6.9.4 WPCS Alternatives

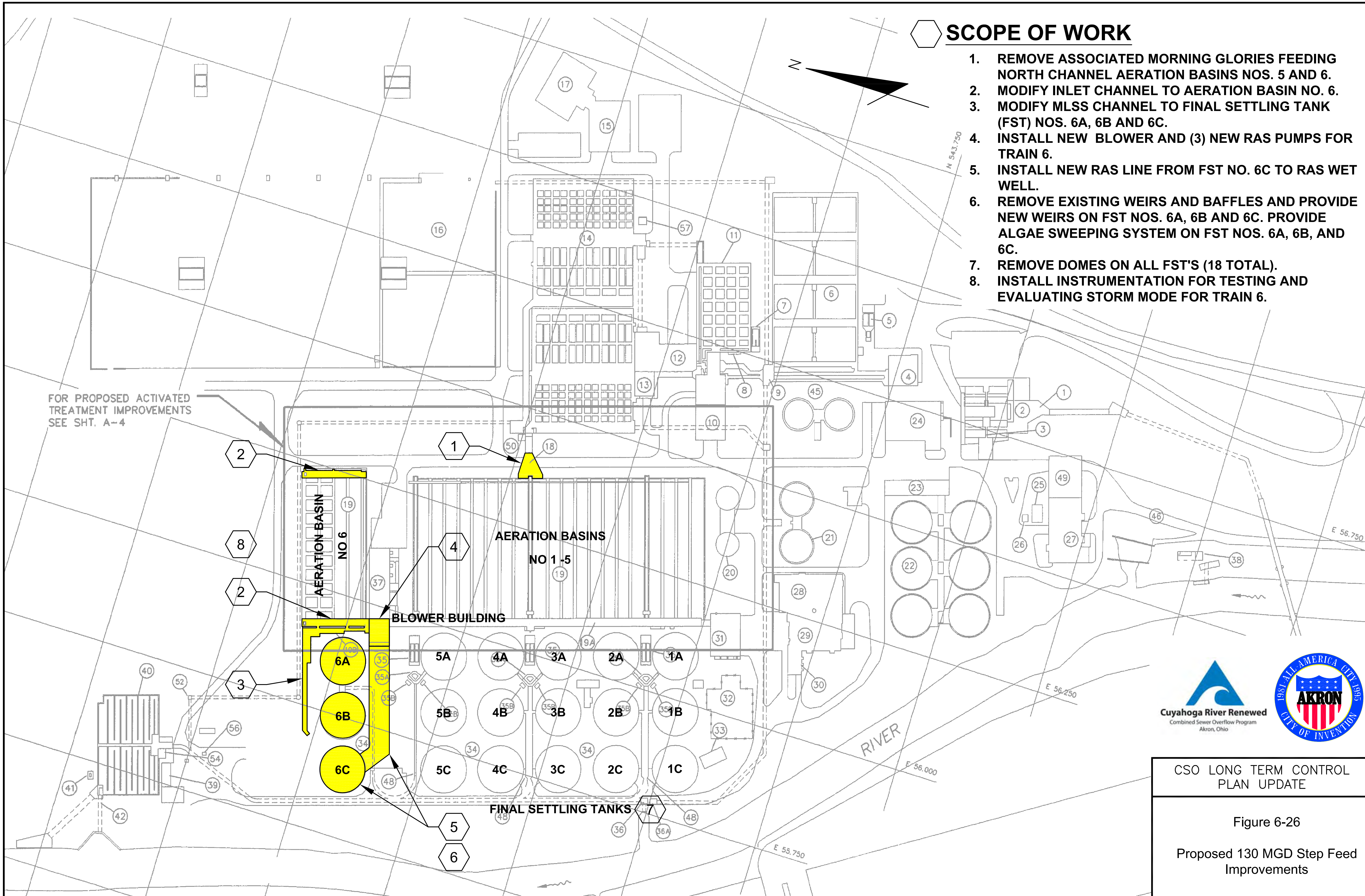
Recommended improvements at the WPCS were discussed above and are summarized in this section. The recommendations consist of increasing secondary capacity to 130 MGD. After those improvements are completed, revised WPCS control measures will be evaluated to further reduce untreated secondary bypass events.

Upgrade WPCS to 130 MGD

The recommended plan is to implement the Step Feed Alternative to increase capacity of the secondary treatment system to approximately 130 MGD by implementing the Step Feed process on one of the six treatment trains while the conventional, plug flow process will still be used for dry weather flow conditions, as shown in Figure 6-26 (Step Feed Phase I Project). Train 6 was originally designed with the capability to operate with both plug flow and step feed processes and is the selected train for the improvements. This project is currently under design with a scheduled completion date of 2015. The estimated project cost for Step Feed Phase I is $15,000,000 in 2010 dollars. The estimated construction cost of $11,500,000 is based on the Basis of Design Report dated September 17, 2010. The Basis of Design Probable Construction Cost is included in Appendix 6-M. An additional $3,500,000 was included in the project cost to test and evaluate the performance of the step feed process.

The Step Feed Project also includes the following proposed capacity improvements, which are summarized in Table 6-9:

- Increase Train 6's existing nominal capacity of 18.3 MGD to 30 MGD
- Achieve an additional 8.5 MGD of secondary treatment capacity through operational modifications in Trains 1 through 5 (an additional 1.7 MGD for each train)



CSO LONG TERM CONTROL PLAN UPDATE

Figure 6-26

Proposed 130 MGD Step Feed Improvements

Table 6-9 Proposed Step Feed Project Secondary Treatment Capacity Improvements

Treatment Train	Primary Effluent Flow Rate (MGD)		
	Existing	Additional	Proposed
1	18.3	1.7	20
2	18.3	1.7	20
3	18.3	1.7	20
4	18.3	1.7	20
5	18.3	1.7	20
6	18.3	11.7	30
Total	**109.8**	**20.2**	**130.0**

The scope of the project consists of the following items:

- Modify Train 6 to include wet weather step feed mode
- Replace/modify and cover Train 6 final settling tank launders
- Modify all final settling tanks by removing the existing domed covers
- Reconfigure/reconstruct aeration influent flume and/or influent channels
- Conduct Stress Tests of Train 6 in step feed mode to determine the maximum capacity of this train, including stress and operational testing during simulated and real wet weather events

Specific elements of the project are as follows:

1. Mitigate recognized hydraulic limitations in the Aeration Basin Splitter by removing morning glories (42-inch flares) feeding North Channel Aeration Basins 5 and 6.
2. Identify and mitigate hydraulic restrictions for step feed operations of Aeration Tank 6. Pending confirmation from the hydraulic analysis to be executed during the pre-design stage, this effort may include:
    a. Modifying the inlet channel to Aeration Basin 6 to minimize hydraulic restrictions and providing primary effluent step feed to Passes 1 through 4.

    b. Modifying the mixed liquor suspended solids (MLSS) channel to Final Settling Tanks (FST) 6A, 6B and 6C, removing the flow control butterfly valve (hydraulic restriction), raising/providing new concrete channel walls, and adding new weir gates to each associated FST.

Once implemented, full-scale testing will be performed to assess the Step Feed process under actual operating conditions to evaluate its effectiveness and to determine the actual, improved secondary treatment system capacity. Per the Consent Decree, stress testing of the step feed mode must be completed and reported by October 15, 2015.

Revised WPCS Control Measures

After full-scale testing of the Upgrade WPCS to 130 MGD project is performed and the increased secondary treatment capacity is verified, the reduced flow that bypasses secondary treatment will be quantified, and further WPCS control measures will be evaluated to further decrease secondary bypass events. The measures to be evaluated may include storage, enhanced high rate clarification (EHRC), or additional modifications for step feed for the remaining five secondary treatment trains.

6.9.5 Additional Consent Decree Projects

The Mud Run Pump Station is in the Mud Run Sanitary Sewer District located in the southwest section of the Kenmore area of the City of Akron. The pump station has the largest wastewater capacity of any of the pump stations in the separate sanitary sewer collection system. The pump station was originally constructed in 1939. A study was prepared in 1989 that addressed pumping capacity issues since raw wastewater overflows were occurring. Improvements were made to the pump station in the 1990s, and a new larger force main was designed and installed at the same time. Two additional studies were prepared to address new issues with the upgraded Mud Run Pump Station. The first study was prepared in 1998, and addressed issues with the pumps, controls, wet well, and the force main. The second study, prepared in 2004, examined how force main performance affected the operation of the three main pumps. Implementation of recommendations from these studies improved operation of the Mud Run Pump Station, but it still has experienced operational problems and has had overflows during storm events that were less than a 10-year storm event, which is OEPA's design standard for the pump station.

The Consent Decree, lodged on November 13, 2009, requires the City of Akron to study and design remedies to eliminate overflows from the Mud Run Pump Station as part of the Mud Run Pump Station Program. The Mud Run Pump Station Program has three phases. The first phase is to identify the causes of overflows from the Mud Run Pump

Station. The second phase is to select alternatives to eliminate overflows from the Mud Run Pump Station. The third phase is to complete construction of the recommended alternative and attain Achievement of Full Operation.

6.10 Hydraulic Conditions

The baseline system-wide plan consists of providing upstream storage and separation and maintaining the current peak flow to the WPCS. Increasing the firm capacity of the WPCS was found to be not feasible based on the NFA. The instantaneous peak flow to the WPCS is not predicted to significantly change following construction of the storage basins and tunnels because the facilities were sized to control overflow volumes from the CSO locations and not to increase conveyance capacity to the WPCS. The current interceptor system to the WPCS is planned to be utilized to convey similar peak flows to the WPCS following implementation of the recommended plan.

After each wet weather event has ended, stored volume would be released to the WPCS at controlled rates from the storage facilities to ensure that the flow rate reaching the WPCS would remain below the planned secondary capacity of 130 MGD. As a result, the length of time that the WPCS would remain at sustained capacity would increase during large events. Depending on the size of the storage basins, the length of time that the system would be operating at sustained secondary capacity would vary. The current operational plan is to dewater the planned storage facilities within a maximum of 48 hours following the completion of the storm event.

7. COST PERFORMANCE CONSIDERATIONS

CSO controls represent a major, long-term public works investment that will place a significant financial burden on Akron residents. The CSO control program must be designed to achieve significant and tangible benefits with affordable costs. To analyze these costs and benefits, the City developed a variety of cost-benefit curves for the controls identified in Section 6.0.

Cost-benefit curves are used to compare alternatives over a range of design conditions or capture levels. Typically, these comparisons indicate that for lower levels of performance, *i.e.,* higher number of overflows per year or lower percent capture, small increments of increased cost would result in large increments of improved performance. For higher levels of control, large increments of increased cost typically result in increasingly smaller increments of improved performance. The optimal point, or “knee-of-the-curve,” is a point where the incremental change in the cost of the control alternatives per change in performance of the control alternative changes most rapidly, indicating that the slope of the curve is changing from shallow to steep or vice versa.

7.1 Cost Estimating Basis

Cost estimating for the storage basins was originally developed for Facilities Plan ’98 Alternatives (1999). The cost estimating was further evaluated, confirmed, and updated in the City of Akron Long-Term Control Plan Review and Disinfection Investigation (2005). Updated costs from this study and original costs from Facilities Plan ’98 were used to develop costs for the 2008 Supposal submittal. Slight adjustments were made to the tank cost and ancillary equipment based on the engineer's construction estimate for the CSO Rack 40/31 Basin Project and bidding information from the same project. Costs for various components such as the washdown system and ground anchors were compared to costs for the same components in the CSO Rack 40/31 Basin Project.

For the latest analysis conducted in 2009-2010, information from the 2008 Supposal was used as a basis to develop costs for various basin sizes for each rack. The piping cost for each storage basin was further evaluated as part of this analysis. Piping costs include influent and overflow lines, dewatering force main, and a diversion/control structure for controlling flow into the storage basin. These costs were then updated to

January of 2010 using the *Engineering News Record* Construction Cost Index. A 30% construction contingency was also added to the cost totals.

Cost estimating for tunnel alternatives was based on tunneling costs presented in the report entitled Ohio Canal CSO Alternatives Advanced Planning Study (2006). These preliminary planning level cost estimates were based on available pricing information for labor, equipment and materials, unit prices, general knowledge of similar projects, and presently available geotechnical information. Costing accounted for mobilization/demobilization, tunnel boring machines, spare parts, launch shafts, extraction shafts, startup and starter tunnels, spoils handling and muck removal, final site cleanup, rack connection drop shafts, and tunnel outlet structures.

Cost estimating for enhanced high rate treatment systems was based on manufacturer's budgetary pricing plus a percentage for construction and installation. Cost estimating for miscellaneous sewer connectors, force main piping, pump stations, and chlorination - dechlorination systems and tanks was based on applicable standardized cost factors and equations presented in the report entitled "Cost Estimating Procedures for Raw Sewage Overflow Control Program" prepared by the Indianapolis Clean Stream Team in 2004. These concept-level cost estimating factors and equations were primarily based on USEPA cost data references.

All tunneling costs were brought forward to January 2010 using the *Engineering News Record* Construction Cost Index. A construction contingency of 20% and a non-construction cost of 30% were added to the tunnel cost totals.

7.2 Storage Basins

The City developed a series of tables and corresponding curves to illustrate cost-benefit information for storage basins at individual CSO rack locations over a variety of control levels. These control levels consisted of 12, 7, 6, 5, 4, 3, 2, 1, and zero overflows per year utilizing the agreed upon adjusted 1994 typical year rainfall data. Tables 7-1 through 7-10 present the following information for each CSO rack where storage is planned:

- Number of overflows in a typical year, including existing conditions
- Gallons of overflow

- Storage basin volume captured, *i.e.,* gallons captured
- Cost (January 2010 dollars)

These tables were submitted as drafts to USEPA in March 2010 titled Preliminary Report on Cost-Benefit Comparison to Predict Sizes and Number of Overflows. These have since been revised using the adjusted 1994 typical year rainfall data. Figures 7-1 through 7-20 present this information graphically in the form of cost-benefit and overflow volume captured curves. Figures 7-21 and 7-22 present the data for all the storage basins combined.

Table 7-1 Cost-Benefit Presentation Table for Rack 3

Alternative Description, Rack 3	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	1,865,006	$6,816,400	$13,100
Storage Basin - Opt 1	1	219,000	1,668,709	$6,452,600	$13,120
Storage Basin - Opt 2	2	394,000	1,595,000	$6,327,100	$13,170
Storage Basin - Opt 3	3	1,825,000	1,227,000	$5,566,000	$13,120
Storage Basin - Opt 4	4	3,112,000	982,000	$5,088,800	$13,100
Storage Basin - Opt 5	5	3,913,000	834,000	$4,726,100	$13,080
Storage Basin - Opt 6	6	4,331,000	613,000	$4,215,600	$13,080
Storage Basin - Opt 7	7	4,788,000	491,000	$3,887,500	$13,070
Storage Basin - Opt 8	12	7,556,000	270,000	$3,242,700	$13,000
Existing Conditions	38	16,100,000			

Revised values based on Adjusted 1994 Typical Year.

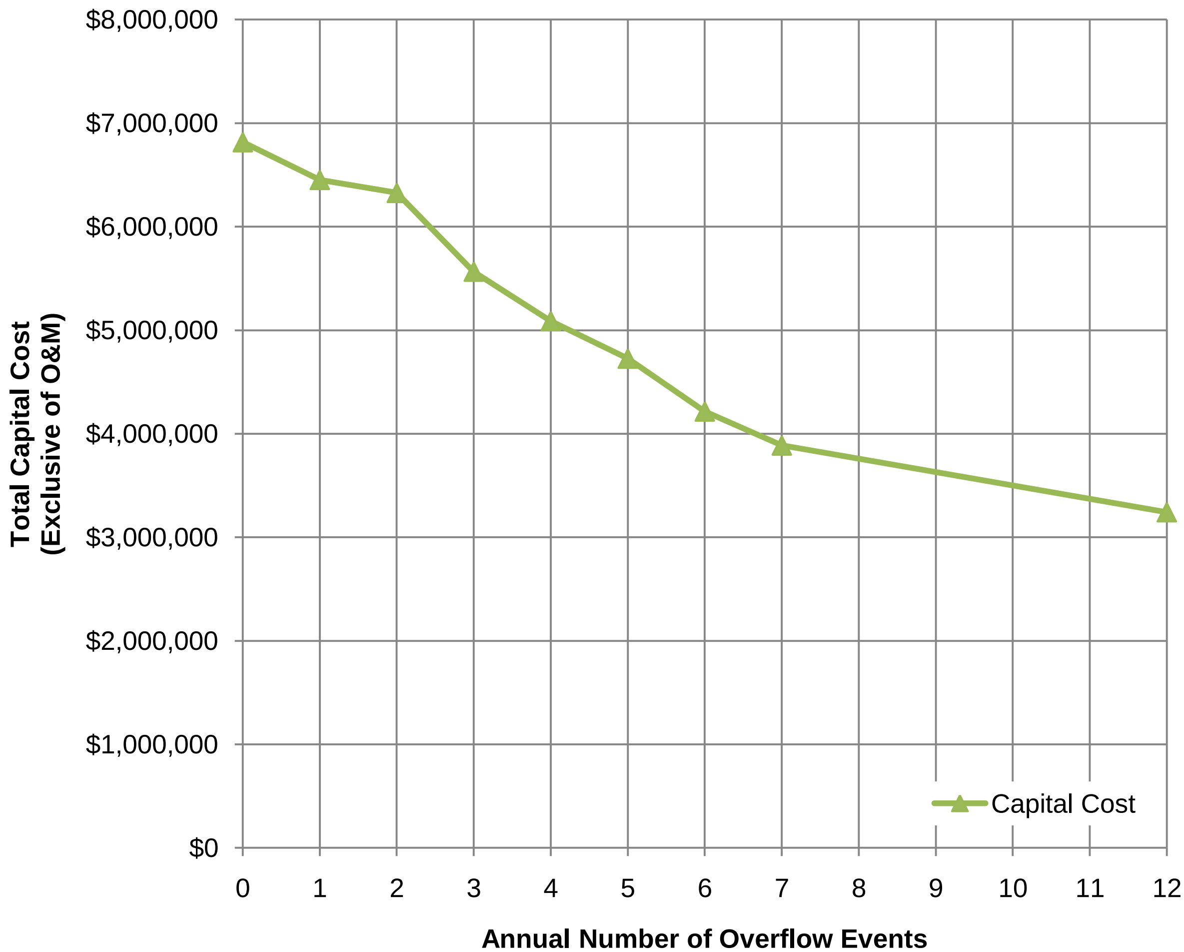


Figure 7-1 Cost-Benefit Curve – Rack 3

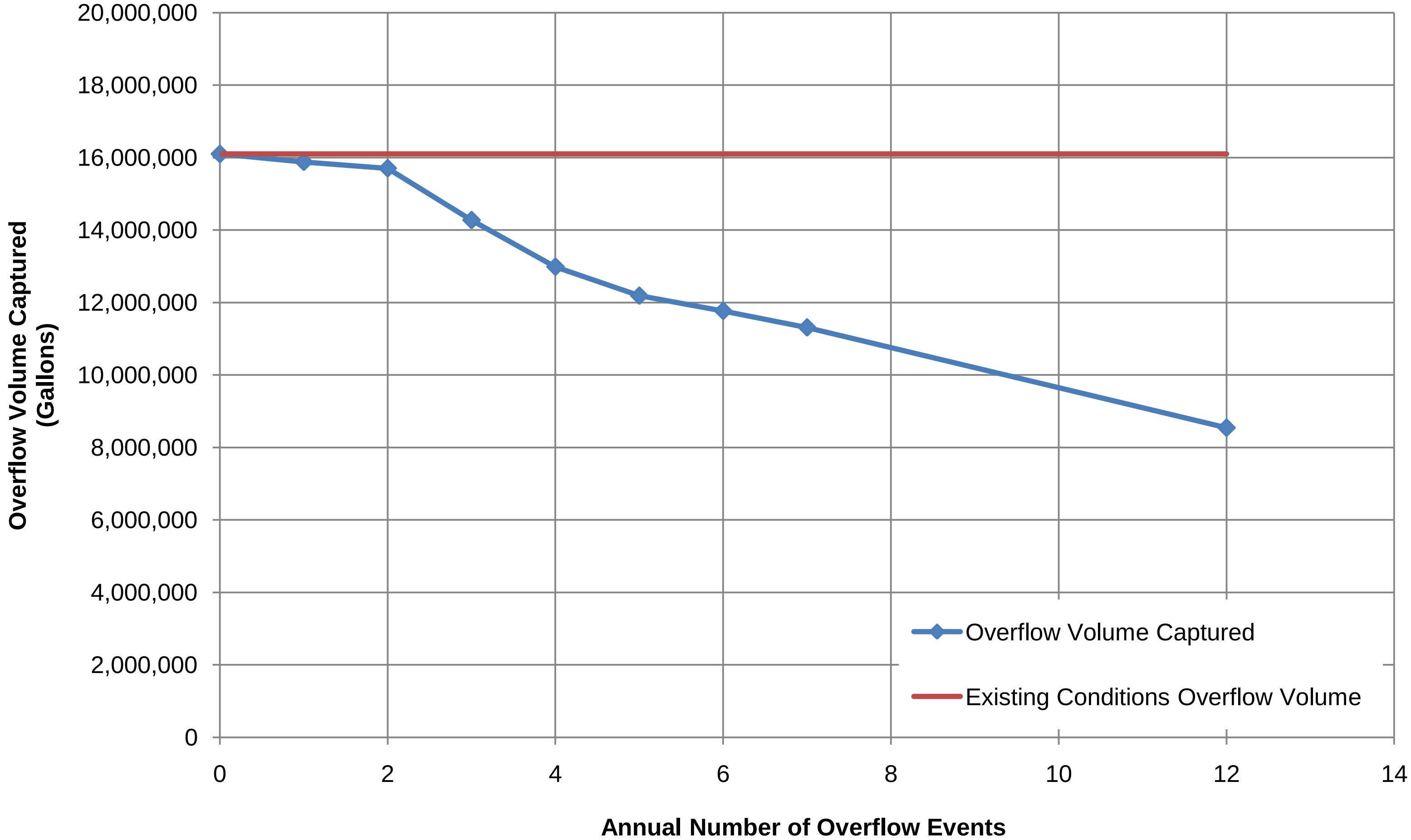


Figure 7-2 Overflow Volume Captured Curve – Rack 3

Table 7-2 Cost-Benefit Presentation Table for Racks 5/7

Alternative Description, Racks 5/7	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	1,105,920	$5,708,800	$8,810
Storage Basin - Opt 1	1	658,000	711,000	$4,711,600	$8,830
Storage Basin - Opt 2	2	995,000	632,000	$4,500,500	$8,830
Storage Basin - Opt 3	3	1,354,000	553,000	$4,289,700	$8,820
Storage Basin - Opt 4	4	1,878,000	474,000	$4,079,200	$8,810
Storage Basin - Opt 5	5	2,401,000	395,000	$3,826,600	$8,790
Storage Basin - Opt 6	6	2,925,000	316,000	$3,532,200	$8,780
Storage Basin - Opt 7	7	4,227,000	158,000	$2,944,200	$8,750
Storage Basin - Opt 8	12	5,177,000	76,000	$2,537,100	$8,730
Existing Conditions	26	6,500,000			

Revised values based on Adjusted 1994 Typical Year.

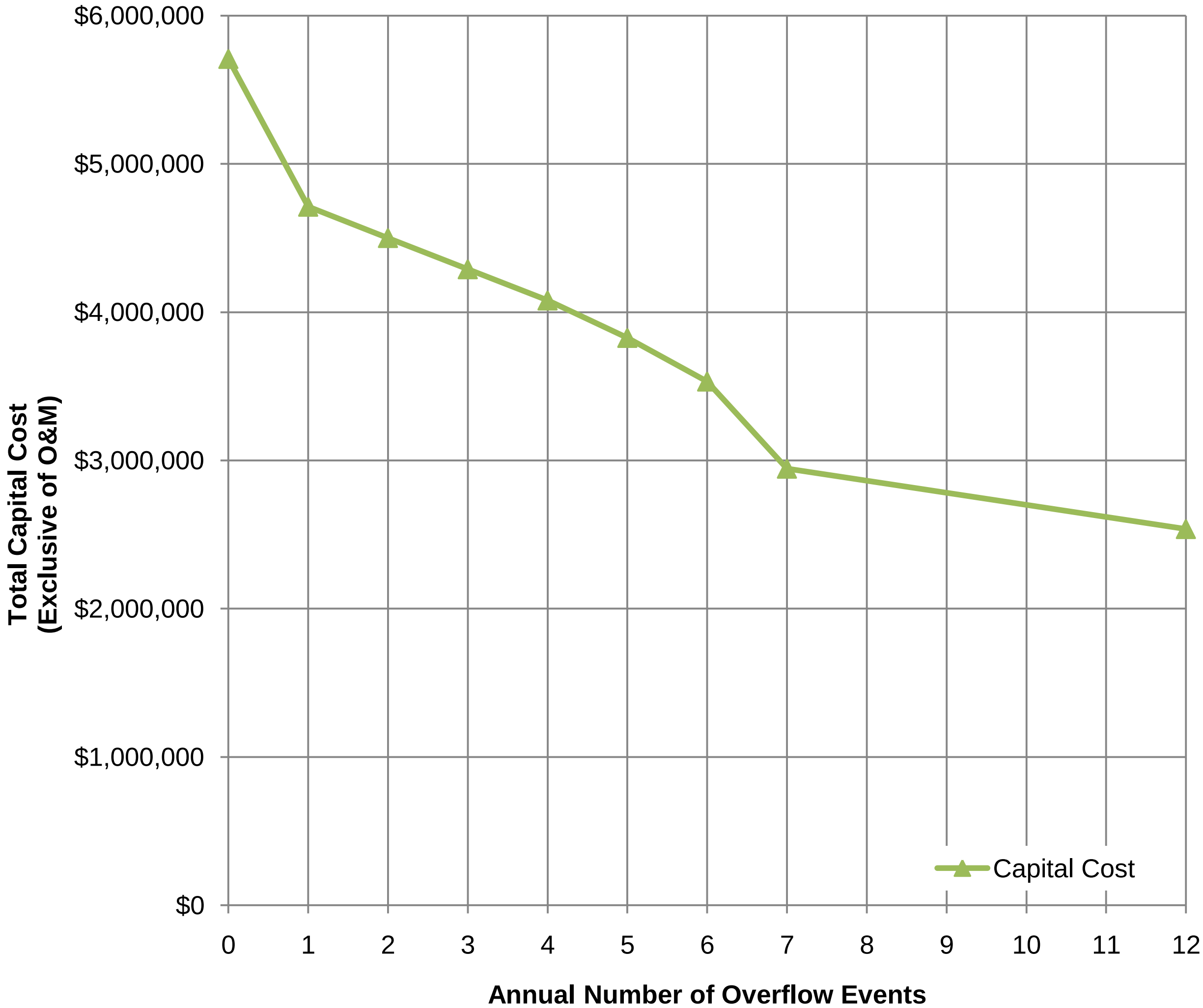


Figure 7-3 Cost-Benefit Curve – Rack 5/7

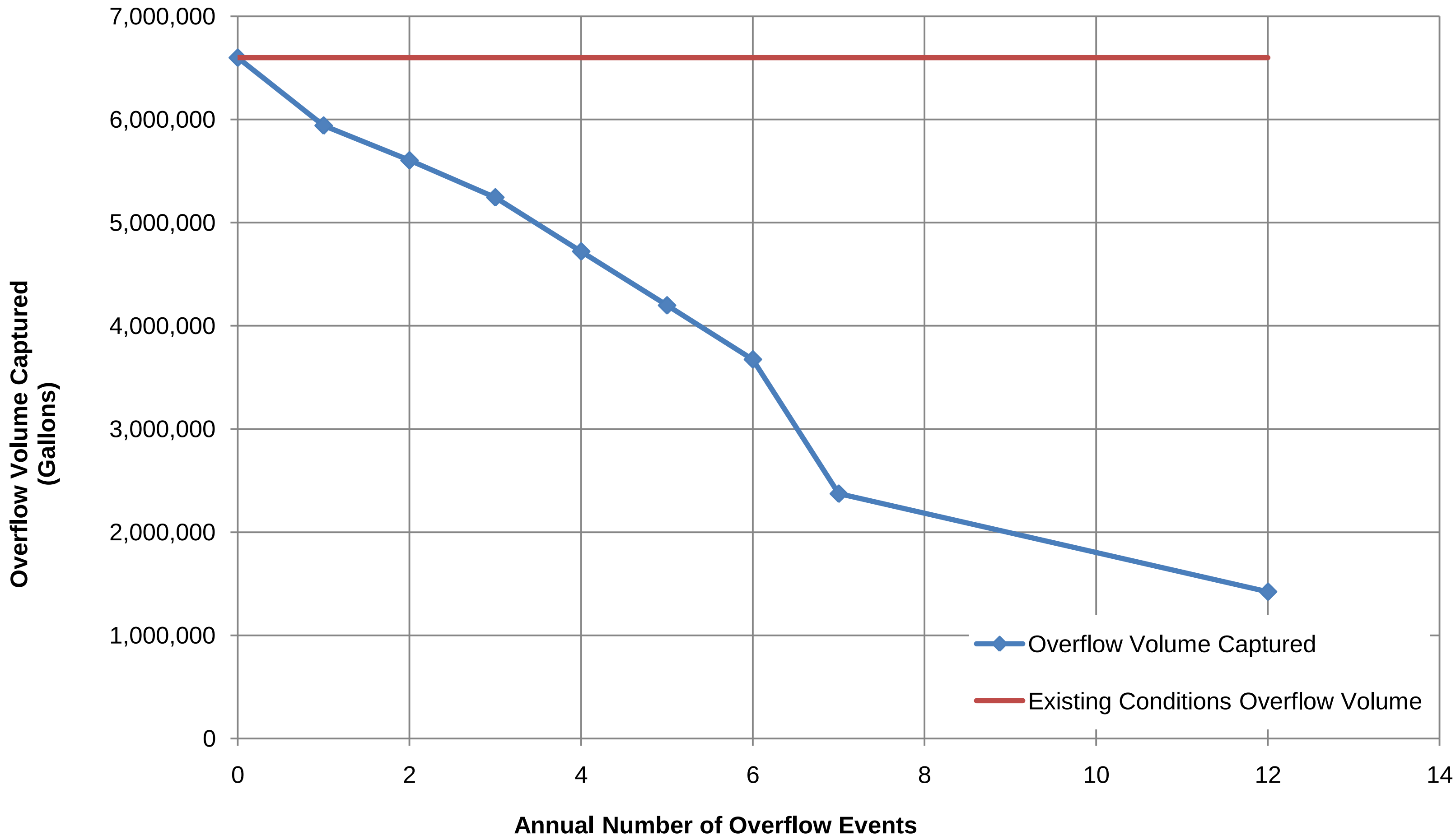


Figure 7-4 Volume Overflow Captured Curve – Rack 5/7

Table 7-3 Cost-Benefit Presentation Table for Rack 10/11

Alternative Description, Rack 10/11	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	2,518,616	$11,758,500	$11,210
Storage Basin - Opt 1	1	542,000	1,959,000	$10,802,700	$11,300
Storage Basin - Opt 2	2	2,125,000	1,399,000	$9,770,000	$11,270
Storage Basin - Opt 3	3	2,828,000	1,259,000	$9,492,200	$11,250
Storage Basin - Opt 4	4	3,651,000	1,119,000	$9,215,100	$11,230
Storage Basin - Opt 5	5	4,638,000	979,000	$8,918,100	$11,210
Storage Basin - Opt 6	6	8,528,000	420,000	$7,597,700	$11,120
Storage Basin - Opt 7	7	9,127,000	350,000	$7,430,000	$11,110
Storage Basin - Opt 8	12	10,922,000	196,000	$6,934,800	$11,070
Existing Conditions	32	23,200,000			

Revised values based on Adjusted 1994 Typical Year.

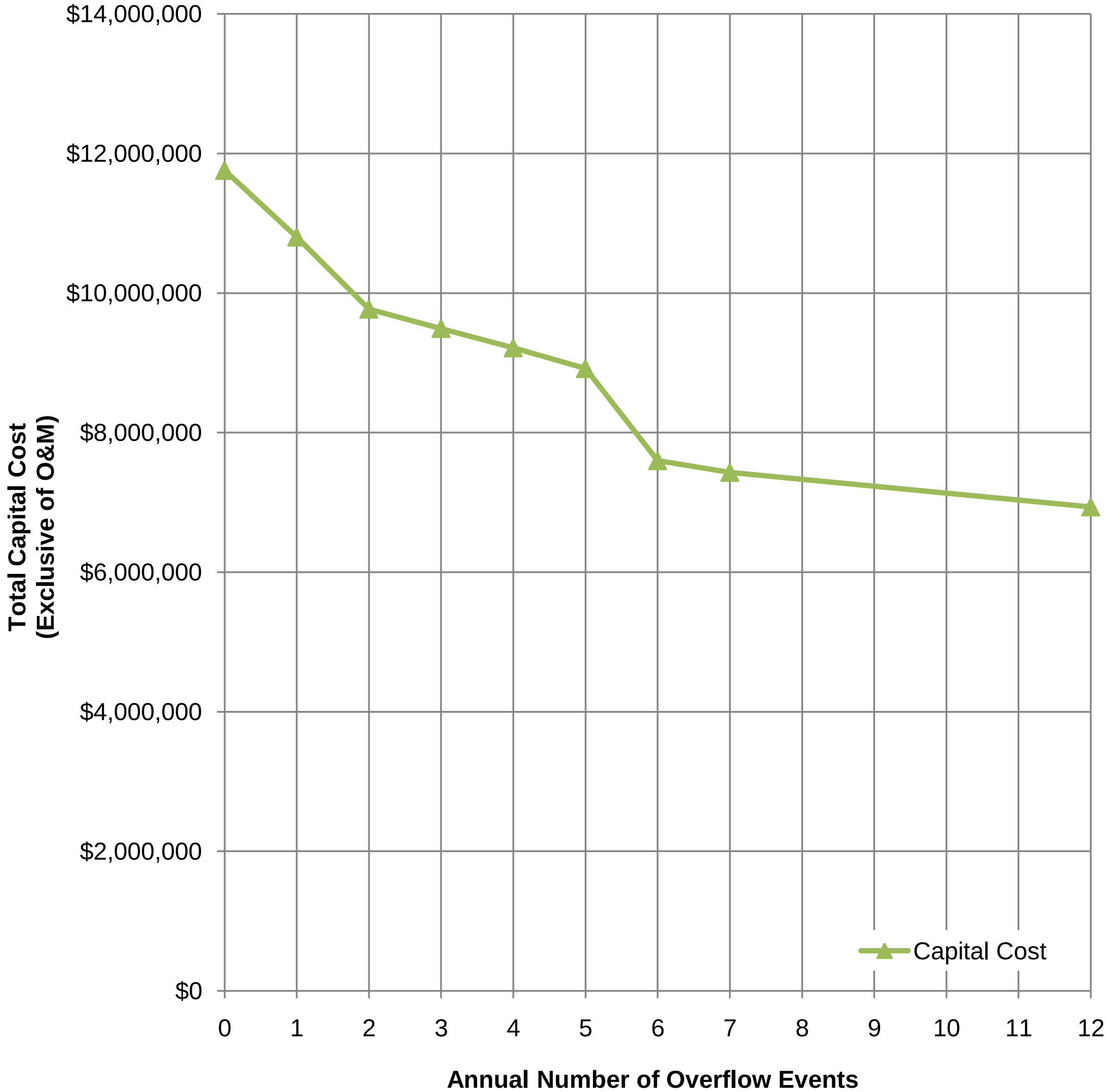


Figure 7-5 Cost-Benefit Curve – Rack 10/11

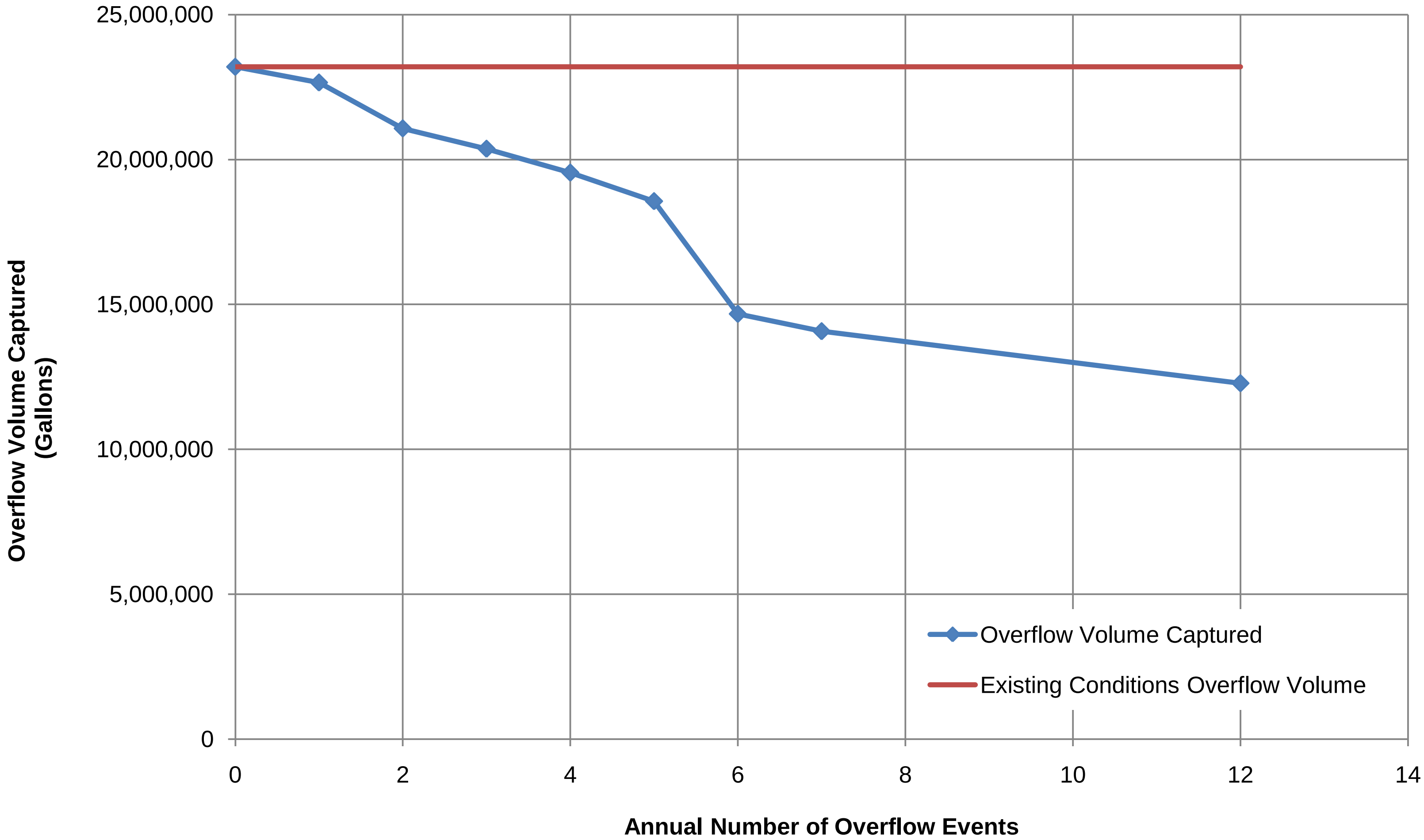


Figure 7-6 Overflow Volume Captured Curve – Rack 10/11

Table 7-4 Cost-Benefit Presentation Table for Rack 12

Alternative Description, Rack 12	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	6,004,454	$10,543,100	$12,840
Storage Basin - Opt 1	1	1,092,000	4,816,000	$9,102,500	$13,110
Storage Basin - Opt 2	2	2,110,000	4,415,000	$8,575,600	$13,080
Storage Basin - Opt 3	3	6,494,000	3,211,000	$7,028,700	$12,960
Storage Basin - Opt 4	4	7,339,000	3,010,000	$6,747,600	$12,930
Storage Basin - Opt 5	5	9,875,000	2,609,000	$6,220,800	$12,870
Storage Basin - Opt 6	6	11,820,000	1,605,000	$4,718,600	$12,710
Storage Basin - Opt 7	7	15,037,000	1,405,000	$4,405,100	$12,670
Storage Basin - Opt 8	12	19,376,000	843,000	$3,445,300	$12,520
Existing Conditions	36	45,500,000			

Revised values based on Adjusted 1994 Typical Year.

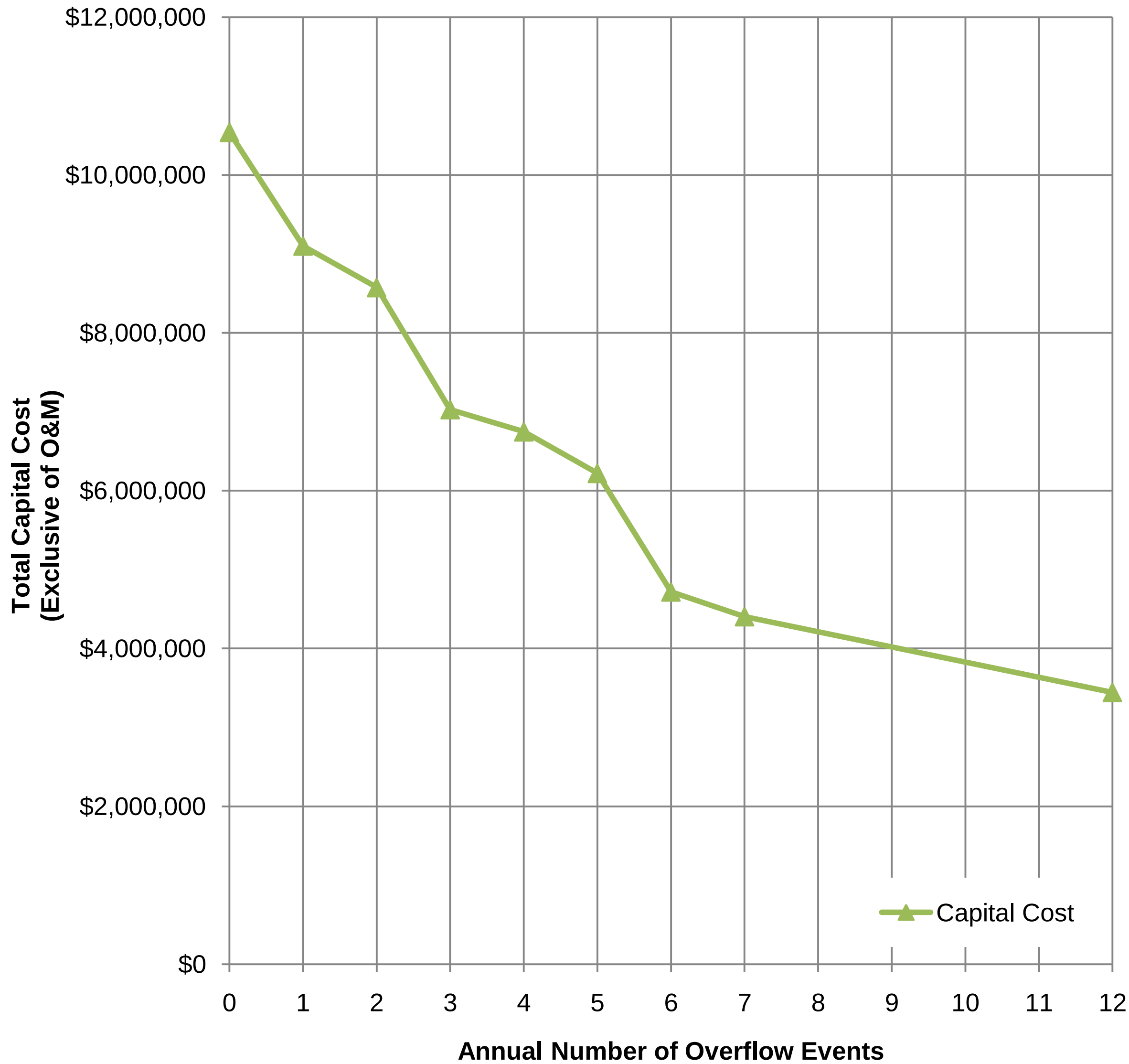


Figure 7-7 Cost-Benefit Curve – Rack 12

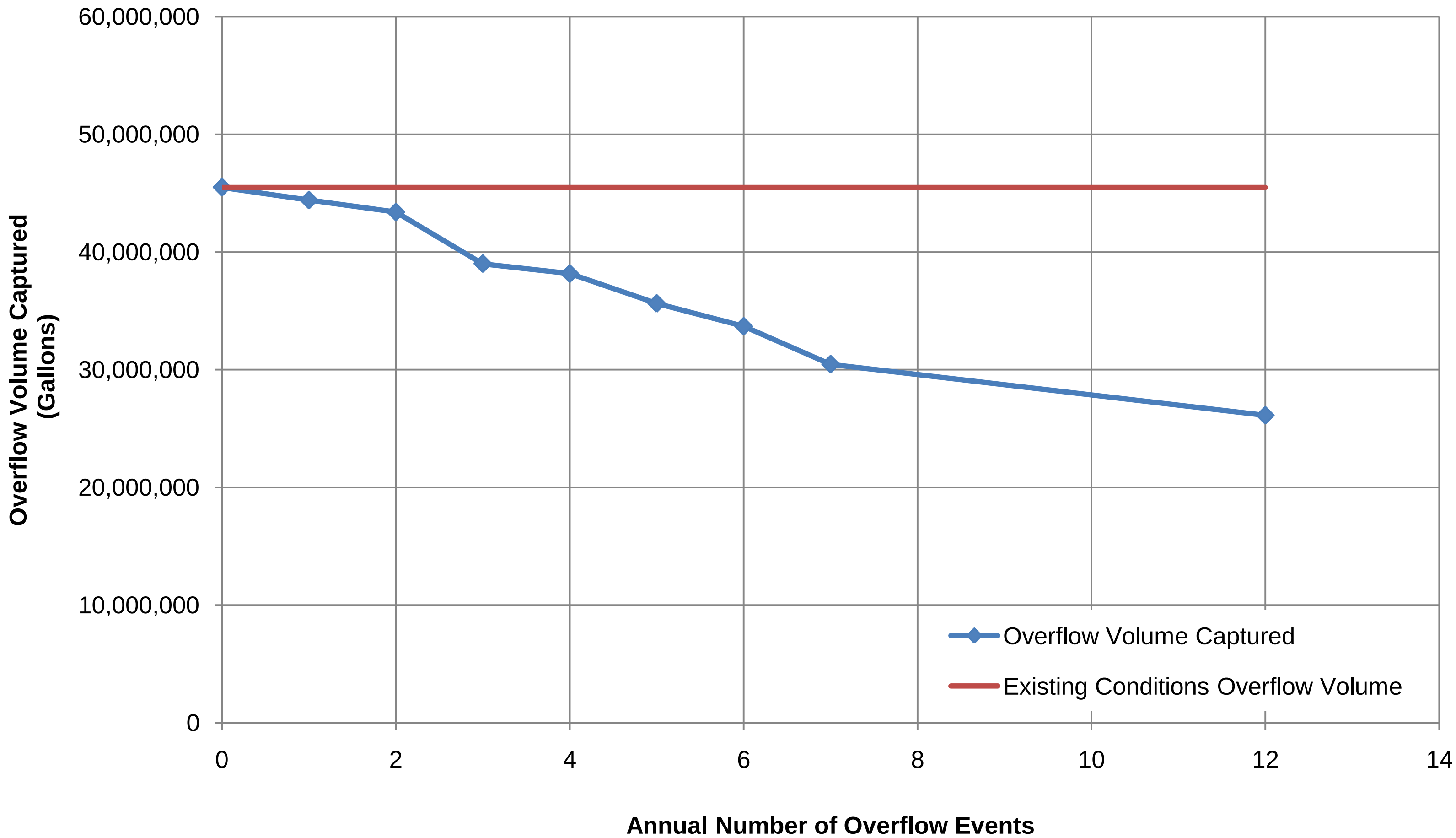


Figure 7-8 Overflow Volume Captured Curve – Rack 12

Table 7-5 Cost-Benefit Presentation Table for Rack 14

Alternative Description, Rack 14	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	1,927,842	$4,526,300	$17,610
Storage Basin - Opt 1	1	67,000	1,839,250	$4,432,700	$17,610
Storage Basin - Opt 2	2	554,000	1,671,470	$4,247,300	$17,620
Storage Basin - Opt 3	3	2,357,000	1,203,000	$3,697,400	$17,630
Storage Basin - Opt 4	4	3,030,000	1,076,000	$3,546,200	$17,610
Storage Basin - Opt 5	5	4,077,000	950,000	$3,419,500	$17,590
Storage Basin - Opt 6	6	5,184,000	823,000	$3,267,100	$17,560
Storage Basin - Opt 7	7	5,289,000	810,000	$3,264,400	$17,560
Storage Basin - Opt 8	12	9,725,000	443,000	$2,837,300	$17,460
Existing Conditions	52	25,900,000			

Revised values based on Adjusted 1994 Typical Year.

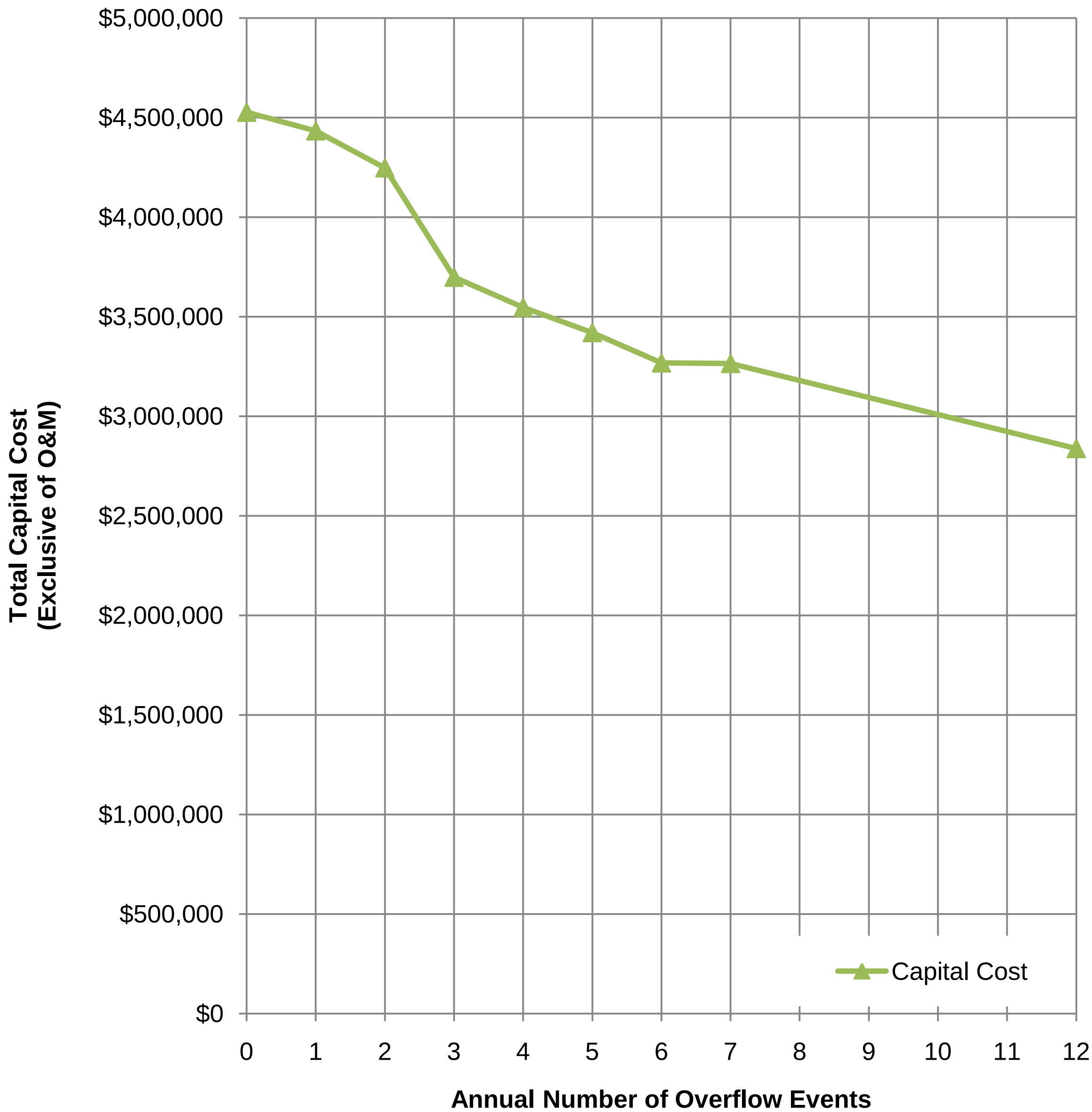


Figure 7-9 Cost-Benefit Curve – Rack 14

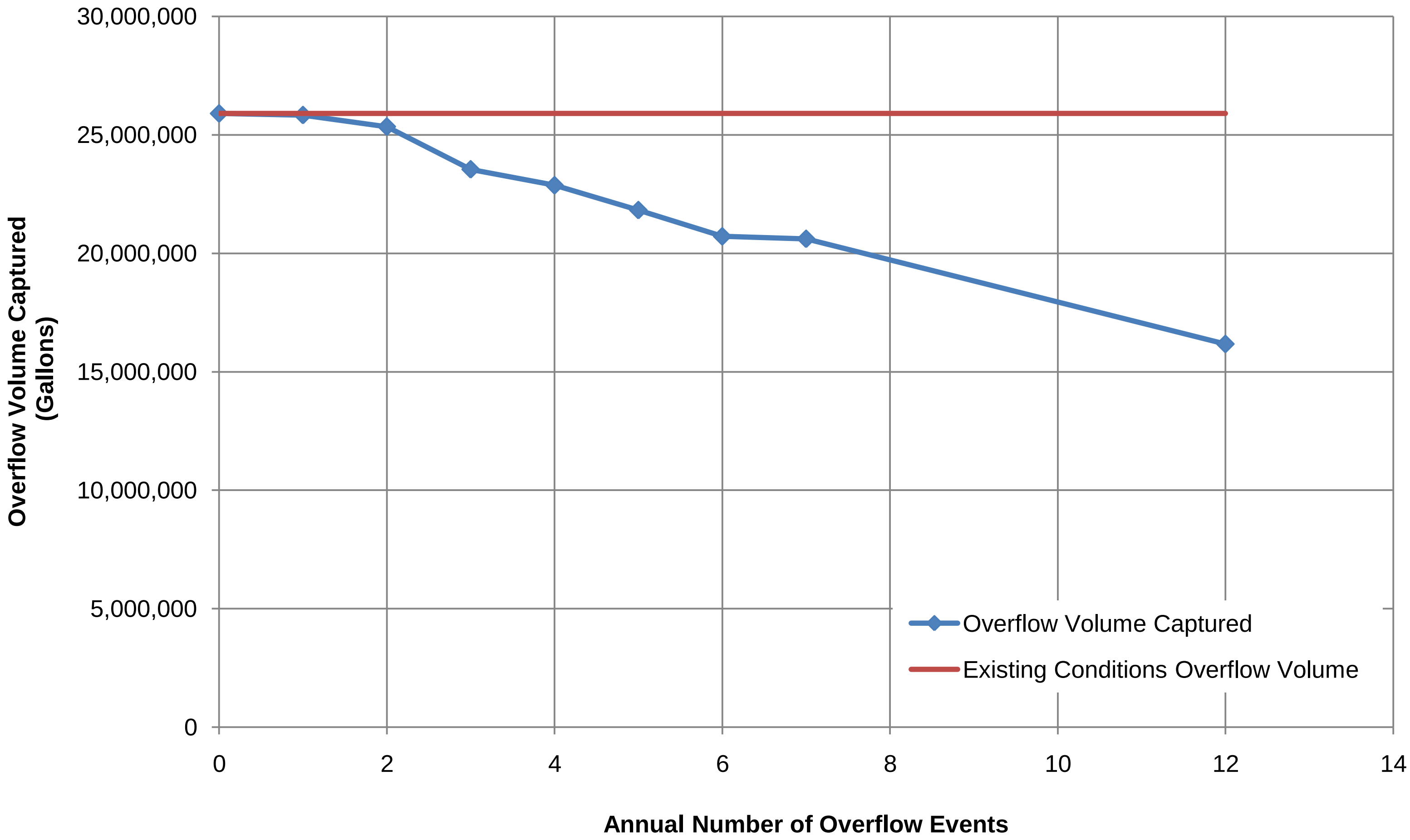


Figure 7-10 Overflow Volume Captured Curve – Rack 14

Table 7-6 Cost-Benefit Presentation Table for Rack 15

Alternative Description, Rack 15	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	1,446,246	$4,130,700	$15,350
Storage Basin - Opt 1	1	143,000	1,370,141	$4,016,700	$15,400
Storage Basin - Opt 2	2	203,000	1,353,000	$4,012,100	$15,430
Storage Basin - Opt 3	3	2,379,000	846,000	$3,200,100	$15,380
Storage Basin - Opt 4	4	3,075,000	744,000	$3,002,800	$15,360
Storage Basin - Opt 5	5	3,531,000	677,000	$2,890,400	$15,350
Storage Basin - Opt 6	6	4,676,000	507,000	$2,581,000	$15,330
Storage Basin - Opt 7	7	5,222,000	440,000	$2,430,100	$15,310
Storage Basin - Opt 8	12	8,005,000	237,000	$1,939,500	$15,250
Existing Conditions	45	14,700,000			

Revised values based on Adjusted 1994 Typical Year.

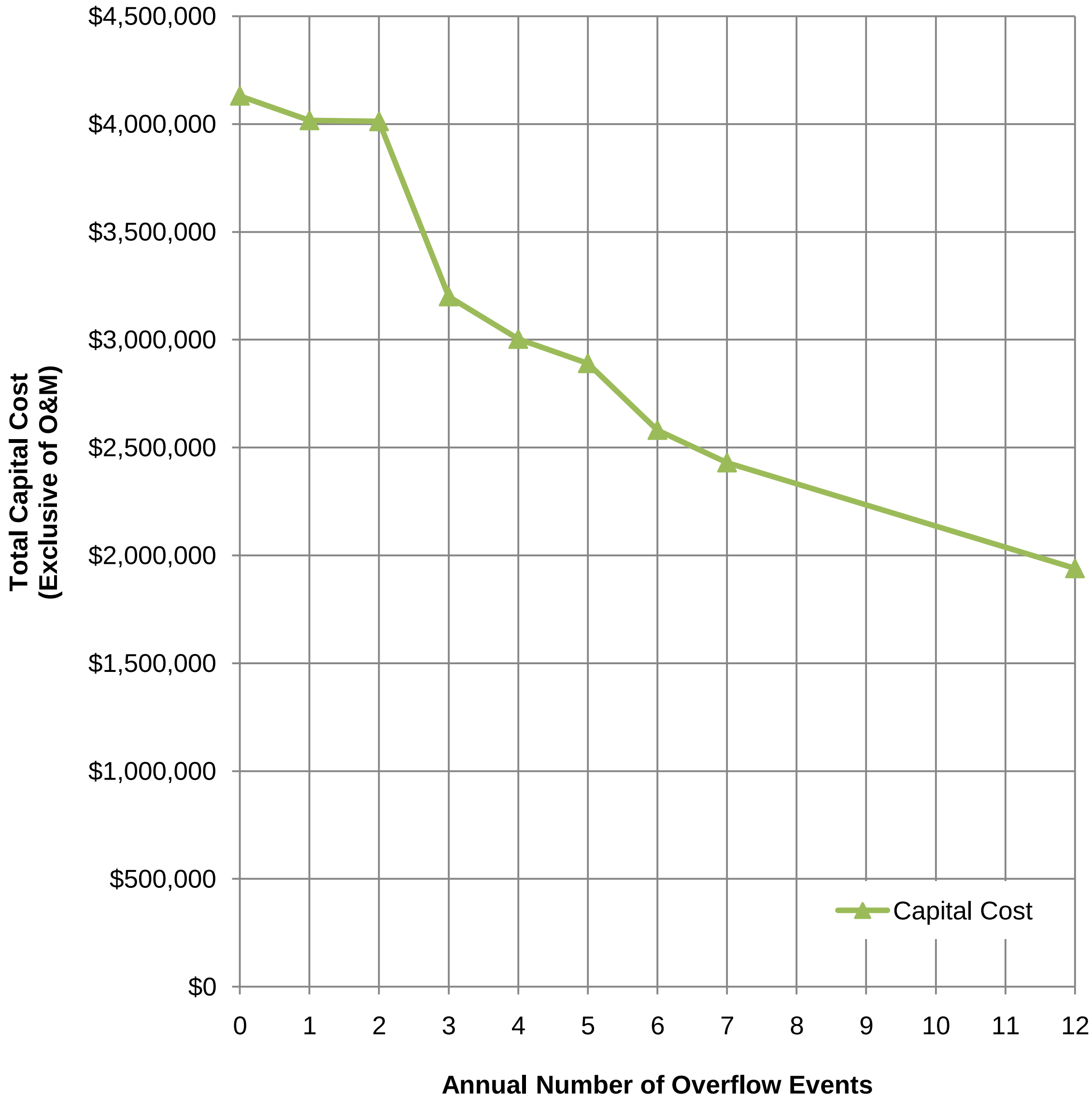


Figure 7-11 Cost-Benefit Curve – Rack 15

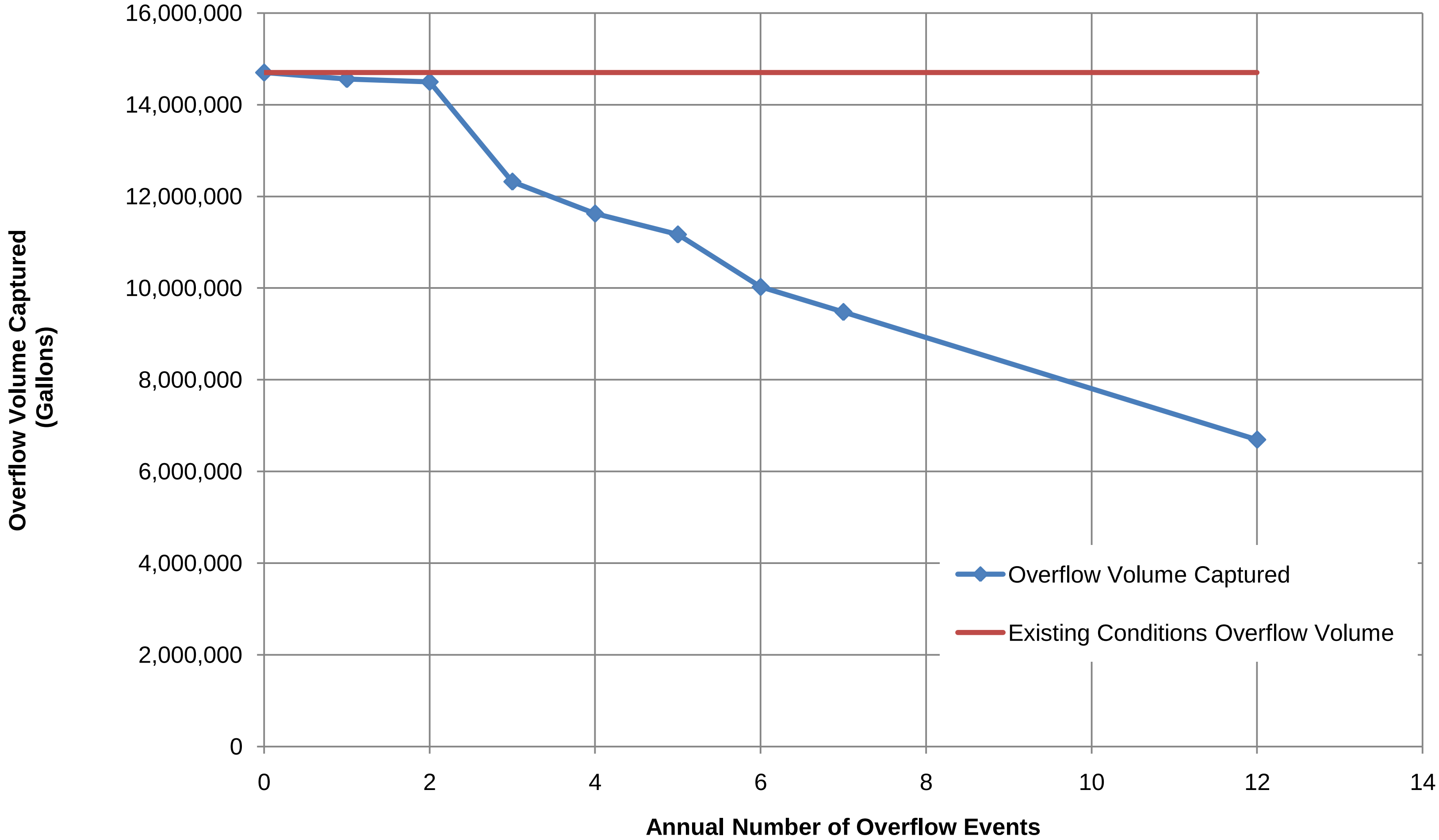


Figure 7-12 Overflow Volume Captured Curve – Rack 15

Table 7-7 Cost-Benefit Presentation Table for Rack 22

Alternative Description, Rack 22	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	2,424,446	$6,034,400	$6,920
Storage Basin - Opt 1	1	557,000	1,796,000	$5,107,000	$6,960
Storage Basin - Opt 2	2	2,132,000	1,257,000	$4,244,100	$6,920
Storage Basin - Opt 3	3	2,491,000	1,167,000	$4,109,500	$6,910
Storage Basin - Opt 4	4	3,883,000	898,000	$3,622,700	$6,880
Storage Basin - Opt 5	5	5,057,000	718,000	$3,284,100	$6,860
Storage Basin - Opt 6	6	7,556,000	359,000	$2,468,200	$6,800
Storage Basin - Opt 7	7	8,005,000	323,000	$2,389,600	$6,790
Storage Basin - Opt 8	12	10,698,000	90,000	$1,647,600	$6,730
Existing Conditions	20	12,200,000			

Revised values based on Adjusted 1994 Typical Year.

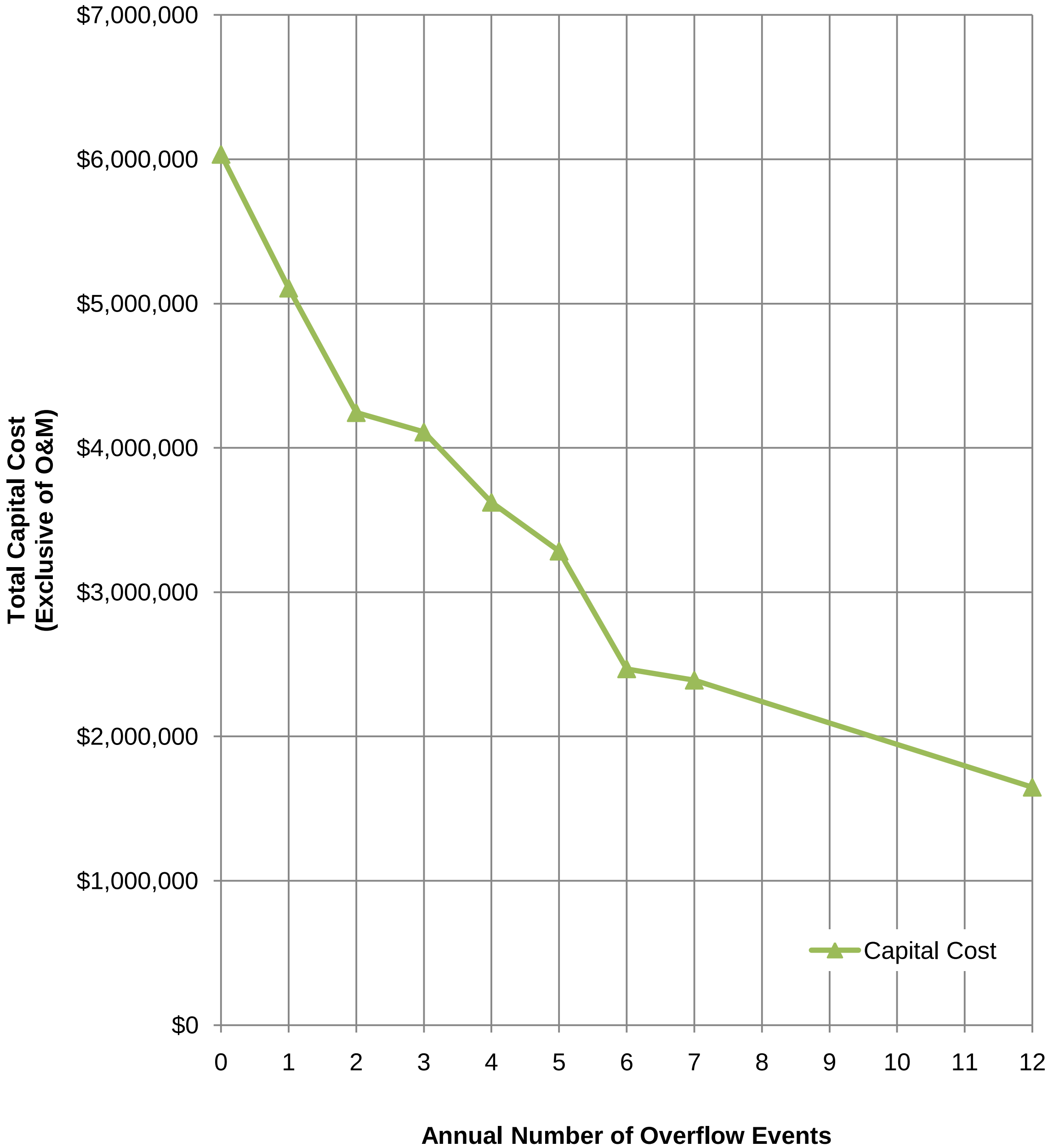


Figure 7-13 Cost-Benefit Curve – Rack 22

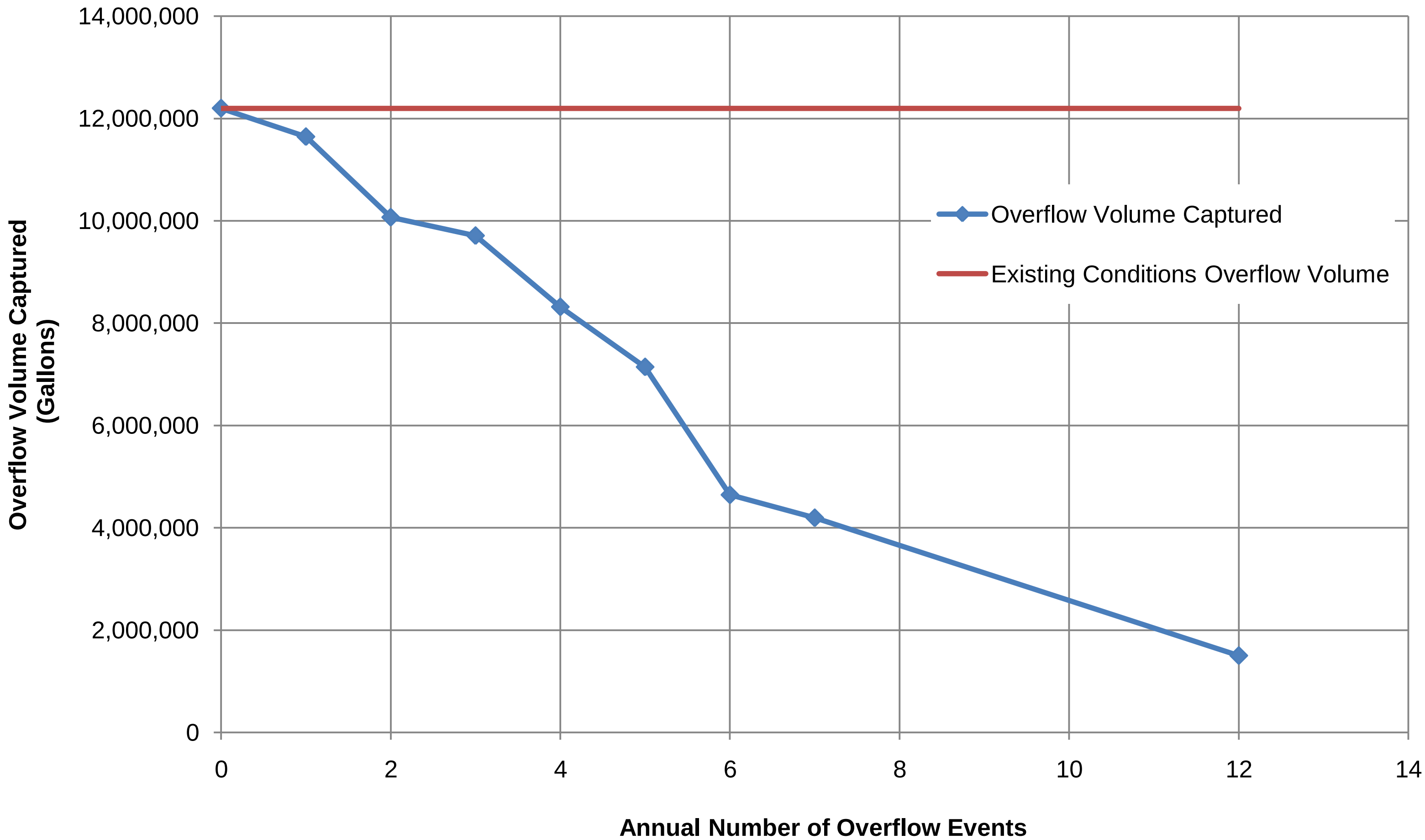


Figure 7-14 Overflow Volume Captured Curve – Rack 22

Table 7-8 Cost-Benefit Presentation Table for Rack 26/28

Alternative Description, Rack 26/28	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	2,296,669	$7,538,200	$16,500
Storage Basin - Opt 1	1	171,000	2,156,465	$7,378,000	$16,540
Storage Basin - Opt 2	2	221,000	2,133,766	$7,318,000	$16,600
Storage Basin - Opt 3	3	3,524,000	1,335,000	$6,019,000	$16,550
Storage Basin - Opt 4	4	5,341,000	1,068,000	$5,551,700	$16,510
Storage Basin - Opt 5	5	5,401,000	1,058,000	$5,547,800	$16,510
Storage Basin - Opt 6	6	7,705,000	721,000	$4,898,800	$16,460
Storage Basin - Opt 7	7	8,229,000	668,000	$4,775,500	$16,440
Storage Basin - Opt 8	12	12,269,000	374,000	$4,093,800	$16,350
Existing Conditions	48	23,600,000			

Revised values based on Adjusted 1994 Typical Year.

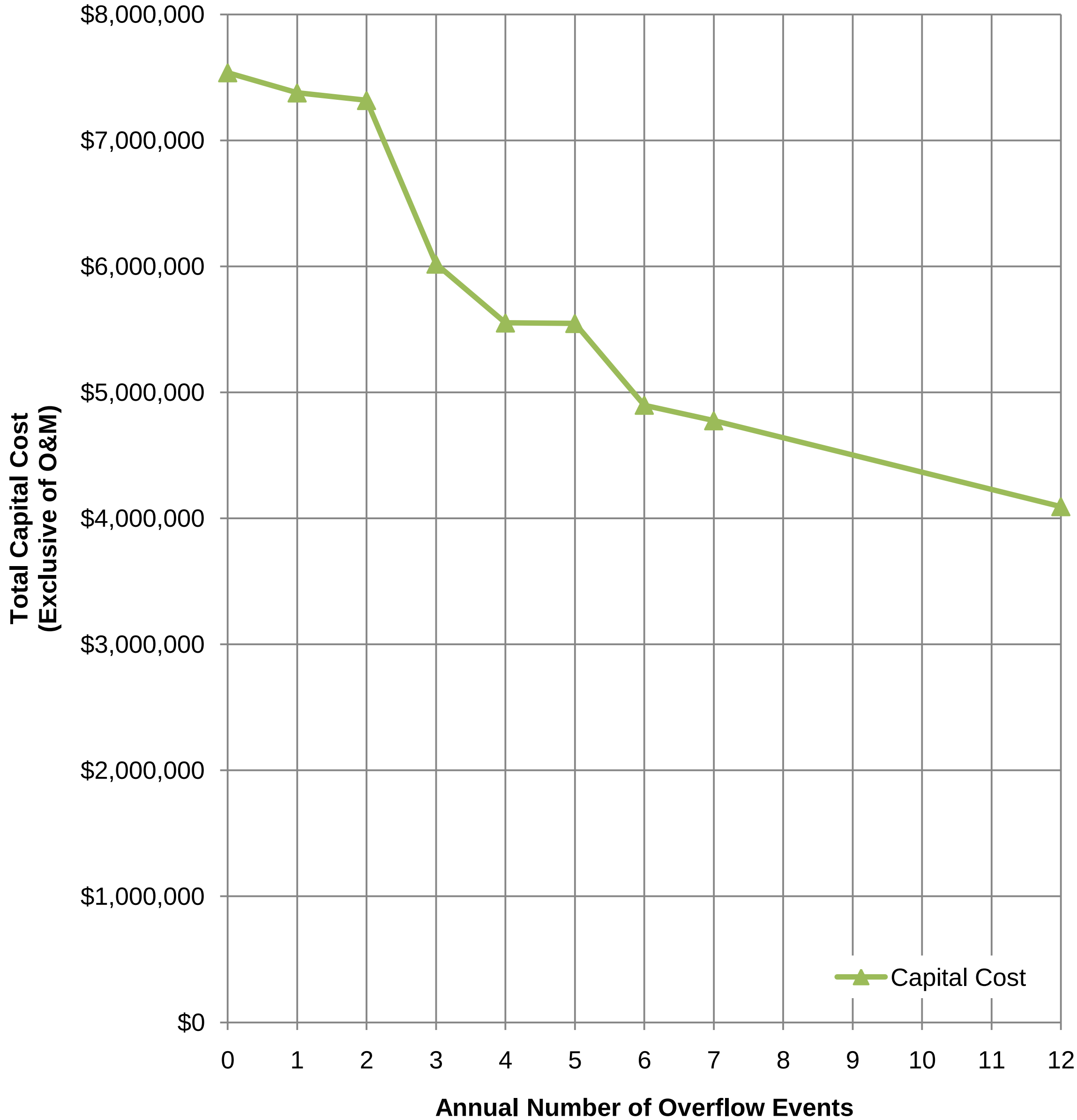


Figure 7-15 Cost-Benefit Curve – Rack 26/28

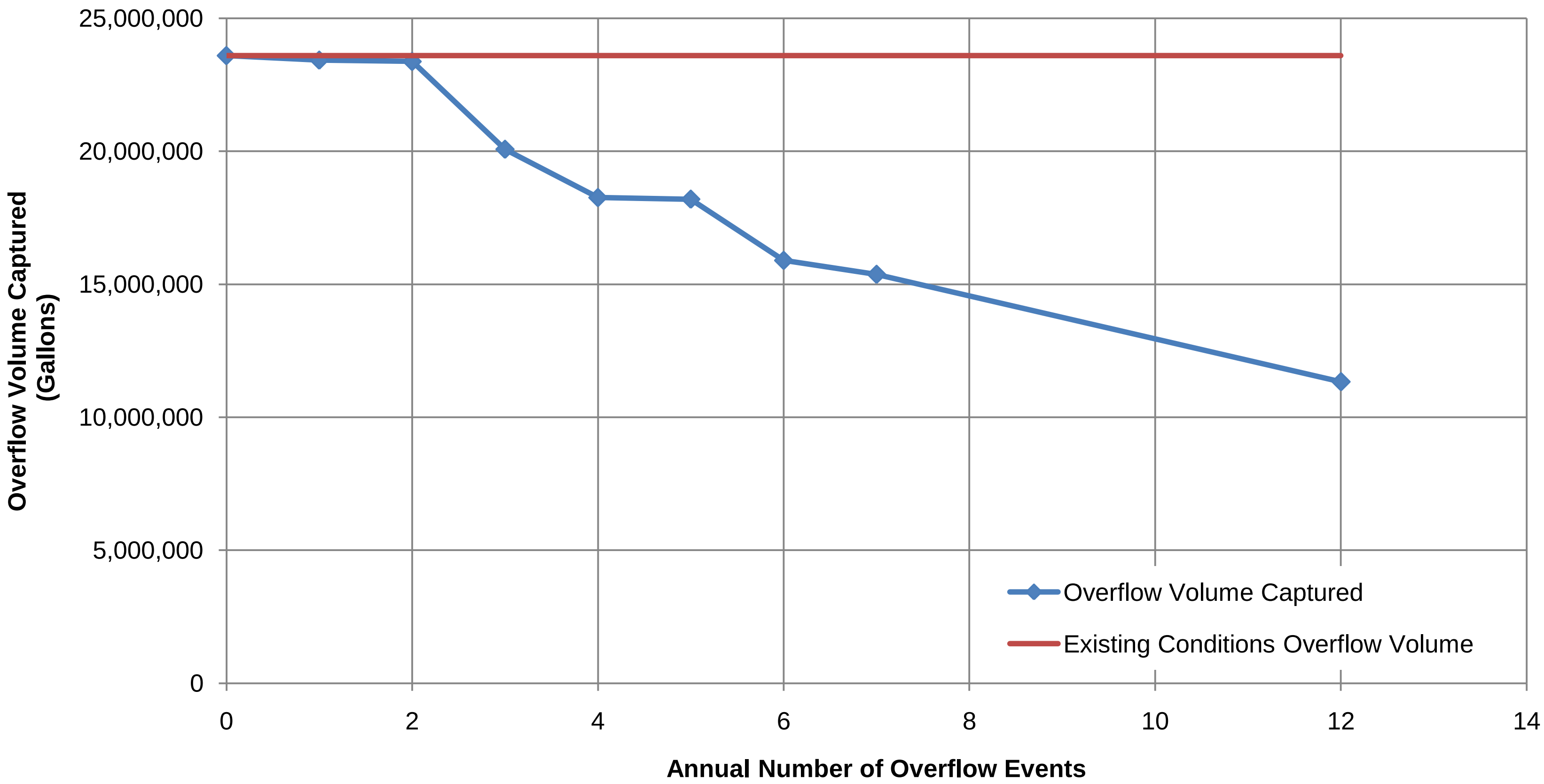


Figure 7-16 Overflow Volume Captured Curve – Rack 26/28

Table 7-9 Cost-Benefit Presentation Table for Rack 27/29

Alternative Description, Rack 27/29	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	1,290,276	$8,616,600	$15,010
Storage Basin - Opt 1	1	35,000	1,262,000	$8,524,000	$15,080
Storage Basin - Opt 2	2	47,000	1,247,862	$8,489,900	$15,100
Storage Basin - Opt 3	3	61,000	1,237,000	$8,458,600	$15,100
Storage Basin - Opt 4	4	1,182,000	1,010,000	$7,792,800	$15,070
Storage Basin - Opt 5	5	4,077,000	353,000	$5,884,900	$15,000
Storage Basin - Opt 6	6	4,788,000	328,000	$5,819,000	$15,000
Storage Basin - Opt 7	7	4,593,000	303,000	$5,753,000	$15,000
Storage Basin - Opt 8	12	6,045,000	151,000	$5,308,800	$14,960
Existing Conditions	44	12,600,000			

Revised values based on Adjusted 1994 Typical Year.

Figure 7-17 Cost-Benefit Curve – Rack 27/29

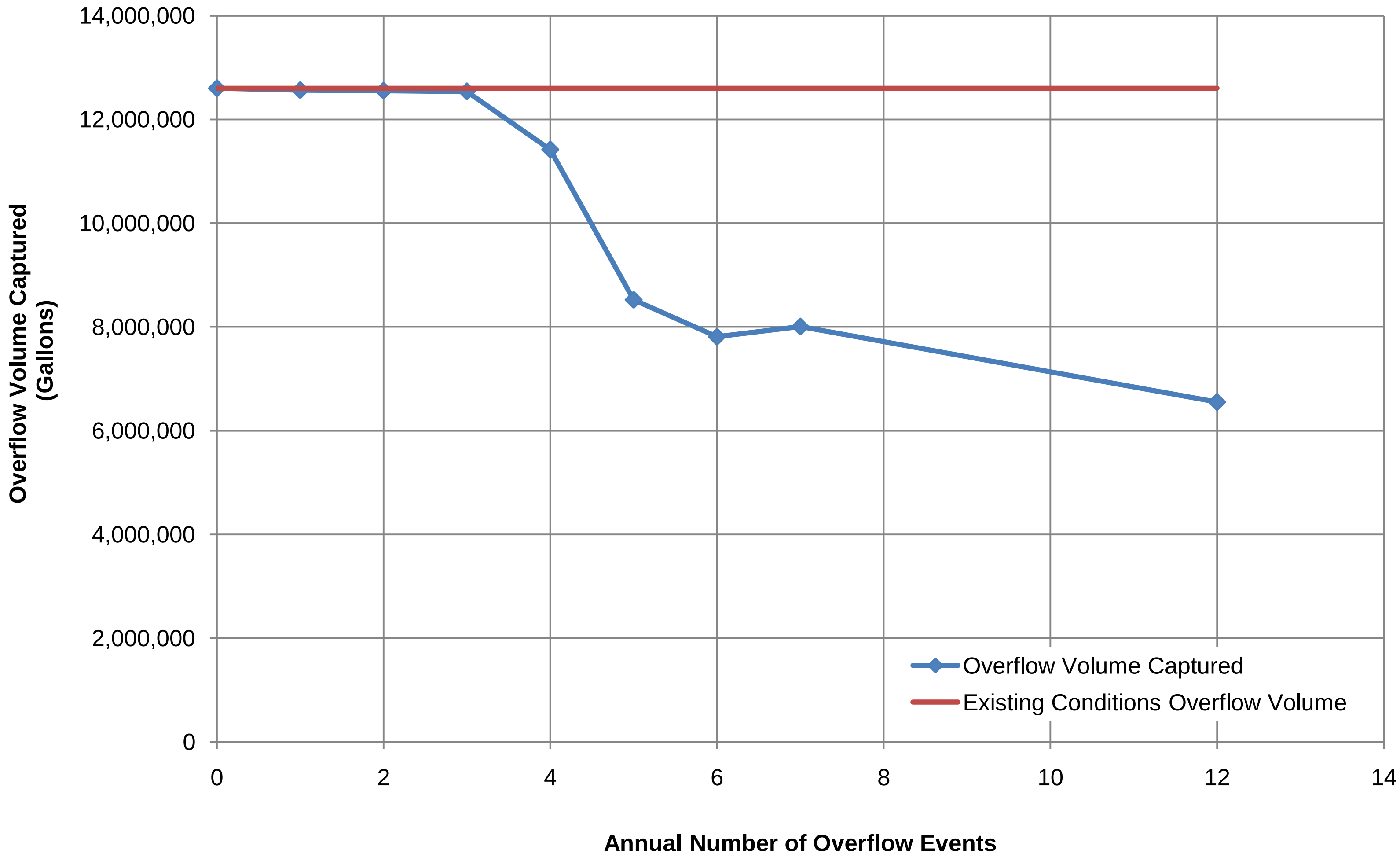


Figure 7-18 Overflow Volume Captured Curve – Rack 27/29

Table 7-10 Cost-Benefit Presentation Table for Rack 36

Alternative Description, Rack 36	Benefits		Size of Storage Basin (gallons)	Capital Cost (dollars)	Annual O&M Cost (dollars)
	Number of Overflows in a Typical Year	Volume of Overflows (gallons)			
Storage Basin - Opt 0	0	0	1,133,074	$4,467,200	$12,260
Storage Basin - Opt 1	1	146,000	848,000	$3,824,800	$12,280
Storage Basin - Opt 2	2	279,000	788,000	$3,676,800	$12,270
Storage Basin - Opt 3	3	1,032,000	606,000	$3,233,200	$12,260
Storage Basin - Opt 4	4	1,751,000	485,000	$2,922,100	$12,240
Storage Basin - Opt 5	5	2,155,000	424,000	$2,774,400	$12,230
Storage Basin - Opt 6	6	2,573,000	364,000	$2,597,500	$12,220
Storage Basin - Opt 7	7	3,449,000	242,000	$2,228,100	$12,200
Storage Basin - Opt 8	12	5,110,000	118,000	$1,754,800	$12,160
Existing Conditions	36	7,900,000			

Revised values based on Adjusted 1994 Typical Year.

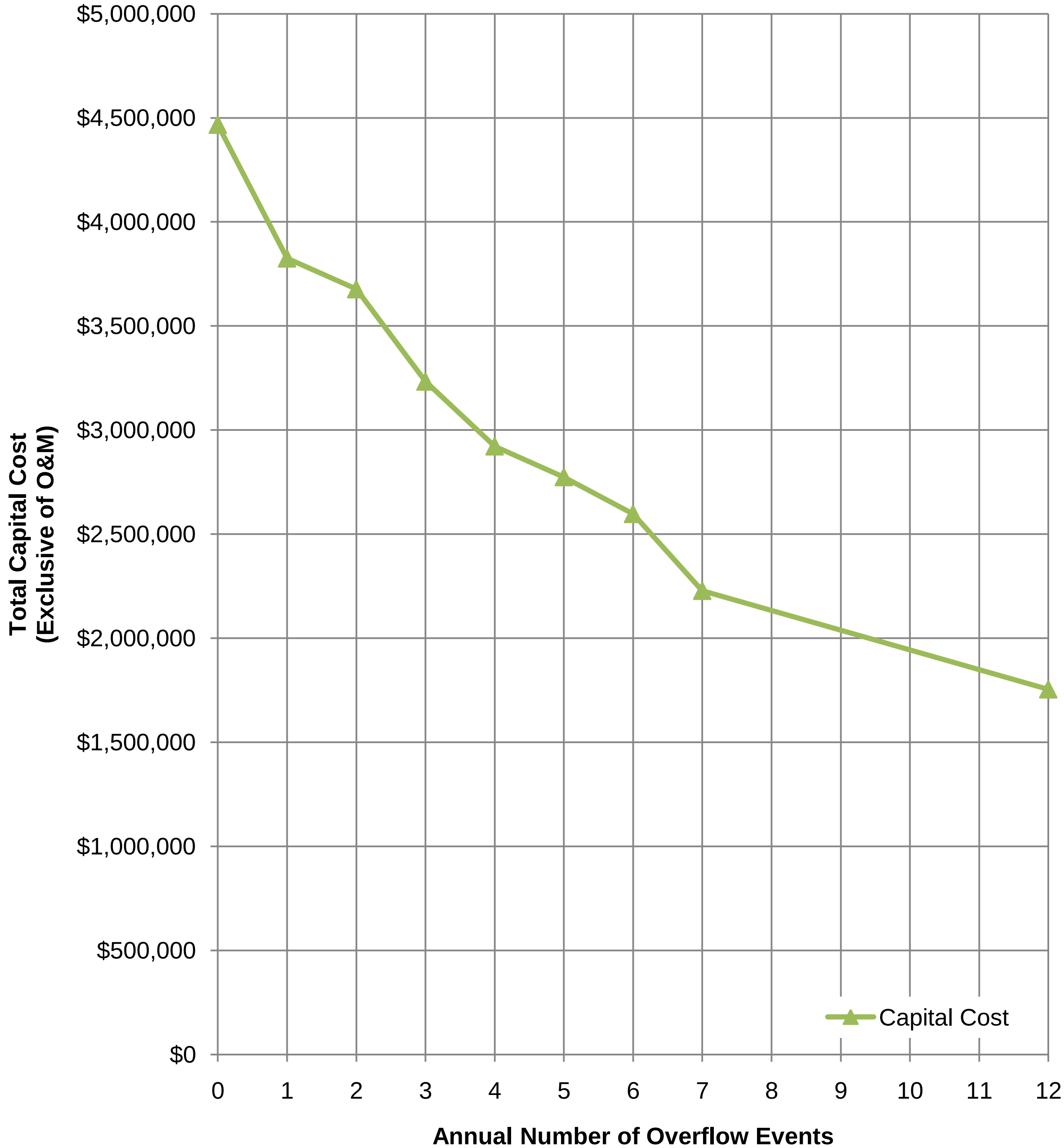


Figure 7-19 Cost-Benefit Curve – Rack 36

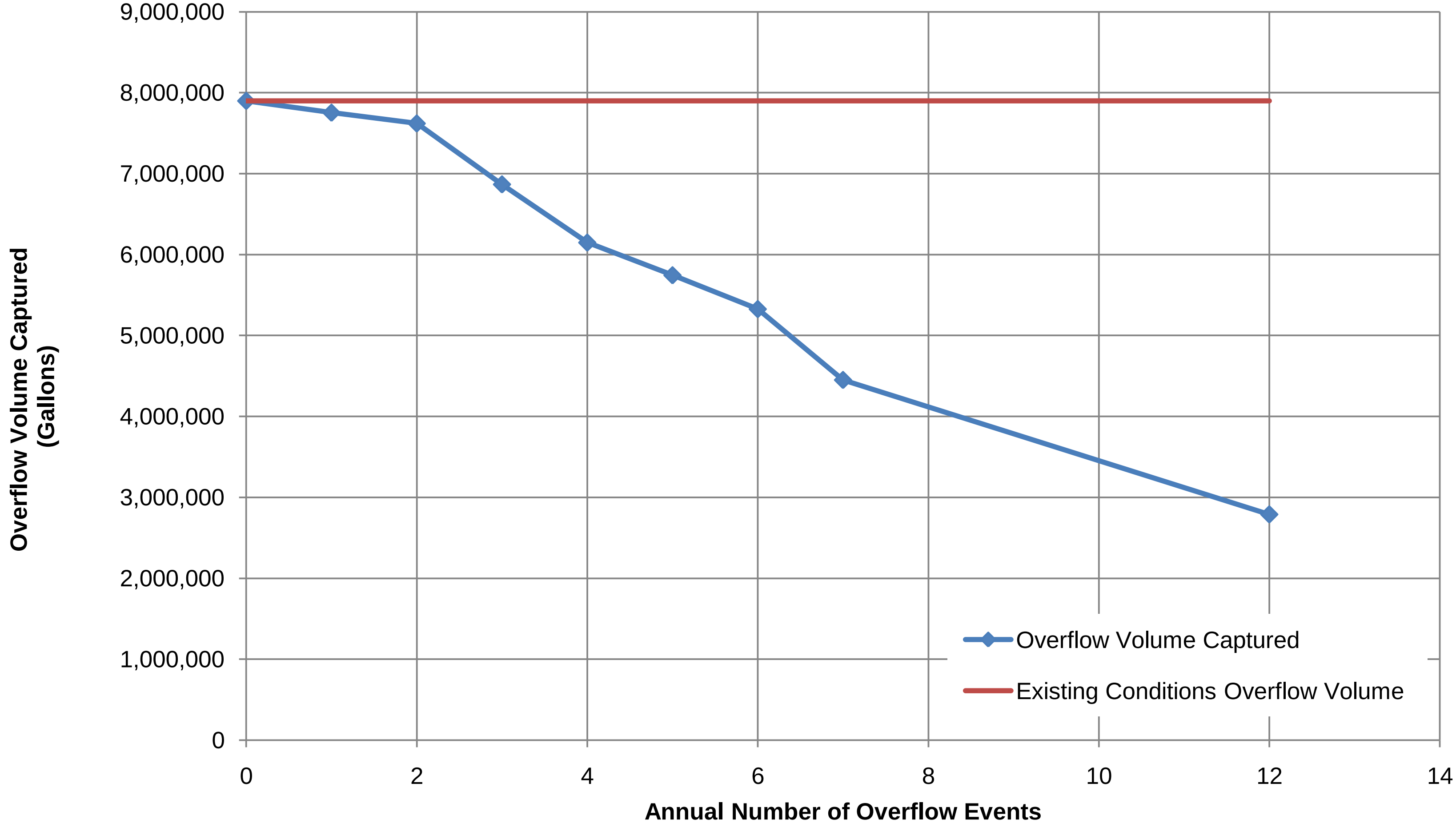


Figure 7-20 Volume Overflow Captured Curve – Rack 36

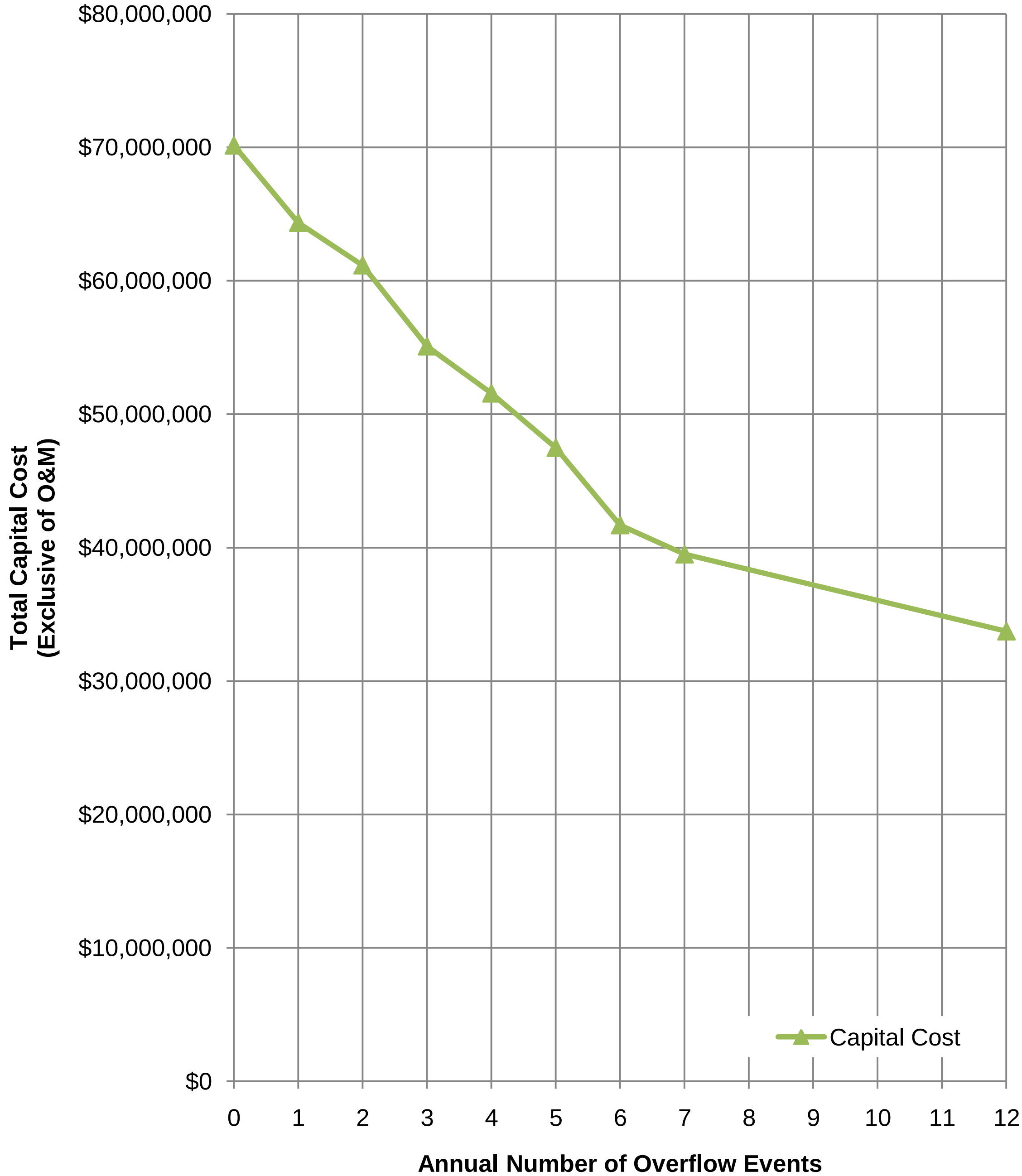


Figure 7-21 Cost-Benefit Curve – All Racks

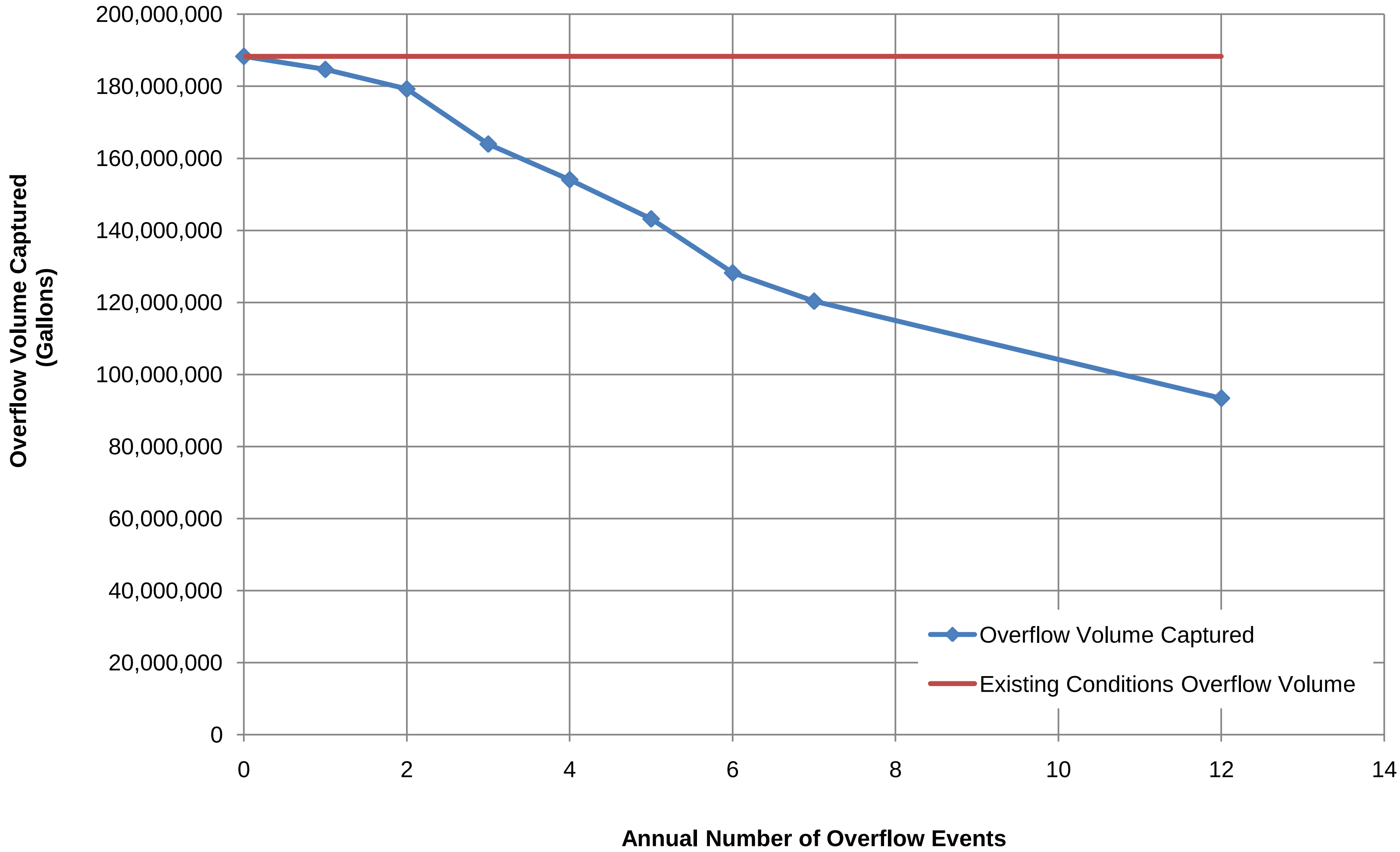


Figure 7-22 Overflow Volume Captured Curve – All Racks

7.3 Ohio Canal Interceptor Tunnel

Similar to information developed for the storage basins, the City prepared cost-benefit data for the Ohio Canal Interceptor Tunnel. Costs and corresponding benefits were evaluated over the same levels of control as CSO racks. Additionally, the City developed cost-benefit information for enhanced high rate treatment (EHRT) of the tunnel overflow for each scenario.

Table 7-11 provides the following information for the Ohio Canal Interceptor Tunnel:

- Number of overflows in a typical year
- Gallons of overflow
- Tunnel size (available storage volume and diameter)
- Tunnel capital construction costs
- Annual Operations and Maintenance (O&M) costs
- Treatment unit size to treat remaining tunnel overflows
- EHRT capital construction costs
- EHRT annual O&M costs

Figure 7-23 illustrates the cost-benefit curves for the Ohio Canal Interceptor Tunnel with and without additional treatment. Figure 7-24 illustrates the overflow volume curve for the Ohio Canal Interceptor Tunnel without treatment.

Table 7-11 Cost-Benefit Presentation Table for the Ohio Canal Interceptor Tunnel

Alternative Description	Tunnel Benefits		Size of Tunnel		Tunnel Cost (dollars)[2]		Size of Treatment to Treat Tunnel Overflow (gallons per minute)	Cost of Treatment to Treat Tunnel Overflow (dollars)[2]	
	Number of Tunnel Overflows in a Typical Year	Volume of Tunnel Overflows (gallons)	Gallons	Dimensions (diameter and length, ft)[1]	Capital	Annual O&M		Capital	Annual O&M
Tunnel/EHRT - Opt 0	0	-	74,100,000	Two at 33.9	$440,700,000	$1,110,000	-	$0	$0
Tunnel/EHRT - Opt 1	1	35,135,000	55,100,000	Two at 29.3	$359,700,000	$907,000	302,000	$73,700,000	$17,000
Tunnel/EHRT - Opt 2	2	83,267,000	40,500,000	35.5	$266,000,000	$673,000	302,000	$73,700,000	$39,000
Tunnel/EHRT - Opt 3	3	119,333,000	24,500,000	27.7	$183,900,000	$467,000	488,000	$107,700,000	$56,000
Tunnel/EHRT - Opt 4	4	135,765,000	22,100,000	26.3	$174,100,000	$443,000	488,000	$107,700,000	$64,000
Tunnel/EHRT - Opt 5	5	188,059,000	15,700,000	22.3	$146,800,000	$375,000	488,000	$107,700,000	$89,000
Tunnel/EHRT - Opt 6	6	231,429,000	11,400,000	19.1	$127,700,000	$327,000	488,000	$107,700,000	$109,000
Tunnel/EHRT - Opt 7	7	237,111,000	10,900,000	18.7	$125,500,000	$321,000	488,000	$107,700,000	$112,000
Tunnel/EHRT - Opt 8	12	317,835,000	5,300,000	13.4	$97,500,000	$251,000	488,000	$108,000,000	$150,000
Existing Conditions	50	443,300,000							

Adjusted 1994 Typical Year

Notes:

(1) PRELIMINARY, FOR RELATIVE COMPARISONS ONLY. Represents tunnel diameter for a fixed tunnel length of 5,550 feet to achieve required storage volume with 4-foot inner dry-weather flow conduit.

(2) January 2010 Dollars (ENRCCI=8660).

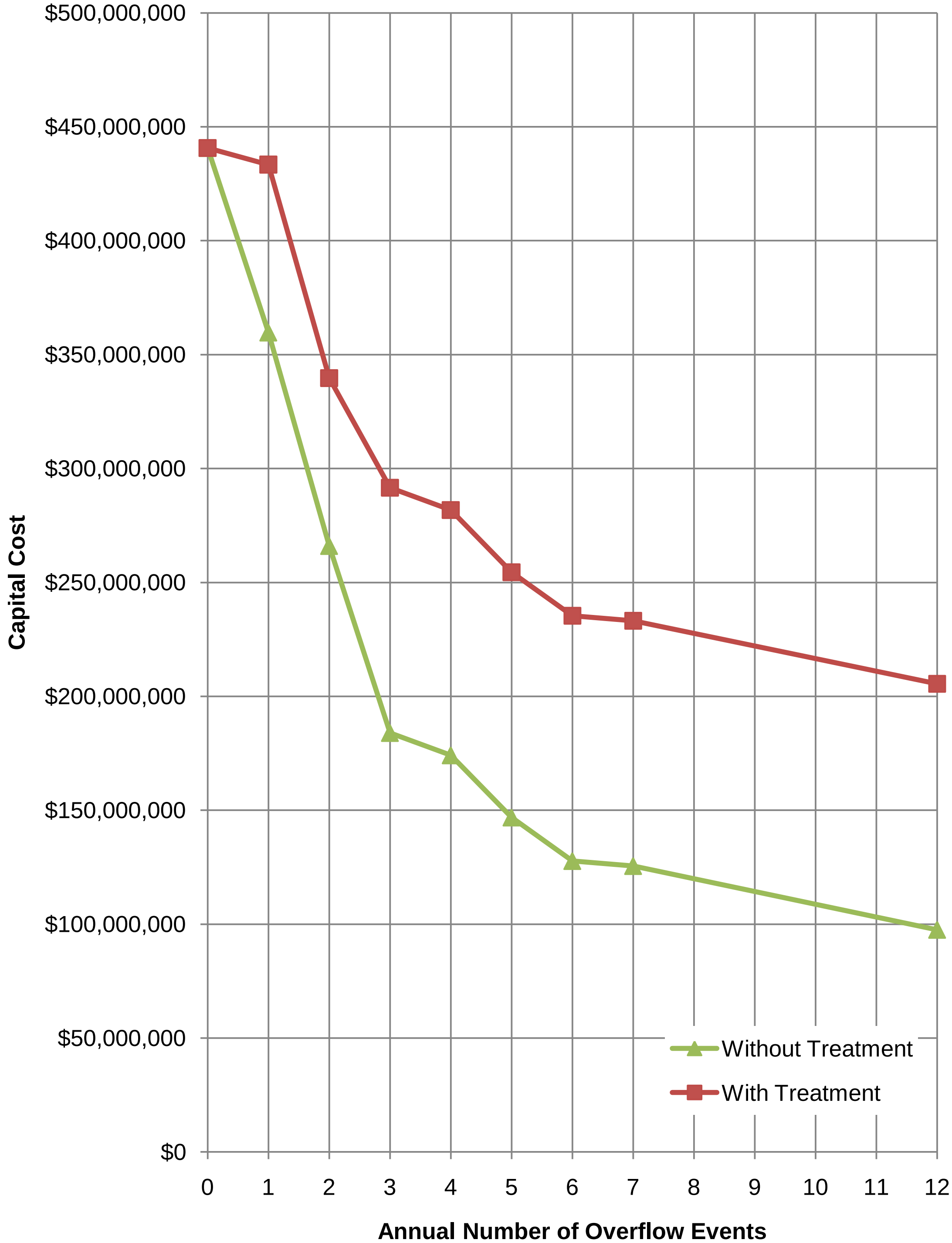


Figure 7-23 Cost-Benefit Curve – Ohio Canal Interceptor Tunnel

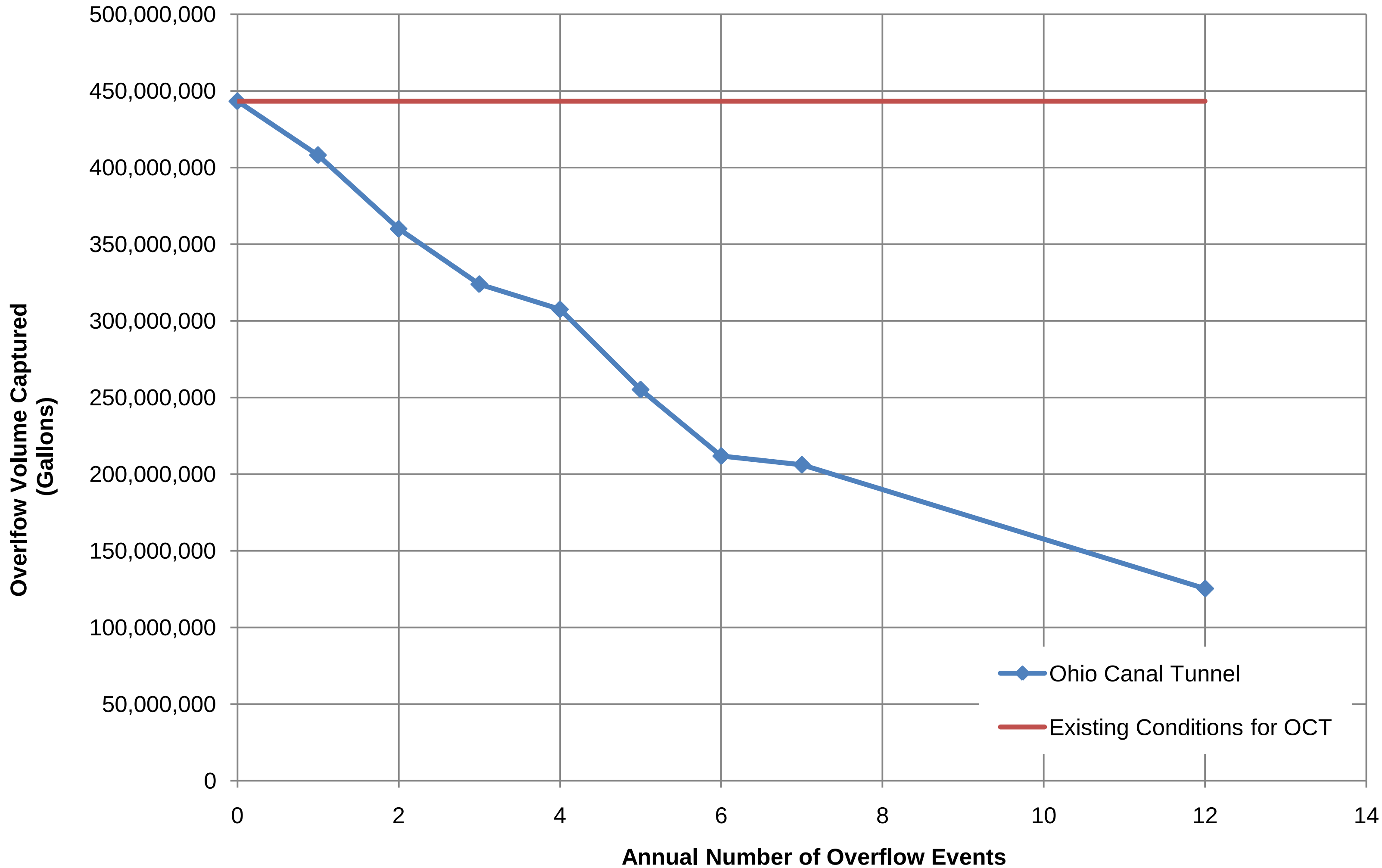


Figure 7-24 Overflow Volume Captured Curve – Ohio Canal Interceptor Tunnel (without treatment)

7.4 Northside Interceptor Tunnel

Table 7-12 and Figure 7-25 present cost-benefit information for the Northside Interceptor (NSI) Tunnel. Note that this information includes combined controls for Racks 32-35 as well as the remaining Cuyahoga Street Storage Facility (CSSF) overflow.

The overflow volume from the CSSF, *i.e.,* the Rack 31/40 storage facility, is impacted by the operation of the upstream storage basins. This in turn affects the size of the NSI Tunnel. The upstream, proposed storage basins were assumed to be dewatered within 24-48 hours. For larger events, that causes the total volume directed to the NSI Tunnel to increase because the upstream storage facilities are dewatering while the CSSF overflow is still active. The NSI Tunnel was sized for this conservative dewatering scenario.

The City also developed cost-benefit information for enhanced high rate treatment (EHRT) of remaining tunnel overflows for each scenario.

7.5 LTCP System Performance

To determine which Long Term Control Plan is at the knee-of-the-curve (KOC), cost-benefit curves were calculated for the sum of all the LTCP projects. The overall system performance is important to consider because the storage basins and OCI Tunnel control structures influence the required NSI Tunnel diameter, thereby affecting its cost and overflow volume. The LTCP total shown in Figures 7-26 to 7-29 was calculated by summing the capital cost, overflow volume captured, and overflow volume remaining from the storage basins, NSI Tunnel, and OCI Tunnel. The cost per volume captured shown in Figure 7-30 was calculated by dividing the total capital cost by the total volume captured for each level of control. The knee of the curve in each graph is the 3-3-3 LTCP alternative.

Table 7-12 Cost-Benefit Presentation Table for the Northside Interceptor Tunnel Combined Control for Racks 32-35 and Remaining Rack 40 Overflows

Alternative Description	System Control Level[(1)]	Tunnel[(2)] Benefits		Size of Tunnel		Tunnel Cost (dollars)[(4)]		Size of Treatment to Treat Tunnel Overflow (gallons per minute)[(5)]	Cost of Treatment to Treat Tunnel Overflow (dollars)[(4)]	
		Number of Tunnel Overflows in a Typical Year	Volume of Tunnel Overflows (gallons)	Gallons	Dimensions (diameter and length, ft)[(3)]	Capital	Annual O&M		Capital	Annual O&M
Tunnel/EHRT - Opt 0	0-0-0	0	-	157,600,000	Two at 37.0	$657,000,000	$2,144,000	-	$0	$0
Tunnel/EHRT - Opt 1	1-1-1	1	27,500,000	74,600,000	36.0	$347,900,000	$1,238,000	87,000	$35,800,000	$147,000
Tunnel/EHRT - Opt 2	2-2-2	2	58,100,000	51,800,000	30.0	$276,200,000	$977,000	114,000	$52,000,000	$341,000
Tunnel/EHRT - Opt 3	3-3-3	3	122,500,000	20,800,000	19.0	$153,800,000	$463,000	136,000	$68,900,000	$657,000
Tunnel/EHRT - Opt 4	4-4-4	4	146,700,000	9,700,000	13.0	$105,500,000	$313,000	136,000	$70,800,000	$694,000
Tunnel/EHRT - Opt 5	5-5-5	5	146,200,000	7,000,000	11.0	$91,400,000	$266,000	136,000	$71,400,000	$705,000
Tunnel/EHRT - Opt 6	6-6-6	6	164,200,000	5,200,000	9.5	$81,200,000	$234,000	170,000	$85,600,000	$828,000
Tunnel/EHRT - Opt 7	7-7-7	7	168,500,000	4,200,000	8.5	$74,500,000	$212,000	170,000	$85,900,000	$835,000
Tunnel/EHRT - Opt 8	12-12-12	12	168,100,000	2,400,000	6.5	$61,700,000	$173,000	170,000	$86,300,000	$842,000

Adjusted 1994 Typical Year

(1) The information in this table represents a single system control level. For example, a System Control Level of 3-3-3 represents 3 overflows from the storage basins, 3 overflows from the Ohio Canal Interceptor (OCI) Tunnel, and 3 overflows from the Northside Interceptor (NSI) Tunnel. A change in the scenario assumptions (e.g., a mix of control levels at upstream racks, and/or a change in dewatering assumptions) would change the projected performance of the Cuyahoga Street Storage Facility and NSI Tunnel.
(2) "Tunnel" refers to combined facility to control Racks 32-35 and remaining CSSF overflows. Pump station costs are distributed between the tunnel and treatment system based on the volume stored versus volume treated.
(3) PRELIMINARY, FOR RELATIVE COMPARISONS ONLY. Represents tunnel diameter for a fixed tunnel length of 10,000 feet to achieve required storage volume with 3.5-foot inner dry-weather flow conduit.
(4) January 2010 Dollars (ENRCCI=8660).
(5) Size of treatment is based on peak flow rates from the CSSF and NSI Tunnel.

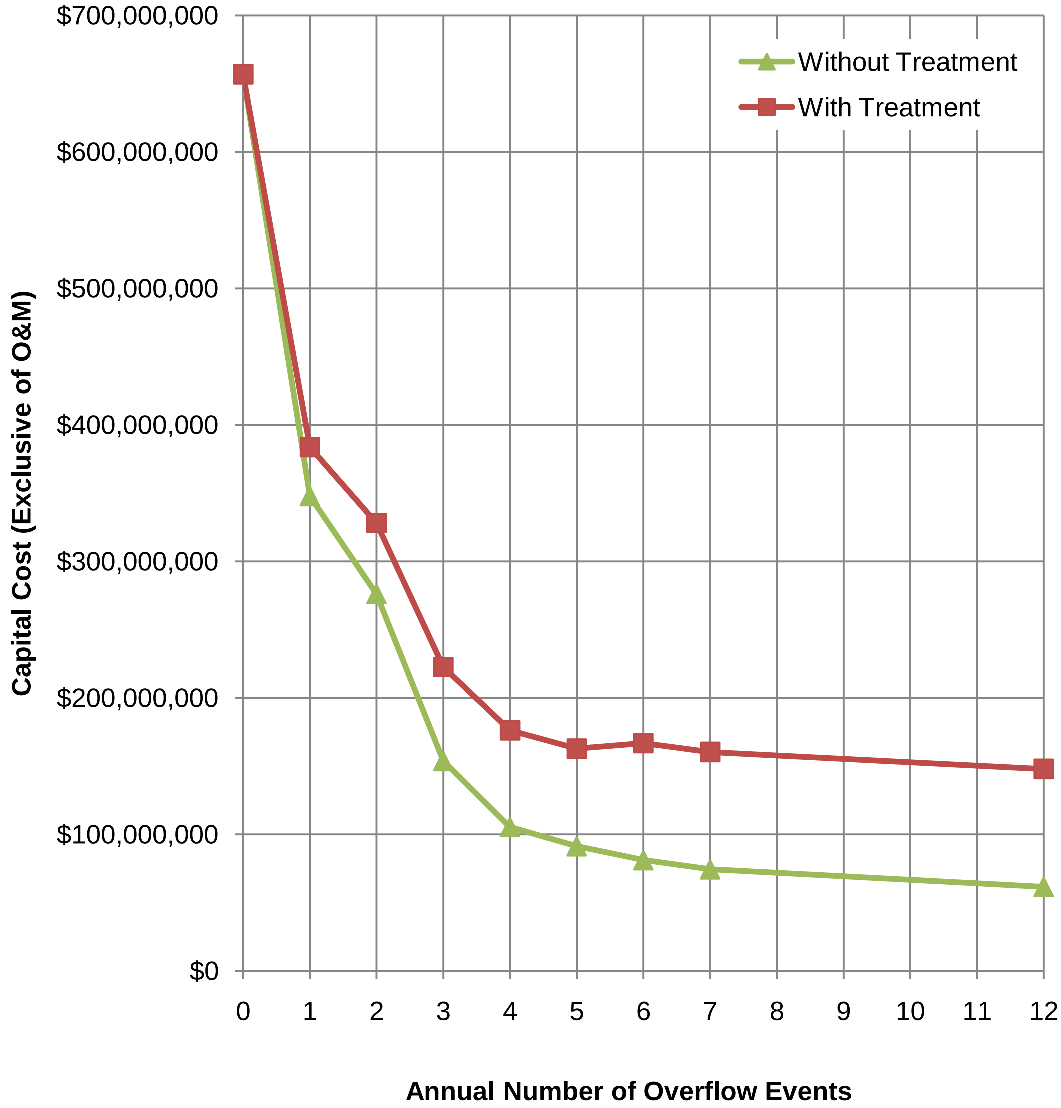


Figure 7-25 Cost-Benefit Curve – Northside Interceptor Tunnel

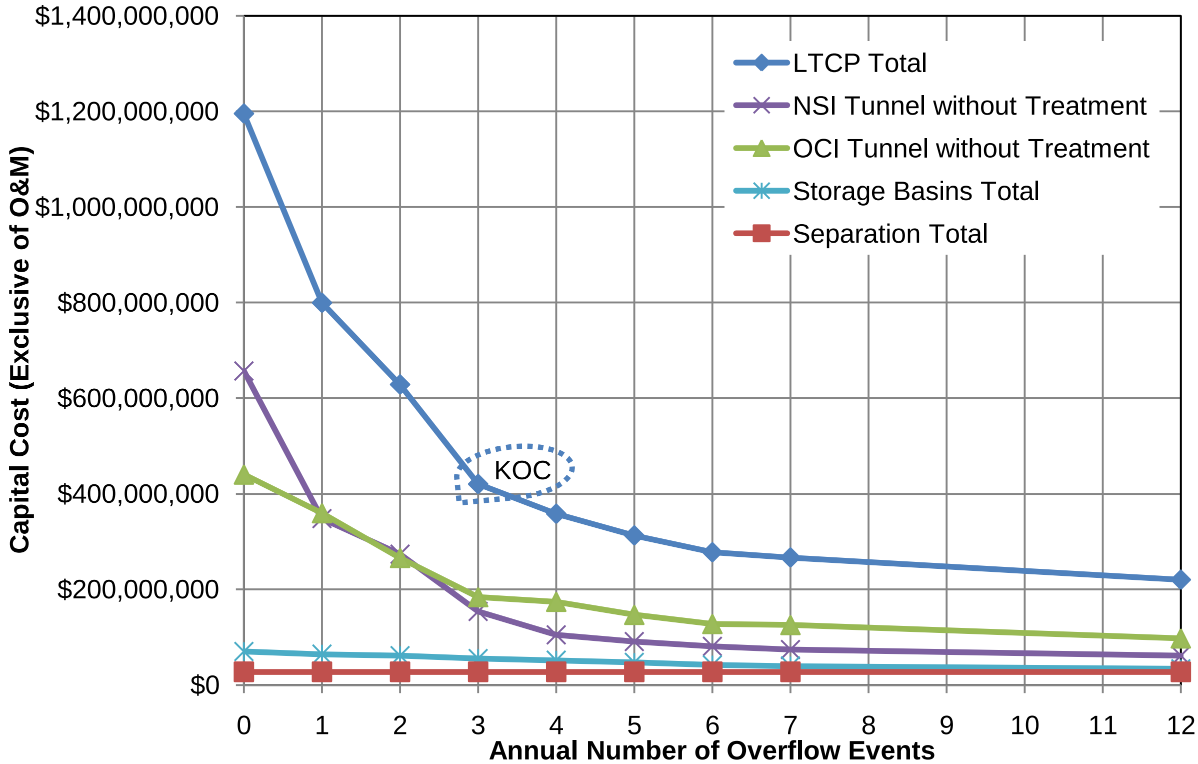


Figure 7-26 Cost-Benefit Curves – All LTCP Projects

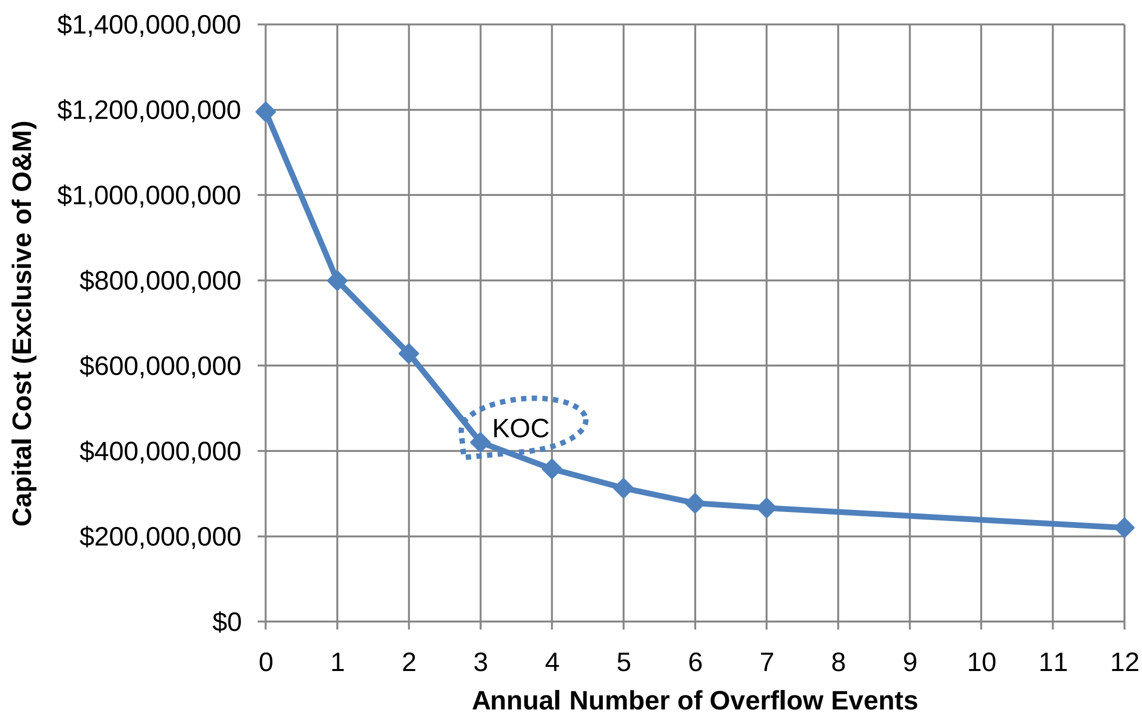


Figure 7-27 Cost-Benefit Curve – Sum of all LTCP Projects

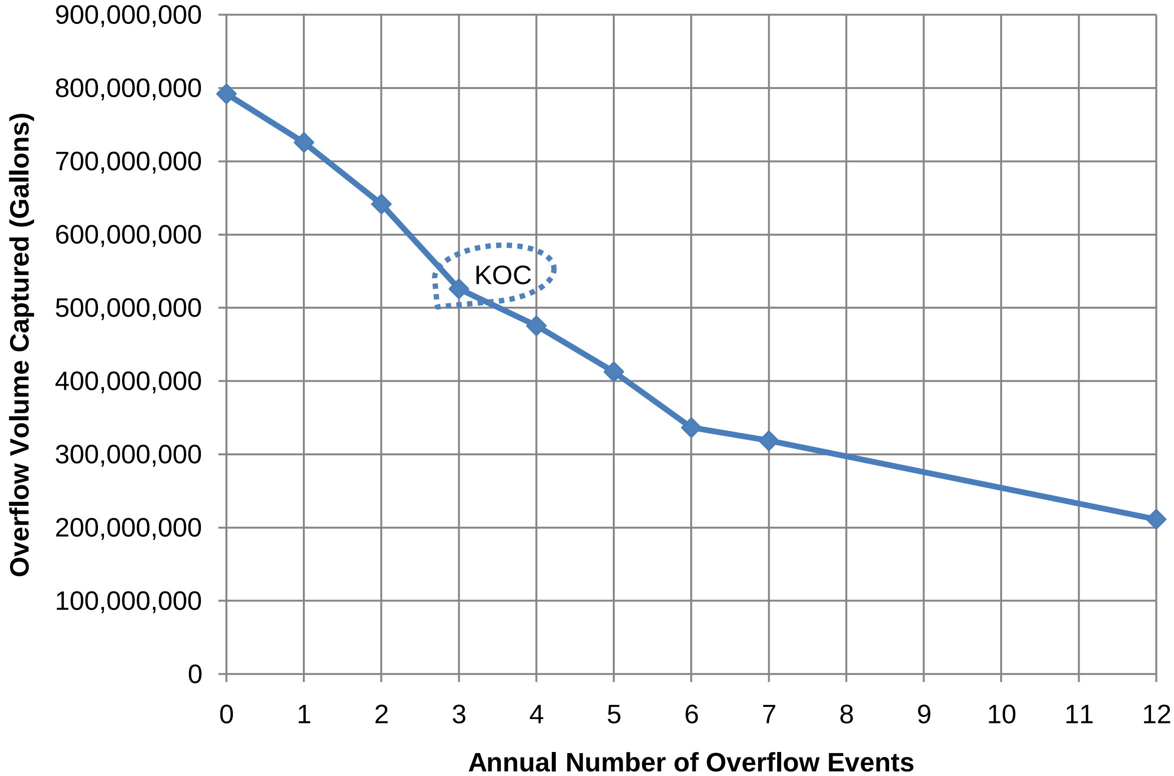


Figure 7-28 Overflow Volume Captured Curve – Sum of all LTCP Projects

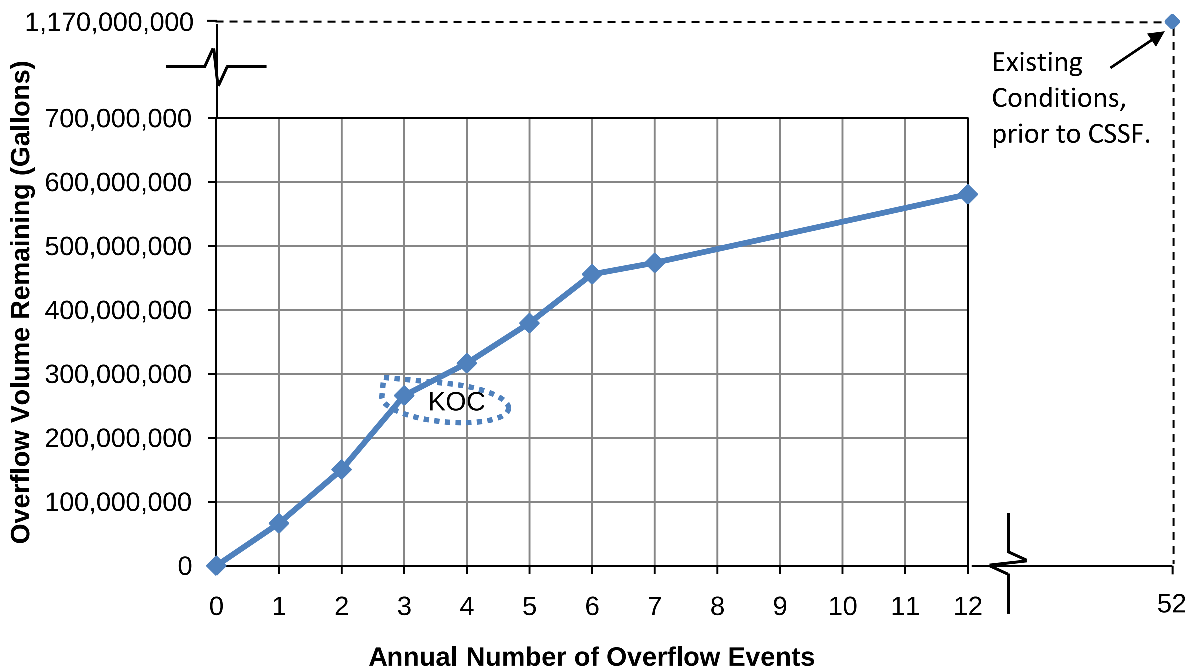


Figure 7-29 Overflow Volume Remaining Curve – Sum of all LTCP Projects

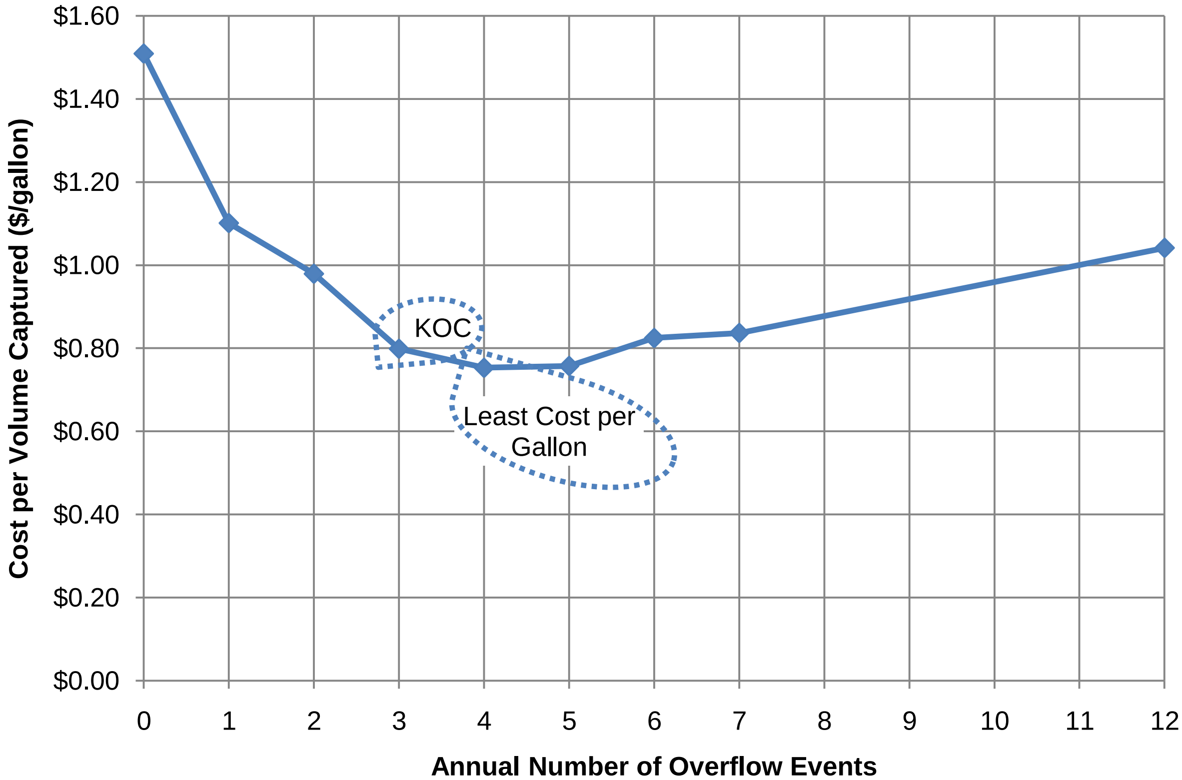


Figure 7-30 Cost per Volume Captured Curve – LTCP Total

Table 7-13 Annual Overflow Duration for Selected Control Levels

Number of Activations		12	6	3
Northside Interceptor Tunnel	Hrs	133	114	71
	Days	5.5	4.7	3.0
Ohio Canal Interceptor Tunnel	Hrs	110	89	66
	Days	4.6	3.7	2.7

7.6 Cost Performance of EHRT

EHRT facilities were evaluated at the end of each tunnel to treat remaining overflows. Facility sizes and costs were presented in Tables 7-11 and 7-12 for the range of activations evaluated. Actual hours of operation for these facilities are shown in Table 7-13. As shown, the hours or days of actual facility operation are very low when compared to their high cost. Many of the activations for these storms are only 1 or 2 hours long.

In addition to the limited hours of operation vs. the high cost, EHRTs are designed to address pollutants such as solids and BOD. As presented in the water quality discussions (Section 2.2), the main pollutant of concern is bacteria. Dissolved oxygen in the receiving streams currently meets water quality standards.

The impact of EHRT on the duration of receiving water bacteria concentrations above the water quality criteria during the typical year was evaluated to develop further information on the cost-effectiveness of including EHRT in the LTCP. For several activation levels, the cost per additional hour below the water quality criteria was calculated. Cost-effectiveness was evaluated based on the estimated capital cost of the facilities compared against the predicted number of additional hours when bacteria concentrations system-wide are below the water quality criteria. The additional hours were calculated by comparing typical year water quality modeling simulations to the E. coli water quality criteria of 298#/100mL and 523#/100mL at the six modeled points along the Cuyahoga River, Little Cuyahoga River, and Ohio Canal. The results, summarized in Table 7-14, show that for a given activation level, the addition of EHRT results in a substantially higher cost per additional hour below the water quality criteria. For example, at the six overflow per year level of control, expenditure of $193 Million (see Tables 7-11 and 7-12) to add EHRT to the LTCP to treat remaining overflows from the NSI and OCI Tunnels would result in 3 additional hours per year below the water quality criterion - *a cost of $64 Million per additional hour*. At the three overflow per year level of control, adding EHRT to the LTCP to treat remaining overflows from the tunnels would result in *no additional hours* below the water quality criterion. Therefore, at the 3 overflow per year control level, expenditure of $177 M for EHRT (see Tables 7-11 and 7-12) would not provide *additional system-wide water quality benefit*.

At all levels of control, the inclusion of EHRT results in a substantially higher capital cost per additional hour below the water quality criteria during the typical year.

Table 7-14 EHRT Cost per Additional Hour Below Water Quality Criterion

	Hours per Year Above Water Quality Criterion				Additional Hours Below Water Quality Criterion				Cost per Additional Hour Below Water Quality Criterion			
Number of CSO Activations:	*12*	*6*	*3*	*0*	*12*	*6*	*3*	*0*	*12*	*6*	*3*	*0*
Existing Conditions	3700	3700	3700	3700								
LTCP w/Tunnel Storage	3690	3690	3687	3687	10	10	13	13	$22 M	$28 M	$32 M	$92 M
Add EHRT for Tunnel Overflows	3687	3687	3687	n/a(1)	3	3	0	n/a(1)	$65 M	$64 M	∞	n/a(1)

At the three overflow per year control level, expenditure of $177 M for EHRT to treat remaining OCI and NSI tunnel overflows would result in no additional improvement in water quality.

(1) At the zero overflows per year control level, the tunnel is sized to capture all overflows and there is no need for EHRT.

Based on the above factors, the City has proceeded based on evaluating system-wide alternatives without EHRT and has focused on improvements that would reduce the number of system-wide activations as opposed to providing EHRT for a larger number of activations. As a result of these analyses, EHRT is not included in the recommended solution.

8. RECOMMENDED PLAN

This section describes the CSO Long Term Control Plan the City has selected. The selected plan is based on the alternatives evaluation presented in Section 6, cost performance information contained in Section 7, and financial capability and financing plan information presented later in this section.

Based on alternatives evaluation and cost performance information, the City of Akron evaluated a short-list of potential recommended plans. These potential plans included:

- 3-3-3 (3 overflows on all racks and both tunnels)
- 6-6-6 (6 overflows on all racks and both tunnels)
- 12-12-12 (12 overflows on all racks and both tunnels)
- Implementing additional Clean Water Program projects, including Consent Decree and Non-Consent Decree projects described in Section 8.1.5 below

Following submittal of the proposed Long Term Control Plan in August 2010, the City received comments from the United States Environmental Protection Agency (see Appendix 8-A) requesting that additional plans be evaluated as part of the final LTCP submittal. Plans requested by USEPA for additional evaluation include:

- 0-0-0 (0 Overflows on all racks and both tunnels)
- 0-0-2+EHRT (0 overflows on all racks; 0 overflows at the Ohio Canal Interceptor Tunnel; 2 overflows at the Northside Interceptor Tunnel with enhanced high rate treatment)
- 0-2+EHRT-2+EHRT (0 overflows on all racks; 2 overflows at the Ohio Canal Interceptor Tunnel with enhanced high rate treatment; 2 overflows at the Northside Interceptor Tunnel with enhanced high rate treatment)

The following sections describe the selection factors used by the City to evaluate LTCP alternatives and the recommended plan it has selected for prospective implementation.

8.1 Plan Selection Factors

The City's selected CSO Long Term Control Plan will be the largest wastewater system capital program ever undertaken by the City in its long history. Once completed, the plan will deliver substantial environmental benefits to local waterways. However, this plan will also place an extremely high economic burden on local ratepayers.

Several related, yet sometimes very diverse factors influence the selection of a recommended Long Term Control Plan. When considered individually, these factors might suggest selection of different LTCPs. The City of Akron's approach to selecting its final recommended plan recognizes that these factors must be considered collectively in order to select the best overall plan. By doing so, the selected LTCP, per the intent of the CSO policy, will provide the best balancing of measures that help improve environmental conditions in local receiving streams, reduce existing combined sewer overflows, address regulatory requirements, and assure that the economic impact to ratepayers is reasonable and affordable, while completing the plan within timelines set forth in the Consent Decree.

8.1.1 CSO Policy Requirements

The USEPA's 1994 CSO Policy "…represents a comprehensive national strategy to ensure that municipalities, permitting authorities, water quality standards authorities and the public engage in a comprehensive and coordinated planning effort to achieve cost effective CSO controls that ultimately meet appropriate health and environmental objectives" (Federal Register, Vol. 59, No 75). The policy provides many specific requirements of both the CSO permittee (in this case, the City of Akron), as well as the NPDES permitting agency (e.g. State of Ohio). These requirements include:

- "Once the long-term CSO control plans are completed, permittees will be responsible to implement the plans' recommendations as soon as practicable."
- "Four key principles ensure that CSO controls are cost-effective and meet the objectives of the CWA. The key principles are:
    - Providing clear levels of control that would be presumed to meet appropriate health and environmental objectives;
    - Providing sufficient flexibility to municipalities, especially financially disadvantaged communities, to consider the site-specific nature of CSOs and to determine the most cost-effective means of reducing pollutants and meeting CWA objectives and requirements;

- Allowing a phased approach to implementation of CSO controls considering a community's financial capability; and

- Review and revision, as appropriate, of water quality standards and their implementation procedures when developing CSO control plans to reflect the site-specific wet weather impacts of CSOs."

The policy also states that "The Plan should also include both fixed-date project implementation schedules (which may be phased) and a financing plan to design and construct the project as soon as practicable."

Finally, the policy states that the permittee's final CSO Long Term Control Plan should adopt either the Presumption Approach or Demonstration Approach. The Presumption Approach is described in the CSO Policy as:

"A program that meets any of the criteria listed below would be presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA, provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas described above. These criteria are provided because data and modeling of wet weather events often do not give a clear picture of the level of CSO controls necessary to protect WQS.

i. No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a CSS as the result of a precipitation event that does not receive the minimum treatment specified below; or

ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis; or

iii. The elimination or removal of no less than the mass of the pollutants identified as causing water quality impairment through the sewer system…."

Figure 8-1 illustrates the percentage of combined sewage (by volume) that receives full primary treatment on a system-wide annual average basis. Approximately 89 percent capture is achieved under existing conditions, with incremental increases predicted under the various control scenarios. Note that 100 percent capture is assumed when enhanced high rate treatment (EHRT) is utilized under the 0-0-2(EHRT) and 0-2(EHRT)-2(EHRT) plans since ballasted flocculation EHRT technology provides “equivalent primary clarification.”

Figure 8-2 shows the percentage capture receiving full secondary treatment at the City’s Water Pollution Control Station. As shown, each evaluated plan exceeds the 85% capture requirement of the Presumption Approach.

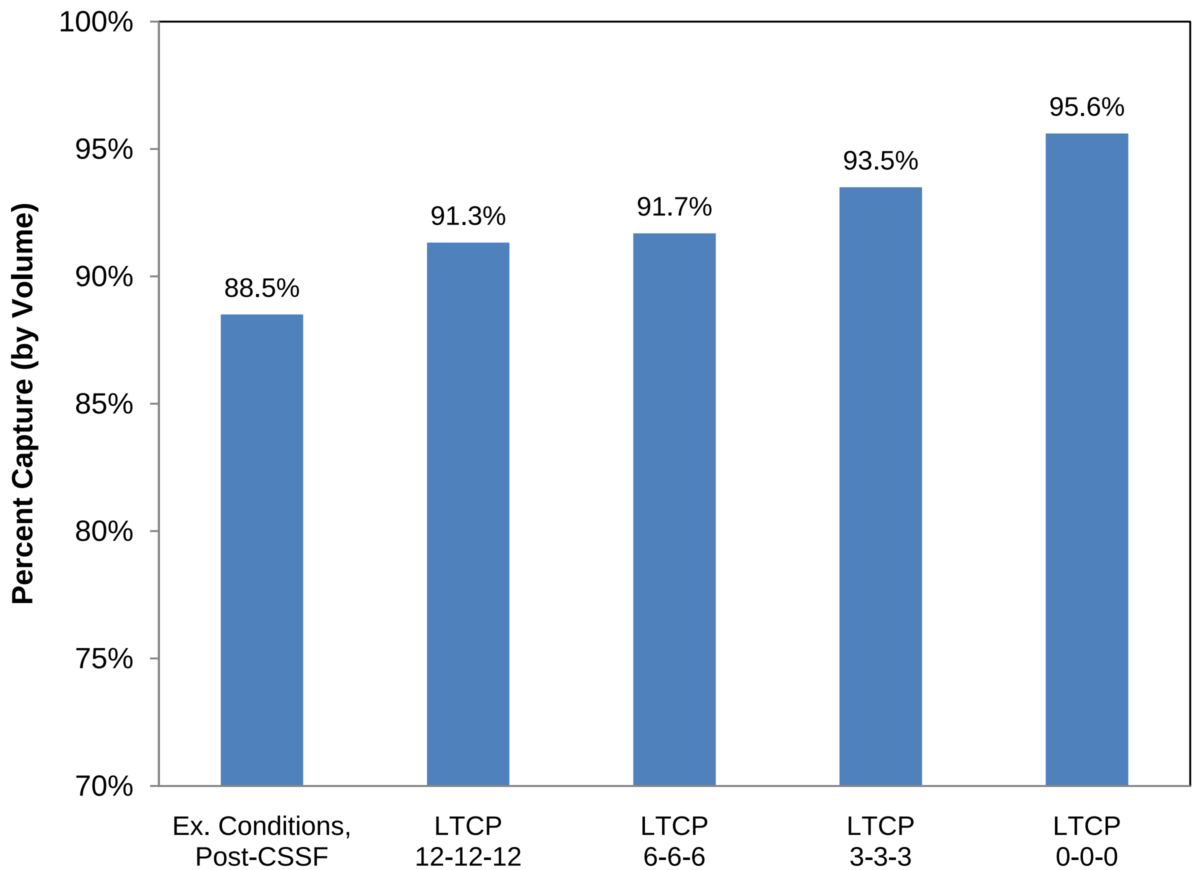


Figure 8-1 System-wide Percent Capture Receiving Full Primary Treatment

Note: Figure 8-1 does not include flow that is treated by the Storm Water Retention Tank at the WPCS and is disinfected.

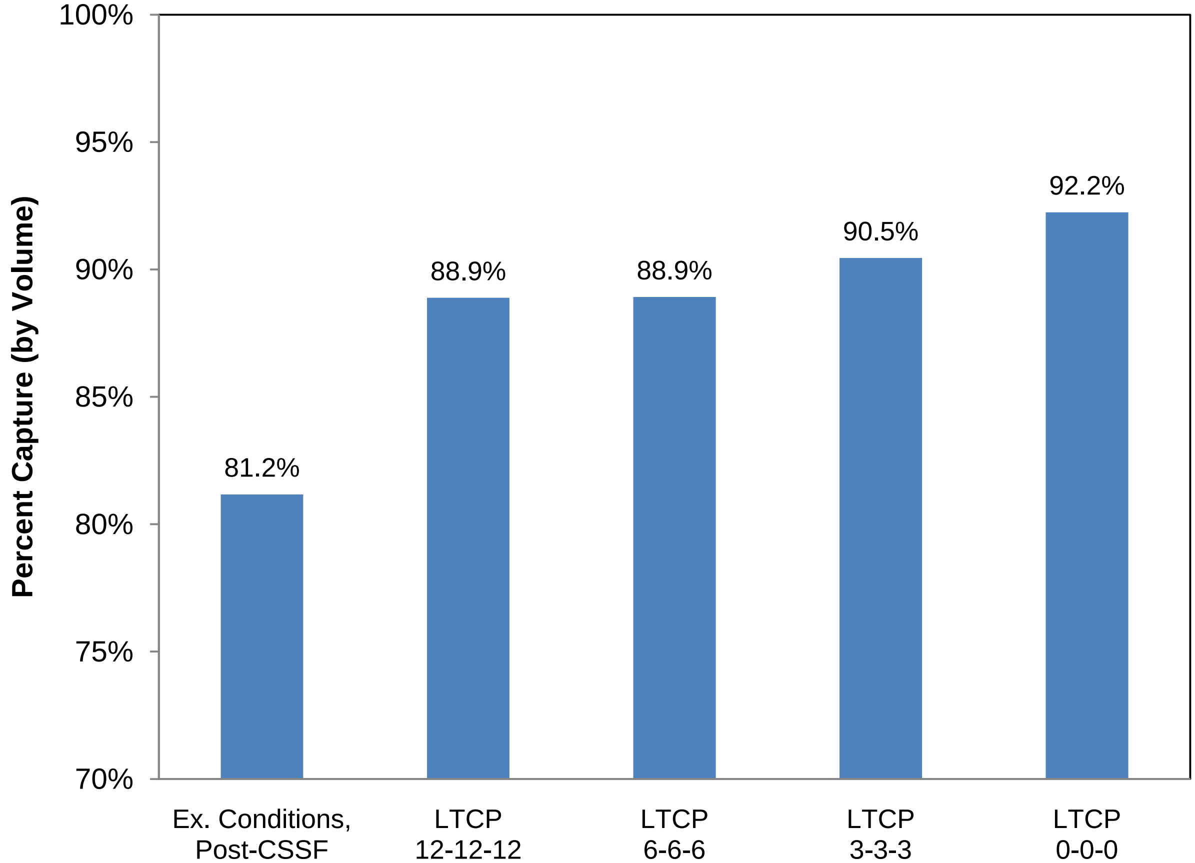


Figure 8-2 System-wide Percent Capture Receiving Full Secondary Treatment

The Demonstration Approach provides the permittee an opportunity to "…demonstrate that a selected control program, though not meeting the criteria of the Presumptive Approach is adequate to meet the water quality based requirements of the Clean Water Act. To be a successful demonstration, the permittee should demonstrate:

i. The planned control program is adequate to meet Water Quality Standards and protect designated uses, unless water quality standards or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs;

ii. The CSO discharges remaining after implementation of the planned control program will not preclude the attainment of water quality standards or the receiving waters' designated uses or contribute to their impairment.

iii. The planned control program will provide the maximum pollution reduction benefits reasonably attainable; and

iv. The planned control program is designed to allow cost effective expansion or cost effective retrofitting if additional controls are subsequently determined to be necessary to meet water quality standards or designated uses."

8.1.2 Knee of the Curve Analysis

The CSO Long Term Control Program should be designed to achieve significant and tangible benefits (as discussed below) while remaining affordable to local ratepayers. Cost-benefit curves are used to compare similar alternatives over a range of design conditions or control levels. Typically, these comparisons indicate that for lower levels of control, small increments of increased cost would result in larger incremental benefits. For high levels of control, large increments of increased cost typically result in increasingly smaller incremental benefits. The optimal point, or "knee-of-the-curve," is the first point where the incremental change in the cost of the control alternatives per change in performance of the control alternative changes most rapidly, indicating that the slope of the curve is changing from shallow to steep or vice versa.

The CSO Policy states that "The permittee should develop appropriate cost/performance curves to demonstrate the relationships among a comprehensive set of reasonable control alternatives that correspond to the different ranges specified in Section II.C.4. This should include an analysis to determine where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs. This analysis, often known as knee of the curve, should be among the considerations used to help guide selection of controls."

To analyze the costs and benefits of various CSO control technologies at various levels of control, the City developed a variety of cost-benefit curves (see Section 7 – Cost Performance Considerations).

8.1.3 Water Quality Benefits

A main goal of implementing CSO controls is helping to improve water quality conditions in local receiving streams. The following paragraphs compare these conditions for the City's three short-listed recommended plans and USEPA's three proposed plans against existing conditions. Note that all three plans proposed by the USEPA have an equivalent treatment level of 0-0-0 because of the use of EHRT.

An initial indicator of the overall benefit of a particular set of CSO controls is to determine the reduction in overflow volume that will result from their implementation. Figure 8-3 below shows the overflow reduction for the potential plans evaluated by the City. A plan with an equivalent treatment level of 0-0-0 would have an overflow volume of 0 MG per year.

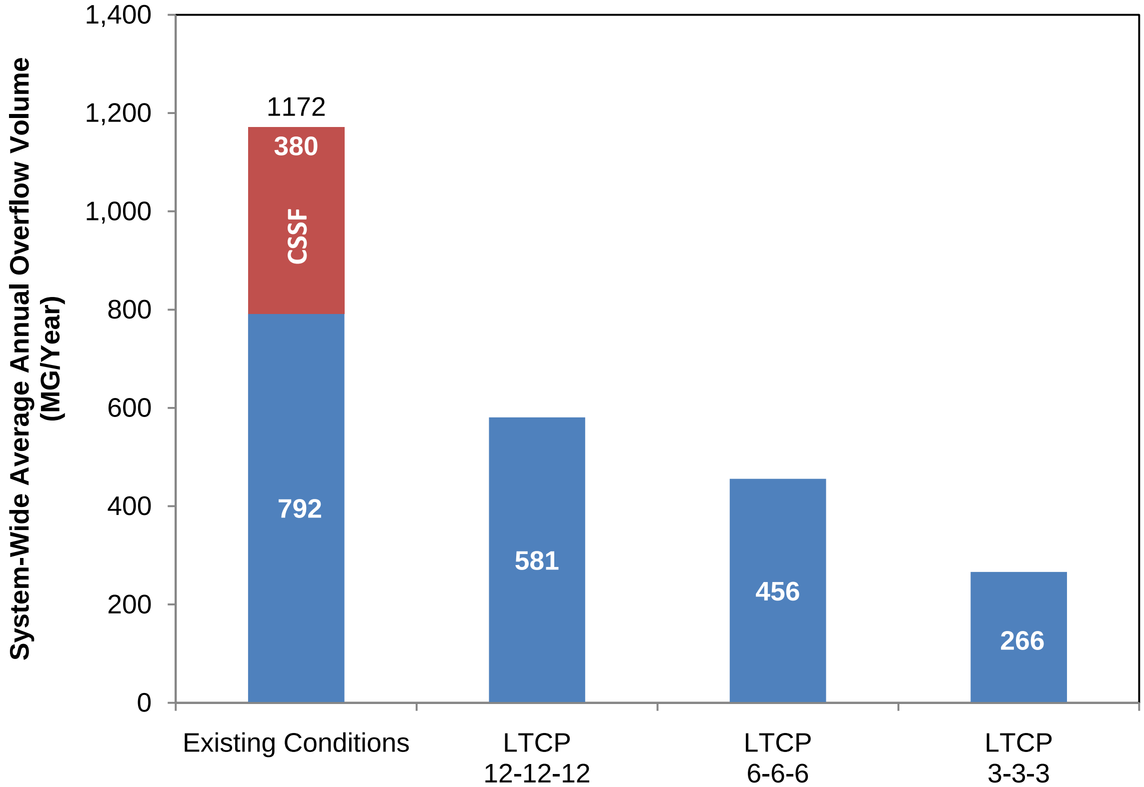


Figure 8-3 Estimated Typical Year Overflow Volumes

Note that prior to construction of the Cuyahoga Street Storage Facility at Rack 40, the annual overflow volume was approximately 1.2 billion gallons per year. As shown on Figure 8-3, the 12 overflows per year plan captures approximately 50 percent of the annual overflow volume in a typical year, while the 3-3-3 plan would capture approximately 77 percent of the annual overflow volume.

Another means of quantifying relative benefits of different CSO control alternatives is to calculate pollutant load to the receiving waters. These are summarized in Figure 8-4 in terms of E. coli colonies per year. The plot shows that the 12 activations plan reduces annual load from CSOs by approximately 50 percent, while the 3 Activations alternative decreases annual load to the receiving waters by about 77 percent. A plan with an equivalent treatment level of 0-0-0 would have an E. coli load from CSOs of 0 colonies per year.

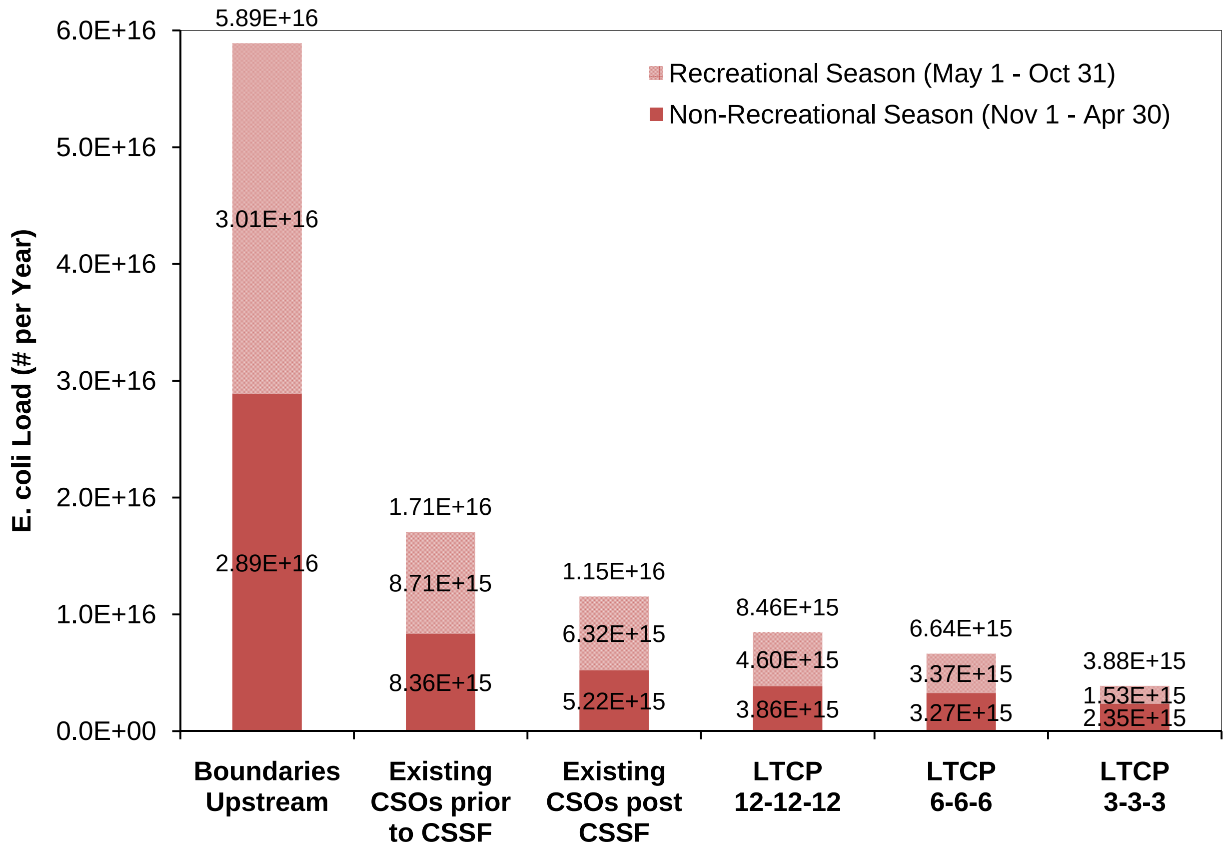


Figure 8-4 Estimated Annual E. coli Load for Potential CSO Control Plans

Figure 8-5 illustrates the E.coli loads by storm event utilizing storm events that occur during the 1994 adjusted typical year. The rain events that cause overflow events within the combined sewer system under each proposed plan that was evaluated are shown. For example, overflows would occur under the 3-3-3 plan during storm events 3, 6, and 10.

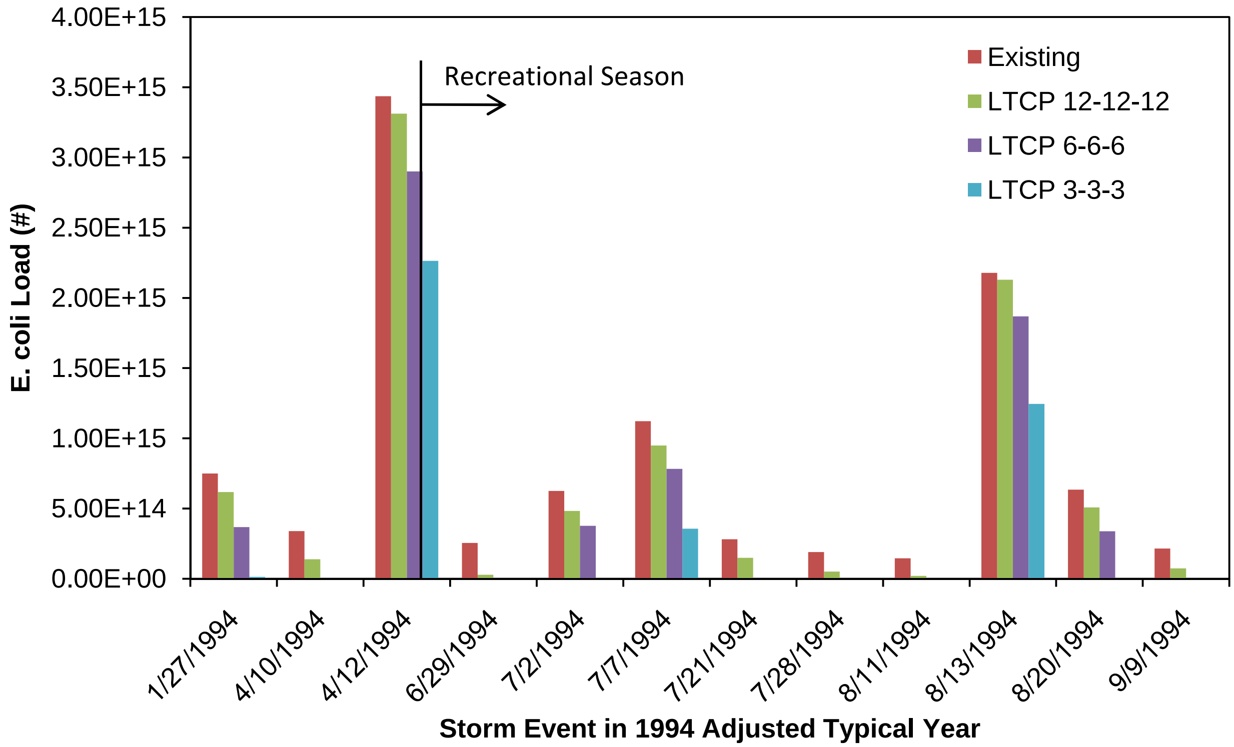


Figure 8-5 E. coli Load by Storm

The City used the receiving water quality model to estimate the hours within a typical year that E. coli limits were above the water quality standards established for individual receiving waters in each receiving stream under existing conditions. The model also simulated the hours of exceedance after CSO controls were implemented for the potential recommended plans. Figure 8-6 shows the estimated system-wide hours of exceedance for the various plans; Figure 8-7 shows estimated hours of exceedance when considering only CSO flows; Figures 8-8 and 8-9 show the estimated hours of exceedance for each receiving water system-wide and for CSO only flows respectively. For the "CSOs only" analysis, the City zeroed out all E. coli load contributions from the upstream boundaries within each receiving stream. This provided an analysis of the water quality benefits for each evaluated plan without impacts from other sources.

Note that these estimates do not mean that a water quality violation occurred. They are shown only to evaluate the effectiveness of individual and system wide CSO controls. State of Ohio E. coli standards are limited to the recreational season (May 1 through

October 31). The full year load and hours of exceedance analysis information presented here are by design conservative in nature.

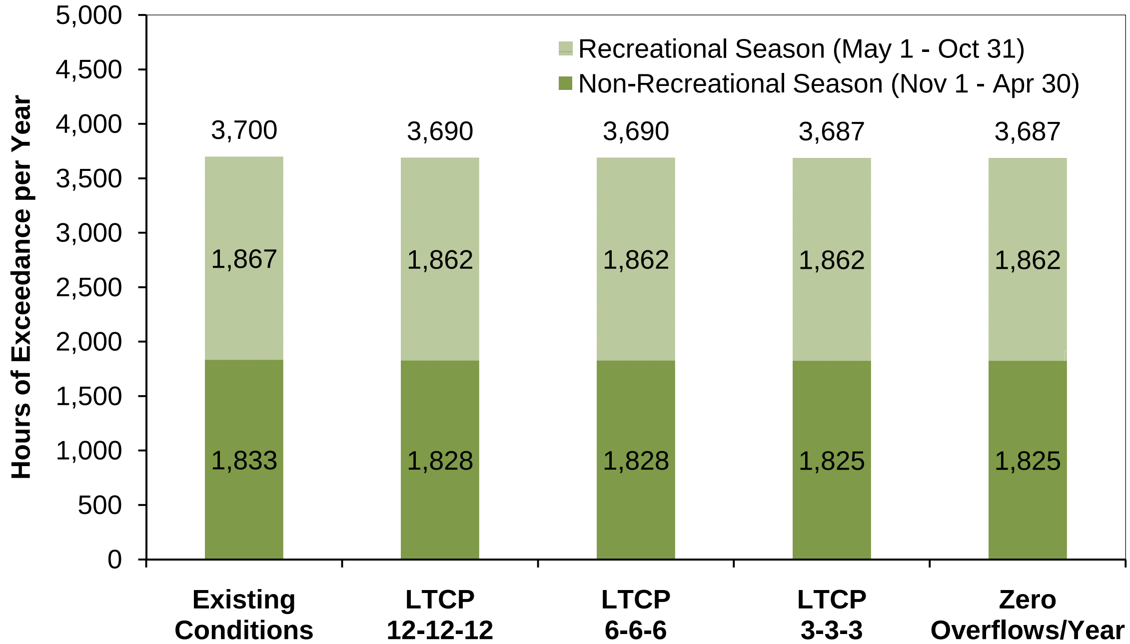


Figure 8-6 Estimated E. coli Hours of Exceedance for Potential CSO Control Plans

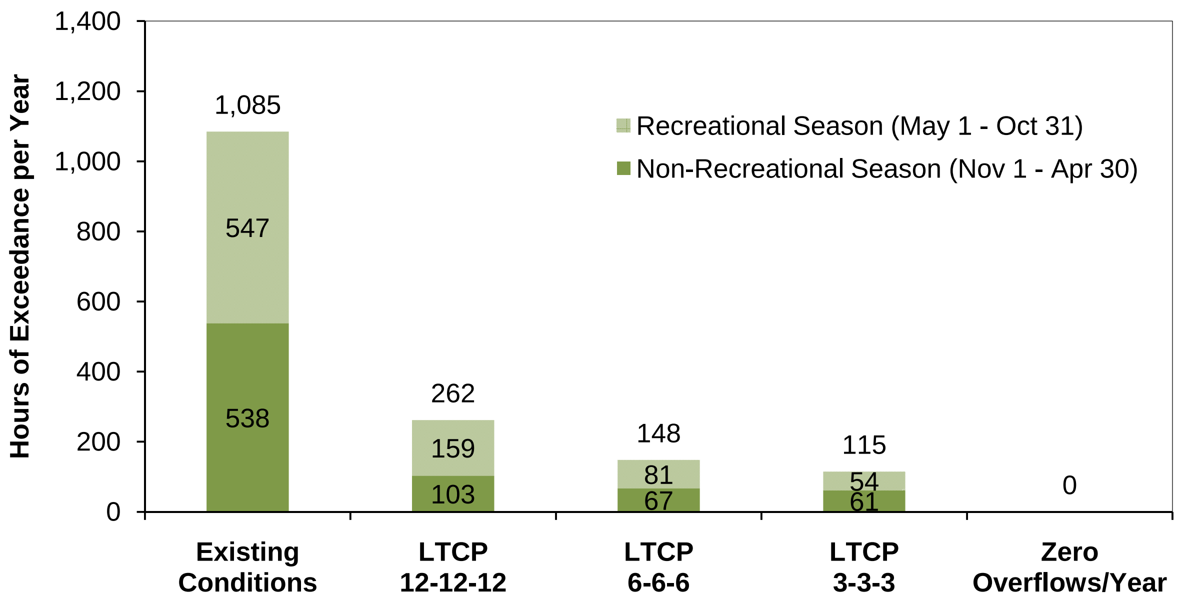


Figure 8-7 Estimated E. coli Hours of Exceedance for Potential CSO Control Plans – CSOs Only

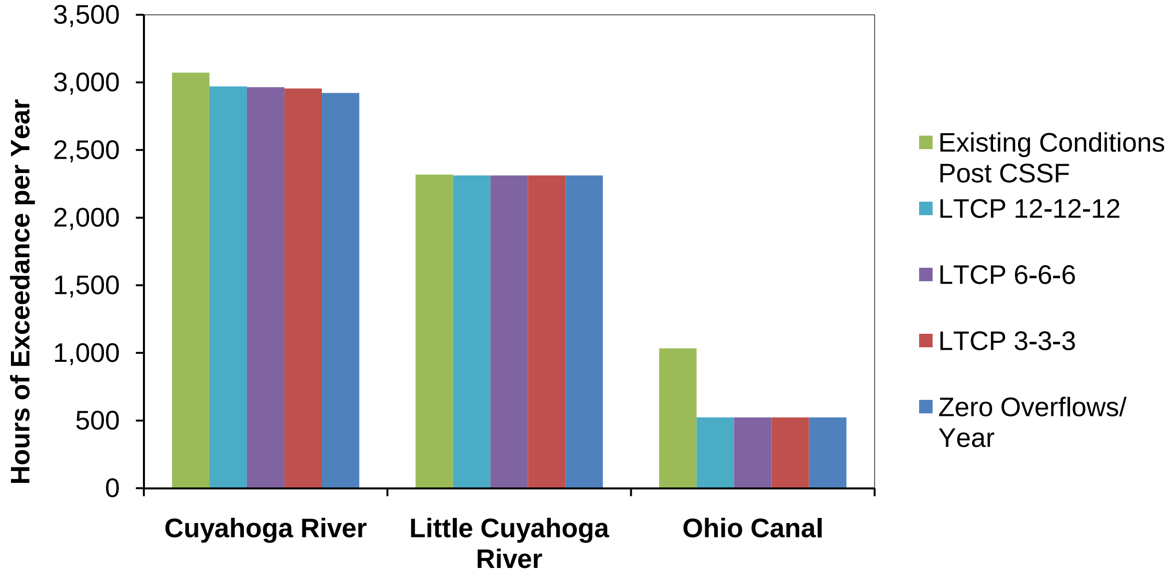


Figure 8-8 Estimated E. coli Hours of Exceedance – by Receiving Water

Note: Hours of exceedance shown are during the typical year. The hours during only the recreational season, as defined by the Ohio Water Quality Standard, would be less.

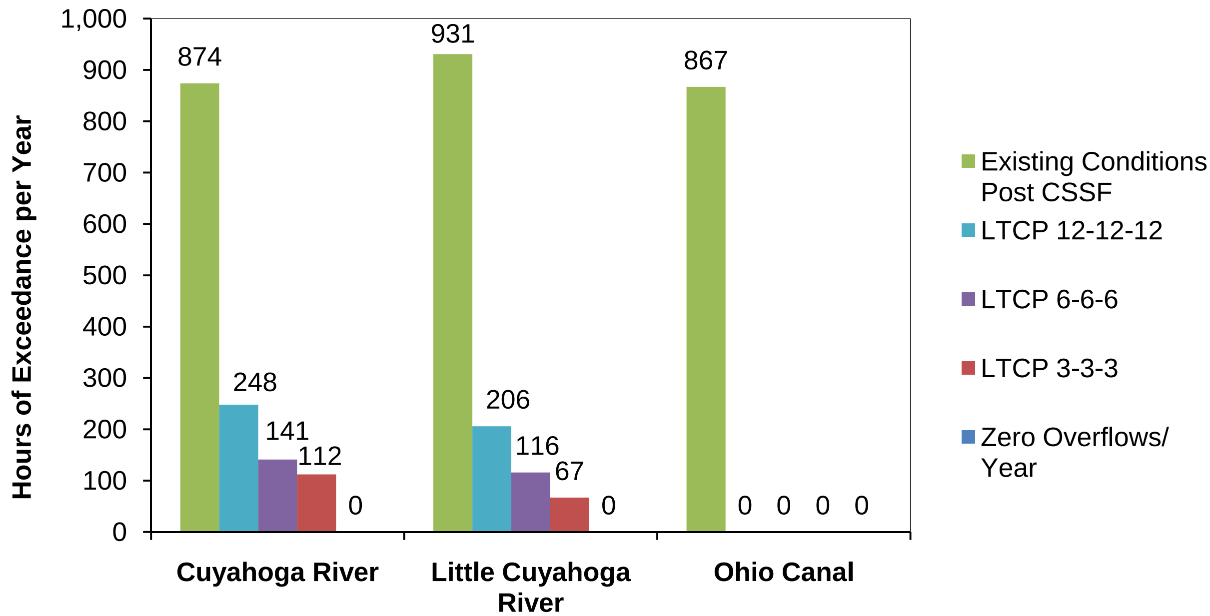


Figure 8-9 Estimated E. coli Hours of Exceedance – by Receiving Water, CSOs Only

Note: Hours of exceedance shown are during the typical year. The hours during only the recreational season, as defined by the Ohio Water Quality Standard, would be less.

The City also evaluated E. coli reductions at the six key monitoring stations within the sewer shed. Table 8-1 illustrates that for the Cuyahoga River stations, the evaluated CSO plans will reduce typical year hours of exceedance by 5-10 percent. The Ohio Canal's hours of exceedance will be reduced by approximately 50 percent. Table 8-2 shows the hours of exceedance for the various evaluated plans when considering only CSO flows.

Table 8-1 Water Quality Model Results

Station	Stream	Class	E. Coli Limit (#/100ml)	Hours of Exceedance per Year				
				Existing	Activations / yr			
					12-12-12	6-6-6	3-3-3	0
CR2	CR	A	298	2,668	2,578	2,564	2,552	2,476
CRVV	CR	A	298	2,897	2,741	2,720	2,719	2,668
CR3	CR	A	298	2,981	2,852	2,836	2,838	2,790
CU2	LCR	B	523	2,183	2,183	2,183	2,183	2,183
CU3	LCR	B	523	2,086	2,065	2,063	2,063	2,063
SG02	OC	B	523	1,036	524	524	524	524

Note: Hours of exceedance shown are during the typical year. The hours during only the recreational season, as defined by the Ohio Water Quality Standard, would be less.

Table 8-2 Water Quality Model Results – CSOs Only

Station	Stream	Class	E. Coli Limit (#/100ml)	Hours of Exceedance per Year				
				Existing	Activations / yr			
					12-12-12	6-6-6	3-3-3	0
CR2	CR	A	298	454	129	103	80	0
CRVV	CR	A	298	771	216	129	103	0
CR3	CR	A	298	775	229	136	109	0
CU2	LCR	B	523	516	148	78	53	0
CU3	LCR	B	523	929	198	113	64	0
SG02	OC	B	523	868	0	0	0	0

Note: Hours of exceedance shown are during the typical year. The hours during only the recreational season, as defined by the Ohio Water Quality Standard, would be less.

In addition to the State single sample maximum standards, the City evaluated the impacts of various proposed plans utilizing the Geometric Mean standard set forth in Ohio Water Quality rules. Table 8-3 illustrates that even under existing conditions for CSO only flows, the City would be in compliance with the geometric mean for E. coli.

Table 8-3 Geometric Mean during the Recreation Season – CSOs Only

Station	Stream	Class	E.coli Geometric Mean (#/100ml)				
			Limit	Existing	Activations / yr		
					12-12-12	6-6-6	3-3-3
CR2	CR	A	126	2.2	1.0	0.9	0.9
CRVV	CR	A	126	2.8	1.2	1.0	0.9
CR3	CR	A	126	2.7	1.0	0.9	0.8
CU2	LCR	B	161	1.7	1.0	1.0	0.9
CU3	LCR	B	161	3.5	1.5	1.3	1.2
SG02	OC	B	161	4.0	1.8	1.8	1.8

Note: The geometric mean was calculated from model results at 12:00 noon each day for the entire recreation season (May 1 to October 31).

The geometric means listed in Table 8-3 are extremely small. This is because all sources other than CSOs were removed, including background concentrations. Further, the number of days with non-negligible concentrations is small. Last, geometric averaging tends to limit the effect of large numbers. For example, the geometric mean of 10 and 10,000 is 316, while the arithmetic mean would be 5,005.

8.1.4 Implementation Schedule

Implementation schedules for CSO LTCP programs are typically established using criteria outlined in USEPA's *Guidance for Financial Capability Assessment and Schedule Development*. This guidance states that it "…does not recommend specific schedules for implementation of the CSO controls based on financial capability or other considerations identified in the CSO Policy. It does, however, provide general boundaries to aid all parties in negotiating reasonable and effective schedules for implementation of the CSO controls." The schedules developed utilizing this guidance depend upon a calculated "burden" that references a residential indicator (e.g. cost per household for current and future wastewater services, percentage of median household income) and an index of other financial indicators (e.g. debt, socioeconomic, and financial management indicators).

As part of consent decree negotiations with USEPA, the Department of Justice, and Ohio EPA, the parties established that "Akron shall develop a schedule that is as expeditious as possible for design, construction, implementation and utilization of the control measures selected in the Proposed LTCP Update to II.A.1 above. The schedule shall contain a deadline for Achievement of Full Operation of all control measures in a manner that is as expeditious as possible, but in no event later than October 15, 2028…." (Draft Consent Decree, Attachment A, Section II.A.3). This requirement means that the City of Akron has approximately 17 years from USEPA and Ohio EPA's approval of the final LTCP to fully implement all projects contained in the final plan.

8.1.5 Other Clean Water Program Requirements

In addition to CSO controls, the City of Akron must implement additional projects that are part of their overall Clean Water Program initiative. These projects are either required by the draft Consent Decree, or necessary to address other system needs and regulatory requirements. The following sections describe the additional projects required as part of the overall Clean Water Program.

Consent Decree Projects

The draft Consent Decree contains several specific action projects that the City must meet in order to avoid stipulated penalties and fulfill their obligations required under the Consent Decree. These consist of:

- Upgrade WPCS to 130 MGD (Section V, Item 10) – this project will increase the secondary (biological) treatment capacity at the WPCS, allowing additional sewer flows to receive full treatment as compared to current conditions.

- Mud Run Pump Station Program (Section VIII, Item 23) – this project will eliminate overflows at this pump station.

- Capacity, Management, Operations and Maintenance Program Implementation (Attachment C, Item 2) – this program will help the City adequately manage, operate, and maintain its sewer collection system, including future system components constructed as part of the CSO Long Term Control Plan.

Non-Consent Decree Projects

The City must also consider the impacts of several non-Consent Decree projects when evaluating overall CSO controls. These projects include:

- Existing System Reinvestment – also referred to as Asset Management, the City must allocate future sewer funds to repair and replace existing sewer system components. With a large majority of the City's current sewers approaching the end of their useful design life, the Asset Management Program is critical to assure that future problems such as pipe failures or capacity limitations are proactively addressed before they become critical.

- New NPDES Permit Requirements – on June 4, 2010, OEPA notified the City that it intended to re-public notice a revised version of the City's NPDES permit. The new permit presented new monitoring and testing requirements, as well as some significantly lower effluent limitations for several parameters, specifically phosphorus, nitrogen, bacteria (E. coli), and CBOD. The City of Akron provided comments to OEPA on July 12, 2010 asking for several modifications to the draft permit. OEPA notified the City on August 6, 2010 that the new NPDES permit would become effective on September 1, 2010. The final permit does not relieve the more stringent effluent limitations for the parameters described above. Therefore, the City must allocate significant future sewer funds to comply with the new NPDES permit.

  The City will also be required to conduct additional sampling for total suspended solids, ammonia-N, E. coli and CBOD5. City crews will set up a rotating schedule to sample at least five (5) stations each month. For each of the five stations, a sample will be collected and data reported once per month for a day when there is a discharge from the station. The annual cost of this additional sampling and reporting will be $825,827 per year.

- Storm Water Improvements – storm water improvements performed by the City can provide significant environmental benefits. These improvements can directly reduce the amount of storm water reaching the combined sewer system and/or WPCS and reduce the amount of pollutants reaching local receiving waters. Allocating future funds to implement storm water projects will help achieve the overall goals of the LTCP.

8.1.6 Financial Capability

Financial capability is a significant factor affecting a community's CSO long-term control plan (LTCP). According to USEPA's 1994 *CSO Guidance for Long-Term Control Plan:*

> As part of LTCP development, the ability of the municipality to finance the final recommendations should be considered. The CSO Control Policy "…recognizes that financial considerations are a major factor affecting the implementation of CSO

> controls… [and]…allows consideration of…financial capability in connection with the [LTCP] effort…and negotiation of enforceable schedules.” The CSO Control Policy also specifically states that “…schedules for implementation of the CSO controls may be phased based on…financial capability.”

A major focus of the financial capability analysis is to estimate the cost per household for Akron customers and assess how that cost compares to household income. EPA’s guidance provides sufficient flexibility to municipalities, especially financially disadvantaged communities, to consider the site-specific nature of CSOs and to determine the most cost-effective means of reducing pollutants and meeting CWA objectives and requirements within their financial capabilities. This guidance document is not binding and the resulting analysis may not fully capture the fiscal stress and/or ability of Akron residents to fund CSO controls. The City projected future revenue requirements and associated rates, taking into account current costs to operate the City’s system, how those costs will change over time, existing debt service, and future debt service resulting from anticipated and identified capital improvements.

The City of Akron’s updated Financial Capability (FinCap) Assessment and Affordability Analysis is included in Appendix 1-B of this Final LTCP Update Report. Following is a summary of the information presented in the FinCap analysis.

Economic Conditions Affecting the City of Akron

National and State Trends. Akron’s economy is connected to the economies of Ohio and the U.S. Consequently, national and state conditions and outlook must be considered when assessing Akron’s condition.

National Trends. Although the national economy may be on a path of economic recovery, it is still a long way from prerecession levels. As shown Figure 8-10, the Congressional Budget Office (CBO) does not expect real gross domestic product to surpass its 2008 peak until 2011. Other economic measures will be even slower to improve.

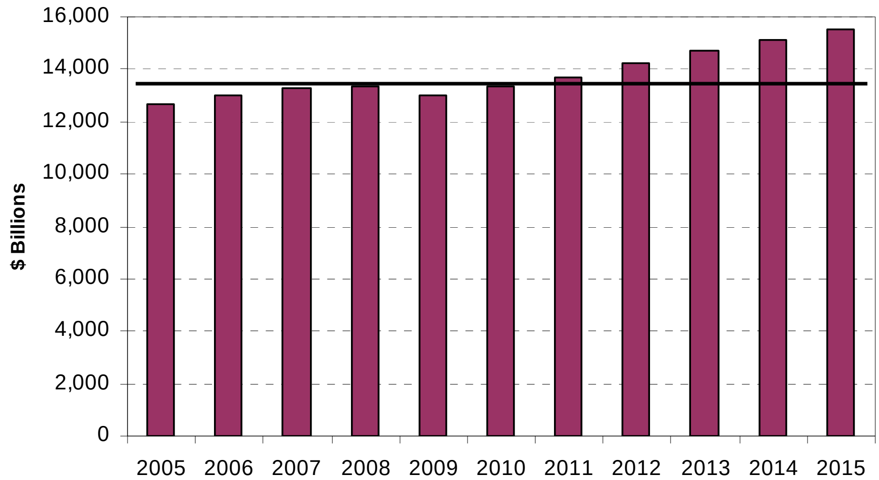


Figure 8-10 Real Gross Domestic Product Trend and Outlook (2005 $)

Even in 2011, the national economy will be worse than it was in 2008, because it will need to provide goods, services, employment, and wages for more people. In fact, the long-term effect of the recession will be a push of the nation's economic output back by $800 billion to $1 trillion annually for the foreseeable future.

National employment has fallen dramatically from its peak in 2007, and it is expected to continue to decline this year despite overall economic recovery (see Figure 8-11). In addition, based on the latest projections by the National Economic Estimating Conference (NEEC), it probably will not reach prerecession levels until 2013.

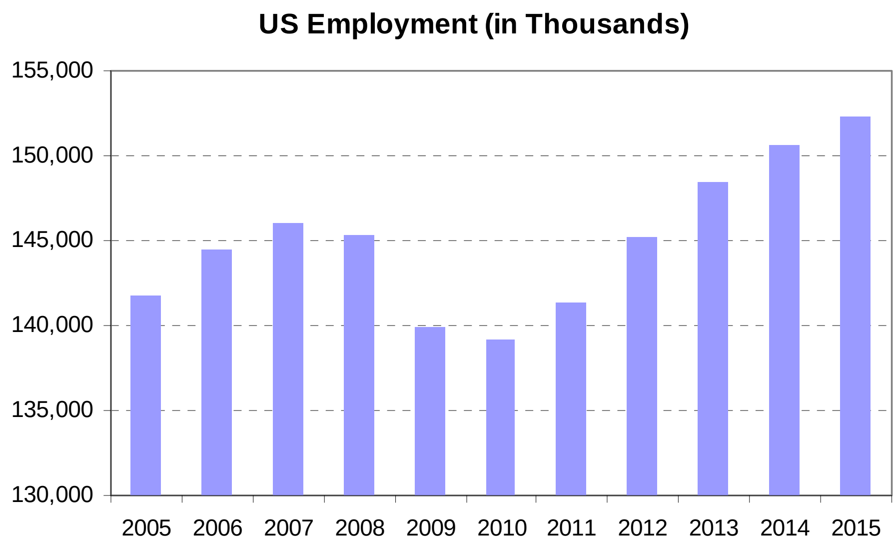


Figure 8-11 US Employment

Given the preceding trends, it is not surprising that the national unemployment rate is projected to remain above its prerecession level for perhaps the next decade.

Nationwide, employment by local governments has not seen the same extent of losses as overall employment for the following three reasons:

1. First, because local government budgets depend on tax revenues from a variety of sources, their staffing reductions will tend to lag behind other sectors.
2. Second, federal stimulus funds helped to ameliorate the size of cutbacks required for local governments to balance their budgets.
3. Third, contracts and political considerations limit the ability of local governments to implement cutbacks.

Despite these factors, local government employment in education (which had been increasing at about 0.9 percent annually from 2006 to 2008, consistent with population growth) decreased by 0.3 percent in 2009, and general local government employment, which benefited somewhat from stimulus funds, fell by 0.1 percent.

Ohio Trends. Although these U.S. trends paint a picture of challenging times for the nation as a whole, the situation in Ohio is markedly worse. Figure 8-12, taken from the April 2010 *Monthly Financial Report of the Ohio Office of Budget and Management*, shows that the State never recovered from the previous recession and has steadily fallen further behind the nation in terms of employment growth.

This pattern – slower and less substantial growth during economic expansion and larger losses during periods of contraction – is likely to be repeated in the coming decade, presenting even greater challenges for Ohio and its communities, including Akron. This indicates that Akron is part of a state characterized by substantial economic vulnerability and that Akron's own recovery is highly uncertain.

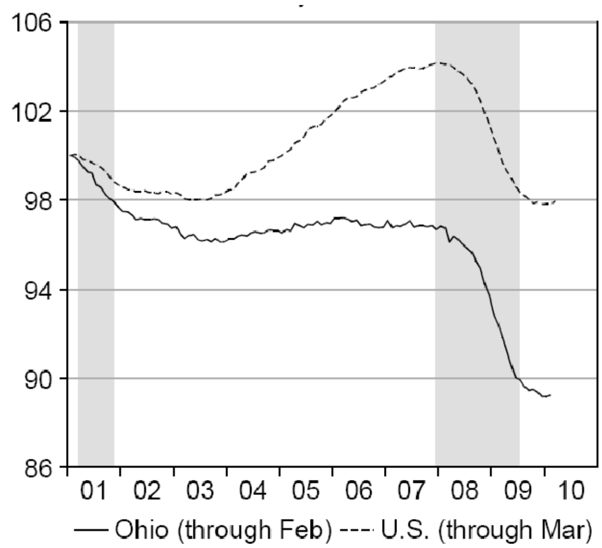


Figure 8-12 Nonfarm Payroll Employment (January 2001 = 100)

Local Trends

Employment and Unemployment. While the employment trend for the Akron Metropolitan Statistical Area (MSA) has roughly mirrored national employment changes, the pattern for Akron has more closely resembled that of the state of Ohio. The difference between the MSA and Akron is shown Figure 8-13. Thus, economic conditions have exacerbated Akron's relative employment position in recent years, which in turn affects Akron's financial position.

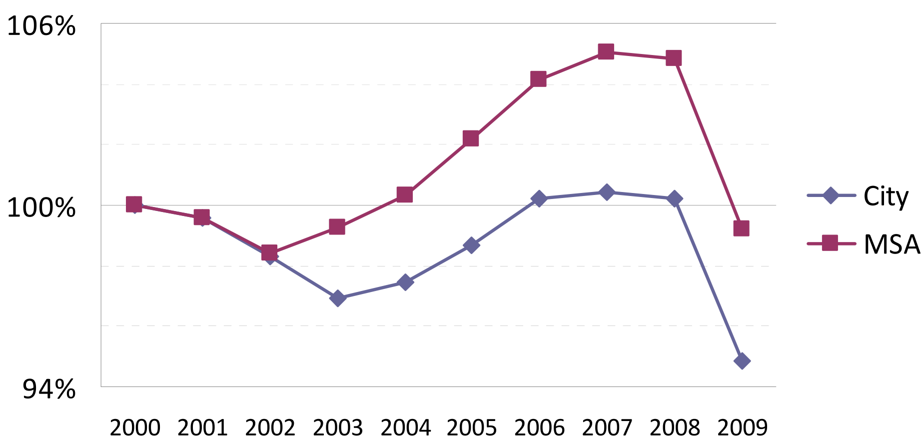


Figure 8-13 Employment Change (2000 base)

The MSA's employment profile has also shifted dramatically over the past two decades, with a loss of 22,000 positions in manufacturing and job growth of 20,000 in education and health services along with 30,000 in professional and business services. Gone are many of the large manufacturing operations that were once thought to be permanent fixtures in the community, replaced by service sector establishments that are much more willing to relocate elsewhere in Northeast Ohio (or beyond) if costs in Akron begin to seriously affect their economic competitiveness.

Another measure of the continued economic struggles of Akron residents is that residential employment has fallen from a high of 108,000 in the fourth quarter of 1999 to 92,000 in the first quarter of 2010, a decline of nearly 15 percent.

Unemployment in Akron, as elsewhere, is much higher than two years ago. According to USEPA guidelines, the unemployment rate for the municipality should be compared to the rate for the U.S. A variance greater than one percentage point from the national rate is one indicator of weak financial capability.

Using Bureau of Labor Statistics (BLS) Survey data for 2009, the Retail Service Area (RSA- which includes virtually all of Akron and a small percentage of the rest of the County) had an unemployment rate of 10.63 percent compared to a rate of 9.28 percent for the U.S (see Table 8-4). The 1.35 percentage point difference results in a "Weak" score for unemployment. For the first six months of 2010, the City of Akron's unemployment rate has averaged 11.8 percent versus the 9.70 percent for the U.S., a 2.1-percent differential.

As noted in the Industrial Economics, Inc. (IEc) July 2009 compilation of recent data on Akron's conditions, the high unemployment rate contributes to foreclosure problems. Job losses also lead to population losses.

During the past decade, Akron's unemployment rate has consistently been much higher than the rate for the nation as a whole. From 1999 through 2009, the gap has only dipped slightly below one percentage point twice (0.92 point in 2004 and 0.93 point in 2008), while Akron's unemployment rate has averaged 1.55 percent above the U.S. rate.

Table 8-4 RSA Unemployment Rate

	2000 (Census)			2009 (BLS)		
	Civilian Labor Force	*Unemployed*		*Civilian Labor Force*	*Unemployed*	*Rate*
Summit County	277,009	13,912		294,439	29,307	9.95%
City of Akron	107,194	7,884		106,947	11,388	10.65%
Balance of County	169,815	6,028		187,492	17,919	9.56%
RSA:						
- part in City of Akron	105,800	7,782		105,557	11,240	10.65%
- part outside of Akron	9,763	378		10,779	1,124	10.43%
Total RSA	**115,564**	**8,160**		**116,336**	**12,364**	**10.63%**

In the past two decades, Akron's unemployment rate has risen faster than the nation's rate in times of recession and fallen more slowly in times of recovery.

Income and Poverty. The 2010 MHI for the RSA is estimated to be $34,531. This is 37.1 percent lower than the 2010 U.S. estimate (based on the 2000-2008 trend) of $54,892. Table 8-5 shows the latest estimates. Based on this comparison, Akron's MHI receives the "Weak" rating on the USEPA benchmarks. The RSA's MHI is higher than Akron's but lower than that of Summit County. However, all three local areas have much slower MHI growth than the nation, which indicates a steadily worsening local situation.

Table 8-5 Median Household Income Estimate

	City	*RSA*	*County*	*U.S.*
2000	$31,835	$32,526	$42,304	$41,994
2008	$32,499	$34,120	$49,411	$52,029
2010	$32,667	$34,531	$51,367	$54,892
Average Annual Change	0.26%	0.62%	2.14%	3.07%

The Guidance also suggests that other socioeconomic factors, such as the poverty rate, may also provide insight into a community's financial capability. Akron's poverty rate is, indeed, another reflection of its socioeconomic condition and a useful indicator of how many households will be severely affected by rising sewer rates. In 2007, the year before the recession, Akron's poverty rate (i.e. percent of households below federal poverty guidelines) was 23.6 percent, or nearly one out of every four people -- a level that is far higher than the national rate of 13.0 percent. Akron's poverty rate has almost certainly increased further as a result of the recession.

There are 75 cities, including Akron, with 2008 population estimates within 50,000 of Akron's figure of 207,510. Of these mid-sized cities, Akron has the fifth lowest 2007 MHI and the eleventh highest 2007 poverty rate.

Another measure of the economic condition of Akron's residents is available from the Ohio Department of Education, which collects data on students' economic status. For the 2008/2009 school year, 82.4 percent of students in the Akron City School District were classified by the State as "economically disadvantaged[1]" because they live in households with incomes below the federal free lunch program thresholds.

Some communities have especially high concentrations of poverty and are areas of particular concern for Akron officials. At the time of the 2000 Census, four neighborhoods (Downtown, Lane-Wooster, Summit Lake, and East Akron) had poverty rates of roughly twice Akron's overall 17.0-percent rate. In these neighborhoods, it is possible that 50 percent of the population is already paying more than 2 percent of their income for sewer services. Renters in these neighborhoods, even though they may not pay a sewer bill directly, pay for the cost of sewer service indirectly in rent.

Utility Issues

Over the past quarter century (1984-2009), Akron's sewer rates have risen 23 percent faster than inflation. With the 2010 rate increases, sewer rates will have risen 68 percent faster than inflation. Because the incomes of Akron residents generally have not kept up with inflation, the impact of sewer rate increases is even more substantial than this differential would indicate. Since 1990, sewer rates have risen 123 percent faster than Akron's MHI.

As a result of various economic and demographic factors, the household base on which Akron must rely primarily to pay for the LTCP has been eroding for some time, and there are indications that the pace of this decline has recently accelerated. From 2001 to 2008, the number of single-family residential accounts declined by an average of about

[1] Economically disadvantaged means the upper income limit is 185 percent of the Federal Poverty level.

400 per year, and in 2009 the number of accounts fell by 1,300. The number of active accounts with monthly consumption of zero to one hundred cubic feet has been steadily rising (by an average of 5.0 percent annually since 2005), which may indicate a growing number of available but vacant units, and a decreasing proportion of accounts that actually represent served households.

Manifold (multi-family) accounts fell by 12,000 in 2009 (over 10 percent), after rising by an average of nearly 3,000 a year since 2003. This may be attributable to a decrease in the number of occupied multi-family structures. Average usage of manifold accounts is variable and affected by seasonal and annual precipitation and temperatures; on average, it appears to be declining slowly.

With the declines noted above, and reasonable expectations of continuing decline, it should be noted that the significant financial resource commitment required for CWA and Consent Decree compliance will be borne by a shrinking customer base, imposing still greater claims on remaining household incomes.

Revenue and Expenditures. Table 8-6 demonstrates that sewer system revenues have not increased significantly (2.5 percent) since 2005, despite significant rate increases. Between 2003 and 2009, consumption declined faster than rates have increased (elasticity implications). As a result, Akron was required to significantly reduce sewer expenditures (after adjusting for inflation), and Sewer Fund reserves have also been depleted. Akron's staffing reductions (340 FTE[2] in 2005 to 256 in 2009) decreased salary cost during the same period. Salary reductions and some other related cost-cutting measures have resulted in an overall decrease of annual expenditures (approximately 5 percent). Annual ending balances decreased from $6,404,437 in 2005 to $4,089,818 in 2009, approximately a 36-percent drop. The 2009 ending balance is approximately 17 percent of the annual operation and maintenance (O&M) cost. Transfers to the capital funds have decreased significantly from about $5.6 million in 2005 to $151,000 in 2009 (a 97-percent decrease) resulting in underfunding of annual capital repair and replacement and deferral of needed projects.

[2] FTE = Full Time Equivalent

Table 8-6 Sewer Operating Fund Summary (2005 through 2009)

	Years				
	2005	2006	2007	2008	2009
Beginning Balance	8,426,924	6,404,437	7,567,164	5,207,020	3,707,400
Revenues	34,301,415	33,781,917	34,953,226	35,353,695	35,173,239
Percent Change		-1.5	3.5	1.1	-0.5
Percent change since 2005		-1.5	1.9	3.1	2.5
Expenses	36,323,902	32,619,189	37,313,370	36,853,316	34,790,821
Ending Balance	**6,404,437**	**7,567,164**	**5,207,020**	**3,707,400**	**4,089,818**
FTE Staff	**340**	**323**	**316**	**285**	**256**

Figure 8-14 presents the distribution of the 2009 billings by customer class. The residential customer base (RSA only) and the Master Meter Suburban (MMS) account for 57.1 and 18.7 percent, respectively, of the billed revenue in 2009. Based on the rate increases approved through 2013, the burden of the residential customer base will increase from 57.1 to 57.5 percent. This of course assumes that the MMS customers contribute to the implementation of the LTCP program.

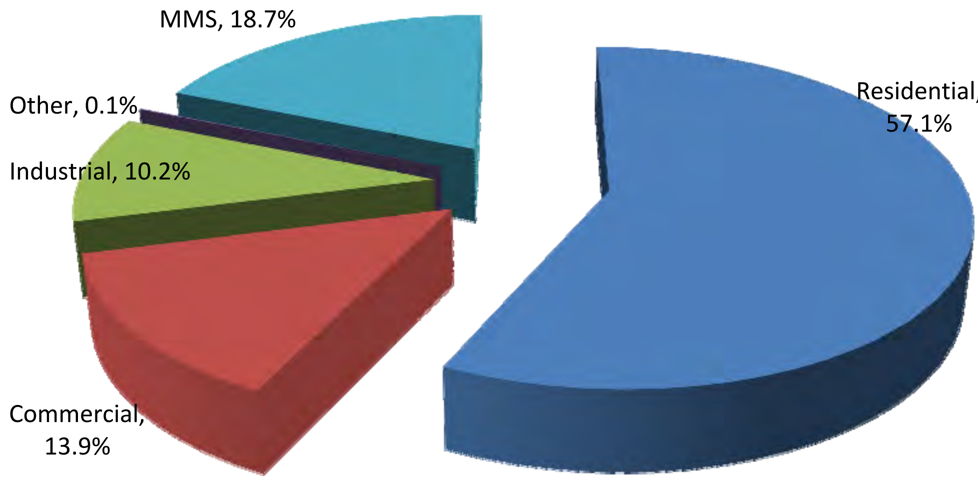


Figure 8-14 Billings by Customer Class (2009)

Although the MMS Communities contribute to the wet-weather flow that is processed by the WPCS, each of the MMS Communities is a separate sanitary sewer system. Each MMS community owns and operates their sewer system independently from Akron. Revenue generated from the MMS communities is critical to support the implementation of the LTCP.

Sewer Rate Increases. Table 8-7 presents a summary of the sewer rate increases since 2005. Rates from 2005 through 2009 increased modestly (about 2.5 percent), but a significant increase was enacted in 2010 that resulted in an average increase of approximately 30 percent.

Table 8-7 Sewer Rate Increases (2005 through 2010)

	Year						***Increase Summary (percent)***	
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2005-2009**	**2010**
Akron Customers	***Rate per HCF (Water Consumption)***							
Residential	2.890	3.035	3.035	3.035	3.035	3.794	5.0	25.0
Commercial	2.852	2.852	2.852	2.852	2.852	4.038	0.0	41.6
Industrial	3.721	3.812	3.812	3.812	3.812	5.291	2.4	38.8
Average	**3.154**	**3.233**	**3.233**	**3.233**	**3.233**	**4.374**	2.5	35.3
Retail Customers (outside Akron)								
Residential	2.614	2.646	2.706	2.706	2.706	3.619	3.5	33.7
Commercial	2.623	2.675	2.697	2.697	2.697	3.610	2.8	33.8
Industrial	3.464	3.620	3.700	3.700	3.700	4.659	6.8	25.9
Average	**2.900**	**2.980**	**3.034**	**3.034**	**3.034**	**3.963**	4.6	30.6
MMS Area	***Rate per 1,000 Gallons (Sewage Flow)***							
Cuyahoga Falls	1.576	1.580	1.613	1.613	1.613	1.836	2.3	13.8
Montrose	1.659	1.688	1.727	1.727	1.727	2.032	4.1	17.7
Mudbrook	1.548	1.540	1.567	1.567	1.567	1.702	1.2	8.6
Lakemore	1.546	1.548	1.572	1.572	1.572	1.703	1.7	10.1
Tallmadge	1.532	1.531	1.560	1.560	1.560	1.785	1.8	14.4

Table 8-8 summarizes the rate increases approved by Akron through 2013. The total average increase from 2009 through 2013 for the RSA is over 100 percent, and over 37 percent for the MMS area.

Figure 8-15 is an index comparison that graphically demonstrates how Akron sewer rates have historically outpaced both inflation and the Akron MHI. Recently enacted sewer rates will significantly widen the gap between these parameters.

Table 8-8 Approved User Fee Increases (2010 through 2013)

	2010	2011	2012	2013
Akron Customers	***Rate per HCF (Water Consumption)***			
Residential	3.794	4.553	5.463	5.955
Commercial	4.038	4.644	5.340	5.821
Industrial	5.291	6.084	6.997	7.627
Average	**4.374**	**5.094**	**5.933**	**6.468**
Retail Customers (Outside Akron)(Note 1)				
Residential	3.619	3.800	3.990	4.190
Commercial	3.610	3.790	3.980	4.179
Industrial	4.659	4.892	5.136	5.393
Average	**3.963**	**4.161**	**4.369**	**4.587**
MMS Area	***Rate per 1,000 Gallons (Sewage Flow)***			
Cuyahoga Falls	1.836	1.928	2.024	2.125
Montrose	2.032	2.134	2.241	2.353
Mudbrook	1.702	1.787	1.876	1.970
Lakemore	1.730	1.817	1.908	2.003
Tallmadge	1.785	1.874	1.968	2.066
Average	**1.817**	**1.908**	**2.003**	**2.103**

Note 1: Rate information presented in Table 8-8 for customers outside Akron reflects only the portion of each customer's bill that is directly related to charges for conveyance and treatment at Akron's WPCS. Customers outside Akron also pay additional charges to their respective cities/systems for local costs including operation, maintenance, capital, regulatory compliance, and customer service costs.

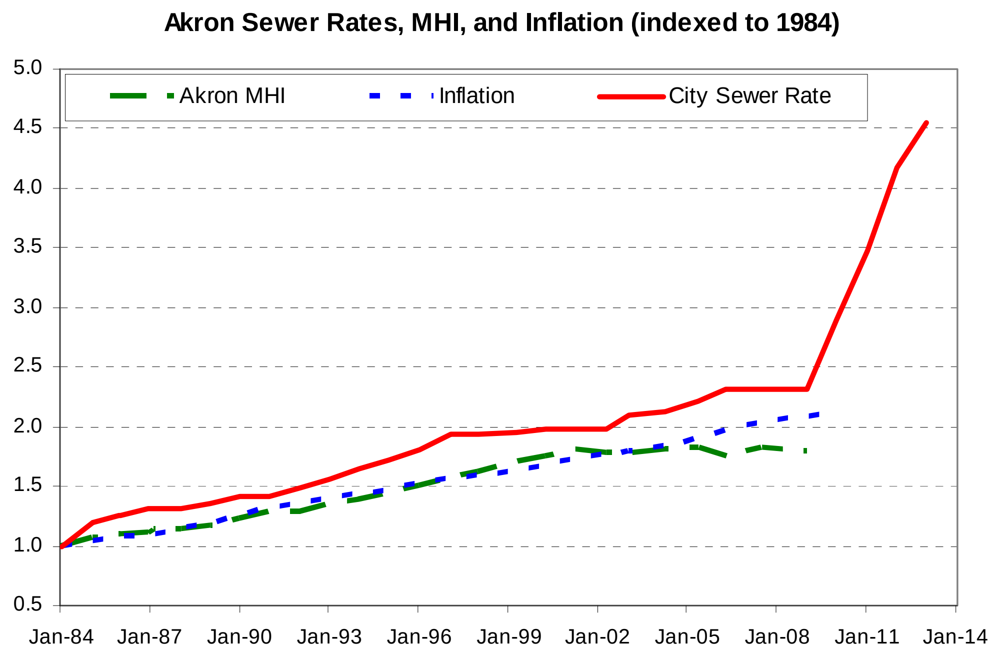


Figure 8-15 Sewer Rate Trends (1984 to 2014)

Consumption and Customer-Based Trends. Table 8-9 presents a summary of the consumption trends in the Akron sewer system. Since 2003, there has been an average decrease of 18.5 percent in billable consumption in the RSA and an average decrease of 3.6 percent in the MMS service area.

Table 8-9 Consumption Trends (2003 through 2009)

Metered Discharge (Mgals/Yr)	**Year**							
	2003	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***Percent Change Since 2003***
Retail Service Area[3]								
RESIDENTIAL	5,467.17	5,439.15	4,946.00	4694.74	4645.23	4,584.86	4,446.60	- 18.7%
COMMERCIAL	1,611.79	1,567.95	1,487.14	1395.22	1427.02	1,408.53	1,299.60	- 19.4%
INDUSTRIAL	854.68	735.93	696.70	661.32	727.69	695.79	719.40	- 15.8%
SUBTOTAL	**7,933.64**	**7,743.03**	**7,129.84**	**6,751.28**	**6,799.94**	**6,689.18**	**6,465.60**	**- 18.5%**
Master Meter Suburban [4]								
CUYAHOGA FALLS	1,284.00	1,473.10	1,336.30	1,278.31	1,340.24	1,284.00	1,101.90	- 14.2%
MONTROSE	318.80	339.10	337.40	337.60	364.66	318.80	368.50	15.6%
MUD BROOK	2,029.90	2,215.00	2,216.40	2,091.84	1,841.31	2,029.90	1,935.50	-4.7%
LAKEMORE	293.70	331.80	310.50	309.45	303.79	293.70	290.00	-1.3%
TALLMADGE	579.80	613.10	629.90	703.70	743.25	579.80	645.90	11.4%
SUBTOTAL	**4,506.20**	**4,972.10**	**4,830.50**	**4,720.90**	**4,593.25**	**4,506.20**	**4,341.80**	**-3.6%**
Total Annual Treated Flow @WPCS	**28,597**	**31,451**	**28,674**	**27,548**	**28,856**	**28,499**	**25,123**	

Starting in 2009, the national and local economic climate has declined significantly. Akron did not raise sewer rates in 2009. Also, 2009 was a drier year. Dry years typically result in higher consumption primarily due to recreational and lawn-sprinkling activities, which results typically in higher revenue. Yet, water consumption declined again in 2009. With the significant increase of sewer rates started in 2010, there will be additional elasticity effects (e.g., water conservation to minimize the impact of the rate increase) on revenue.

Delinquencies. Like most urban centers in Ohio, Akron has issues with nonpayment of sewer and water bills. Table 8-10 presents a summary of the outstanding delinquencies

[3] Based on metered Water Consumption
[4] Based on metered Wastewater Flow

(as of April 15, 2010) for bills issued in the years 2007 through 2009 by zip code for all customer classes. In addition, Table 8-10 summarizes the total outstanding balances for those years, the total number of accounts by zip code and the total delinquencies per account. The top five delinquency areas per account are within zip codes 44307, 44260, 44312, 44321, and 44306. In 2009, more than 5 percent of the accounts were delinquent. Table 8-10 does not include outstanding delinquencies prior to 2007.

Table 8-10 Total Outstanding Delinquencies for 2007 through 2009 for all Customer Classes

Zip Codes	2009	2008	2007	Total	Total No. of Accounts by Zip Code	Delinquencies ($) per Accounts
-	$ 7,871.42	$ 1,101.60	$ 1,356.52	$ 10,329.54		
44223	2,429.13	717.52	516.21	3,662.86	614	$5.96
44250	2,322.83	1,229.11	-	3,551.94		
44260	40,093.29	2,140.52	1,409.63	43,643.44	1,498	29.13
44278	-	-	83.41	83.41	106	0.79
44301	21,612.81	16,298.18	16,307.42	54,218.41	6,287	8.62
44302	11,047.77	7,428.52	5,528.80	24,005.09	1,818	13.20
44303	9,709.62	3,352.97	3,992.43	17,055.02	2,707	6.30
44304	6,082.72	2,433.08	9,817.13	18,332.93	1,111	16.50
44305	31,904.04	23,459.31	24,729.96	80,093.31	9,077	8.82
44306	74,528.17	46,568.37	31,108.33	152,204.87	7,618	19.98
44307	190,505.08	22,035.24	466,854.95	679,395.27	2,669	254.55
44308	1,602.37	1.91	47.77	1,652.05	370	4.47
44310	64,914.47	25,982.92	20,749.31	111,646.70	8,189	13.63
44311	14,937.87	8,180.53	16,168.49	39,286.89	2,344	13.77
44312	120,735.01	58,391.28	17,689.35	196,815.64	7,998	24.61
44313	13,923.49	5,744.87	6,027.19	25,695.55	8,881	2.89
44314	22,476.24	19,130.10	22,919.64	64,525.98	7,567	8.53
44319	3,403.16	2,010.99	634.87	6,049.02	952	6.35
44320	48,546.82	36,943.55	28,020.61	113,510.98	7,301	15.55
44321	49,730.88	3,701.25	158.50	53,590.63	2,665	20.01
44333	2,280.01	1,115.15	691.44	4,086.60	4,113	0.99
Totals	**$ 740,657.20**	**$ 287,966.97**	**$ 674,811.96**	**$1,703,436.13**	**83,885**	
Total Number of Sewer Accounts					**85,571**	

Akron has aggressively pursued these delinquencies and has turned off the water supply for nonpayment. However, most of the delinquencies fall in one of the following categories:

- The property was sold and the customers moved out of the area.[5]
- Bankruptcies
- Bill disputes
- The customer has agreed to pay the bill over installments.

All outstanding accounts that can be tied to a specific residence and owner are certified to the Summit County Auditor and placed on the tax duplicate. Of course, extra collection efforts increase costs, and some revenue is lost from uncollectable bills.

Approximately 44 percent of the outstanding delinquencies are from residential accounts, and approximately 39 percent are industrial accounts. The majority of the outstanding delinquencies are within the urban center of Akron. ZIP Code 44307 accounts for 91 percent of the industrial delinquencies. These are also the neighborhoods with the lowest MHI and the highest poverty and unemployment.

Account delinquencies are primarily attributable to a lack of income. In the RSA, for every drop of $10,000 in a ZIP Code's MHI, the delinquency rate on 2009 charges rises by 2.4 percentage points (Figure 8-16). A proportion of accounts with outstanding delinquencies from 2007 and 2008 are still quite substantial at the beginning of 2010. This suggests that delinquencies will increase by 50 percent or more as Akron's sewer rates rise with the implementation of this Final LTCP.

Such increases in delinquencies mean that Akron's revenue growth will not keep up with its rate increases and that Akron will have to increase its expenditures on collection efforts. More importantly, these delinquencies evidence an increasing scale of hardship experienced by some of the poorest residents in the service area.

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[5] The Akron Law Department has a program to pursue payment.

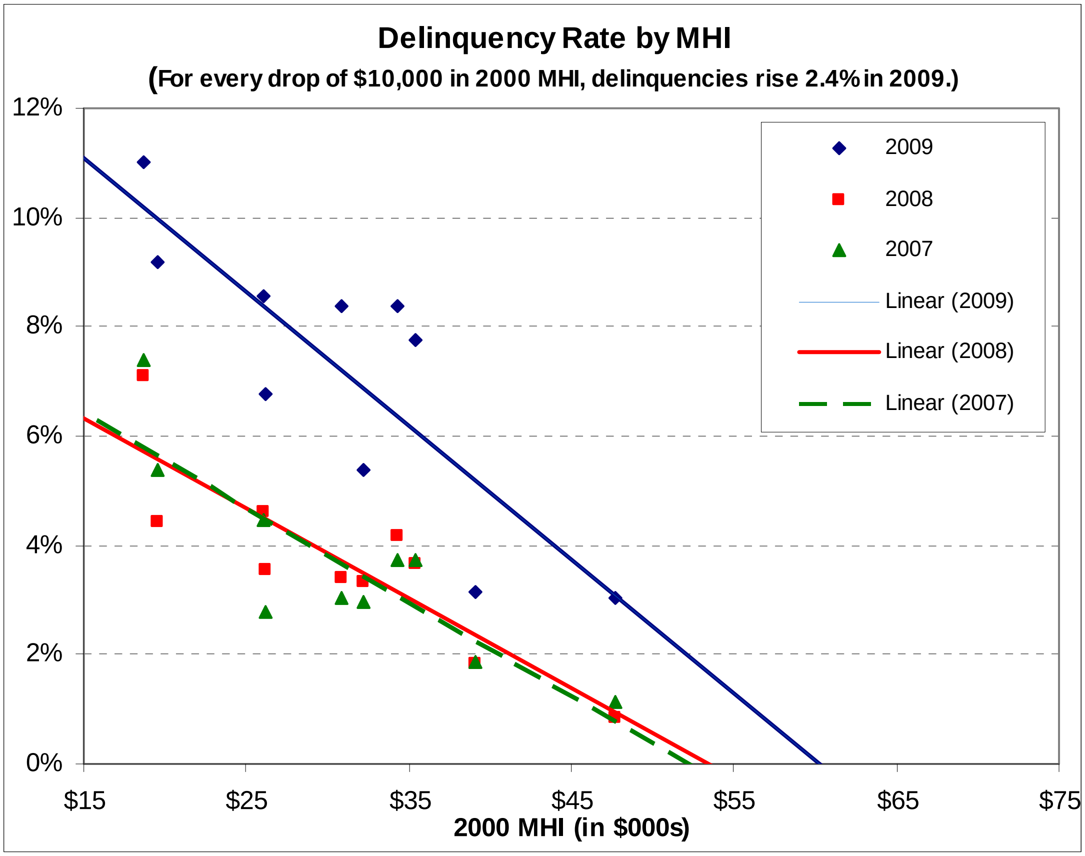

Figure 8-16 Delinquency Rate by MHI

The 2000 MHI in a ZIP Code explains more than 80 percent of the delinquency rate. It is notable that Akron's financial situation is much worse than the average for local governments. As noted earlier, the impact of the recession on employment for local governments in the nation as a whole was negligible. Akron's substantial layoffs in 2009 indicate that it is among the cities that have been most severely affected by the recession, and it will almost certainly be among the last to fully recover.

Retail Service Area (RSA)

Although Akron is the permittee submitting this LTCP, Akron's Publicly Owned Treatment Works (POTW) also serves a number of customers who are not Akron residents. Most of these customers are located within Akron's RSA – the geographic area covered by Akron's collection system. Akron also provides treatment and limited conveyance services for five MMS Communities. In these areas, the five communities own, operate, and maintain their individual collection systems, set rates, and bill individual customers. While Akron sets rates (per thousand gallons of metered sewage flow) for the services it provides to these communities (only the conveyance of MMS system sewage through the Akron sewer system and subsequent treatment at the WPCS), the terms of previously negotiated contracts developed in response to a judicial consent decree historically have constrained the rate setting process.

For purposes of assessing its financial capability, Akron believes using the economic conditions of the RSA is most appropriate.

Rationale/Concept. There are three reasons for basing this economic assessment on the RSA.

1. The MMS Communities are upstream from Akron's sewer system.

2. MMS Communities' level of participation in the debt that will be incurred to implement the LTCP is unknown at this time. Given this uncertainty, it is inappropriate to include their economic capacity in calculating Akron's financial capability.

3. There are substantial economic differences between Akron's RSA and the MMS Communities. These differences have a dramatic effect on financial capability and household affordability calculations. Ratepayers in MMS communities pay for not only a portion of Akron's cost of service, but also for costs applied by their respective communities. Therefore, as a matter of economic/environmental justice, the economic assessment should be based on the RSA with additional consideration being given to impacts on households in the City of Akron.

These RSA distinctions are substantive, and USEPA has, in fact, embraced the RSA concept in reaching agreements with other Midwestern communities.

Poverty Rate. The only portions of the RSA with low poverty rates are either outside the City of Akron or within the Northwest Akron neighborhood. By contrast, none of the census tracts in the MMS Communities had 2000 poverty rates above the national average, and many of them had rates less than half the national figure.

Median Household Income. In 2000, roughly half of the RSA falls in one of the two lowest income categories, but no areas in the MMS Communities are similarly situated. By 2007, the gap between the RSA and the MMS Communities had widened further with about 70 percent of all tracts in the RSA having MHIs below 78 percent of the U.S. figure, while the MMS areas were relatively unchanged.

Unemployment Rate. Almost all of the RSA tracts had unemployment above the national average, and more than half of Akron's tracts had unemployment rates at least 3.3 percent above the U.S. average. On the other hand the MMS Communities are dominated by tracts with extremely low unemployment rates.

Update of City Conditions

Property Taxes. Property values are declining. Summit County data reported by the Ohio Department of Taxation shows the ratio between assessed value and sales price for all property transfers. Up through 2005, these ratios followed a standard triennial trend consistent with market appreciation between appraisal years and reappraisals catching up with the market. Figure 8-17 presents that, beginning in 2006, the County has experienced a three-year departure from this trend, which looks like an absence of appreciation in 2006, and depreciation occurring at an accelerating pace in 2007 and 2008. This is borne out by the data on the 2008 reappraisal, which shows a decline in the aggregate residential property value from 2007 to 2008. This is borne out by Ohio Department of Taxation data from the Real Property Abstracts for Akron for 2007, 2008, and 2009 which show a decline in the City's aggregate residential property value in each of the past two years. This decline in property values represents a loss of wealth for City households, which lessens their ability to increase their expenditures.

Property taxes now exceed 4 percent of property value. The Ohio Department of Taxation has also posted data showing that taxes paid by property owners in the Akron City School District were 4.3 percent of full market property value for the 2008 tax year.

Economically Disadvantaged Residents. The recession has had substantial impacts on Akron residents. Akron City School District data from the Ohio Department of Education demonstrate the worsening economic conditions facing Akron residents. For the 2005/06 through 2007/08 school years, on average, 78.4 percent of students were considered by the State to be economically disadvantaged based on family income, but this figure rose to 82.4 percent in the 2008/09 school year. From another perspective, out of every 125 students, the number who are NOT economically disadvantaged dropped by 19 percent from 27 to 22.

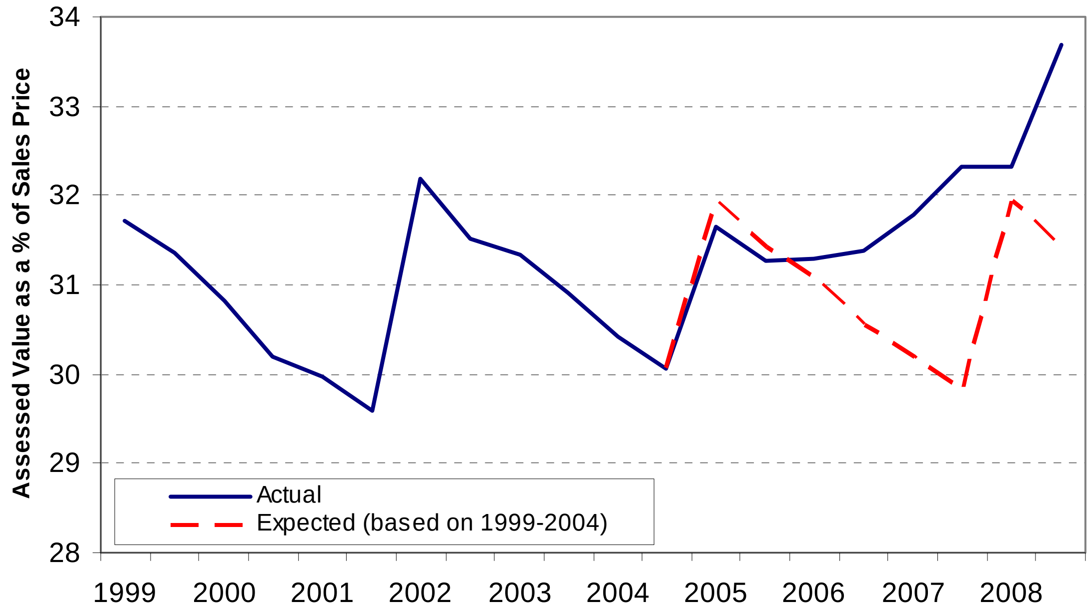

Figure 8-17 Summit County Residential Real Estate Sales Ratios

The proportion of students who are homeless more than doubled, from an average of 1.1 percent over the three-year period to 2.5 percent in the last school year. Nearly every other school district in Summit County also had dramatic increases in both measures.

Incomes of Akron residents have stagnated for a number of years. The Ohio Department of Education reports the median income for all tax filers in each school district, and this figure for residents of the Akron City School District increased only 0.3 percent from 2003/04 to 2008/09.

Budget. Akron currently finds itself in what may be the most difficult financial condition it has faced in recent history.

On September 15, 2009, Akron issued a news release entitled *City of Akron Lays Off 201 Employees; First in 27 Years, Due to Economy*. Part of the mayor's explanation, as quoted in the release, was as follows:

> We are still tied to the world economy, and we can't escape the worldwide recession and its impact. Employment in the private sector of Akron is down. At the end of August, income tax revenues are down $3.5 million. Property tax income, investment income, and the funds we receive from the state are all down. Health care costs are

> up. We are looking at a deficit in excess of $7 million by December 31 if we do nothing else. I have a legal obligation to balance the budget by the end of the year.

On December 7, 2009, another news release was issued entitled *Mayor Issues More Wage Freezes*:

> The City of Akron is preparing for a second year of what national experts say will be a continued downturn in the economy, with employment numbers not projected to return to 2007 levels until possibly 2011. “This global recession has impacted all local governments,” said Mayor Don Plusquellic. “All around us cities are cutting expenses, limiting public services, reducing wages, imposing furloughs, and employing other cost- reductions to try to stay afloat.”

An article in the *Akron Beacon Journal* on February 19, 2010 states:

> Akron’s income tax revenue for this year was down about 4 percent compared to last year. Last year's income tax revenue was down 7.4 percent from 2008. Finance Director Diane Miller-Dawson is projecting a decline in general fund revenue of 5 percent this year compared to last year.

One month later, an article about Akron’s 2010 budget contained the following description:

> The $514 million operating budget is about a 6 percent reduction from last year’s $548 million budget, Finance Director Diane Miller-Dawson told members of Council’s Budget and Finance Committee. The general fund budget of $139 million is down $16 million from last year, she added. Miller-Dawson said Akron continues to try to find a way to operate in the second year of a recession. “Revenue continued to shrink, and we also need to reduce expenses,” she said.

Most recently, in his annual State of the City Address (April 8, 2010), Mayor Don Plusquellic described Akron’s financial situation in this way:

> The direct impact of unemployment and underemployment is that we collect less income tax. In 2009, the City income tax - our primary source of funding - was down

7.5 percent. Money from the state - our share of the sales tax and other funds - was down 13 percent. Our small share of property taxes was down 6 percent.

Our income to operate the general fund in the City is mostly dependent on people working – the City income tax. And when one of every ten people has lost their job – we have to cut back.

This year, the financial forecast remains “mostly cloudy.” Through March, City income taxes are down about two percent. Other sources of revenues, down eight percent.

Other Economic Considerations

Debt Per Capita. This is another measure of financial capability and of Akron’s ability to borrow. According to Akron’s *2008 Budget in Brief* (the latest available), Akron’s total of all direct and overlapping debt is $762.5 million (as of December 31, 2008). This amounts to more than $3,600 per capita. Per EPA’s guidance, when this metric exceeds $3,000, it is an indication that a community’s debt condition is weak.

Falling Income Tax Revenues. In 2004, the income tax rate was increased from 2 to 2.25 percent which somewhat distorts the income tax revenue figures (the 0.25 percent increase is dedicated to funding local school reconstruction). The current lower employment level combined with uncertain prospects for recovery indicates that the City will continue to face substantial economic challenges.

Figure 8-18 clearly demonstrates that as employment increases, income tax revenues increase, (and vice versa) when employment decreases, income tax revenues decreases.

State / Local Tax Structure. An additional consideration in evaluating the prospective impact of the LTCP program requires recognition of the implications of the State of Ohio’s tax structure. Local governments in the State of Ohio levy a municipal income tax on residents and commuters as well as state income taxes ranging from 0.712 to 7.185 percent. Akron’s municipal income tax of 2.25 percent represents a significant additional tax burden and must be considered in an accurate evaluation of financial capability.

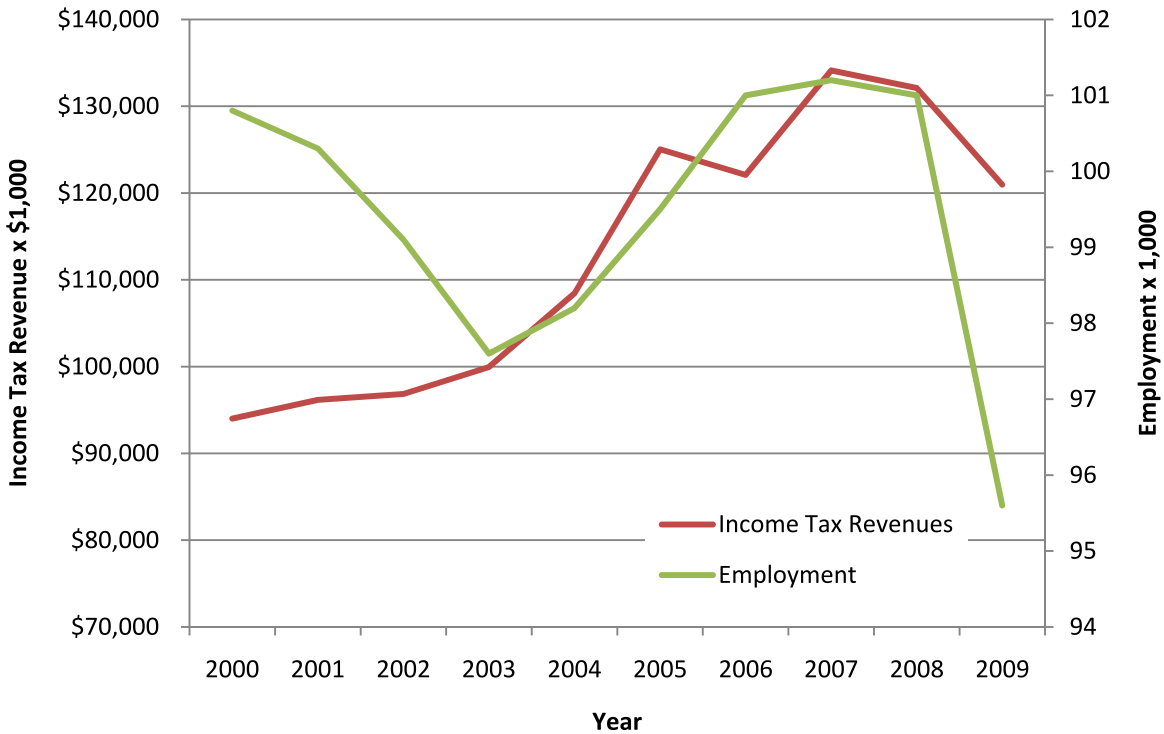

Figure 8-18 Employment versus Income Tax Return

Further, while it may be argued that many communities across the nation impose some form of additional, non-property tax on their residents, and therefore the FCA calculation should not be adjusted, this position would deny recognition that the tax structure in the State of Ohio generally, and Akron specifically, is relatively burdensome as compared to many if not most other communities in the country despite its relatively acute economic challenges.

At the state level, this assessment is supported by research produced by the Tax Foundation, which shows that the state/local tax burden for Ohio residents is one of the highest in the country and has been increasing (Tax Foundation 2010). According to the Tax Foundation, Ohio's state/local tax burden percentage in 2004 was estimated at 11.3 percent of income, making it the third highest in the nation (only New York and Maine are higher), exceeding the national average of 10.0 percent.

At the local level, it is notable that Akron has one of the highest earnings tax rates in the State of Ohio. Out of 549 cities and villages with earnings taxes, only ten have higher rates and seven have the same rate.

Environmental Justice Impacts

The preceding financial analysis using *EPA's Guidance* indicates that Akron residents will experience a substantial financial obligation. Given the anticipated cost of the LTCP and the economic conditions (as presented earlier in this section) that confront Akron residents, serious attention should be given to the environmental justice considerations presented here.

USEPA's concern for environmental justice calls, in part, for encouraging the cleaning up of polluted sites (including CSOs) so that people living near those areas do not unfairly bear the burden of environmental degradation. However, it is equally important that these community residents not be forced to pay an unreasonably large share of their income in order to receive these benefits.

Environmental Investment Expenditures. Akron's economic challenges suggest a limited capability for water quality investments. In addition to its LTCP projects to improve water quality, Akron's economic development initiatives require funding to promote industries that are more environmentally friendly than Akron's historical industrial base. To the extent that Akron's ability to continue and enhance these activities could be compromised by high burden water quality investment requirements, Akron's more environmentally sustainable economic re-development will be hindered.

Low Income Rate Payers. As noted above, Akron faces a number of economic challenges including protecting and developing opportunities for a relatively sizeable low-income population.

As of 1999,[6] almost 37,000 individuals, or 17.5 percent of Akron's population had incomes below 150 percent of the federal poverty line.[7] This sub-population and others in the larger utility service area, by definition, face financial challenges that make additional claims on limited disposable income untenable. This is particularly true when cost increases occur at rates above income (or assistance) growth, thereby requiring

[6] Profile of Selected Demographic Characteristics - Social Characteristics, 2000, City of Akron, Ohio, U.S. Census.

[7] The 150 percent of federal poverty line threshold is used in a number of social service programs to establish eligibility for low-income assistance and thereby provides an indicator of the proportion of the population facing economic hardships that is not revealed by reference to Median Household Income.

such ratepayers to substitute other needed goods and services to pay for additional wastewater service costs.

Akron's wastewater program schedule is projected to require cumulative rate increases of between 50 percent and 60 percent over the next five years,[8] and numerous additional rate increases above the assumed 3 percent inflation rate throughout the forecast period. These projected rate and associated wastewater bill increases are well above either the historical or projected rate of income growth in the Akron region. As a result, low-income customers may be expected to face particularly adverse impacts associated with Akron's wastewater program financing.

Renters' Ability to become Homeowners*.* A particularly important barometer for communities seeking to foster economic growth and revitalization relates to home ownership. In Akron, despite the relatively low cost of housing, 40 percent of occupied housing units were rented as of 2000.[9] Wastewater bills represent claims on potential homeowners' disposable income that may not be dedicated to mortgage payments. As such, wastewater bill escalation at rates greater than income growth will widen the gap for potential homeowners seeking to qualify for home ownership.

Environmental Justice Implications. Given these substantial differences, basing the financial capability assessment on the RSA becomes a matter of environmental justice, since this serves to limit the financial burden imposed on the numerous lower-income residents served by the City's system.

If the MMS communities are included in the analysis without adequate consideration of the distribution of incomes across the City's service area, program costs that could result in people in poverty having to pay in excess of 5 percent of their income for the CSO program may be deemed within the City's financial capabilities – an outcome that would ignore environmental justice concerns.

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[8] Summary of rate increase projections for 2007-2011 developed for alternative capital financing scenarios. Documentation of the strategic financial planning model analyses used to derive these projections is available upon request.

[9] Profile of Selected Demographic Characteristics - Housing Characteristics, 2000, City of Akron, Ohio, U.S. Census.

This presentation of environmental justice considerations provides a foundation for understanding why the RSA is more appropriate for evaluating financial capability than the combined RSA and MMS areas.

USEPA Workbook Calculations

The USEPA's CSO Control Policy recognizes the importance of both environmental and financial issues in the development of an implementation schedule for CSO controls. *The Guidance* document for CSO communities presents one approach for evaluating the financial capability of a community to implement its LTCP. This section presents the results of an assessment of Akron's LTCP using *The Guidance* document and data for the RSA.

The assessment includes two phases: Phase 1 is the *Residential Indicator* and Phase 2 is the *Permittee Financial Capability Indicators.* Phase 2 includes an index of six indicators in the sub-categories of debt, socioeconomic, and financial management indicators. *The Guidance* analysis presents a snapshot that may not adequately represent the dynamics of financial capability changes of a community over time. *The Guidance* encourages the use of additional information to enhance assessment of financial capability and assist in determining an appropriate CSO program implementation schedule. Some of the additional factors that impact Akron's financial capability are presented within the context of the USEPA's formulaic assessment.

As shown in Appendix 1-B (Updated Financial Capability Assessment and Affordability Analysis for Akron's CSO LTCP), the City's CSO program will place a high burden on local ratepayers. Table 8-11 shows where the City scored for both the residential and financial indicators based on the 3-3-3 plan.

Table 8-11 USEPA Workbook Scores for Residential and Permittee Financial Indicators

	Akron Retail Service Area	Retail Service Area + Master Meter Communities
Residential Indicator (cost per household as a percentage of Median Household Income)	1.92	1.66
Financial Indicator	1.5	1.5

Using the EPA workbook, the City scores in the "Mid-Range" category for the Residential Indicator and the "Weak" category for the index of Permittee Financial Indicators. This leads to the designation that the City's LTCP will impose a "High Burden" per USEPA's Guidance. Table 8-12 illustrates the High Burden designation.

Table 8-12 Assessment of Financial Capability for Akron

Permittee Financial Capability Indicators Score (Socioeconomic, Debt and Financial Indicators)	**Residential Indicator Cost per Household as a Percentage of MHI**		
	Low Burden (Below 1.0%)	Mid-Range (Between 1.0 and 2.0%)	High (Greater than 2.0%)
Weak (Below 1.5)	Medium Burden	**High Burden**	High Burden
Mid-Range (between 1.5 and 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

Conclusion

The information presented above summarizes information called for in the EPA Guidance to assess the City's financial capability to implement the recommended LTCP, as well as additional information (also as called for by the Guidance) to more fully characterize the City's financial condition. This information demonstrates that the City's recommended LTCP will impose a High Burden on Akron ratepayers, and that referencing the City's residential service area will serve to better address the City's financial capability, as well as concerns about the City's low-income populations. Given that the recommended LTCP will impose a High Burden, higher levels of control are untenable within the Consent Decree mandated program schedule period.

8.1.7 Financing Plan

Introduction

Akron has provided quality, reliable water and wastewater service to the City and surrounding communities for over 100 years. In doing so, the City has provided important environmental protection services and supported economic development in the region. With asset book value exceeding $180 million and a $42 million per annum revenue stream, Akron's sewer system is a significant economic force whose rates and charges, capital projects and programs have profound impacts on the community. Prospectively, Akron's rates and charges must reflect a balance of its economic and environmental objectives, as contemplated in the CWA and the *CSO Control Policy*, particularly in light of the acute economic challenges facing the region. Akron has demonstrated a strong, renewed commitment to environmental protection by adopting an unprecedented, four-year rate increase program in 2009 that would almost double typical residential customer bills by 2013.

In order to determine the components and schedule[10] for Akron's Capital Improvement Program (CIP), including the levels of controls, Akron developed a cash-flow analysis model to evaluate program configuration options that appropriately balance its environmental stewardship and financial responsibilities. This evaluation used principles highlighted *in The Guidance* with enhancements to the workbook calculations. This financial capability assessment (FCA) recognizes key imperatives of the City's prospective program financing that define what may be financed "as expeditiously as practicable," such as:

- Akron's program and milestones were developed taking into consideration the total costs of wastewater and stormwater management services to be imposed on ratepayers. The assessment of these costs does not separate the impacts of individual components but rather considers the total claims on ratepayer income for Clean Water Act related costs.
- Limits on the pace, magnitude and effectiveness of future rate increases impose capital financing constraints on levels of control and milestones. These constraints may supersede the scheduling of projects "as expeditiously as possible" from a purely technical, project delivery perspective. Nevertheless,

[10] Specific years for completion of projects per the baseline schedule to be based on the date of approval of the City's LTCP, and may be adjusted based on changing economic conditions as discussed herein.

Akron's program contemplates accelerated 18-percent, per annum, rate increases in 2013-15 for Akron ratepayers (and 6-percent per annum increases for MMS communities) superseding the last year of the Council adopted 2010-2013 rate program and raising rates such that typical Akron residential bills will reach two percent of Akron's MHI by 2015.

- Akron's schedule attempts to prioritize water quality investments so that those projects yielding greatest benefit per dollar are scheduled first, while investments with lower returns are deferred, although limitations on this prioritization prevail due to financing constraints.[11] Benefits are defined not only by water quality improvements but also by mitigation of environmental justice concerns. Similarly, water quality investments cannot be prioritized above system integrity through inadequate funding of asset renewal and replacement.

- Akron's schedule is presented as a "baseline" that is subject to adjustment because of the dynamic nature of factors impacting its financial capability over the prescribed 17-year implementation period.

This FCA uses general principles outlined in the *CSO Control Policy* and *The Guidance* – perhaps most notably that scheduling should be determined in a manner that mitigates economic burden. Though residential costs as a percentage of MHI are shown to be inadequate to fully reflect burden, this metric is used, like The Guidance, to gauge financial capability. In addition, the FCA incorporates financing assumptions designed to preserve Akron's financial health, as suggested by *The Guidance's* references to Permittee Financial Indicators.

This section of the FCA supplements Akron's update to calculations that follow *The Guidance* offering an "Open Book Portfolio Management" (OBPM) approach. This approach responds to three imperatives for Akron's forthcoming LTCP:

1. Akron must commit to levels of control for which the scope and estimated costs do not impose rate increases that are untenable for ratepayers. Future rate increases are limited so that the 2 percent of MHI threshold indicator of High Burden (suggested by *The Guidance*) is not exceeded for as long as practicable beyond the 2010-2015 rate program (through 2024).[12]

[11] For example, tunnel projects are deferred to the extent practicable as financing capacity is not adequate in initial years of the forecast period without either untenable rate increases and/or deferral of other high priority investments.

[12] Nevertheless, a second series of substantial rate increases ranging from 6.0 percent to 12 percent per annum over a 7-year period between 2020 and 2026 is projected to build financing capacity for tunnel construction, which are projected to ultimately result in residential bills reaching 2.38 percent of MHI - a High Burden that is as onerous as several recent Consent Decrees and an extraordinary commitment for a community that, as previously discussed, faces acute economic challenges.

2. Akron must commit to scope and milestones that enable them to adequately renew and rehabilitate its systems, support effective operations, and meet regulatory requirements (such as those imposed in a new NPDES permit effective September 1, 2010).

3. Since both the factors that impact financial capability and the benefits of individual projects change over time, Akron must retain flexibility to prioritize investments and schedules as financial and logistical constraints evolve.

As noted, in order for Akron to determine the scope, levels of control, and project schedule of the LTCP, a strategic financial planning model (discussed in detail below) was developed to assess the City's financing capacity given tenable rate increases. Akron is prepared to demonstrate how alternative assumptions and CIP configurations affect program financing and associated projections of rate impacts and burden.

Legislative and Regulatory Intent

The City's baseline schedule was developed to preserve its financial health and ensure that program financing may be carried out on favorable credit terms to ensure implementation at the most economical cost over the estimated life of the works. Akron's focus on prioritizing projects and levels of control within its financial capability is consistent with concepts of cost-effectiveness called for in the CSO policy. These concepts suggest allocation of limited resources to those investments yielding the highest returns per dollar (though, in some respects, preferable alternatives yielding still higher returns are not available under the prevailing 17-year schedule limitation).

Akron follows other permittees in advancing a practical, transparent and flexible approach to financial capability assessment that incorporates the principles described in the *CSO Control Policy* (and extends and enhances analyses in *The Guidance*) by:

- Incorporating the imperatives for, and local constraints on their capital financing capacity by mirroring the procedures that support bonded indebtedness

- Directly assessing claims on household incomes based on projected service billings

- Providing regular review and adjustment of schedules based on changes in economic conditions that affect financial capability over time

- Providing a framework for addressing "*the specific circumstances of each permittee's environmental and financial situation*" (*The Guidance*, Page 49) in defining levels of control and schedule

Open Book Portfolio Management

Akron's approach to financial capability assessment is consistent with the commonsense connotation of the term "financial capability." Individuals and business units define their financial capabilities by assessing how much money they can commit to spend within their income constraints. Similarly, Akron's assessment of its financial capability is grounded in a determination of net revenues that may be generated under strained yet potentially feasible rate and fee increase scenarios. The feasibility of these scenarios is, in part, a reflection of current and projected burden of wastewater service costs, in part on other Ohio communities' commitments, and in part a reflection of the unique socio-economic attributes of Akron's service area.

Akron's "Open Book Portfolio Management" (OBPM) approach to financial capability assessment focuses on projections of future cash flows and the burdens on ratepayers associated with rate increases. Specifically, Akron used its cash-flow forecasting model[13] to determine capital project financing capacity under tenable wastewater rate increases. Procedurally, the analyses were similar to those required to demonstrate the feasibility of debt issues in credit markets (arguably enhancing *The Guidance's* static references to financial indicators). The forecasts employ well-documented, publicly available information on Akron's financial position, as well as a number of critical assumptions. The forecast model also can show how changes in assumptions may affect Akron's capital financing capacity. For example, cash-flow projections based on alternative assumptions about the extent to which MMS communities share in program financing may enable Akron to determine a relevant range of potential CIP spending that could be financed within its capability.[14] Similarly, the model may illustrate the potential effect of improved (or deteriorating) economic conditions that influence system account growth

[13] Most public wastewater agencies develop cash-flow analyses for purposes of establishing annual budgets, developing rate forecasts, and general utility system financial planning.

[14] Scenarios may be developed to recognize and account for Akron-specific environmental and financial circumstances (discussed previously) that constrain the City's revenue generation potential. In particular, the disparity of household income levels across the City service area is pronounced. Akron residents' Median Household Income (MHI) is considerably lower than those among Master Metered Suburban communities– $34,531 vs. $57,157, respectively. Because of the important constraints on the City's ability to redistribute revenue responsibilities across user populations, the City's baseline forecast (discussed below) was developed assuming that Master Metered Community's rate increases would be approximately one-third of those imposed on Akron ratepayers - reflecting estimates of prospective allocations of cost responsibilities under current contract arrangements. Alternative scenarios were developed assuming system rate increases could be applied to both inside-City and Master Metered Suburban customers uniformly.

and/or per-account usage levels. Tenable prospective wastewater rate increases incorporated into Akron's baseline scenario effectively defined the capital project financing capacity available within the limits of its financial capability. Akron's Final LTCP levels of control reflect the use of this capacity to achieve water quality improvement where expenditures are prioritized based on their contribution to program goals given project delivery imperatives.

Holistic Evaluation of Program Costs

Although the determination of remedial measures for Akron's systems focused on individual system components (e.g., CSOs, SSOs), Akron's FCA and associated development of its baseline scenario reflect a holistic evaluation of program costs. Ratepayer burden is defined by the bills to be imposed to finance water quality improvements which also must pay for Akron to effectively manage operations, renew and replace system assets, upgrade treatment facilities, and secure outstanding indebtedness. Accordingly, Akron has developed projections of revenue requirements that will enable it to continue to exhibit the attributes of an "effective utility"[15] including compliance with current and certain anticipated future regulatory requirements.[16]Akron's cash-flow analysis considers the total costs to be imposed on City ratepayers through its wastewater service charges and storm water service charges.[17]

Akron has used conservative, industry-standard practices to estimate capital project costs. These cost estimates were updated based on 2010 cost parameters, reflect regional cost indices, and include industry-accepted cost contingencies. Uncertainties, such as future construction cost escalation which directly affect the amount of project

[15] Recommendations for a Water Utility Sector Management Strategy: A Final Report Submitted by the Effective Utility Management Steering Committee to the Collaborating Organizations – March 30, 2007, American Public Works Association, American Water Works Association, Association of Metropolitan Water Agencies, National Association of Clean Water Agencies, National Association of Water Companies, U.S. Environmental Protection Agency, Water Environment Federation

[16] However, the City's projected capital expenditures may underestimate costs from prospective requirements related to nutrient removal and do not provide for improvements to address, for example, potential Total Maximum Daily Load limitations or requirements to address emerging constituents of concern.

[17] The City's long-range projections of revenue requirements, which reflect capital financing through a combination of debt and equity, provide for full financing of the LTCP (e.g., absent alternative revenue sources). As such, the City's long-range financial projections facilitate evaluation of prospective burden in that projected City service rates enable direct calculation of typical residential bills' impacts.

work that may be completed within Akron's financial capability, suggest the efficacy of a portfolio management approach that facilitates project and schedule adjustments.

Portfolio Management

The dynamic nature of the market conditions in which Akron operates (i.e., recent volatility of construction costs and the profound effects of current economic downturn) reinforces the importance of the flexibility called for in the *CSO Control Policy*. Risks involved in program implementation combined with constraints on Akron's capital financing capacity, mean that financial capability assessment is essentially a portfolio management challenge. Over the program implementation period, Akron must allocate substantial (although limited) resources to investments that yield the highest returns (generally defined in terms of water quality benefits) while managing prevailing risks.

Akron's "Open Book Portfolio Management" approach includes two fundamental activities: (1) Prioritization and (2) Risk Management.

(1) Project Prioritization

Akron's long-range financial projection model has been used to evaluate Akron's capital financing capacity. The model allowed adjustments to the City's CIP to ensure required rate increases will not impose rates that push Akron's burden either too rapidly or too far beyond 2% of MHI. Akron used a structured project evaluation and prioritization process to help ensure that its proposed infrastructure investment can be sustained over multiple generations. Akron proposes to collaborate with regulators and community stakeholders to refine prioritization criteria, procedures and assignments of interim project milestones. Further, it should be noted that collaboration will be required over the program implementation period. Project scheduling flexibility is necessary over the program's life to ensure that the program remains within Akron's financial capability while, at the same time, it effects completion of Consent Decree requirements as expeditiously as possible.

(2) Risk Management - Project and Schedule Adjustment

"Open Book Portfolio Management" can assess and manage risks through reallocation of resources as conditions affecting financial capability change over the program implementation period. Individuals realign their use of financial resources based on changes in prices, income, investment options, and risks change their financial capabilities. Similarly, Akron's approach recognizes that its financial capability is a function of market dynamics that, by definition, will change over the program implementation period. Risk management, in this context,[18] is addressed through project and interim milestone adjustments and facilitates an “adaptive management” approach, similar in principle to that advocated by EPA in watershed management.[19]

- **Project Adjustments** – Akron’s preliminary assessment of the condition of wastewater collection systems, hydraulic flow characteristics, sewer reconstruction requirements, and other factors are by no means precise or certain. Given these uncertainties and to preserve flexibility to efficiently and effectively install the most cost-effective system improvements, Akron’s LTCP is being submitted as a baseline CIP subject to revision. As information is collected, projects will be specified or realigned to maximize the benefits of capital expenditures.[20] These types of changes in the composition of programs is contemplated in the CSO Control Policy which, for example, notes that “[t]he selected controls should be designed to allow cost-effective expansion or cost effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS, including existing and designated uses.”[21]

- **Schedule Adjustments** – Akron’s baseline CIP also anticipates (automatic) adjustment of interim project milestones schedules by variances between projected and actual conditions affecting financial capability.[22] At agreed-upon intervals in program implementation, Akron will update projected cash flows associated with the baseline CIP. Updating will include, at least, (1) current information on system revenues (reflecting rate increases aligned to MHI escalation, contract negotiations with Master Metered communities, and system growth); (2) actual expenses and experienced cost inflation; (3) updated capital financing terms; and (4) current MHI statistics. The resultant updated cash-flow forecasts will redefine the funds available for program financing. In the event that the funding level is greater than anticipated, projects will be accelerated to the extent practicable to employ available resources. To the extent that the funding level is less than anticipated, or

[18] Relating to the overall composition and scheduling of program components as opposed to risk management techniques employed in relation to individual project delivery.

[19] See, for example, USEPA’s *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (March 2008), “EPA recognizes that the processes involved in watershed assessment, planning, and management are iterative and that targeted actions might not result in complete success during the first or second cycle. It is expected, however, that through adjustments made during the management cycles, water quality improvements can be documented and continuous progress toward attaining water quality standards can be achieved.” - Chapter 2. Overview of Watershed Planning Process, Section 2.2.1 Watershed Planning Is an Iterative and Adaptive Process

[20] However, the City’s project prioritization process may enable selection of some lower-risk projects that are anticipated to yield lower “returns” (in terms of water quality benefit per dollar of expenditure) in preference to other higher-yield but higher-risk projects due to scheduling, environmental justice or other considerations.

[21] Federal Register / Vol. 59, No.75, April 19, 1994 / Notices p. 18691, paragraph C. Long-Term CSO Control Plan

[22] Baseline scheduling based on project financing constraints may remedy the Guidance’s disconnection between capability arithmetic and actual program financing. However, perhaps the most fundamental problem with the Guidance is that it fails, through its “snapshot” approach, to provide for changes in economic and program conditions over time. Permittees are essentially asked to commit to program implementation schedules without adequate allowances for potential changes in program scopes, project costs, financing conditions, or community financial wherewithal.

project costs are higher than anticipated, project deferrals or revisions to the levels of control to be achieved will conform to resource limitations. Similarly, project prioritizations may be adjusted at the designated review intervals to reflect current information on water quality impacts and facilitate adaptive watershed management.

Zero Sum Protocol

A variety of factors place priority claims on the City's limited resources for capital spending not required by the LTCP. For example, Akron must provide for adequate system renewal and rehabilitation to avoid degradation of service levels. It must also comply with future treatment regulations while addressing wet weather compliance. Akron's baseline plan provides limited funding to address these prospective capital needs and enable funding of planned LTCP work. However, funding is not available for major new requirements that may be mandated within the 17-year program implementation extension period. For example, in the event that it is required to construct major treatment plant upgrades to address regulation related to micro-constituents or climate change, Akron will be required to reschedule its CIP to accommodate this additional funding requirement. Given that Akron is at the limit of its capital financing capacity, effectively a "zero-sum protocol" is required whereby new project funding is accommodated by a dollar-for-dollar deferral or cancellation of previously scheduled projects. Akron anticipates that the basis for project rescheduling will be provided through program reporting requirements and collaborative discussions with EPA/OEPA.

While a regular review of program financing represents a more involved and ongoing set of calculations than contemplated by the Guidance, it is no more complex than that which is required for demonstration of the financial feasibility of credit issues. For regulators, interested parties and Akron's customers, this will involve a clearly defined and understood review procedure that is appropriate for such major infrastructure investments. Fundamentally, it involves review and calibration of Akron's strategic financial planning model.

APUB Strategic Financial Planning Model

Akron's LTCP project components, levels of control, and interim milestone schedule were developed, in part, based on an evaluation of the CIP that may be financed within Akron's financial capability as evaluated in its Strategic Financial Planning (SFP) model. This model was used to determine wastewater service rate adjustments required to fund utility operations and projected capital spending while maintaining compliance with key financial policies. The model, in Microsoft Excel format, is comprised of a series of integrated spreadsheets specifically designed to represent Akron's Sewer Fund cash flows. A listing of individual spreadsheets is provided in Table 8-13.

Table 8-13 Spreadsheet Description

Spreadsheet Name	Description
Assumptions	Major system financing assumptions
Revenues @ Existing Rates	Input of base service revenues (without rate increases) and projections of miscellaneous revenues and interest on reserve funds
Rate Increase	Projections of revenues resulting from rate increases (net of price elasticity adjustments)
O&M Budget Structure	Input of Operating Budget cost centers, cost categories and annual cost escalation assumptions
O&M Forecast	Input of historical O&M spending by line item category (in summary or by cost center), and forecast of projected O&M spending given application of cost escalation factors and input incremental O&M spending amounts
CIP – Expend	Input of planned capital improvement expenditures (in current dollar values) and application of assumed escalation factors to derive planned nominal CIP spending to be financed through the financial plan.
Ex Debt	Schedules of existing debt service requirements for revenue bonds and OWPC and OWDA loan payments
New Debt	Projections of debt service requirements on new senior lien or subordinate debt issues
Fin Plan	Capital financing plan and projected rate increases based on key financial performance metrics – including calculations of debt service coverage ratios and minimum fund balance targets
FundSum	Projected Sources and Uses of Funds, on a cash basis, for the Sewer Funds
• In addition, the SFP model generates various graphics in spreadsheets with "CH-" prefixes to present projected bills vs. 2% MHI (escalated at 2.8%), the composition of planned capital spending, projected debt service coverage, projected bills as a percent of MHI, and projected service area revenue growth.	

Further description of the individual SFP model spreadsheets and key assumptions used to assess Akron's capital financing capacity is provided below. While certain key assumptions are summarized in the "Assumptions" spreadsheet, it is important to note that the model requires inputs in most of the individual spreadsheets. Specifically, the SFP model requires input of historical or budget information associated with utility operations including service revenues, other revenues, base Operations and Maintenance (O&M) expenses and any intergovernmental fund transfers. Differing O&M expense escalation factors may be inputs for individual O&M expense line items and incremental O&M expenses associated with future capital spending must be input separately. Debt service requirements from existing debt are entered; debt service associated with planned debt issues are either calculated using a level payment assumption or input based on data provided by Akron's Financial Advisors. Finally, the financial plan is developed through user input of debt and equity capital financing components and annual rate increases for the RSA and MMS such that all projected capital spending is financed and key financial performance targets (minimum reserves, debt service coverage) are satisfied.

1. **Assumptions.**[23] Cash-flow projections require a number of assumptions including general cost escalation factors, terms for debt financing, price elasticity of demand / economic transition factors, uncollectible rates, and beginning fund balances. The model also requires entry of a target fund balance, percent equity financing and debt service coverage levels. The model provides capacity for identification of capital projects into five alternative cost categories (with separate cost escalation factors) and for inclusion or exclusion of specified reserves for debt service revenue requirements. Current MHI values are entered as well as assumptions related to the projected growth of MHI over the forecast period.

2. **Revenues at Existing Rates.** To determine relative rate increase requirements[24], projections of revenues under current rates, including other operating revenues and non-operating revenues, are required. These other revenues include Income Tax / Special Assessments; License, Permit & Fee Revenue; Intergovernmental Revenue; Other (Non-Rate) Charges for Services; Miscellaneous Revenues and Other Financing Sources.

   Revenues for FY 2011 were projected based on FY 2010 Budget amounts adjusted to reflect recent economic conditions. A negative 2.5% value, the "FY 2011 Economic Adjustment" was input to reflect FY 2011 revenue performance that exhibited the effects of recent economic decline. Base service revenues

[23] Insofar as the SFP model framework was constructed in anticipation of potential applications not yet employed by Akron, certain inputs are not used. For example, CIP spending is input based on planned expenditure levels rather than encumbrance amounts that would necessitate use of capital project spend-down patterns. Similarly, discount rates are not employed in the basic model calculations but may be used in the future to evaluate the net present values of projected cost streams.
[24] Where MMS communities were assumed to be subject to rate increases of one-third those applicable to RSA ratepayers.

projected over the forecast period are based on annual growth rates provided by TAZ Population Forecasts for 2000 – 2030 for Akron and suburban communities. These population forecasts indicate continuing decline in the greater Akron area that will be somewhat offset by limited growth in selected MMS communities.

3. **Rate Increase.** Annual system-wide rate revenues are calculated by applying expected price elasticity / economic condition factor impacts to projected service revenues at existing rates. As shown in the Assumptions and Rate Increase spreadsheets, price elasticity/economic condition factors are changed incrementally from -4.6 percent to -1.50 percent from 2010 - 2020. The -4.6 percent factor means that for a 10 percent increase in rates, a 4.6 percent decrease in overall usage is anticipated. This adjustment establishes a reduced base level of water usage for revenue forecasting purposes. The spreadsheet then calculates the expected increase in rate revenues attributed to the proposed multi-year rate increase plan. The price elasticity of demand/economic condition factors are based in part on recent research[25] and in part on recent corroborating experience. FY 2010 revenue collections indicate that the 26.7 percent rate increase implemented in FY 2010 resulted in revenue increases of approximately 15.7 percent.

4. **O&M Budget Structure / O&M Forecast.** O&M cost projections are based on budgeted expenditures for FY 2010 escalated using the cost escalation factors input into the O&M Budget Structure sheet. Separate cost escalation factors may be applied on an individual line-item basis for each year of the forecast period. Cost escalation factors were set at 3 percent for the baseline SFP model forecast throughout the forecast period, though selected line items have recently escalated above this assumption (perhaps most notably Utilities Expenses, State/County Charges and Insurance Expenses).

5. **CIP Expend.** Capital project cost estimates developed in base year (2011) dollars are input for each year of the forecast period. Projected capital project expenditures are then expressed in nominal dollar terms by applying relevant escalation factors. Projected nominal dollar expenditure values for alternative LTCP configurations and asset management programs are summarized by major cost category and in aggregate. A default CIP cost escalation factor of 3 percent was applied across all capital project costs.

6. **Forecasted Revenue-Bond & OWPC/OWDA Debt Service Requirements.** The Existing Debt and New Debt worksheets are used to track existing and new debt service requirements for both senior lien and subordinate debt. The "Existing Debt" worksheet organizes repayment schedules for senior lien debt, for which a 1.50x debt service coverage target has been established, and also forecasts outstanding OPWC/OWDA loan payments. The "New Debt" spreadsheet contains the additional projected revenue bond debt and OPWC/OWDA borrowings that, in addition to the existing debt obligations, will be used to effect financing of the CIP including both LTCP program costs and other capital project expenditures. Payment schedules are forecast based on financing terms entered in the "Assumptions" worksheet.

[25] See http://www.oberlin.edu/faculty/sgaudin/research/PriceInformation_AE05.pdf

7. **Fin Plan.** The Strategic Financial Planning model has the capacity to develop up to 30-year forecasts, and was truncated for development of the Consent Decree financial plan. Akron's financial plan was constructed through active balancing of a number of capital financing options including debt sizing, sewer rate increases, and "pay as you go" transfers while monitoring key performance metrics such as debt service coverage and fund balances. This spreadsheet summarizes fund balances for the utility systems and all available funding sources for capital improvement projects. Capacity is also available to evaluate differential rate increases for Akron & JEDD Residential, All Other Retail, and MMS users.

8. **FundSum.** Annual revenue and expense amounts are summarized in a Sources and Uses of Funds format. This Pro Forma Fund Summary spreadsheet may be used to support system bond offerings and manage compliance with bond covenants.

Financial Plan for LTCP Implementation

Using the SFP, financial plans to support the Final LTCP levels of control and interim project milestones were developed. Required rate increases, resultant bills, residential bill impacts and claims on residential MHI that are projected to be necessary to finance the preliminary scheduling of the 3 Overflow LTCP option and anticipated asset management requirements within the 17-year LTCP period limitation.

LTCP Expenditure Schedule

As shown in Figure 8-19 the City's CIP contemplates capital program expenditures of approximately $786 million ($545 million in 2010 dollars) over the LTCP implementation period. In constant dollars, Akron's CIP is forecasted to require approximately $491 million for scheduled LTCP projects, additional Consent Decree expenditures (Mud Run Pump Station Controls) of $20 million, and assumed non-LTCP system reinvestment of approximately $34 million.[26]

Financing this capital investment will require substantial rate increases that are projected to push residential bills well beyond the 2 percent MHI value. These rate increases will build requisite revenue capacity to aggressively address CSO issues, but at the same time will elevate claims on ratepayer income already strained by economic decline as shown in Figure 8-20.

[26] Includes $2 million per annum in system reinvestment / asset management and $2 million every 5 years (in 2010 dollars) for compliance with new regulations, timed in association with NPDES permit renewals.

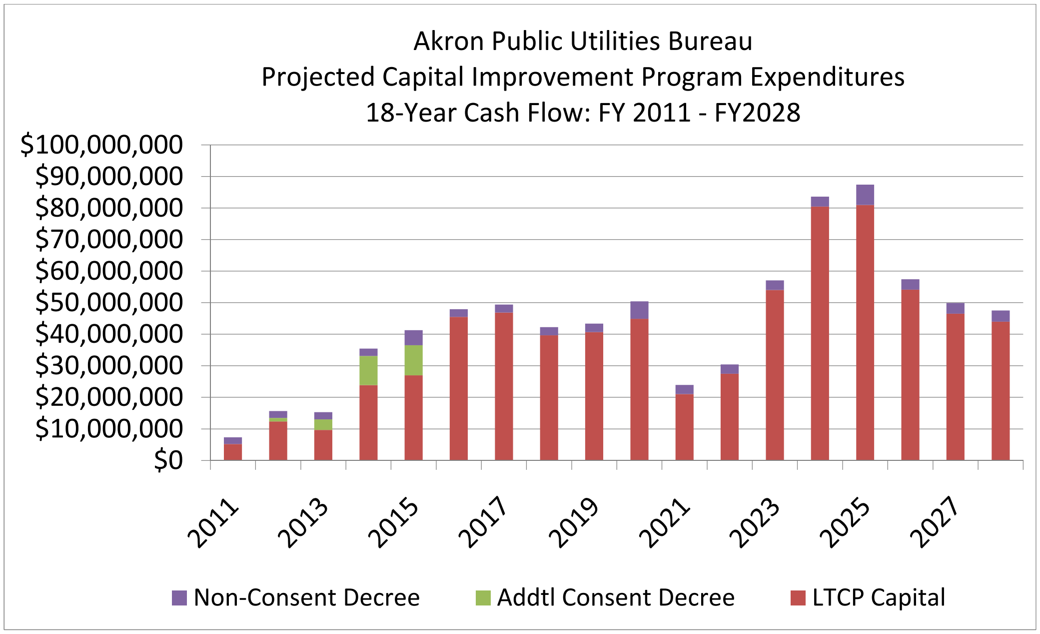

Figure 8-19 Akron Public Utilities Bureau Projected Capital Improvement Expenditures

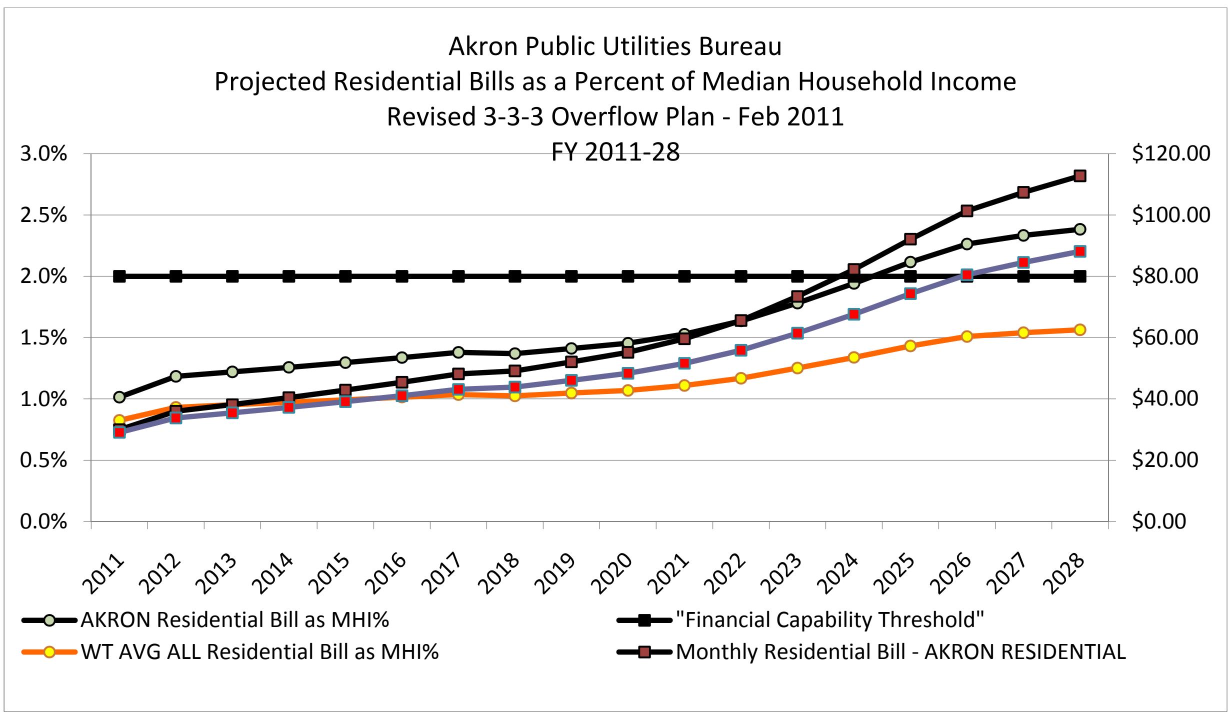

Figure 8-20 Projected Residential Bills as a Percent of Median Household Income

To the extent that 2 percent of MHI may be viewed as representing a High Burden, as indicated by the matrix evaluation of *The Guidance*[27], Akron's 3 Overflow LTCP is projected to impose levels of burden that are particularly difficult in light of the acute economic challenges facing Akron. This projected burden is comparable to select other Ohio communities (e.g., Cincinnati, Columbus) under Consent Decrees whose economic difficulties, while profound, are not as acute as those facing Akron. These cash-flow projections illustrate that Akron's planned 3 Overflow LTCP will impose particularly difficult financial burdens for Akron ratepayers, and that alternative LTCPs that contemplate higher spending levels within the prescribed Consent Decree period are simply untenable.

CSO Control Policy Compliance / Enhancements to the Guidance

The Open Book Portfolio Management approach to financial capability assessment builds on and enhances *The Guidance*, while addressing several limitations that have proven problematic in practice. The two-step workbook approach employed in *The Guidance* defines burden by reference to a Residential Indicator and Permittee Financial Capability Indicators. Akron's approach employs the elements of these indicators within a framework consistent with utility capital financing practices:

- **Residential Indicator Calculation.** This calculation determines current and projected utility costs on MHI. Rather than indirectly calculating this claim by allocating a point-in-time estimate of costs based on the residential share of flow, Akron's approach calculates typical residential bills given projected rate increases over the cash-flow forecast period. Residential bills relative to MHI not only directly measure the "financial impact on the residential users" but also enable monitoring of these impacts over the program implementation period.

- **Permittee Financial Indicators.** This calculation attempts to evaluate the financial capability by reference to debt burden, socioeconomic conditions, and financial operations indicators. However, in the case of a city like Akron, selected indicators may not be applicable or are fundamentally flawed. Rather than assigning scores and calculating an index of relative financial strength divorced from a city's capital financing imperatives, Akron's approach considers these factors by defining limits on indebtedness and prospective rate adjustments consistent with bond rating criteria that ultimately define capital project financing capacity.

[27] Even for communities, unlike Akron, with relatively stronger financial indicators.

Conclusions

Akron has conducted an assessment of its financial capability consistent with the legislative and regulatory intent of the Clean Water Act and CSO Control Policy. Its baseline schedule reflects an appropriate balancing of its environmental stewardship and financial responsibilities – providing for cost-effective program implementation as expeditiously as practicable within its financial capability. In so doing, Akron recognizes that cost effectiveness is a matter not only of defining lowest cost solutions but also ensuring program financing on favorable terms. Akron also recognizes that implementation as expeditiously as practicable is not only a matter of engineering, construction and other project delivery constraints but also a question of financing capacity.

Open Book Portfolio Management defines an approach to financial capability assessment (and review) that is consistent with the common-sense meaning of the term "financial capability." Using readily available information, it examines capital financing capacity within bounds defined by (tenuously) acceptable rate increases that will impose significant financial burden on the ratepayer populations. It contemplates a holistic view of financial capability recognizing that all capital project investments – whether CSOs, SSOs, or asset management – place financial claims on rate revenues. Moreover, it facilitates the balancing of unique local considerations as called for in the CSO Control Policy and the Guidance. Akron's baseline schedule and associated program financing plan will set aside the challenges of securing cost participation by MMS customers, and it will attempt to provide for levels of control and interim project milestones that aggressively pursue the water quality improvements called for by the Clean Water Act and CSO Control Policy – within Akron's financial capability.

Akron has demonstrated through its Financial Capability Assessment update that the High Burden anticipated in its earlier submittals continues to be anticipated for ratepayers. This burden is affirmed by updated calculations per the Guidance, and is directly evidenced by conservative projections of rate increase requirements for LTCP cost estimates. As such, levels of control and interim project milestones will need to be tailored to these acute financial realities, particularly in light of the exceptional economic challenges that plague Akron. An Open Book Portfolio Management approach to define program components, levels of control and interim project milestones provides a transparent, tractable and flexible approach to program definition that responds to the realities of dynamic market conditions.

8.1.8 Public Participation and Feedback

The City's efforts to involve the public in its selection of the recommended CSO Long Term Control Plan are documented in Section 3 of this LTCP Update Report. Most notably, the CSO Community Action Group (CSO CAG) has provided input to the City on technical, financial, environmental benefits, and environmental justice issues related to the CSO program. Overall, the CSO CAG agreed with the City's approach of balancing water quality improvements that will be realized by implementing the CSO LTCP with the extremely high demand that the plan will place on Akron ratepayers.

Akron residents also provided input into the draft Consent Decree during the public comment period. The parties (DOJ, USEPA, OEPA, and the City) received approximately 17 comments on the draft decree. Of the 17 comments received, 15 were from residents who were very concerned about what any CSO plan would do to their monthly sewer bills. Many residents voiced strong opposition to the plan for fear that they would be unable to pay their sewer bill during these tough economic times if rate increases were required to pay for the CSO program.

8.1.9 Summary of Control Plan Selection Factors

Table 8-14 illustrates ranking scores for how each short-listed plan ranked based on a series of selection factors. Rankings range from "1" for the option that was most preferred/best at meeting selection factor criteria to "6" for the least preferred/worst at meeting selection criteria option.

Table 8-14 Ranking of Various Control Plans versus Selection Factors

Selection Factor	3-3-3 Plan	6-6-6 Plan	12-12-12 Plan	0-0-0 Plan	0-0-2(EHRT) Plan	0-2(EHRT)-2(EHRT) Plan
CSO Policy – Presumption Approach	2	3	4	1	1	1
Knee of the Curve	1	2	3	6	5	4
Water Quality Benefits	2	3	4	1	1	1
Implementation Schedule (17 years)	3	2	1	6	5	4
Other Clean Water Requirements	1	1	1	1	1	1
Financial Capability	3	2	1	6	5	4
Affordability	3	2	1	6	5	4
Public Comments	3	2	1	6	5	4
Total Ranking Scores	**18**	**17**	**16**	**33**	**28**	**23**

As illustrated in Table 8-14, the 12-12-12 Plan ranked as the most preferred LTCP option given the evaluated selection factors. The factors most influencing this were the 17 year implementation schedule provided for in the Consent Decree, the capability of Akron's ratepayers to adequately pay for the recommended plan within the 17 year schedule, and the public's desire to minimize any future rate increases required to implement the CSO program. However, based on further discussions with and correspondence from USEPA and OEPA (Appendix 8), the City understands that both agencies desire that the City increase its level of control on future CSO control facilities. Because the 3-3-3 plan scored very close to the 12-12-12 plan, the City believes that this is also a viable alternative.

8.2 Recommended CSO Long Term Control Plan

The City's recommend CSO LTCP is described in further detail below. Information presented in this section is based on the City implementing a 3-3-3 Long-Term Control Plan within the remaining 17-years of the 19 year time frame set forth in the Consent Decree.

8.2.1 CSO Rack Storage Basins

Section 6.9.3 of this Final Long Term Control Plan Update Report contains detailed descriptions and site plans for the proposed storage basins. Table 8-15 provides an overview of the estimated capital and annual operations and maintenance costs for each basin.

Table 8-15 CSO Storage Basin Information for Recommended Plan

CSO Rack Number	Basin Size (gallons)	Estimated Capital Cost (dollars)	Estimated Annual O&M Cost (dollars)
3	1,227,000	$ 5,566,000	$ 13,170
5/7	553,000	$ 4,289,700	$ 8,820
10/11	1,259,000	$ 9,492,200	$ 11,250
12	3,211,000	$ 7,028,700	$ 12,960
14	1,203,000	$ 3,697,400	$ 17,630
15	846,000	$ 3,200,100	$ 15,380
22	1,167,000	$ 4,109,500	$ 6,910
26/28	1,335,000	$ 6,019,000	$ 16,550
27/29	1,237,000	$ 8,458,600	$ 15,100
36	606,000	$ 3,233,200	$ 12,260
Total		**$ 55,094,400**	**$ 130,030**

8.2.2 Ohio Canal Interceptor Tunnel

Section 6.9.1 of this Final Long-term Control Plan Update Report contains detailed descriptions and site plans for the proposed Ohio Canal Interceptor Tunnel. The general details of the tunnel are as follows:

- Tunnel length – 5,550 feet
- Tunnel diameter – approximately 27.7 feet
- Capital cost – approximately $183,900,000
- Annual O&M cost – approximately $467,000

8.2.3 Northside Interceptor Tunnel

Section 6.9.1 of this Final Long-term Control Plan Update Report contains detailed descriptions and site plans for the proposed Northside Interceptor Tunnel. The general details of the tunnel are as follows:

- Tunnel length – 10,000 feet
- Tunnel diameter – approximately 19 feet
- Capital cost – approximately $153,800,000
- Annual O&M cost – approximately $463,000

8.2.4 Sewer Separation Projects

Detailed information regarding sewer separation projects is shown in Section 6.9.2 of this report. Table 8-16 below provides estimated cost information for each project.

Table 8-16 Sewer Separation Project Information for Recommended Plan

CSO Rack Number	Estimated Capital Cost (dollars)	Estimated Annual O&M Cost (dollars)
8	$ 3,300,000	$ 6,600
25	$ 4,200,000	$ 8,400
21	$ 3,100,000	$ 6,200
30	$ 10,700,000	$ 21,400
13	$ 6,100,000	$ 12,200
Total	**$ 27,400,000**	**$ 54,800**

8.2.5 Consent Decree Projects

- Upgrade WPCS to 130 MGD – As required by Section V of the Consent Decree, the City will perform improvements at the WPCS to achieve a minimum secondary treatment capacity of 130 MGD. The City is currently designing the WPCS Step Feed Phase I project which consists of modifying Train 6 of the secondary aeration tanks to operate in step-feed mode, and other operational modifications to Trains 1 through 5. The estimated project cost for Phase I is $15,000,000, which consists of $11,500,000 for construction of the improvements, and $3,500,000 for full-scale testing and assessment of the modified secondary aeration tanks under actual operating conditions.

- Upgrade WPCS to greater than 130 MGD – As required by Appendix A, Section V of the Consent Decree, following assessment of Phase I, the City will evaluate alternatives and construct control measures that eliminate or reduce, to the maximum extent feasible, bypasses of the secondary treatment system. This WPCS Upgrade Phase II project is estimated to cost $50,000,000.

- Mud Run Pump Station – as required by Section VIII of the Consent Decree, the City will perform improvements at the Mud Run Pump Station in order to eliminate existing overflows. The City is currently performing the study required to submit a Report of Findings to USEPA and Ohio EPA no later than January 15, 2012 (Consent Decree Section VIII, paragraph 23). Based upon past experience and initial investigation, the City currently estimates that capital improvements will cost approximately $20,000,000.

- Capacity, Management, Operations, and Maintenance Program – as outlined in Section 10 of this LTCP Update Report, the City submitted their comprehensive CMOM program to USEPA and OEPA on May 12, 2010. The annual increase in cost to implement this plan as currently written is approximately $2,000,000. Final cost estimates will be further refined following approval of the CMOM program by USEPA and OEPA.

8.2.6 Non-Consent Decree Projects

As stated above, the City must also consider the impacts of several non-Consent Decree projects as part of their overall Clean Water Program. These projects include:

- Existing System Reinvestment – the City currently estimates that $2,000,000 per year will be required for repair and replacement of their existing collection and treatment systems. This amount is in addition to current expenditure levels which have been adequate to sustain the City's infrastructure investment.

- New NPDES Permit Requirements –the City estimates that significant additional costs will be required to comply with the new NPDES permit being issued by OEPA. As outlined in previous submittals, implementing phosphorous removal facilities would cost approximately $29 million over the 17 year program period. In order to achieve a level of control of 3 overflows per year, the City will require the current NPDES permit phosphorous limits to be modified back to 1 mg/l (as consistent with the previous permit). This would mean that no additional investment would be required for phosphorous removal at the WPCS.

- Disinfection Improvements - The ability of the WPCS to meet the new E. coli discharge limitations set by OEPA is currently under evaluation. It is possible that additional disinfection capability may be required to meet the new limitations. The '98 Facilities Plan described an evaluation of alternatives to provide additional disinfection capacity during wet weather conditions. It was recommended that additional capacity be provided by increasing the existing chlorine contact tank (CCT) capacity. This approach could also be applicable for providing additional capacity to meet the new E. coli discharge standards. The City currently estimates the cost of these additional disinfection improvements to be approximately $7,000,000.

- Storm Water Improvements – the City currently estimates that $2,000,000 per year will be required to address existing and future storm water issues. Individual projects will be developed through the annual Capital Improvements Program. However, in order to meet a level of control of 3 overflows per year, the City is removing this item from our recommended plan. Any future storm water regulations imposed by USEPA/OEPA would require additional funding that is not provided for at this time. The City cannot guarantee that this funding will be available in the future.

8.3 LTCP Benefits

The Final LTCP, Consent Decree, and non-Consent Decree improvements described above will provide several benefits to local receiving waters. The following figures illustrate the water quality benefits of the LTCP compared to existing conditions:

- Figure 8-21 shows the overall volume reduction of existing overflows after the entire LTCP is implemented

- Figure 8-22 shows the total reduction in hours of exceedance of E. coli standard system wide

- Figure 8-23 shows the total reduction in hours of exceedance of E. coli standard for CSO only flows

- Figure 8-24 shows the annual reduction in hours of exceedance of the E. coli standard by receiving water

- Figure 8-25 shows the annual reduction in hours of exceedance of the E. coli standard by receiving water for CSO only flows

- Figure 8-26 shows the number of overflow events predicted to occur during the typical year based upon hydraulic modeling results. Based on current information, approximately 2 overflow events will generally occur during the recreational season under the 3-3-3 plan

- Table 8-17 shows the storm events causing overflows during the typical year by CSO control structure type (i.e. basins, Ohio Canal Tunnel, Northside Tunnel)

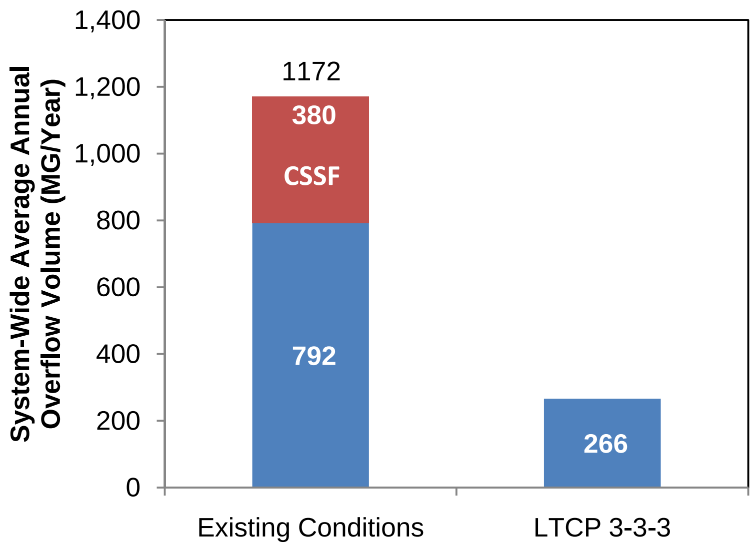

Figure 8-21 Typical Year Estimated Overflow Volume for 3-3-3 Plan

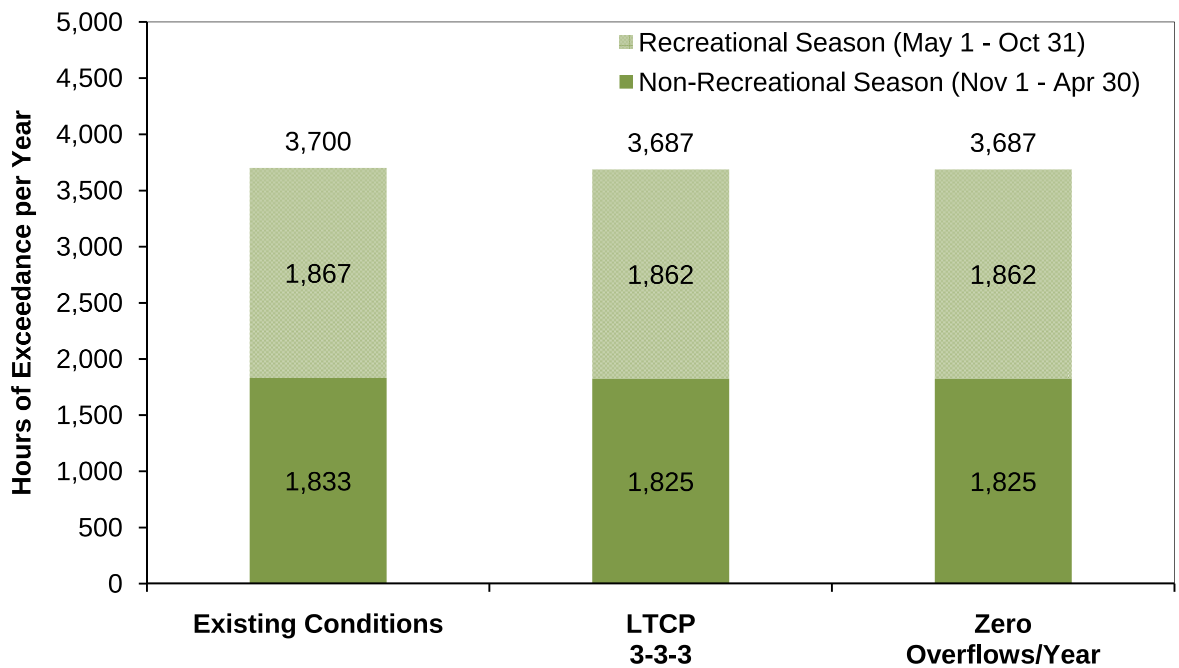

Figure 8-22 Estimated E. coli Hours of Exceedance per Year

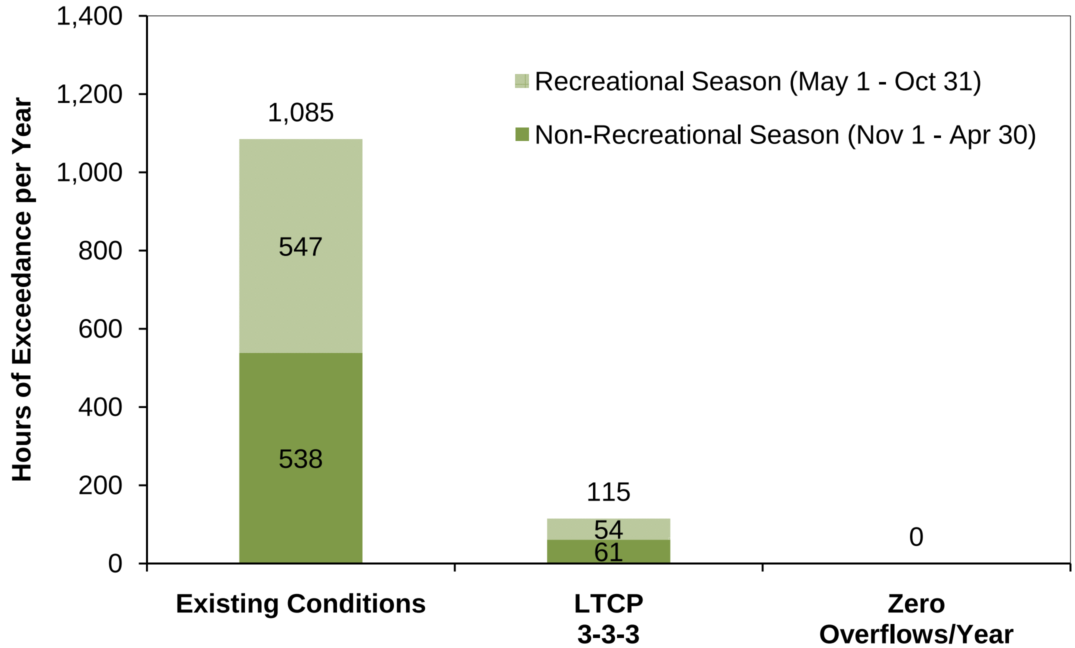

Figure 8-23 Estimated E. coli Hours of Exceedance per Year – CSOs Only

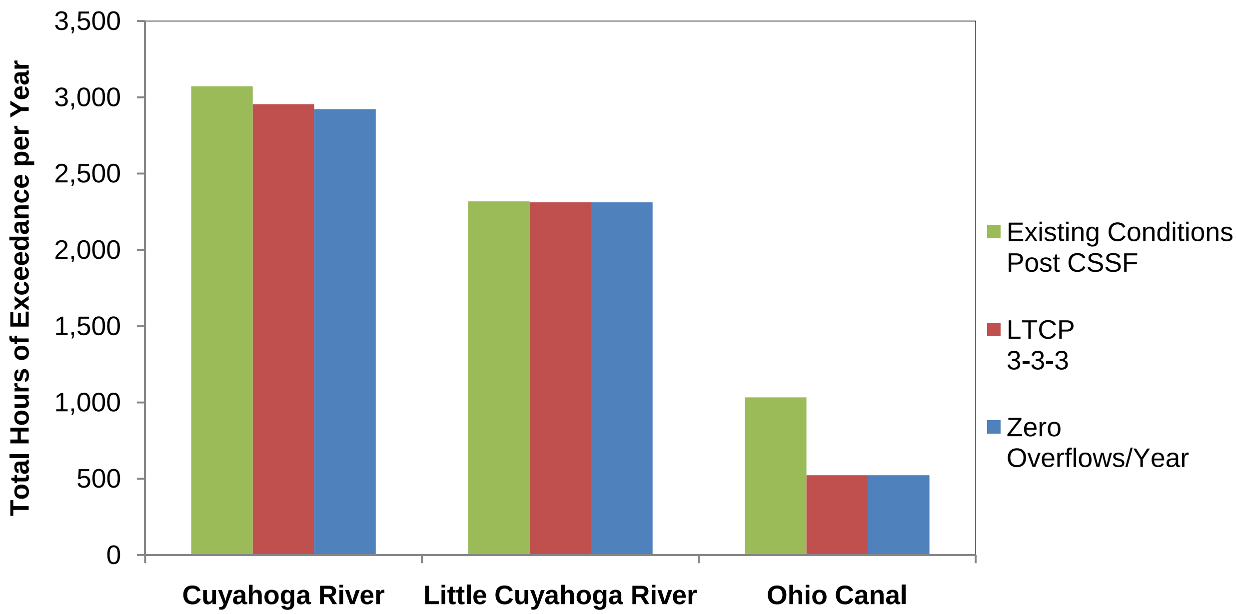

Figure 8-24 Estimated E. coli Hours of Exceedance per Year by Receiving Water

Note: Hours of exceedance shown are during the typical year. The hours during only the recreational season, as defined by the Ohio Water Quality Standard, would be less.

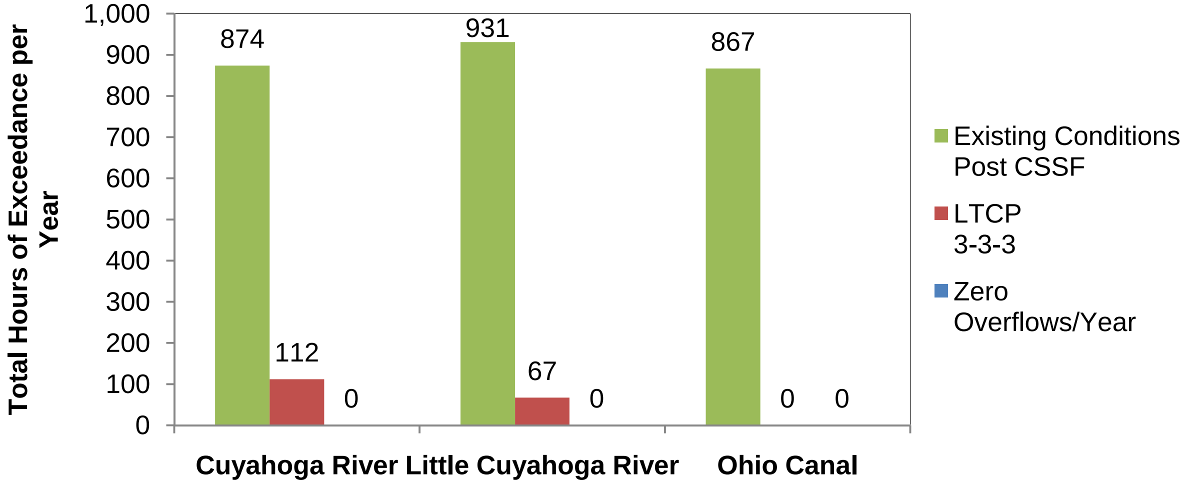

Figure 8-25 Estimated E. coli Hours of Exceedance per Year by Receiving Water – CSOs Only

Note: Hours of exceedance shown are during the typical year. The hours during only the recreational season, as defined by the Ohio Water Quality Standard, would be less.

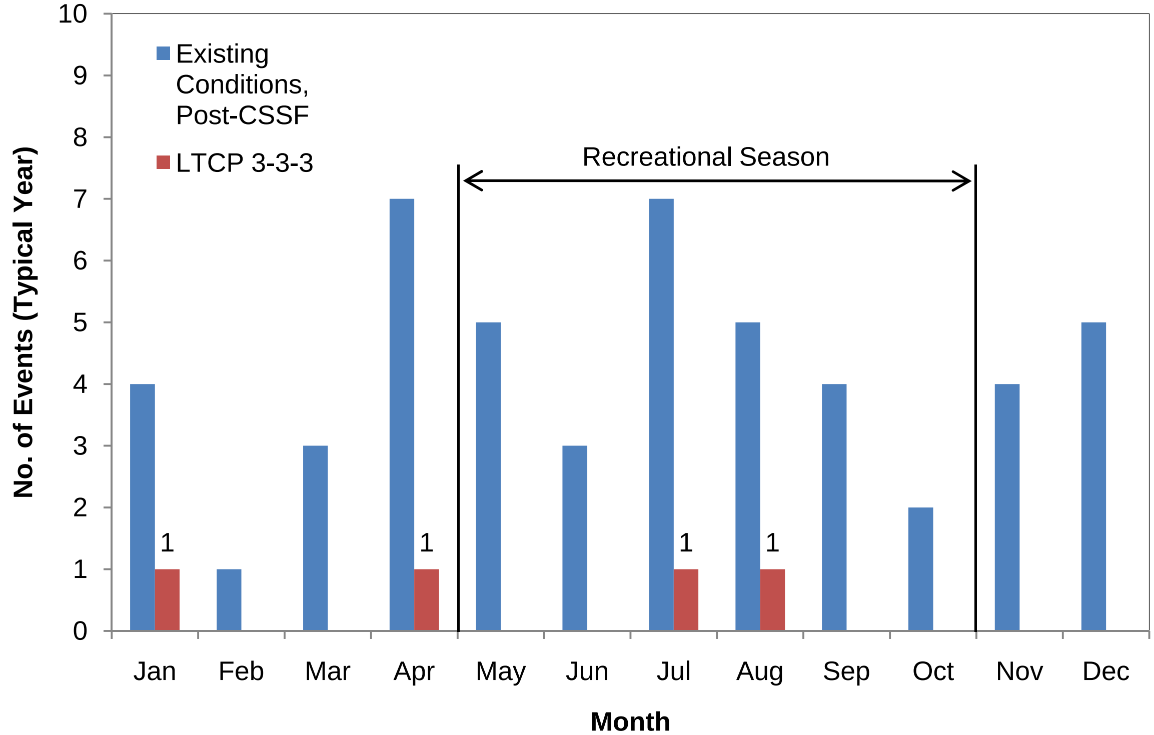

Figure 8-26 Storm Events Causing Overflows for 3-3-3 Plan

Table 8-17 Storm Events Causing Overflows by Control Structure

Control Structure	January	April	Recreational Season July	Recreational Season August	Total
Storage Basins	0	0 or 1(1)	1	1	2 or 3
NSI Tunnel	1	1	0	1	3
OCI Tunnel	0	1	1	1	3

(1) Storage basins controlling Rack 22 and Racks 5/7 do not overflow during the April event.

8.4 Impact of LTCP on Sensitive Areas

There are currently 34 CSOs in the City of Akron sewer system. Twenty-one of the CSOs discharge to the Little Cuyahoga River, seven CSOs discharge to the Ohio Canal, five CSOs discharge to the Cuyahoga River, and one CSO discharges to Camp Brook. Based on evaluations conducted for this LTCP update, it is not physically possible and economically achievable to eliminate all CSOs to sensitive areas since this would require essentially total CSO elimination for the entire system. The following CSO receiving waters are classified as waters with primary contact recreation in the State of Ohio Water Quality Standards and, thus, qualify as sensitive areas according to the CSO Control Policy: Ohio Canal, Little Cuyahoga River, and Cuyahoga River.

The recommended plan does achieve CSO elimination for the Ohio Canal as a result of the proposed Ohio Canal Interceptor Tunnel (by controlling and redirecting CSOs to the Little Cuyahoga River), and four CSOs are eliminated along the Little Cuyahoga River as a result of proposed sewer separation. The City has also eliminated several CSOs that discharge to the Cuyahoga and Little Cuyahoga Rivers under CSO control projects that have been implemented.

Implementation of the recommended CSO control plan will provide an improvement in the water quality of the Ohio Canal, Little Cuyahoga and Cuyahoga Rivers, and Camp Brook by reducing the bacteria levels, solids, volume, carbonaceous biochemical oxygen demand ($CBOD_5$), and floatables in the discharge from the combined sewer system. For the sensitive areas in the planning area, these improvements will reduce the risk to human health by reducing or eliminating exceedances of water quality standards and will help protect aquatic life and its habitat. Also, as part of the City's NPDES Permit requirements, all CSO outfalls will be identified by signage that is visible from the land and water, which will further limit the risk of public exposure to CSOs.

8.5 Implementation Schedule

The City's proposed schedule for implementing the recommended CSO controls contained in their recommended plan is shown in Table 9-1 and discussed in Section 9. This schedule presents the dates for bidding and achievement of full operation for each CSO control project. This schedule was developed to assure compliance with the condition set forth in the Consent Decree that all projects must achieve full operation no later than October 15, 2028. Based on financial constraints and impending High Burden that the CSO LTCP will place on local ratepayers, the City believes that this schedule completes the necessary projects as soon as possible.

In many other CSO communities around the country, sewer rates representing 2 percent of median household income (MHI) for residential customers are considered to place a high burden on ratepayers. The recommended plan that Akron is proposing will push our ratepayers to the 2 percent threshold in very short order (by 2014). At the conclusion of the 17 year implementation period, Akron Retail Service Area customer's monthly sewer bills will represent close to 2.4 percent of their median household income. This equates to a typical Akron residential customer paying approximately $120 per month for sewer service in 2028 after the CSO projects are constructed.

8.6 Alternative Proposal

The City's recommended plan reduces overflow occurrences within the combined sewer system to approximately 3 times in a typical year. As demonstrated above, the City cannot go to a higher level of control (less overflow occurrences) within the 17 year time frame prescribed by the Consent Decree while still keeping rates affordable. However, as an alternative proposal, the City is willing to implement projects that achieve a higher level of CSO control so long as the City has an adequate amount of time to implement these projects. As part of the financing plan for these projects the City will commit to a rate structure that keeps rates at or near 2.1 percent MHI for as long as it takes to implement the controls. USEPA and OEPA can select the level of control and the order of the projects so long as there is a demonstrated cost benefit and water quality benefits.

Benefit of Akron's Alternative Proposal

Akron will, because of its documented and proven commitment to the environment, agree to implement a longer-term solution which will impose a High Burden on its ratepayers starting in the next few years, and to keep rates there until Consent Decree objectives are met. While this may take longer than 17 years, the City would like to develop, in collaboration with its regulators and stakeholders, a revised LTCP that achieves improved water quality benefits under a schedule that more fully recognizes the limitations of its financial capabilities.

Continuation of our clean-up activities will begin immediately. It is important to note that many of the improvements proposed by USEPA would have been completed or at least started by now if the City had been allowed to invest in the system in the last six years through the agreement it had reached with the State of Ohio. However, the City has been required to focus its resources on responding to information requests, re-performing technical analysis that had already been completed, and negotiating the terms of the Consent Decree.

9. IMPLEMENTATION SCHEDULE

Table 9-1 City of Akron - Long Term Control Plan Update Control Measures, Design Criteria, Performance Criteria, and Critical Milestones

CSO Control Measures						
No.	**Control Measure**	**Description**	**Design Criteria (Note 1)**	**Performance Criteria (Note 2)**	**Bidding of Control Measure**	**Achievement of Full Operation**
1	Separation of Racks 8 and 25	Separation of the combined sewer system tributary to Racks 8 and 25.	New sanitary sewer pipes sized for peak flows.	Elimination of Racks 8 and 25 and associated outfalls	November 13, 2012	November 13, 2013
2	Separation of Rack 21	Separation of the combined sewer system tributary to Rack 21.		Elimination of Rack 21 and associated outfall	November 13, 2014	November 13, 2015
3	Separation of Racks 30 and 13	Separation of the combined sewer system tributary to Racks 30 and 13.		Elimination of Racks 30 and 13 and associated outfalls	November 13, 2016	November 13, 2017
4	Rack 3 Storage Basin	Storage basin for Rack 3 overflows.	1,227,000 gallons	3 overflows/year	October 18, 2024	April 16, 2027
5	Racks 5/7 Storage Basin	Storage basin for Racks 5 and 7 overflows.	553,000 gallons	3 overflows/year	October 23, 2024	October 21, 2026
6	Racks 10/11 Storage Basin	Storage basin for Rack 10 and 11 overflows.	1,259,000 gallons	3 overflows/year	April 26, 2024	October 23, 2026
7	Rack 12 Storage Basin	Storage basin for Rack 12 overflows.	3,211,000 gallons	3 overflows/year	October 25, 2022	October 21, 2025
8	Rack 14 Storage Basin	Storage basin for Rack 14 overflows.	1,203,000 gallons	3 overflows/year	October 21, 2022	April 18, 2025
9	Rack 15 Storage Basin	Storage basin for Rack 15 overflows.	846,000 gallons	3 overflows/year	October 21, 2022	October 18, 2024
10	Rack 22 Storage Basin	Storage basin for Rack 22 overflows.	1,167,000 gallons	3 overflows/year	October 17, 2024	April 15, 2027
11	Racks 26/28 Storage Basin	Storage basin for Racks 26 and 28 overflows.	1,335,000 gallons	3 overflows/year	October 19, 2021	April 16, 2024
12	Racks 27/29 Storage Basin	Storage basin for Racks 27 and 29 overflows.	1,237,000 gallons	3 overflows/year	October 29, 2021	April 26, 2024
13	Rack 36 Storage Basin	Storage basin for Rack 36 overflows.	606,000 gallons	3 overflows/year	October 23, 2024	October 21, 2026
14	Ohio Canal Interceptor Tunnel	Storage and conveyance tunnel to control overflow from Racks 4, 16, 17, 18, 19, 20, 23, 24, and 37. Tunnel will overflow downstream to the Little Cuyahoga River.	24,500,000 gallons	3 overflows/year	August 1, 2016	August 3, 2020
15	Northside Interceptor Tunnel	Storage tunnel to control overflow from Racks 32 - 35, and remaining overflow from the existing Cuyahoga River Storage Facility which controls overflow from Racks 40, 30, and 31. Tunnel will overflow downstream to the Cuyahoga River.	20,800,000 gallons	3 overflows/year	February 16, 2024	July 7, 2028

Table 9-1 City of Akron - Long Term Control Plan Update Control Measures, Design Criteria, Performance Criteria, and Critical Milestones (Continued)

WPCS Measures							
No.	Control Measure	Description	Design Criteria (Note 1)	Performance Criteria (Note 2)		Bidding of Control Measure	Achievement of Full Operation
				Capacity (MGD)	Number of Bypasses		
1	Upgrade WPCS to 130 MGD	Increase secondary treatment capacity at the WPCS to 130 MGD to reduce overflow events.	Modification of the secondary treatment Train 6 to include a step feed mode, replacing/modifying and covering the Train 6 final settling tanks launders, modifying all final settling tanks by removing the domed covers, and reconstructing the aeration influent flume.	130 MGD	15	October 17, 2011	October 15, 2013
2	Upgrade WPCS to 130 MGD - Contingency Project	If WPCS Control Measure No. 1 above does not achieve 130 MGD through secondary treatment, implement the WPCS Contingency Project.	Modification to include replacing/modifying and covering the Trains 1-5 final settling tank launders, constructing improvements to aeration blowers, and raising aeration basin walls.	130 MGD	15	February 1, 2016	October 15, 2017
3	Upgrade WPCS to 170 MGD	Increase secondary treatment capacity at WPCS to 170 MGD to further reduce overflow events (Note 3).	Additional modifications to the secondary treatment system to be determined during future study and evaluation.	170 MGD (Note 4)	6 (Note 4)	February 24, 2023	December 26, 2025

Notes:

(1) Design Criteria will be refined during final design of the control measures based on the latest modeling information and current status of the Long Term Control Plan and Consent Decree projects. The intent is to meet the Performance Criteria through appropriate revision of the Design Criteria.
The Design Criteria for sewer separation is based on City design standards.
The Design Criteria for storage basins is based on the cost performance evaluation for the recommended plan.
The Design Criteria for WPCS measures is based on the No Feasible Alternative (NFA) report (2009).

(2) The Performance Criteria for sewer separation is rack elimination
The Performance Criteria for storage basins is based on the recommended plan.
The Performance Criteria for WPCS measures is based on the NFA report (2009).

(3) The control measure, or combination of control measures, will (a) eliminate or reduce, to the maximum extent feasible, bypasses of the secondary treatment system, and (b) provide maximum feasible treatment for any remaining bypasses. Performance criteria shall be provided both in terms of secondary treatment capacity and in terms of secondary bypasses remaining in the typical year.

(4) Per the City's NFA report (2009). Actual performance capacity will be determined following future evaluations, pilot testing, and coordination with 2010 NPDES limits.

10. OPERATIONAL PLAN

The Operational Plan sets forth guidance and structure to improve the City's collection system by maximizing the removal of pollutants during and after precipitation events. This includes making corrections or adjustments to the system that may reduce sewer overflows.

This Final LTCP Update Report recommends approaches within the sewer system to decrease pollutants from point source discharges, and maximize flows within the system per the Nine Minimum Controls Document (1996). In addition, a Capacity, Management, Operations, and Maintenance (CMOM) Program was developed to address certain CSO standards and procedures set forth by the USEPA. As a result of the Final LTCP Update Report recommendations, along with the Akron Consent Decree 2009 CMOM Program (2010), Operations & Maintenance (O&M) plans will be revised to meet the new standards with regards to the Nine Minimum Controls, as they are implemented.

10.1 Standard Operating Procedures and Checklists

The City of Akron has developed a standard operating procedure (SOP) manual along with various checklists to help staff perform everyday tasks as outlined in the Sewer Overflow Response and Notification Plan (SORNP) submitted to USEPA and OEPA on February 11, 2010 and the CMOM manual submitted on May 12, 2010. This manual contains fourteen SOP document groups as shown in Table 10-1.

Table 10-1 City of Akron Sewer System SOP Groups

Standard Operating Procedure Groups		
Administrative	Regulatory	Maintenance
Inventory	Payroll	Sewer Laterals
DataStream 7i Extended	Dispatcher	Work Order Database
OHSA Regulations	Overtime	Safety
Timesheets	Pump Stations	

The SOP's and Checklists were developed to ensure that proper execution and safety procedures are followed while completing everyday tasks.

10.2 Existing Progress within the Operational & Maintenance Plan

The City performed a readiness review that evaluated current City practices. The readiness review included reviewing existing documents, conducting staff interviews, and performing onsite/fieldwork observations. This review determined the level of documentation, how to improve certain elements, and prioritized each element addressed by EPA in the Consent Decree. As a result, the following current practices have been noted.

10.2.1 Sewer System Component and Equipment Inventory

The City maintains sewer systems components and equipment inventory in paper documents and electronic databases. Paper documents consist of record drawings, sewer system maps, and a Pump Station Notebook. The Pump Station Notebook combines drawings of racks, lengths and sizes of force mains, and locations of pump stations with pictures into one access location.

Three electronic databases inventory equipment and sewer system components. These include the Geographical Information System (GIS), Computerized Maintenance Management System (CMMS-Infor EAM), and Computerized Maintenance Management System for Vehicles (Fleet Focus) databases.

Geographical Information System

GIS provides geographical location and characteristics of structures/pipes within the sewer system. Typical characteristics include size, type, length, and pipe material. Due to non-populated GIS data, SOPs have been developed to constantly update the system.

Computerized Maintenance Management System

CMMS-Infor EAM's main goals are tracking maintenance work performed, system equipment and component costs, and updating inventory for spare parts. The City follows multiple SOPs to keep the database current, such as entering parts into the inventory and assigning parts to work orders. There are currently six inventories maintained by the Sewer Maintenance Division through CMMS-Infor EAM. These inventories include equipment and materials pertaining to maintenance, construction, pump stations, closed-circuit television (CCTV) inspection, and miscellaneous items.

Computerized Maintenance Management System for Vehicles

Fleet Focus software helps create databases which keep vehicle inventory within the system, and determines routine vehicle maintenance. This helps establish when vehicles need maintenance and/or replacement.

10.2.2 Daily CSO Rack Inspections, Identifying Overflows, and Cleaning Program

Employees inspect and clean CSO racks on a daily basis. In accordance with SOPs, these employees document the type and quantity of debris removed from the racks.

Rack locations operate with remotely monitored level sensors connected to a Supervisory Control and Data Acquisition (SCADA) system that transfers data to the Sewer Maintenance dispatch office. Pump station crews maintain the SCADA system. Any time the SCADA system reports an overflow, an alarm signals in the Sewer Maintenance Dispatch office. During wet weather events the SCADA system records the overflow parameters. If an alarm occurs during dry weather, a Sewer Maintenance crew is dispatched to the site to investigate the cause of the alarm. If they encounter an overflow, they perform the necessary corrective action to eliminate the overflow.

10.2.3 Continuing CCTV Inspection of Entire Sewer System

The City is on pace to complete CCTV inspection of the full sewer system by the end of the 2014 calendar year. Scheduling is based on sewer districts within the system, with each district broken into mini-districts. Inspection locations are prioritized based on other consent decree requirements and upcoming capital improvement projects.

The City currently uses three CCTV trucks to inspect sewers. In areas that the Sewer Maintenance crews cannot CCTV inspect, outside contractors are hired to assist in sewer inspections. New technologies, such as automated sewer inspection equipment, may be implemented to ensure the entire system is CCTV'ed by 2014.

10.2.4 Routine Proactive Inspection and Condition Assessment of the Sewer System

CCTV inspections of pipes identify sewer blockages and structural deficiencies within the sewer system. These inspections help maximize flow in the sewer system by identifying areas that may result in system failure. The areas are prioritized, based on severity, to determine which locations need more frequent maintenance, rehabilitation, or reconstruction.

Pipe and Structure PACP Coding

Pipeline Assessment and Certification Program (PACP) coding is used during CCTV inspection to identify structural and O&M defects. The City has telemonitoring technicians and 20 other staff members trained on the PACP coding system. PACP coding results for pipes and structures provide detailed information on the exact location where structural or O&M defects occur. These unique defects are analyzed and assigned a severity rating from 1 to 5, with 5 being most severe. The ratings assist in evaluating the remaining useful life of the pipe segments.

Sewer System Pipe CCTV

The City uses CCTV to inspect the collection system, focusing on cleaning known problem areas that have caused previous system blockages. These cleaning programs, known as Speed Rodder and Root Lists, take note of grease and/or root problems to help prevent potential surcharging within pipes.

On February 11, 2010, the City submitted an Emergency Response Plan (SORNP) to the USEPA and OEPA for review and approval. The plan involves follow-up inspections downstream of sewer overflow occurrences to determine if blockages or structural deficiencies contribute to overflows. If an O&M defect is found during CCTV, the location is analyzed in accordance with SOPs for possible inclusion on the Speed Rodder or Root List. If a structural deficiency is identified, rehabilitation or repair will take place.

Manhole Procedure and Inspections

Inspecting manholes is part of the cleaning and inspection program. The City is on pace to inspect the 19,000 manholes in the collection system by the end of 2014. Manhole inspections involve identifying structural defects or infiltration and inflow (I/I). When I/I is identified, manholes are evaluated to be sealed as part of a capital improvement project. When structural deficiencies are identified, proper maintenance and repair is addressed.

Manhole inspections are documented and tracked in the GIS. The City's semi-annual Consent Decree reports contain the number of manholes inspected. The City plans on inspecting all manholes in the sewer system every 5 years.

Manhole Procedure and Inspection Improvements

Once all manholes have been inspected, the City plans to streamline visual inspection procedures for identifying structural deficiencies. Defect locations will be linked to GIS, along with the inspection date, what defects were found, and when defects were repaired. Different technologies will also be explored to assist in the inspection processes.

There is currently no program pertaining specifically to the sealing of manholes or the identification and remediation of poor construction. These programs will be included in the condition assessment and the rehabilitation/replacement program for the sewer system.

10.2.5 Pump Stations and Force Mains

The City tracks preventative and annual maintenance for pump stations in their CMMS-Infor EAM. Pump stations are monitored remotely through a SCADA system by the Sewer Maintenance Dispatcher. The SCADA system provides alarms that signal whenever a potential problem exists. Crews are dispatched to pump stations to confirm the validity of the alarm, inspect the station, correct the situation, or create work orders to have the problem resolved. The City also maintains routine weekly inspections for each pump station. Inspections include, but are not limited to, running pumps and generators, cleaning bar screens, and recording pump hours. If necessary, the pump stations oil will be changed and equipment will be lubricated. All work is logged into the CMMS-Infor EAM per each visit.

10.2.6 Specifications

Construction specifications are based on the Akron Construction and Material Specifications (ACMS) manual 2008 Edition along with standard construction drawings and design. The City’s standards are the basis for all sewer designs and construction installations in the Akron collection system. The ACMS manual is updated on an as needed basis and has been recently updated in 2002, 2004, and 2008.

Design and Construction Approval Process

Sewer Maintenance personnel and/or Akron Engineering Bureau personnel review designs for sewer installations to ensure requirements and standards are followed. The engineer of record stamps all construction drawings, indicating approval of design. The Akron Engineering Bureau, Public Utilities Bureau, and/or the Summit County Plans and Permits Division review and approve the sewer system plans prior to construction.

10.2.7 Prioritizing Rehabilitation and Replacement Projects

Renew and Replacement (R&R) projects are based on condition assessments. Condition assessments identify the severity of defects and allow for prioritizing segments for R&R. These selections are identified and placed in the 5-year CIP. At the beginning of each fiscal year, staff members prioritize segments for R&R based on need and budget. If a segment is not funded in the first year, it is considered for funding in the next year. Areas of high concern can be considered an emergency and repaired through an emergency contract.

10.2.8 Tracking Repairs within the Sewer System

Repairs made to pipes and structures within the system by City crews are tracked using work orders in the CMMS-Infor. In addition, all defects that occurred in 2008, 2009, and the first half of 2010, including a separate list of the acute defects, are listed in the City of Akron's Semi-Annual Report (2010). The City has one year to correct acute defects from the date they were logged. Examples of acute defects include collapsed pipes or blockages, which may cause an overflow event unrelated to rainfall. Each repair contains a work order code that can be queried from the CMMS-Infor EAM.

When a contractor performs a repair, it is noted in contract drawings. Repairs made by contractors are captured by the Akron Engineering Bureau and/or Public Utilities Bureau staff when inspecting sewer installations and connections.

10.2.9 Reducing Fats, Oils, and Grease (FOG) within the Sewer System

Action has been taken to decrease the amount of Fats, Oils, and Grease (FOG) within the sewer system. Per the CMOM Program (2010), the City maintains a list of pipe segments that contain blockages or back-ups due to FOG. Procedures to identify and mitigate backups are in the SOP Sewer Blockage Investigations and SOP Proper Manhole Inspections.

The City of Akron Health Department or the Summit County Health Department is responsible for the inspection of Food Service Establishments (FSEs). When a back-up occurs at a FSE, the City of Akron Sewer Maintenance staff investigates the blockage and informs the Akron or Summit County Health Department that there may be a problem with the FSE FOG control device. Currently, there are no formal coordination procedures between the City and the Health Departments with FSEs pertaining to FOG.

Informing the Public of FOG

The Sewer Maintenance Division sends out annual bill stuffers about prohibiting FOG discharges to help educate the FSE and residents about FOG. In addition, representatives from the Sewer Maintenance Division attend various public meetings to inform the citizens about FOG discharges and provide handouts.

10.2.10 Identifying Roots

Roots can cause major blockages within a sanitary sewer system and may completely deteriorate pipes. The condition assessment program encompasses root control inspection through CCTV investigation. Identified root problems are evaluated to be placed on the Root Rodder list. At their regularly scheduled maintenance period, the segment is cleaned. The City has determined that mechanical root control is the most effective process. In 2007, the root list was CCTV'ed and an updated root list was created. This list will continue to be updated through the routine CCTV inspection program. Areas identified as high risk are placed on the R&R list and considered as a capital project.

10.3 Recommended O&M Plan Revisions as a Result of the LTCP Update

Once there is an agreement between USEPA, OEPA, and the City on the accepted long term CSO controls, and a program has been implemented to address these controls, the O&M manuals will be revised. The O&M revisions will also be incorporated into the existing operation and maintenance program for the combined sewer system.

11. Post-Construction Monitoring Program

The City of Akron's CSO Long Term Control Plan will implement a series of aggressive controls to significantly reduce the amount of combined sewage discharged to Camp Brook, the Ohio Canal, Little Cuyahoga River, and Cuyahoga River. While CSOs are only one of many pollutant sources impacting the rivers, it is expected that CSO controls will result in a net benefit to the receiving waters and improve water quality. The overall goal of the Post-Construction Monitoring Program is to assess performance of the City's CSO control measures in terms of specific end-of-pipe activation criteria, and to add to the City's ongoing investigation of overall stream conditions, including tracking changes in water quality over time.

The City's Post-Construction Monitoring Program will be used for several specific purposes:

- Support ongoing reporting of CSO activity as part of the Semi-Annual Reports under Section XV of the City's Consent Decree.
- Collect CSO outfall data to support a model-based determination of whether the City has achieved the performance criteria for CSO control measures set forth in the Long Term Control Plan Update (Table 9-1).
- Demonstrate compliance with the City's Current NPDES Permit requirements (including any water quality based requirements) applicable to the CSOs, subject to Section XX of the Consent Decree.

This section describes the key elements of the proposed program for post-construction monitoring activities, summarized as follows:

- The necessary monitoring schedule, sampling locations, and monitoring procedures to collect data related to environmental impacts from CSOs on receiving streams, and compliance with the City's Current NPDES permit requirements (including water quality based requirements) applicable to the CSOs, subject to Section XX of the Consent Decree.
- A model-based mechanism, including supporting outfall and rainfall monitoring data, to determine whether CSO control measures are meeting the Performance Criteria identified in the Long Term Control Plan Update.
- Evaluation and analysis of monitoring data to assess the benefit of CSO control measures and for reporting progress to regulatory agencies and the public.

The monitoring program will assess the control program's effectiveness at meeting facility-specific Performance Criteria – 3 overflow events[1] at the CSO storage basins in a typical year, 3 overflow events at the Ohio Canal Interceptor Tunnel in a typical year, and 3 overflow events at the Northside Interceptor Tunnel in a typical year. The frequency of CSO overflow events will vary year-to-year because of variation in annual rainfall. For example, if the level of control is 3 overflow events per typical year, actual overflow frequency is expected to range from 0 to 10 overflow events per year (it should be noted that it is not possible to put a firm upper bound on this range due to rainfall variability).

The results of the monitoring program will be reported to USEPA and OEPA on an ongoing basis as part of Semi-Annual reporting, and as part of specific interim and final performance assessments set forth below in this Post-Construction Monitoring Program. In addition, the City views the Program as a key mechanism for supporting dialogue with the public. The City will compile monitoring results, submit reports to regulatory agencies, and use the information to report progress to the public.

11.1 Regulatory Requirements

USEPA requires CSO communities to conduct a post-construction monitoring program during and after LTCP implementation "to help determine the effectiveness of the overall program in meeting [Clean Water Act] requirements and achieving local water quality goals" per the Combined Sewer Overflows Guidance for Long Term Control Plan (1995). This program should collect data that measures the effectiveness of CSO controls relative to specific performance criteria identified in the LTCP, along with their overall impact on water quality. The program should also utilize existing monitoring stations used in previous studies of the waterways and sewer system in order to compare results to conditions before controls were put in place.

In USEPA's December 2001 Report to Congress: Implementation and Enforcement of the Combined Sewer Overflow Control Policy, the agency noted the difficulty of establishing a monitoring and tracking program for CSO control programs. "Monitoring

[1] An "overflow event" is as defined in the Presumption Approach of the CSO Control Policy – "*an overflow event is one or more overflows from a CSS as the result of a precipitation event*." For the purposes of the City's selected CSO control measures, the definition is applied on a facility basis rather than a full combined sewer system (CSS) basis. Furthermore, discrete overflow events are defined as being separated by a longer than 12-hour inter-event duration, consistent with the methodology and analysis presented in the City's LTCP.

programs need to be targeted and implemented in a consistent manner from year to year to be able to establish pre-control baseline conditions and to identify meaningful trends over time as CSO controls are implemented," the report said. "In practice, it is often difficult, and in some instances impossible, to link environmental conditions or results to a single source of pollution, such as CSOs. In most instances, water quality is impacted by multiple sources, and trends over time reflect the change in loadings on a watershed scale from a variety of environmental programs." The report also noted that weather conditions and rainfall totals vary significantly from storm to storm and year to year, making comparisons difficult.

11.2 Purpose & Scope

This Post-Construction Monitoring Program will collect the necessary data to assess the impact of the City of Akron's CSO LTCP. CSO controls are expected to provide two positive impacts:

- First, control CSOs to the Performance Criteria provided in Table 9-1. The monitoring program will collect the requisite end-of-pipe data to assess performance of the controls using the Model-Based Approach presented in Section 11.6.1.
- Second, improve water quality on local rivers. As noted in USEPA's Report to Congress, "…it is often difficult, and in some instances impossible, to link environmental conditions or results to a single source of pollution, such as CSOs." However, the monitoring program will collect instream data to assess the trends over time as CSO controls are implemented. To compare post-construction water quality trends to current conditions and historic data, the proposed monitoring program makes use of the City's current water quality monitoring stations.

In addition to collecting data to assess CSO control performance and instream water quality trends, the Post-Construction Monitoring Program will develop documentation to support regulatory reporting requirements and communicate with the public.

The water bodies included in this plan are Camp Brook, the Ohio Canal, the Little Cuyahoga River, and the Cuyahoga River. The City's post-construction monitoring program is a part of the following overall progression of past, current, and future work:

- Document Current Baseline Conditions: During development of the LTCP, the City conducted a significant amount of characterization work. The results of the characterization and documentation of current baseline conditions are presented in Section 2.

- Identify Parameters of Concern: During the system characterization effort and through subsequent discussions with USEPA and OEPA, the City identified E. coli bacteria as the parameter of concern in local water bodies. The revised E. coli standard is documented in the Ohio Water Use Designation and Statewide Criteria, which is described in more detail in Section 2. Therefore, the City will use E. coli to measure the effect of its long term CSO control measures on receiving streams.

- Prepare and execute Post-Construction Monitoring: The City's monitoring program is the focus of this document, with individual elements and approach described in detail in Section 11.3.

- Report Results to State and Federal Agencies: The results and observations from the post-construction monitoring will be provided to USEPA and OEPA through Post-Construction Monitoring Reports. The reports will provide documentation of facility performance relative to the Performance Criteria in Table 9-1, along with a presentation of observed water quality trends. Section 11.8 presents the City's plan for reporting progress to the regulatory agencies.

- Provide Public Information on Water Quality: The City will continue distributing information on the CSO LTCP, including water quality issues, to the public through the program described in Section 3 of the LTCP.

11.3 Program Elements

The City of Akron will implement the CSO Long Term Control Plan as a series of CSO control measures according to the schedule provided in Table 9-1. CSO control measures have been grouped for implementation purposes according to priority and required engineering sequencing. The full impact of CSO control measures on water quality will be realized once the LTCP is fully implemented.

Akron's LTCP collection system projects will consist of four major components: the Ohio Canal Interceptor Tunnel, the Northside Interceptor Tunnel, ten storage basins at CSO outfalls/racks, and separation projects. The two tunnels are expected to be the largest projects. To facilitate interim performance monitoring, Akron will conduct the post-construction monitoring program in two phases. The first phase will occur after Achievement of Full Operation of the first tunnel, and will encompass that tunnel as well as any storage basins and separation projects completed prior to completion of the first tunnel. The second phase will occur after Achievement of Full Operation of all CSO control measures. Each post-construction monitoring phase will encompass the full range of activities described in this plan.

11.3.1 Performance Criteria

The Performance Criteria for the City's CSO control measures are expressed as number of activations in a typical year. The required Performance Criteria - 3 overflow events at the CSO storage basins in a typical year, 3 overflow events at the Ohio Canal Interceptor Tunnel in a typical year, and 3 overflow events at the Northside Interceptor Tunnel in a typical year - are provided in Table 9-1. As explained in the Section 11 introduction above, the actual frequency of CSO overflow events will vary year-to-year because of variation in annual rainfall. The City will assess the average performance of CSO control measures in two phases, first following the Achievement of Full Operation of the first set of controls and second following the Achievement of Full Operation of all controls. The assessment of performance, and the resulting determination of compliance with the Performance Criteria during a typical year, will be performed with the collection system modeling approach described in Section 11.6.

11.3.2 Water Quality Measures

The Water Quality Measures are data-based indicators of instream water quality, in particular the long term trends in improvements due to implementation of the City's CSO control measures. A strong baseline of existing water quality conditions in the rivers has already been established through the City of Akron's water quality monitoring program. The Water Quality Measure incorporated in the City's Post-Construction Monitoring Plan is E. coli bacteria (or other pathogen indicator, to the extent applicable water quality standards might be revised to include a different applicable pathogen indicator). Recreational use impairment has been established as the primary concern with respect to CSO control, based on the City's completed system characterization efforts and discussion with USEPA and OEPA.

The City will collect data to measure and evaluate improvements to instream E. coli bacteria counts that can be attributed, at least in part, to CSO control measures. It is unlikely that CSO controls alone will result in attainment of Ohio's E. coli standards for primary contact recreation due to numerous E. coli sources in the environment. Because the E. coli counts in water bodies may be subject to contribution from various sources, for the purpose of determining compliance with this decree, an instream water quality value will not be imposed. Rather, the City will analyze trends in both dry-weather and wet-weather E. coli levels and compare them to historic monitoring data and modeling predictions to determine improvement in water quality and to evaluate whether residual CSO discharges impair applicable recreational uses. A different pathogen indicator other than E. coli may be requested by OEPA or USEPA in accordance with this paragraph to the extent the applicable water quality standards are revised to include a different pathogen indicator.

11.4 Post-Construction Monitoring and Data Collection

The City will implement the following field data collection program to support the overall Post-Construction Monitoring Program. The field sampling program combines CSO flow monitoring, river water quality sampling, NPDES required sampling at the WPCS, and rainfall monitoring to collect data sufficient to characterize the benefits achieved through implementation of CSO controls.

11.4.1 Monitoring Schedule

The post-construction monitoring schedule is dictated by the terms of the Consent Order and the Schedule of Construction of Projects, which will be finalized in an approved Final LTCP Update. As explained in Section 11.3, there will be two phases of post-construction monitoring. The first phase commences following achievement of full operation of the first of the two proposed tunnels and is to include monitoring for any other CSO control measures completed by that date. The second phase commences at the Achievement of Full Operation of all CSO control measures. The Consent Order specifies that October 15, 2028 will be the date for Achievement of Full Operation of all CSO control measures. In the intervening period between this submittal and initiation of the first phase of post-construction monitoring, the City of Akron will continue operation of current flow monitoring systems and will complete sampling at both instream and WPCS sampling stations as required in the current NPDES permit. The Post-Construction Monitoring Program described below will use the stream monitoring stations as required in the NPDES permit to provide a comparison between pre- and post- construction conditions.

The Post-Construction Monitoring Program will provide the data for the final Post-Construction Monitoring Report (scheduled for submission within 2 years following Achievement of Full Operation of all LTCP projects). After review of the final Post-Construction Monitoring Report by USEPA and OEPA, the City will modify the Post-

Construction Monitoring Program as appropriate to satisfy ongoing reporting requirements.

11.4.2 Current Monitoring Stations

The City's current monitoring programs have been designed to fully characterize the existing system in terms of CSO discharges and receiving water quality trends. The following stations are included in these current programs:

- *Stream monitoring.* The USGS maintains one gauging station in and around Akron.
- *CSO flow monitoring*. The City of Akron currently has two components to their CSO monitoring program:
  - Telemetry that provides measured overflow duration (and estimates of overflow volume) at each of the CSO rack locations.
  - A comprehensive monitoring program for the Cuyahoga Street Storage Facility (CSSF), with data access at the WPCS for real-time decisions on CSSF operation and dewatering.
- *River water quality sampling.* The City currently collects water quality samples at seven locations per their existing 2010 NPDES permit. Five of the seven locations monitor water quality upstream and downstream of CSO outfalls, and the remaining two monitor water quality at the WPCS outfall.
- *WPCS effluent monitoring.* Per NPDES permit requirements, the City collects effluent samples at three stations prior to discharge.
- *Rainfall monitoring.* The City maintains a network of 13 rain gauges, distributed over the service area to adequately capture typical rainfall patterns and distributions.

Given that the above monitoring locations were designed to properly characterize the existing system and receiving water conditions, the City has identified them as the proper starting point for the Post-Construction Monitoring Program. Each of these monitoring programs is presented in more detail below, including a discussion of how they may be modified over time to maximize their purpose in the Post-Construction Monitoring Program.

The City's current (and post-construction) monitoring station locations, along with the reasons for selection, monitoring equipment types, monitoring frequencies, and monitoring parameters are presented in Section 2. The locations of these stations are displayed on Figure 2-3. The City's distributed rain gauge network locations are described in Table 2-1.

The City may, after consultation and agreement with USEPA and OEPA, add, modify, remove, or relocate current monitoring stations, as necessary, during or after implementation of CSO control measures to address any changes that may be necessary as a result of new technologies, facility planning, design, and construction.

11.4.3 Stream Monitoring

One USGS gauging station is maintained in the City of Akron CSO receiving waters. (04206000 CUYAHOGA RIVER AT OLD PORTAGE, OH LOCATION.--Lat 41°08'08", long 81°32'50", Summit County, Hydrologic Unit 04110002, on right bank 230 ft upstream from North Portage Path bridge at Old Portage, 1.2 mi downstream from Little Cuyahoga River). This gauge is maintained by USGS in cooperation with the City of Akron. Flow measurements from this gauge have been the basis for loading calculations for both NPDES permits and TMDL allocations of the Akron discharges. The City has used and intends to continue using this USGS data to provide long-term stream monitoring as part of its wet-weather program. As with all USGS gauging stations, standard equipment, procedures, and protocols will be used for data collection, and USGS personnel are responsible for maintenance, calibration, and data processing at this location.

11.4.4 CSO Outfall Monitoring

The City of Akron will continue to collect overflow duration and estimated overflow volume data from each rack overflow using a telemetry system. This system tabulates hours of overflow, overflow volume, days with overflow, and number of events in a given period. As new CSO control structures are completed, refined flow monitoring will be implemented to provide Akron with a constantly advancing dataset. This data will be used for calibration of the updated collection system model to include the new structures and improvements.

Plans for new monitoring stations will be included in PTI applications to Ohio EPA for each structure as they are constructed. The new monitoring stations will be designed to collect a series of operational data depending on the size of the facility, such as measurements of occurrence, volume, and duration for influent flow, dewatering flow, and any overflow of the control structures. Therefore, the PTI application process will provide a mechanism for the USEPA and OEPA to comment on the selection of specific monitoring devices at any of the planned facilities. It is anticipated that most if not all of the current monitoring locations will be eliminated as facilities are constructed.

The in-place CSSF facility provides a good example of the refined CSO outfall monitoring approaches that are likely for future major control facilities. Operators at the WPCS view real-time CSSF data feeds on a SCADA-like screen, and use that information to make decisions on operating and dewatering the facility. Further, all of the collected CSSF data is archived for future use and analysis.

Depending on the level of control of each storage basin or tunnel, sampling overflow events may be desirable under the Post-Construction Monitoring Program to determine the potential source loading of each structure and its potential contribution to future impairment of recreational uses. Within three years following construction of each facility, the City will collect overflow samples for water quality (E. coli) analysis during two overflow events if they occur. Each event will include a time series of sampling if the event continues for more than one hour. The time series will include the following:

- A sample within the first hour
- If the event continues, a second sample should be collected within the next three hours (hour 2- 4)
- If the event continues, a third sample should be collected within the next four hours (hour 4-8)
- If the overflow event continues beyond eight hours, additional samples should be taken every 12 hours to characterize the range of concentrations of bacteria present in the combined sewage that exceeds the design capacity of controls

These concentrations will be used for comparison with the extensive data set collected by the City of Akron during completed characterization of the existing overflows. Overflow concentrations can then be used in conjunction with instream water quality monitoring to fully evaluate to what extent future overflows might cause or contribute to recreational use impairment.

11.4.5 Water Quality Monitoring

The City of Akron currently monitors five instream locations for CSO outfall monitoring as a requirement of their existing 2010 NPDES permit. For the purposes of post-construction monitoring, the City has selected five instream locations that include four of the five current sites and an additional site to be located in the vicinity of the Ohio Edison Dam upstream of all CSOs on the Cuyahoga River. The four existing sites selected to be carried forward into the Post-Construction Monitoring Program include the following:

- Station 804 upstream of overflows on the Little Cuyahoga River
- Station 806 upstream of overflows on the Ohio Canal
- Station 803 instream on the Little Cuyahoga River at Otto Street
- Station 802 downstream of all CSOs at the Old Portage Gauging station

Current site Station 805 at Lock No. 15 on the Ohio Canal will not be used routinely for post-construction monitoring, since all Ohio Canal CSO discharges will be captured in the proposed tunnel and remaining overflow from the tunnel would most likely discharge directly into the Little Cuyahoga River in the vicinity of Otto Street. The Otto Street station may need to be relocated depending on the location of the final designed discharge point of the Ohio Canal tunnel. This combination of five sites provides upstream stations on all three streams and two downstream locations, one proximal to the historically highest volume overflows and the other downstream of all CSO control locations.

Monitoring at these locations will focus on the water quality issue of concern, impairment of recreational uses as measured currently by the indicator bacteria E. coli as defined by Ohio Water Quality Standards. If subsequent OEPA recreational use criteria utilize a different indicator organism or method the sampling will need to be modified to use to the most appropriate current method. Field measurements of dissolved oxygen, conductivity, temperature and pH will also be collected to provide general information on instream water quality conditions.

Sampling will be conducted in the summer recreational season only, and will be initiated in the two years prior and two years following completion of each of the two defined construction phases. This “before” and “after” monitoring will provide the best comparison of the efficacy of the constructed remedies. A minimum of five samples will be collected by grab sampling methods in each calendar month at each of the five instream stations. Current and antecedent weather and overflow conditions will be noted during each sample collection event. If only five samples are collected, at least one will be collected per week. For any sampling round, all sites should be sampled on the same day within a two to four hour period.

11.4.6 WPCS Effluent Monitoring

The City of Akron will continue to monitor plant discharges as required in the current NPDES permits. Current monitoring at the WPCS includes monitoring of secondary treated effluent, secondary bypass, and combined final effluent stations. As modifications to the treatment process occur, some of the stations currently described may be changed to monitor future operation. The current NPDES permit also requires instream monitoring both upstream and downstream of the WPCS, which will continue under the Post-Construction Monitoring Program.

11.4.7 Rainfall Monitoring

The City has a network of 13 rain gauges to measure rainfall across the service area. These gauges have been in place for 10-15 years depending on location, and are managed by ADS Environmental Services. The distribution of gauges in the network has been configured to represent temporal and spatial rainfall patterns in the Akron area.

The City intends to maintain the current rain gauge network (or equivalent) up until and after initiation of the Post-Construction Monitoring Program. The collected rainfall data will support the wet-weather analyses and modeling described below in Section 11.6.

11.5 Data Retrieval and Management

Two kinds of data will be collected, managed, and analyzed as part of the City's Post-Construction Monitoring Program – activation and flow data collected at CSO outfalls and discrete water quality data collected at river monitoring sites. Both of these data types are currently being collected as part of the City's ongoing monitoring program; as a result, the new data collected as part of the Post-Construction Monitoring Program will be integrated into existing data validation, archiving, retrieval, and management tools.

The City will continue taking all necessary measures so that monitoring objectives are met.

The City has been collecting system-wide CSO outfall data using their telemetry system which was installed from 1993-1997. This system tabulates hours of overflow, volume of overflow, days with overflow, and number of events in a given period. The City will continue using its current data storage and retrieval system for the telemetry system. As new monitoring technologies are incorporated in future CSO control facilities, additional data management, analysis, and retrieval tools will be implemented.

The City has been collecting water quality data on the Ohio Canal, Little Cuyahoga River, and Cuyahoga River under various programs dating back to the 1980 Facilities Plan. The Post-Construction Monitoring Program will continue the protocols used for current sampling under the City's NPDES permit, including chain-of-custody, data analysis, data management, and data retrieval protocols.

Consistent with the current monitoring programs, all personnel involved in the Post-Construction Monitoring Plan will be experienced and familiar with the requirements of the data collection program. Given the duration of the City's LTCP program and post-construction monitoring period, it is likely that data management and analysis techniques will evolve and improve within the wet-weather industry over the duration of the implementation period. If this occurs, any recommended changes to the City's approach will be discussed with USEPA and OEPA to obtain consensus prior to implementation.

11.6 Compliance Assessment

A primary purpose of the Post-Construction Monitoring Program is to assess compliance with the Performance Criteria set forth in Table 9-1. To assess the Performance Criteria in terms of CSO activations, the City is proposing a model-based approach similar to the method recently approved for several USEPA Region 5 utilities. In addition, given the importance of the assessment process, and recognizing that methods to assess average performance of CSO control measures per the CSO Policy are in their infancy, the City is allowing for the possibility that an improved alternative, or modified, approach may be identified in the future.

11.6.1 Model-Based Approach

The City has developed a dynamic model that fully integrates the hydrology and hydraulics of the combined sewer system (collection system model). By no later than 24 months after Achievement of Full Operation of the LTCP control measures, the City will complete steps 1 through 8 below using sound engineering judgment and best industry practices, to update and utilize the collection system model to determine whether the City has achieved compliance with the Performance Criteria set forth in Table 9-1. This model-based assessment of compliance will be performed at the beginning of each phase of post-construction monitoring (i.e., the first and second phases described above), and will be used to determine whether the City has achieved the Performance Criteria set forth in Table 9-1.

1. Collect CSO outfall data for 12 months after completion of the construction of the CSO control measures identified in the Long Term Control Plan Update, consistent with the post-construction monitoring phases described above.

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

3. Utilize the model (incorporating the improved sewer collection system with in-place CSO control measures) in its previously-calibrated state and the rainfall data collected during the 12-month post-construction monitoring period, to run a continuous simulation of CSO discharges for the 12-month post-construction monitoring period.

4. Compare 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. Model re-calibration will be not be needed if the model achieves at least the same degree of calibration as was achieved for pre-CSO Long-Term Control conditions during the LTCP development process, and there is a high degree of agreement between the model output and CSO monitoring data for activation frequency for the 12-month post-construction monitoring period. Otherwise, model re-calibration will be needed in accordance with Steps 5 through 7.

5. If re-calibration is needed, select two or more appropriate rainfall events from the 12-month post-construction monitoring period for model recalibration. The City will apply the standard of practice used in the collection system modeling industry in selecting the best candidate events for model calibration.

6. Develop an initial parameter set for use with the model and perform successive applications of the model with appropriate parameter adjustment until there is a high degree of agreement between the model output and the CSO monitoring data for the selected recalibration events. In making such adjustments, the City will consider the inherent variability in both the collection system model and in flow monitoring data, and will exercise sound engineering judgment and best

industry practices so as to not compromise the overall representativeness of the model.

7. Once the model has been re-calibrated in accordance with Step 6, the City will verify the re-calibrated model by again utilizing the model and the rainfall data collected during the 12-month post-construction monitoring period, to run another continuous simulation for the 12-month post-construction monitoring period. The City will again compare the continuous simulation outputs to the CSO monitoring data for the 12-month post-construction monitoring period as described in Step 4, to determine whether additional re-calibration of the collection system model is needed. Re-calibration will be determined to be adequate if the model achieves at least the same degree of calibration as was achieved for pre-CSO Long-Term Control conditions during the LTCP development process, and there is a high degree of agreement between the model output and CSO monitoring data for activation frequency for the 12-month post-construction monitoring period. Otherwise, further re-calibration will be needed in accordance with these Steps 5 through 7 until the model achieves at least the same degree of calibration as was achieved for pre-CSO Long-Term Control conditions during the LTCP development process, and there is a high degree of agreement between the model output and CSO monitoring data for activation frequency for the 12-month post-construction monitoring period.

8. Akron will prepare and submit to the USEPA and OEPA, for review and approval, a report ("Post-Construction Monitoring Report") that summarizes the changes made to the hydraulic model as a result of the post-construction monitoring program, presents the calibration and verification data used to update the model, discusses why the updated model achieves at least the same degree of calibration as was achieved for pre-CSO Long-Term Control conditions during the LTCP development process, and compares the model output and CSO monitoring data for activation frequency for the 12-month post-construction monitoring period. In developing the Post-Construction Monitoring Report, the City will utilize the original or re-calibrated model to run a continuous simulation for the adjusted 1994 typical year that was agreed on between Akron, USEPA, and OEPA. The City will use this simulation to evaluate whether the City has achieved the Performance Criteria set forth in Table 9-1, and will include the results of the simulation in the Post-Construction Monitoring Report.

11.6.2 Alternate Approach

The City may propose an alternate compliance assessment approach other than the Model-Based Approach described above. Such an alternate compliance assessment approach may be implemented by the City, in lieu of the Model-Based Approach, if approved by USEPA and OEPA. To provide sufficient time for agency review and approval to allow timely implementation, any proposal by the City for use of an alternate compliance assessment approach should be submitted to USEPA and OEPA no later than one year prior to the Achievement of Full Operation of the first tunnel.

11.7 Quality Control

The City has Standard Operating Procedures (SOPs) in place for both of the core activities in the Post-Construction Monitoring Program, CSO outfall monitoring and river water quality sampling. Both of these programs have been ongoing in their current form since installation of the Motorola monitoring system, allowing for over 15 years of field experience and identification of potential difficulties.

All activities under the Post-Construction Monitoring Program will be implemented with appropriate quality control standards, including potential updates to the standards in response to industry trends. While the detailed procedures associated with many activities have in-place SOPs (as explained above), a general summary of the quality control procedures follows:

- Stream flow data is collected by the USGS under their typical quality control procedures. The City makes use of this stream flow data as part of their wet-weather program.
- CSO outfall monitoring through the Telemetry system is managed by the Sewer Maintenance Facility and Pump Station crews, following SOPs for maintenance, equipment replacement, data downloads, and associated field activities. Recorded data is reviewed for validity and representativeness by the City.
- River water quality sampling is performed by trained staff. Standard sampling procedures and documentation are a required part of the program, including use of chain-of-custody forms, appropriate sample preservation techniques, etc.
- Laboratory analysis of water quality samples is performed by the City's certified WPCS laboratory. The City's laboratory follows all standard and required protocols and documentation needs.
- Rainfall data is downloaded and archived by ADS Environmental Services. Rain gauge field work and downloading activities follow an established program SOP.

11.8 Data Evaluation & Progress Reporting

As part of the City's agreement with USEPA and OEPA, regular reporting of activities and progress is required for the duration of the LTCP implementation process. Semi-annual reports are required under the Consent Decree, and these will include updates on the Post-Construction Monitoring Program as appropriate. In addition to the reporting required under the Consent Decree, the City will provide Post-Construction Monitoring Reports as described below to USEPA and OEPA.

A second purpose for the progress reporting is to keep Akron's public and ratepayers aware of the City's progress. A key goal of the City's overall wet-weather control philosophy is to ensure that public monies are spent in an effective and prudent manner. As part of pursuing that goal, the City is committed to keeping the public informed on where, how, and to what benefit their money is being spent.

As explained previously in this plan, and recognized by USEPA in their December 2001 Report to Congress, "it is often difficult, and in some instances impossible, to link environmental conditions or results to a single source of pollution, such as CSOs. In most instances, water quality is impacted by multiple sources, and trends over time reflect the change in loadings on a watershed scale from a variety of environmental programs." Therefore, it is unlikely that the reports described below will be able to definitively link any measurable water quality indicator to in-place CSO controls. However, the City's reporting will document progress towards complying with the Performance Criteria in Table 9-1, along with progress towards the common goal of improving instream water quality.

11.8.1 Post-Construction Monitoring Reports

As introduced in Section 11.6.1, a Post-Construction Monitoring Report will be prepared at the beginning of each of the two phases of post-construction monitoring. The first phase will occur after Achievement of Full Operation of the first tunnel, and will encompass that tunnel as well as any storage basins and separation projects completed prior to completion of the first tunnel. The second phase will occur after Achievement of Full Operation of all CSO control measures.

The Post-Construction Monitoring Reports will be submitted within two years following Achievement of Full Operation of the applicable CSO project(s) in each phase, and include data related to the following information:

- Description of CSO controls being implemented
- CSO monitoring and rainfall monitoring results
- River water quality sampling results
- Results of the Model-Based Compliance Assessment Approach, as described above in Step 8 of Section 11.6.1. This assessment evaluates whether the implemented controls are complying with the Performance Criteria in Table 9-1.

- A discussion of significant variances from the Performance Criteria, including impacting factors and associated water quality impacts (if observed). This discussion will serve as the basis for a Supplemental Compliance Report, prepared separately, as described below in Section 11.9.
- Re-evaluation and proposed corrective action (if necessary). This discussion will serve as the basis for a Supplemental Compliance Report, prepared separately, as described below in Section 11.9.

The second Post-Construction Monitoring Report, submitted in 2030 after Achievement of Full Operation of the second tunnel and remaining CSO controls, will include an assessment of the combined LTCP controls. While the performance of the first tunnel and other initial CSO controls in terms of activations can be assessed after its achievement of full operation, the full impact of CSO control measures on the receiving waters cannot be assessed until implementation of the full set of CSO control measures.

11.8.2 Progress Report to Public

As noted above, a key goal of the City's overall wet-weather control philosophy is to ensure that public monies are spent in an effective and prudent manner. The City takes this obligation very seriously, given that City ratepayers are funding the CSO control measures required under the LTCP. Therefore, progress reporting to the public is analogous to informing an owner on the status of his or her investment.

The City has an active public information program related to wet weather control, and will continue disseminating information on the status of LTCP implementation through this program. Public outreach will be ongoing during LTCP implementation, starting in 2010. The Post-Construction Monitoring Reports described above will also provide information for focused public education periods, during which ratepayers will be shown costs to date and any observed trends in improved water quality.

11.9 Supplemental Compliance Plan

If the modeled overflow frequency based on the typical year simulation does not achieve the Performance Criteria set forth in Table 9-1, Akron will prepare and submit to USEPA and OEPA, for review and approval, a Supplemental Compliance Plan in accordance with Paragraph 20 of the Consent Decree, that may include some or all of the following: (1) the volume, frequency and factors causing the additional overflow frequency, (2) observed impacts on water quality, including designated uses, from the additional overflow frequency, (3) control options to reduce the CSO frequency to achieve the Performance Criteria, (4) associated costs for additional control options, (5) a schedule to implement additional control options, (6) expected benefits from such control options, and (7) a recommendation as to whether additional control measures are necessary to protect designated uses.

11.10 Summary

The City's Post-Construction Monitoring Program is designed to assess the impact of the CSO Long Term Control Plan. Given the City's investment of hundreds of millions of dollars in wet-weather control, it is critical to have a mechanism to measure benefit. The Post-Construction Monitoring Program will evaluate, document, and disseminate the effectiveness of the CSO control program in achieving performance requirements and improving water quality.

The Program consists of the following steps:

- Implementation of a defined monitoring program designed to measure reductions in overflow activations and changes in instream water quality.
- Analysis and assessment of model simulation results to evaluate whether implemented CSO control measures are meeting the Performance Criteria in Table 9-1.
- Analysis and assessment of water quality data to establish trends in improving instream water quality.
- Preparation of Post-Construction Monitoring Reports to document the success of the LTCP implementation, or identify weak links in the implemented CSO control system and present appropriate corrective action.
- Dissemination of information on LTCP implementation to the Akron public and ratepayers, including important measures of cost and benefit.

The City's Post-Construction Monitoring Program addresses USEPA and OEPA requirements, as outlined in the CSO Policy, for monitoring the performance of CSO control measures.

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