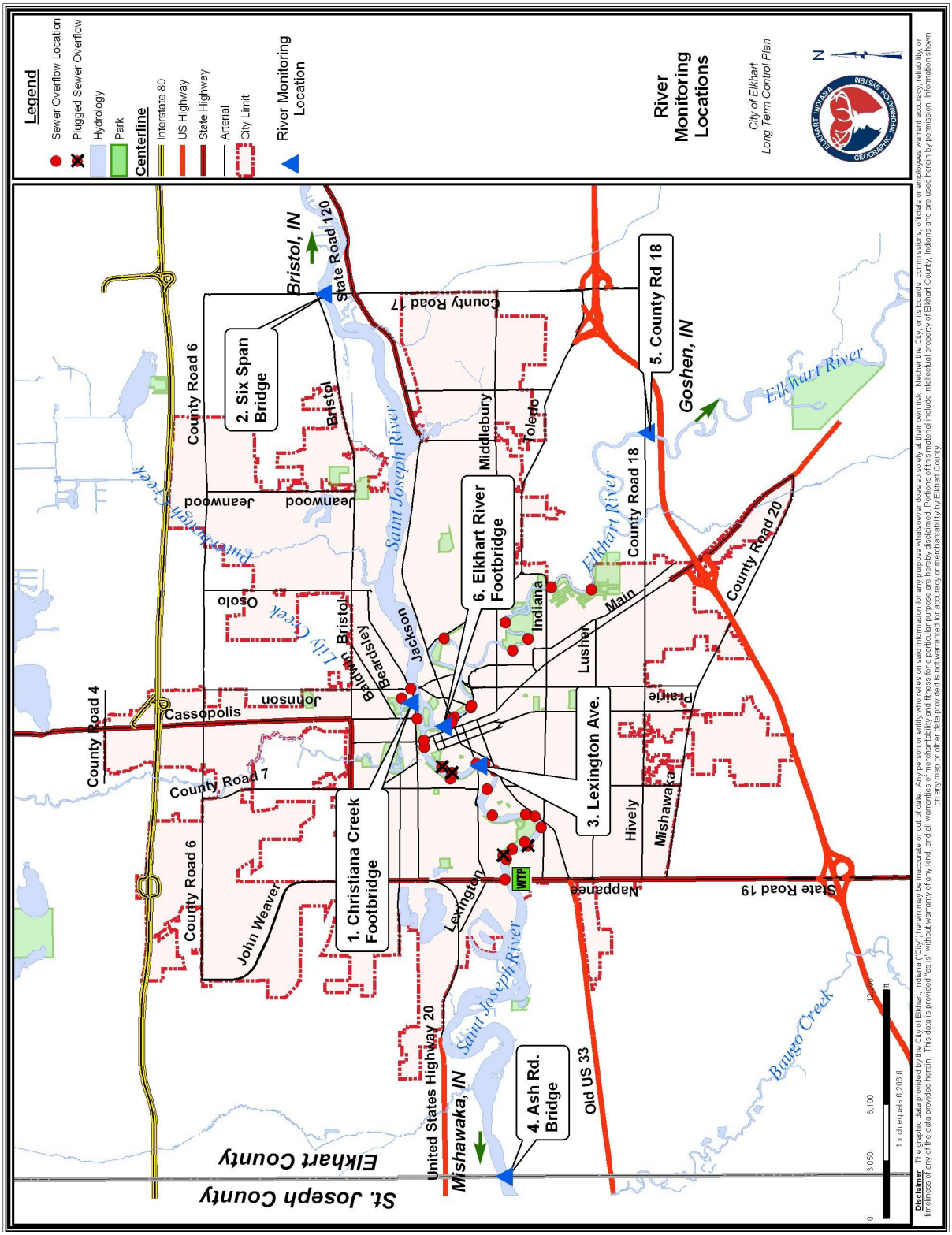
[2] The City will note observations regarding floatables, color, odor and extent of algae at each sampling location

Analytical Parameter Abbreviations:
DO – dissolved oxygen, mg/L
pH – pH, s.u.
Temp – water temperature, deg C
Wthr – weather (1)
Wa – water appearance (2)
E. Coli – E. Coli, cfu

Additional notes to document weather and water conditions:
1 – Weather conditions: 1 = clear / sunny, 2 = partly sunny, 3 = cloudy, 4 = lt rain, 5 = rain, 6 = lt snow, 7 = snow, 8 – windy
2 – Water appearance: 1 = clear, 2 = cloudy, 3 = murky, 4 = muddy

Figure 8-1 illustrates the stream monitoring locations described above.

Figure 2-1 River Monitoring Locations



2.3.1.2 CSO Outfall Monitoring

Elkhart shall continue to monitor active CSO outfalls using its CSO activation monitoring system. The monitoring system, which currently uses a combination of daily site visits and continuous monitors, will be modified during the first five years of the LTCP implementation plan to include continuous monitoring of depth of flow and activations at all active CSOs while limiting site visits to twice a month for maintenance and calibration. CSO activation monitoring system changes will be updated in the CSO Operation Plan as they occur.

2.3.1.3 Precipitation Monitoring

Elkhart has three active rain gauge monitoring stations across the service area. Elkhart shall continue to monitor rainfall at those stations. Elkhart shall monitor rainfall during each storm event during the post-construction monitoring period to record each storm event.

2.3.1.4 CMDF Treatment Process Monitoring

CMDF influent and effluent turbidity probes will be installed for real-time trending of CMDF process performance throughout each wet weather event. Refrigerated samplers will also be installed on both the CMDF influent and effluent channels for flow-paced composite or discreet sampling and laboratory analysis.

2.3.2 Data Management and Analysis

2.3.2.1 Collection System Data Analysis

Elkhart shall use sound engineering judgment and best industry practices to use the collection system model to determine whether the City has achieved compliance with the Performance Criteria set forth in Table 1-3. Elkhart shall update and calibrate the model by performing the following steps:

1. Collect flow monitoring, rainfall, and CSO activation data sufficient to re-calibrate the collection system and water quality models during a 12-month post-construction monitoring period after Achievement of Full Operations of all CSO Control Measures in the LTCP.

2. Perform quality assurance and quality control of the data collected in Step 1, as described in the City's Quality Assurance Project Plan (QAPP)[3].

3. Update the collection system model to incorporate all completed projects and any other system improvements completed since the LTCP calibration effort. Utilize the updated collection system model and the rainfall data collected during the monitoring period to run a continuous simulation of CSO discharges for the 12-month post-construction monitoring period.

4. Compare CSO activation frequency and annual average system-wide CSO volume in the continuous simulation outputs to the CSO monitoring data for the 12-month post-construction monitoring period to determine whether re-calibration of the collection system model is needed. The model-predicted activations shall be no more than one activation less than monitored activations for

[3] St. Joseph River Watershed Initiative for a Safer Environment (WISE) Quality Assurance Project Plan (205(j) Grant A305-2-01-399-0), October 25, 2002, and revised on April 29, 2003.

CSOs with more than five monitored activations during a Typical Year. (That is, to be considered calibrated, for an outfall that is predicted to have six overflows during a Typical Year and which experienced 8 overflows during post-construction monitoring, the model must predict 7 or more overflows for that outfall for that same post-construction monitoring period). Additionally, no individual outfall shall have more than nine model-predicted activations or monitored activations during a Typical Year. Moreover, for CSO numbers 6, 25, and 37, the model-predicted activations shall be no less than the number of monitored activations during a Typical Year. Finally, the model also shall predict the system-wide annual average overflow volume within +/- 20 percent. Model re-calibration will not be needed if the model achieves the aforementioned criteria. If these criteria are not met, Elkhart shall recalibrate the model in accordance with Steps 5-6. At the conclusion of Step 4, Elkhart shall prepare an Initial Model Validation Report and present it to EPA and IDEM for authorization to proceed to the next step.

5. If re-calibration is needed, Elkhart shall select two or more appropriate rainfall events from the12-month post-construction monitoring period for model recalibration.6. After Elkhart re-calibrates the model using sound engineering judgment in accordance with standard industry practices, Elkhart shall run another continuous simulation for the entire monitoring period to verify the re-calibrated model. Thereafter, Elkhart shall compare the continuous simulation outputs to the CSO monitoring data as described in Step 4, to determine whether additional re-calibration is needed. If so, Elkhart shall conduct re-calibration in accordance with Steps 5-6 until the model achieves the criteria described in Step 4, above.

If EPA and IDEM agree that Elkhart has adequately calibrated and validated the model, based on recalibration efforts, Elkhart shall prepare a Model Re-Calibration Report documenting the recalibration and validation. After receiving authorization from EPA and IDEM, Elkhart then may proceed to the Performance Criteria analysis described in Section 2.4.1.

2.3.2.2 Receiving Water Data Analysis

Elkhart shall use its river model to evaluate in-stream water quality with appropriate analyses including the same analyses presented in Section 1 of this Appendix. These analyses include compliance with current water quality standards at key locations (including the State line), evaluating compliance with all sources and isolating the potential impact of any remaining Elkhart CSOs on in-stream water quality. These analyses will provide a before-and-after characterization of water quality, allowing Elkhart to quantify benefits and improvements to the river from the implementation of Elkhart's LTCP.

Elkhart shall use sound engineering judgment and best industry practices to use the monitoring data and river model to determine how often the river attains the designated uses (recreation and aquatic life). The river model is configured to evaluate recreation use by simulating *E. coli* fate and transport and is applied for the Typical Year. Like all computer models, the river model inevitably carries with it some inherent variability and calibration relies on reproducing the magnitude and timing of in-stream concentrations. Elkhart shall perform the following steps to update the collection system model calibration:

1. Collect data during dry and wet weather over a 12-month post-construction monitoring period after Achievement of Full Operations of all CSO Control Measures in the LTCP.

2. Perform quality assurance and quality control of the data collected in Step 1.

3. After Elkhart updates the collection system model calibration, Elkhart shall use the river model in its previously-calibrated state with collection system model results and the rainfall data collected during the monitoring period to run a continuous simulation of the Elkhart and St. Joseph Rivers for the 12-month post-construction monitoring period.

4. Compare the continuous simulation river model outputs to the in-stream *E. coli* monitoring data for the 12-month post-construction monitoring period to determine whether re-calibration of the river model is needed. Model re-calibration will be not be needed if the model achieves at least the same degree of calibration as was achieved during the LTCP development process, and there is a high degree of agreement between the range of concentrations in the model output and monitoring data for the monitoring period. Otherwise, model re-calibration will be needed in accordance with Steps 5-6.

5. If re-calibration is needed, the Elkhart shall select one rainfall event from the 12-month post-construction monitoring period for model recalibration.

6. After Elkhart has recalibrated the river model using sound engineering judgment in accordance with standard industry practices, Elkhart shall verify the re-calibrated model by running another continuous simulation for the monitoring period. The continuous simulation period shall include at least two additional wet weather events. Thereafter, Elkhart shall again compare the continuous simulation outputs to the in-stream monitoring data as described in Step 4, to determine whether additional re-calibration is needed. Re-calibration will be conducted in accordance with Steps 5-6 until the model achieves at least the same degree of calibration as was achieved during the LTCP development process, and there is a high degree of agreement between the range of concentrations in the model output and monitoring data for the monitoring period.

This re-calibration procedure will result in model-data comparisons for at least three rainfall events. Standard modeling practice (Chapra, 1997) is to calibrate the model to a single dataset and then to confirm or validate the model's calibration by simulating at least one different dataset and comparing model predictions to monitoring data. In Elkhart's re-calibration approach, a single rainfall event will serve as the calibration dataset (Step 5). Elkhart then shall validate the model by running it for two other rainfall events (Step 6).

After Elkhart has adequately calibrated and validated the water quality model, based on re-calibration efforts, Elkhart shall prepare a Model Re-Calibration Report documenting the re-calibration and validation. With authorization from EPA and IDEM, Elkhart then may proceed to the Water Quality Standards Assessment described in Section 2.4.2.

2.4 Achievement of Performance Criteria

Following re-calibration (if necessary) of the collection system model using the criteria described in section 2.3.2.1 of this Appendix A, Elkhart shall use the validated collection system model to run a continuous simulation for the Typical Year to determine whether Elkhart has achieved the Performance Criteria set forth in Table 1-3. Elkhart shall be deemed to have achieved the Performance Criteria if the simulation shows nine or fewer Overflow Events system-wide and only one overflow into Christiana Creek, based on Typical Year rainfall.

Elkhart expects that Elkhart's LTCP, when fully-implemented, will result in fully capturing all but nine storm events in a Typical Year along the Elkhart and St. Joseph Rivers, and all but one storm event in a Typical Year along Christiana Creek. Actual overflow frequency, however, will vary from year to year, depending on rainfall conditions. Nevertheless, the CSO control measures will capture for treatment the first part of each storm, known as the first flush, which carries the largest concentration of pollutants.

In Section 1 of this Appendix, Elkhart identified several outfalls that may be sealed if post-construction monitoring shows that closing the overflows would have no harmful effects during large storm events. This will be evaluated by reviewing peak hydraulic grade lines and flooding under large storm conditions. Assuming that monitoring confirms the absence of basement flooding

or other adverse system effects, these outfalls will be permanently sealed. If monitoring and/or modeling do not confirm the lack of adverse system effects, the outfalls will need to remain open as system relief points during extreme storm events.

If model results show that Elkhart's LTCP did not meet the Performance Criteria in Table 1.3, Elkhart shall identify deficiencies or performance-limiting factors in system design process, operations, and maintenance that may have limiter the ability of the CSO Control Measures to achieve their intended performance. If necessary, Elkhart shall document corrective measures. If alternative operating strategies, structural modifications, or additional facilities and processes are needed to meet applicable requirements, Elkhart shall identify them in the final Post-Construction Monitoring Report. If necessary, Elkhart shall submit to EPA and IDEM for review and approval a plan and schedule for the implementation of additional CSO controls necessary to allow the comb9ined sewer to meet the Performance Criteria in Table 1-3.

2.4.2 Water Quality Standards Assessment

After implementing the LTCP, Elkhart shall use the water quality model to evaluate whether or not residual CSO Discharges interfere with designated uses. Elkhart then shall submit to the United States and Indiana a Post-Construction Water Quality Assessment Report documenting Elkhart's analysis based on Typical Year performance.

2.5 Progress Reporting

This section describes the Semi-Annual Reports and the Post-Construction Monitoring Report that Elkhart is required to prepare to document progress in implementing Elkhart's LTCP, meeting milestone dates, and achieving the Design Criteria and Performance Criteria required in Section 1 of this Appendix. Elkhart shall submit all reports to the United States and Indiana for their review and approval.

2.5.1 Semi-Annual Reports

Elkhart is required to submit a Semi-Annual Report by July 31 of each year for the preceding six months between January 1 and June 30; and by January 31 of each year for the preceding six months between July 1 and December 31; that shall include:

1. a statement of all deadlines that the Consent Decree required Elkhart to meet during the six-month period, whether and to what extent Elkhart met those requirements, and the reasons for any noncompliance. Notification to the United States and Indiana of any anticipated delay shall not, by itself, excuse the delay;

2. a general description of the work completed within the six-month period, and a projection of work to be performed pursuant to the Consent Decree during the next six month period;

3. information generated pursuant to the requirements of the Long Term Control and any Supplemental Compliance Plan required by the Decree; and

4. copies of all Monthly Monitoring Reports and other reports pertaining to CSO discharges and bypassing that Elkhart submitted to IDEM in accordance with Elkhart's Current Permits during the six-month period.

If Elkhart violates, or has reason to believe it may violate, any requirement of the Consent Decree, Elkhart is required notify the United States and Indiana of such violation and its likely duration in writing within ten working days of the day Elkhart first became aware of the violation or potential

violation, with an explanation of the violation's likely cause and of the remedial steps taken, or planned, to prevent or minimize the violation. If the cause of the violation cannot be fully explained at the time the report is due, Elkhart shall include a statement to that effect in the report. Elkhart shall investigate to determine the cause of the violation and then shall submit an amendment to the report, including a full explanation of the cause of the violation, within 30 Days of the day Elkhart becomes aware of the cause of the violation.

2.5.2 Final Post-Construction Monitoring Report

Within three years following Achievement of Full Operations of all CSO Control Measures in Table 1-3 of this Appendix, Elkhart shall submit a final Post-Construction Monitoring Report to the United States and Indiana. Pursuant to the Consent Decree, the final Post Construction Monitoring Report shall:

a. demonstrate that Elkhart implemented the Post-Construction Monitoring Plan in compliance with the schedule and terms set forth therein;

b. evaluate whether or not the Facility improvements and other remedial measures required by the Long Term Control Plan, as constructed, operated, or otherwise implemented, meet the Design Criteria and Performance Criteria required by the Long Term Control Plan;

c. summarize the data collected during the entirety of the Post-Construction Monitoring Plan and include any new data relevant to the evaluation that Elkhart did not previously submit to EPA or IDEM;

d. evaluate whether or not Elkhart has any Unlisted Discharges;

e. evaluate whether or not Elkhart's remaining CSO Discharges, if any, comply with all applicable requirements in the Long Term Control Plan and Elkhart's Current Permits; and

f. evaluate whether or not Elkhart has eliminated Bypasses, or to the extent that Elkhart has not eliminated Bypasses, evaluates whether or not Elkhart's remaining Bypasses meet the conditions governing Bypass in Elkhart's Current Permits.

The purpose of the Final Post-Construction Monitoring Report shall be to document how well Elkhart's entire Facility is performing as a whole, following completion of all CSO Control Measures, and shall include an assessment of whether the Facility is meeting the Performance Criteria regarding system-wide Overflow Event frequency. Elkhart also shall report overflow volume measured during the monitoring period and estimated based on collection system modeling of Typical Year performance. After completing construction of all CSO Control Measures, Elkhart shall monitor a series of rainfall events for at least 12 months or longer if needed to obtain data regarding a sufficient number of rainfall events consistent with Design Criteria have occurred so that Elkhart can obtain sufficient sampling data. Elkhart may, however, request that EPA and IDEM allow a monitoring period shorter than 12 months if Elkhart believes that it has collected sufficient monitoring data. A request for a monitoring period shorter than 12 months, however, is subject to the unreviewable discretion of EPA and IDEM and Elkhart may not invoke dispute resolution procedures in this Consent Decree for any denial of such a request by either EPA or IDEM.

The Final Post-Construction Monitoring Report shall evaluate whether CSO Control Measures were constructed as designed and are performing as designed and expected. Elkhart shall use the collection system model to evaluate Typical Year performance and whether Elkhart achieved Performance Criteria. In the Final Post-Construction Monitoring Report, Elkhart also shall assess water quality conditions in CSO receiving streams to compare to baseline conditions, using the water quality model. As described earlier in Section 2.4, if necessary, Elkhart shall include in the

Final Post-Construction Monitoring Report a description of additional facilities, processes or operating strategies necessary to meet the Performance Criteria regarding Overflow Event frequency in Table 1-3. Table 2-2 summarizes some of the data, analysis, and information that will be included in the Final Post-Construction Monitoring Report.

Table 2-2 Final Post-Construction Monitoring Report Contents

Watershed	CSO Outfalls	12 Month Monitoring Data[1]		Modeled Typical Year Performance[2]		Performance Criteria Met?[3]		Critical Milestones Met?		Comments
		CSO Volume	Overflow Frequency	CSO Volume	Overflow Frequency	Yes	No	Yes	No	
Christiana Creek CSO Control Measure 1										
Christiana	CSO 14									
Upper Elkhart River CSO Control Measure 2										
Elkhart	CSO 4									
Elkhart	CSO 16									
Elkhart	CSO 30									
Elkhart	CSO 31									
Elkhart	CSO 33									
Lower Elkhart River CSO Control Measure 4										
Elkhart	CSO 6									
Elkhart	CSO 7									
Elkhart	CSO 8									
Elkhart	CSO 11									
Oakland Avenue CSO Control Measure 5										
St. Joseph	CSO 24									
St. Joseph	CSO 37									
Upper St. Joseph River (Direct) Control Measure 6										
St. Joseph	CSO 13									
St. Joseph	CSO 25									
St. Joseph	CSO 26									
St. Joseph	CSO 29									
St. Joseph	CSO 39									
Lower St. Joseph River CSO Control Measure 7										
St. Joseph	CSO 17									
St. Joseph	CSO 18									
St. Joseph	CSO 19									
St. Joseph	CSO 20									
St. Joseph	CSO 21									
St. Joseph	CSO 23									
St. Joseph	CSO 32									
Riverside Drive CSO Control Measure 8										
St. Joseph	CSO 15									
Previously Controlled CSO Locations										
Elkhart	CSO 5							NA	NA	
Elkhart	CSO 9							NA	NA	
St. Joseph	CSO 12							NA	NA	
St. Joseph	CSO 27							NA	NA	
St. Joseph	CSO 28							NA	NA	
St. Joseph	CSO 34							NA	NA	
St. Joseph	CSO 40							NA	NA	
St. Joseph	CSO 41							NA	NA	
St. Joseph River - Systemwide Performance[3]										
	All									

Notes:
NA = Not applicable

[1] After completing construction of all CSO Control Measures, Elkhart shall monitor a series of rainfall event for at least 12 months or longer if needed to obtain data regarding a sufficient number of rainfall events consistent with design criteria so that Elkhart can obtain sufficient sampling data. Elkhart may, however, request that EPA and IDEM allow a monitoring period shorter than 12 months if Elkhart believes that it has collected sufficient monitoring data. A request for a monitoring period shorter than 12 months, however, is subject to the unreviewable discretion of EPA and IDEM and Elkhart may not invoke dispute resolution procedures in this Consent Decree for any denial of such a request by either EPA or IDEM.

[2] Typical Year Performance Criteria of no more than 9 Overflow Events system-wide (and no more than 1 overflow event on Christiana Creek) are based on using the collection system model to evaluate the efficacy of the CSO Control Measures using the rainfall data for a Typical Year. Elkhart shall assess Typical Year performance again after completing construction of all CSO Control Measures with this post-construction simulation after first confirming the sewer collection system model is adequately calibrated and validated, as described in Section 2.3.2.

[3] Performance Criteria regarding Overflow Event frequency will be met if there are no more than 1 overflow events in a typical year to Christiana Creek and no more than 9 Overflow Events system-wide during a Typical Year.

As noted earlier, Elkhart also will monitor and report on water quality improvements in CSO receiving streams. Water quality improvements and attainment of designated uses will be evaluated using monitoring data and river model results. Elkhart shall evaluate the attainment of aquatic life uses using the post-construction monitoring data for dissolved oxygen, temperature and pH. Elkhart

shall use the post-construction monitoring data for *E. coli* to update the river model calibration if needed.

2.6 Summary

Elkhart shall monitor its sewer system and area waterways during and after construction to determine the effectiveness of the CSO Control Measures. Elkhart's Post-Construction Monitoring Program shall include:

- Semi-Annual Reports that document whether Elkhart has built the CSO Control Measures required in Table 1-3 of this Appendix and that they are meeting the Design Criteria;
- A Final Post-Construction Monitoring Report to document whether the CSO Control Measures have achieved their Performance Criteria; and
- Monitoring and reporting of in-stream water quality improvements and reductions in CSO volume, frequency and duration when compared to baseline conditions and a determination of whether residual CSOs continue to impair the designated uses.