1.0 INTRODUCTION

1.1 Background

The City of Lockport was issued a State Pollutant Discharge Elimination System (SPDES) permit modification on November 1, 1996. That permit (NY 002 7057) identified 30 Combined Sewer Overflows (CSOs) and included a Compliance Schedule incorporating a Sewer System Monitoring Plan. The City proceeded to accomplish many Best Management Practices (BMPs), submitted a draft Monitoring Plan for CSOs and CSO Impacts (MP), initiated major construction with assistance from the NYS Bond Act and Financial Assistance to Business (FAB) programs and has effectively eliminated approximately 20 CSOs. Proactive action by the City since November 1996 include:

A copy of the SPDES permit, as modified on November 1, 2005, is included as Appendix I. The CSO Interim Report was transmitted to the New York State Department of Environmental Conservation (NYSDEC) on July 2, 2005.

1) Records Review

Record drawings of the City sewers and Wastewater Treatment Plant (WWTP) were reviewed; previous reports re-read, industrial discharges re-evaluated, and numerous CSO information confirmed thus taking advantage of available information.

Additional information reviewed since the July 2005 Interim Report includes Facilities Reports, monthly DMRs, flow data at WWTP, precipitation data, storm sewer mapping, sensitive area information, routine CSO observations, flow data from non-City contributors, Sewer System Evaluation Survey (SSES) for area serving Hoover Pump Station, sewer repair data, and City resident complaints.

2) GIS Mapping

A new GIS mapping system was developed to identify specific sewers contributing to specific CSOs.

The City continues to expand its GIS capabilities to support the preparation of the CSO Characterization and Monitoring Report and the Long-Term Control Plan (LTCP). Features beyond the CSO number, contributing sewers, significant industries, monitoring locations, etc., now include contours, City resident sewer complaints by date and location, land use, aerial photography, etc. To facilitate a clearer understanding of this document, the following maps previously generated during the Plan for CSOs and CSO Impacts, July 2003 and the CSO Interim Report, July 2005 are included/upgraded for

easy reference while reviewing this and are included at the end of this report following the Appendices.

See Map #1 General Location Map, City of Lockport – identifies area, topography, and area served from Town; Map #3 Wastewater System & CSOs – with CSO outfalls, sewers (combined, sanitary and storm), SIUs, rain gauges, monitors; Map #5 Zoning.

3) Bond Act Funding

The City aggressively pursued grant assistance from the NYS Bond Act in 1997 and 1998 resulting in the following four grant awards:

Project		Grant Amount	Construction Completed
1.	New storm sewers to redirect swamp drainage out of the City's collection system (Vine-North Project).	$119,000	2000
2&3.	Sewer Separation Project at Ohio and Simmonds Streets.	$459,000	2002
4.	New WWTP clarifier to enhance treatment during high flows, plus new pumps, valves, and Supervisory Control and Data Acquisition (SCADA) improvements.	$1,405,050	2004

4) FAB Funding

Grant assistance was secured from the FAB program to eliminate CSOs at Richmond and Exchange Streets ($170,625 and $138,600 secured, respectively). Construction involving new drill hole construction, sewer cleaning, televising and lining was completed in fall 2004.

5) CSO Reductions

Through the proactive efforts of the City, permitted CSOs have been reduced from the original 30 to approximately ten.

As of October 2, 2006, there are thirteen active CSOs including: 002, 005, 006, 007, 008, 011, 014, 018, 019, 020, 023, 024, and 034.

Seventeen CSOs are closed permanently including: 003, 004, 009, 010, 012, 013, 015, 016, 017, 021, 022, 025, 026, 029, 030, 031, and 032.

Five CSOs are now candidates for plugging on a temporary basis with follow-up observations including: 005, 011, 018, 019, and 020 which would reduce active CSOs to eight if the temporary plugging is successful.

6) Monitoring Plan for CSOs and CSO Impacts

The CSO Monitoring Plan was submitted to NYSDEC in July 2003 and approved by NYSDEC on April 2, 2004.

7) Direct Connections Eliminated

Preliminary results of the CSO Monitoring Plan revealed 20 direct connections of raw sewage to Eighteenmile Creek. Construction to redirect this flow to the sewer system and avoid a public issue risk has been completed at a City cost of $146,210.

The City identified additional direct connections on Stevens Street. When the sewer separation project in the Ohio/Simonds Street area was performed, apparently the contractor inadvertently connected four house service laterals directly to the 12-inch diameter storm sewer leading to the Barge Canal instead of connecting to the sanitary sewer. Once identified, the sewer laterals were correctly routed to the sanitary sewer. This work was completed in September 2006.

8) Water Quality Monitoring

Flow monitoring at key City manholes and in the area receiving streams in combination with water quality monitoring in those streams was conducted in spring 2004, as recommended in the MP.

9) USEPA CSO Compliance Inspection

On August 12, 2002 USEPA conducted a CSO Compliance Inspection and identified in a September 4, 2002 letter to the City that significant CSO work had been accomplished. They noted non-compliance with Proper Operation and Regulator NYS Maintenance Programs for the sewer system and CSO Outfalls as well as lack of NYSDEC approval for the MP.

As noted in a previous paragraph, the MP has since been approved. See the next paragraph specific to progress with Maintenance of Sewer System and CSOs.

10) New Sewer System Equipment

The City purchased a new vacuum truck to facilitate a regular program of catch basin cleaning/street cleaning to minimize unnecessary debris/floatables reaching the WWTP or area streams.

11) Financial Investment

The City's previous success with grant funding has facilitated many proactive construction projects beneficial to water quality. These projects are not without significant investment of local share funding and the investment of countless hours by City Staff observing CSOs during and after storm events as well as CSO sampling, analyses and report preparation. Since 1996 other projects have included sewer and manhole lining, grit system rehabilitation, sewer system cleaning and televising, new drill hole construction, SCADA system installation, new return activated sludge pumps, valves and flow monitoring equipment at the WWTP, and the NYSDEC consent order for the replacement of WWTP bar screens. A summary of the Sewer Repair and Maintenance history from 2000 through 2004 is attached at the end of this section. The dollar value of each project is included and the total expenditure of City funds for these projects is approximately $3.05 million. In addition, the City typically spends in excess of $200,000 annually for sewer system maintenance.

Additional projects completed at the WWTP since July 2005 include grit system automation, clarifier piping repair, and installation of three new bar screens. The pumps and motors at Hoover Lift Station were replaced, direct lateral connections were removed on Stevens Street as noted in previous paragraph 7, sewers on Main Street were relined from Cottage Street to Locust Street, and a variety of sewers and receivers have been replaced.

Also attached at the end of this section is the summary of the Sewer Repair and Maintenance history for 2005 and 2006.

12) NYSACEC Award Recognition

The team of local City Staff and our consultant, Clough Harbour & Associates LLP (CHA), have demonstrated the ability to produce effective wastewater projects for the City's overall benefit and overall water quality benefit to the area when funds are available. The American Council of Engineering Companies of NY has recognized the City's CSO Improvements for Engineering Excellence at an awards ceremony in New York City on April 2, 2005.

A copy of the award publication is included as Appendix J.

Through these actions, the City has been aggressively pursuing projects to reduce the frequency and quantity of CSO throughout their sewer system.

Sewer Repair & Maintenance

Job #	Description	Cost
2004		
2200	Main Street Storm Sewer	$180,504
2226	Grit Collector Replacements	$346,000
2229	Removal of Laterals from 18 Mile Creek Culvert	$146,210
2232	Main Street Sewer Relining (3100')	$318,619
	Main Street Manhole Rehab. (11 Ea.)	$ 25,300
2204	Massachusetts Ave. Sewer Relining (810')	$ 48,480
	Massachusetts Ave. Manhole Rehab. (8 ea.)	$ 23,200
2204	Lock Street Sewer Relining	$ 84,550
	Lock Street Manhole Rehab (4 Ea)	$ 5,800
2164	WWTP Clarifier	$1,945,205
	Engineering	$410,035
	(Grant- $1,405,050)	
	Total City Funds	**$2,128,853**
2003		
2166	Lincoln Ave. Sewer By Pass (1900')	$107,600
2165	Exchange St & Lock St Drill Hole & Sewer	$112,436
	Engineering	$ 78,013
	(Grant – $126,000)	
2222	Clean & Televise Sewers (5,138')	$ 28,837
	Total City Funds	**$200,886**
2002		
2212	Richmond Ave Sewer Relining (700')	$ 85,050
	Richmond Ave Manhole Rehab. (5 Ea.)	$ 11,340
2163	Simonds, Ohio, Stevens Sts, Storm Sewer (4,000'±)	$638,333
	Engineering	$ 37,893
	(Grant - $459,000)	
	Total City Funds	**$313,616**
2001		
2143	Richfield Street Storm Sewer (830')	$ 59,396
2202	Chapel Street Sewer	$ 14,417
	Total City Funds	**$73,813**
2000		
2189	Gulf Interceptor Sewer Televising & Repair (4,000')	$112,064
2180	Arterial Sewers Cleaning & Televising (8,800')	$ 14,345
2193	Grant, Beattie, High Sts. Sewer Televising (3,700')	$ 5,557
2158	North Adam, Vine Sts. Storm Sewer	$333,825
	Engineering	$ 22,619
	(Grant - $207,675)	
2184	Pine Street CSO #5 Outfall replacement	$ 50,000
	Total City Funds	**$330,735**

(Continued)

1995 – 1999		
2162	Walnut St. Storm Sewer (2040')	$ 41,905
2141	Carlisle Gardens Sewer Relining	$ 54,588
2142	Sewer Replacement next to #352 Clinton Street	$ 14,072
2148	Market Street Culvert Repair	$ 4,400
2147	North Transit Road Manhole Repair	$ 8,400
2061	Clinton Bldg. Sewer Relining	$ 30,135
	Total City Funds	**$153,500**

CSO Monitoring
Rain Team Events

Total City Funds 2000-2004 - $3,047,903

Sewer Repair & Maintenance

2005/2006

1. Sanitary Sewer Replacement — $ 7,100

   - Howard Avenue (75 ft.)
   - Waterman Street (10 ft.)
   - Caledonia Street (23 ft.)
   - Green Street (8 ft.)
   - Union Street (26 ft.)

2. Storm Sewer Receivers Replace/Repair — $ 30,875
3. Direct Connection Removal — $ 14,000
4. WWTP Bar Screen Replacement — $544,000
5. Hoover Lift Station Pump Replacement — $ 60,000

Total City Funds 2000-2006 **$3,703,878**

2.0 SYSTEM CHARACTERIZATION

2.1 Public Participation

To ensure the public has appropriate input in the development of a long term control plan (LTCP) the City will develop a series of public information pieces that:

- describe the National CSO Control Policy
- summarize the City's status with respect to 15 BMPs
- identify background conditions and alternatives to meet current water quality standards.
- present the cost, capital funding options, and impact on wastewater fees.

A draft Public Participation Plan was submitted to NYSDEC on May 1, 2006 (see Appendix K). The submission met the LTCP Compliance Date included on page 16 of 22 in the SPDES permit.

2.2 Goals/Objectives

This Interim Report is prepared to summarize the activities and progress in implementing The Monitoring Plan for CSOs and CSO Impacts (MP) as submitted to NYS Department of Environmental Conservation (NYSDEC) on November 14, 2003.

The CSO Characterization and Monitoring Report is prepared to further elaborate on the activities and progress since submittal of the CSO Interim Report to NYSDEC on July 2, 2005. The goals are to:

1) continually improve upon the understanding of this complicated sewer system;
2) implement affordable projects that have obvious water quality benefits;
3) identify data voids with action to resolve them;
4) enhance effectiveness in achieving 15 BMPs; and
5) achieve CSO policy compliance through use of the Presumptive Approach.

2.3 Compilation and Analysis of Monitoring Data

2.3.1 Baseline Conditions of Receiving Streams

The CSS discharges via CSOs to two receiving waters, Eighteenmile Creek and The Barge Canal. To determine baseline conditions two of ten monitoring sites were established upstream of any CSOs. (MS-1 upstream of CSOs on the Barge Canal and MS-6 upstream of any CSOs on Eighteenmile Creek). Samples were secured and CSO water quality data noted on the following days.

Fecal concentrations at various flow rates reveal the following:

MS-1						
Collection Dates	Condition	Rainfall	# Events	#/100 mls		
				Low	High	Average
1999-2000	Dry-Dry	0	8	34	67	
1999-2000	Dry-Wet	0	7	27	700	
1999-2000 2004	Wet-Dry	0.34-1.26 0.72	2 1	149	290 3,960	
1999-2000 2004	Wet-Wet	0.53-0.67 0.74	2 1	-	1,980 3,960	
		0 to 1.26	21			

On 7 of 21 occasions concentrations were 27 to 700/100 mls. On two separate occasions 3,960/100 mls were recorded as highs on 5/24/04 and 7/12/04 respectively.

MS-6						
Collection Dates	Condition	Rainfall	# Events	#/100 mls		
				Low	High	Average
1999-2000	Dry-Dry	0	7	20	260	
1999-2000	Dry-Wet	0	8	<9	1,188	
1999-2000 2004	Wet-Dry	0.34-1.26 0.49-1.16	2 4	5,941 <1,000	21,000 14,854	
1999-2000 2004	Wet-Wet	0.67-0.71 1.16	2 1	69 -	7,921 20,000	
		0-1.26	24			

In relative comparisons the background fecal coliform levels for the Eighteenmile Creek run appreciably higher than those on the Erie Barge Canal, typically at least three times greater.

Condition	Rainfall	Date	Fecal		Ratio
			MS-1	MS-6	MS-6 to MS-1
Dry-Dry	0	6/2/99	40	99	>2x
Dry-Dry	0	10/7/99	46	136	>2x
Dry-Dry	0	6/1/00	62	36	-
Dry-Dry	0	7/25/00	34	163	>4x
Dry-Dry	0	9/19/00	37	240	>6x
Dry-Dry	0	10/3/00	67	260	>3x

Condition	Rainfall	Date	Fecal		Ratio
			MS-1	MS-6	MS-6 to MS-1
Dry-Wet	0	7/22/99	50	901	>18x
Dry-Wet	0	8/18/99	50	350	>7x
Dry-Wet	0	9/14/99	62	36	-
Dry-Wet	0	11/04/99	300	1,188	>3x
Dry-Wet	0	1/07/00	113	19	-
Dry-Wet	0	5/11/00	700	580	-
Dry-Wet	0	8/8/00	103	693	>6x

Condition	Rainfall	Date	Fecal		Ratio
			MS-1	MS-6	MS-6 to MS-1
Wet-Dry	0.34/0.34	6/25/99	149	5,941	>39x
Wet-Dry	1.26/1.26	7/6/99	290	21,000	>7x
Wet-Dry	0.72/0.80	7/12/04	3,960	14,854	>3x

Condition	Rainfall	Date	Fecal		Ratio
			MS-1	MS-6	MS-6 to MS-1
Wet-Wet	0.67/0.67	4/8/00	1,980	7,921	>4x
Wet-Wet	0.74/1.16	5/24/04	3,960	20,000	>5x

Sewer system conditions in the City have changed over the past several years due to proactive sewer system improvement projects and a reduction in the local Significant Industrial Users (SIUs) (see list in Table 1). However, the data indicates that typically fecal coliform levels at MS-6 are greater than at MS-1.

It is not within the scope of this study/report for the City to investigate sources of elevated fecal coliform levels outside the City boundaries, nor does the City have the authority to do so. The City continues with efforts focused on water quality within City limits. Perhaps NYSDEC can offer insight on the elevated levels of fecal coliform in Eighteenmile Creek.

2.3.2 CSS Response to Precipitation

Due to the significant topography variations in the City, storm events can be localized. Therefore the City collected rainfall data at the following monitoring locations:

Table 2
City of Lockport
CSO Activation Status

DATE											
WWTP RAINFALL (in.)											
WWTP FLOW (MGD)											
CSO Number	TYPE	Open / Closed	LOCATION	RECEIVING STREAM	No. of Times Activated	No. of Times Inspected	% of Time Activated	Potential Closures	Weir Raised	Notes	Weir Elevation
2	WEIR	O	E. OF JACKSON, N. OF WILLIAM	18 MILE CREEK	10	15	67		X	Most Frequent diversion in system. (Previous monitoring attempts failed)	3.5 ft
3	WEIR	C	HILL STREET	18 MILE CREEK						Vine/North Project will eliminate significant storm flows. CSO eliminated	
4	WEIR	C	MILL ST. & PORTER ST.	18 MILE CREEK						CSO was eliminated in February 1998.	
5	WEIR	O	PINE ST & SERVICE RD	BARGE CANAL	0	4	0	X		City knows this CSO does divert, but only with major precipitation. Overflow repaired. Observe. High weir built '85. Brick weir about 4 ft.	14 in
6	WEIR	O	NIAGARA & RICHMOND	BARGE CANAL	0	4	0	X	2/18/2002	Several events close, but no diversion. Will raise weir 6" week of 02/18/02. May close after Richmond project.	2.5 ft
7	WEIR	O	COTTAGE & MAIN	BARGE CANAL	20	35	57	X		If plugged, may flood bldg. at Main St.	
8	WEIR	O	W. MAIN	BARGE CANAL	16	67	24		X	Serves a large area with three industrial users. Raised weir 6 inches in Jan '98	
9	WEIR	C	S. TRANSIT RD.	BARGE CANAL					2/18/2002	High trains area - difficult to observe. No diversion when 55 mgd @ WWTF. To be closed week of 02/18/02	
10	WEIR	C	STATE RD & W. HIGH ST.	BARGE CANAL						No diversion when 55 mgd @ WWTF. Closed 02/14/02	2 ft
11	WEIR	O	PROSPECT STREET	BARGE CANAL	0	4	0			Ohio/Simonds Project will eliminate significant storm flows. Observe after project.	
12	WEIR	O	STATE RD OPP. MINARD ST.	BARGE CANAL						Observe	
13	WEIR	C	STATE RD. OPP. NICHOLS ST.	BARGE CANAL						Observe	
14	WEIR	O	STATE RD 1150 FT. S. OF NICHOLS ST	BARGE CANAL	2	2	100		X	Get bulk flow when filtration plant discharges. But services large area. Weir raised approx 6 inches in 2003	
15	WEIR	O	MARKET STREET	18 MILE CREEK						Observe. Small area. In sidewalk	
16	WEIR	C	MARKET ST. E. OF EXCHANGE	18 MILE CREEK						CSO eliminated July 1997	
17	WEIR	C	VINE ST & MARKET ST.	BARGE CANAL						CSO eliminated in February 1998	2.5 ft
18	WEIR	O	MARKET ST BWT HOUSES 471 & 485	BARGE CANAL	0	4	0		X	Raised weir 6" on 02/14/02	2.5 ft
19	WEIR	O	GARDEN STREET	18 MILE CREEK	ND	ND	-			Known to divert regularly. Exchange/Spring project may eliminate - new drill hole at Exchange & Market.	1.5 ft
20	WEIR	O	SPRING ST & UNION ST	18 MILE CREEK	0	4	0			Exchange/Spring project may eliminate - new drill hole.	
21	WEIR	C	MCCOLLUM & UNION	18 MILE CREEK						Closed 2001	
22	WEIR	C	CHESNUT ST.	18 MILE CREEK						Closed 2001	2.5 ft
23	WEIR	O	208 EAST AVENUE (NEAR CAVE E. OF CREEK)	18 MILE CREEK	ND	ND	-		X	Observe. No diversion when 55 mgd @ WWTF. Weir raised approx 6-8 inches in Feb 2002.	3.0 ft
24	WEIR	O	CARLTON PLACE	18 MILE CREEK	ND	ND	-		X	Weir raised 6" on 01/23/02. Rebuilt weir in 1992-1993	
25	WEIR	C	WALNUT STREET	18 MILE CREEK						Small area. No diversion when 55 mgd @ WWTF. Closed 01/23/02	
26	WEIR	C	POUND STREET	18 MILE CREEK						CSO eliminated July 1997	
29	WEIR	C	W. JACKSON STREET	GULF CREEK						No diversions at location but diversions in system. Observe.	
30	WEIR	C	S. NIAGARA ST. & RAILROAD	GULF CREEK					X	Weir raised 6 inches Feb. 1998. Two out of eight events since then have diverted. Will raised another 6" on 02/14/02	
31	WEIR	C	W. GREEN STREET	GULF CREEK						Scheduled for elimination. May have been closed. Danny to check.	
32	PUMPED	O	LINCOLN AVE PS	DONNER CREEK	0	0	-			Influenced by Town's blockage at storm sewer outlet. Rerouted PS flow in new sanitary sewer Summer 2003.	
34	WEIR	O	EAST AVENUE & CAVE ST (W. OF CREEK)	18 MILE CREEK	ND	ND	-		X	Observe. No diversion when 55 mgd @ WWTF. Weir raised approx 6-8 inches in Feb 2002.	2.5 ft

* Y = YES
* N = NO, FLOW DATA REPORTED NO LEVEL OR VELOCITY
* NC = NOT CHECKED
* ND = NO DATA, FLOW DATA REPORTED LEVEL ONLY OR NO DATA

SHADING = CSO ELIMINATED

The City's emergency water supply intake on the Barge Canal is 900± feet upstream of CSO 014. This intake has only been activated on 6± occasions since the 1950s with no activations since the mid 1990s. Those previous activations were to facilitate replacement or repair/relining of the primary intake which the Water Superintendent now reports to be in excellent condition. During those times, effective disinfection was incorporated yielding a safe water supply for City residents.

2.3.5 CSO and Water Monitoring

2.3.5.1 Flow Monitoring

The City completed flow monitoring at specific CSO, water quality monitoring stations and sewer system locations as identified in the NYSDEC approved MP to quantify the volume of water diverted to the receiving streams during an overflow event and to identify the frequency of CSO activations. This monitoring allowed for the identification of flows in the sewers and quantified volume of wastewater discharged at specific CSO locations.

The following table summarizes currently active CSOs and water quality monitoring stations that were monitored or observed during the Spring 2004 monitoring period:

Number	*Monitor*	*Observe*	*Notes*
CSO 002 OF	X		
CSO 002 san	X		
CSO 005 OF		X	0 OF /16 events observed dating back to September 1997.
CSO 006 OF		X	May close after Richmond Ave. project.
CSO 007 OF	X		
CSO 007 san	X		
CSO 007 storm	X		
CSO 008 OF	X		
CSO 008 san 42	X		
CSO 008 san 29x48	X		
CSO 011 OF		X	0 OF /3 events observed following the completion of the Ohio-Simonds sewer separation project.
CSO 014 OF	X		
CSO 014 san	X		
CSO 018 OF		X	1 OF/ 22 events observed. CSO has not activated since January 1998.
CSO 020 OF		X	0 OF / 23 events observed dating back to September 1997.
CSO 023 OF	X		
CSO 023 san	X		
CSO 024 OF	X		
CSO 024 san	X		
CSO 034 OF	X		
CSO 034 san 21	X		
CSO 034 san 38	X		

MS - 2	X		Barge Canal – Upstream of CSO 008 (Level Only)
MS - 5	X		Barge Canal – Downstream of CSO 018
MS - 6	X		Eighteenmile Creek – Upstream of CSO 025
MS - 8	X		Eighteenmile Creek – Upstream of CSO 002
MS - 10	X		Eighteenmile Creek – Downstream of WWTP discharge

Flow monitors were installed on discharges for CSOs 002, 007, 008, 014, 023, 024, and 034 from March 30, 2004 through July 19, 2004. Additional monitors were installed during the same time period in the sewer collection system upstream of these overflows to characterize the amount of flow in the collection system. Summary flow data tables for the overflow and sewer collection system monitors are presented in Appendix C.

Listed below is information pertaining to the peak wet weather discharge date for each of these CSOs:

CSO 002

During the flow monitoring period, CSO 002 diverted three times in April, five times in May and two times in June. The peak wet weather discharge from CSO 002 was on May 24, 2004. During this 1.16 inch wet weather event, approximately 2.3 million gallons of water diverted to Eighteenmile Creek. The overflow from this CSO occurred twice during the day, once for a 45-minute period and the second diversion was for a 2-hour period.

The flow monitor in the sewer system upstream of the overflow recorded approximately 22.5 million gallons on this date.

CSO 007

CSO 007 diverted two times in March, 15 times in April and six times in May, during the flow monitoring period. There is no flow monitor data for this location after May 28, 2004. The peak wet weather discharge from CSO 007 was on May 24, 2004. During this 1.16 inch wet weather event, approximately 113,000 gallons of water diverted to the Barge Canal. The overflow from this CSO occurred twice during the day, once for a 90-minute period and the second diversion was for a 6.25-hour period. The second diversion started after a 75-minute period of no diversion.

The flow monitor in the sewer system upstream of the overflow recorded negative velocity throughout the day. The storm sewer that discharges to the overflow manhole recorded a volume of approximately 12,750 gallons on this date. Subsequent to this monitoring program, the City has removed this storm sewer from the combined sewer system.

observed these overflows were:

- April 18, 2004
- April 26, 2004
- May 24, 2004
- July 4, 2004

The overflows were not active at the time of the inspection for each of these wet weather events. The weir for CSO 018 was damp on three (3) of the wet weather events indicating the possibility of overflow prior to inspection.

Monthly Overflow Data

The Table 2 summary page, included in Section 2.3.3, identifies the number of times that an overflow was diverting during a wet weather event. The data for CSOs with installed flow monitors were reported as "yes" the overflow diverted, if the flow monitor recorded level and velocity readings. If a zero was recorded for level and velocity, a "no" the overflow did not divert was noted. In instances where level only or no data was recorded, a "no data" recorded was noted. The Table 2 activation status summary reflects the number of times an overflow was diverting versus the total number of times the overflow was "inspected" (combination of "yes" and "no" data). For example, CSO 002 was noted to divert 10 of 15 times (67 percent) during the monitoring period. CSO 007 diverted 57 percent of the time (20 diversions during 35 wet weather events). CSO 008 was reported to divert 24 percent of the time (16 diversions during 67 wet weather events).

Physical inspections were conducted for CSOs 005, 006, 011, 018 and 020 during four wet weather events as previously reported. These overflows did not divert at the time of inspection.

Presented in Appendix F is a summary of the monthly overflow activations compared with precipitation data. This data was analyzed to determine the size wet weather event that caused an overflow to divert. A summary of the information pertaining to specific overflows follows:

- CSO 002 diverted during wet weather events ranging in size from 0.26 inches of rain over a duration of 3 hours to 1.16 inches of rain over a duration of 5 hours. This overflow also diverted during a similar sized wet weather event (0.28 inches) over a shorter duration (1.5 hours).

- CSO 007 diverted during wet weather events ranging in size from 0.02 inches of rain over a duration of 15 minutes to 1.16 inches of rain over a duration of 5 hours.

- CSO 008 diverted during wet weather events ranging in size from 0.01

inches of rain over a duration of 15 minutes to 1.37 inches of rain over a duration of 4 hours.

- CSO 014 diverted during wet weather events ranging in size from 0.72 inches of rain over a duration of 4 hours to 1.16 inches of rain over a duration of 5 hours (note: there were only two events recorded with level and velocity data).

2.3.5.2 Water Quality Monitoring Program

The water quality monitoring program was developed to provide site-specific information required to allow assessment of the expected water quality impacts and the effects of the City's CSO discharges on the receiving waters.

Table 3 presents the twelve (12) monitoring locations for the collection of water quality data on the Barge Canal, Eighteenmile Creek including three (3) CSOs. The approved MP proposed a total of eleven (11) monitoring locations (nine Monitoring Stations MS and two CSO locations). The City added CSO 014 to the list to gain additional information related to the water quality impact of this CSO on the Barge Canal.

TABLE 3

WATER QUALITY MONITORING LOCATIONS

Number	Location		Purpose
MS –1	Barge Canal	Upstream of CSO 014	Define baseline water quality conditions of the Barge Canal upstream of all CSO discharges
MS –2	Barge Canal	Immediately upstream of CSO 008	Define the water quality impacts from CSO 008
MS – 3	Barge Canal	Immediately downstream of CSO 008	Define the water quality impacts from CSO 008
MS – 4	Barge Canal	Immediately upstream of flow diversion to Eighteenmile Creek	Define the pollutant loading discharged from the Barge Canal into Eighteenmile Creek (via the flow diversion)
MS - 5	Barge Canal	Immediately downstream of CSO 018	Assess impact of all the CSO discharges to the Barge Canal
MS – 6	Eighteenmile Creek	Upstream of CSO 025	Define baseline water quality conditions in Eighteenmile Creek upstream of all CSO discharges
MS – 8	Eighteenmile Creek	Immediately upstream of CSO 002	Define the water quality impacts from CSO 002
MS – 9	Eighteenmile Creek	Immediately downstream of CSO 002	Define the water quality impacts from CSO 002
MS – 10	Eighteenmile Creek	Immediately downstream of WWTP discharge	Define the water quality impacts from WWTP discharge.
CSO 002	Eighteenmile Creek	CSO 002 diversion	Define the water quality impacts from CSO 002
CSO 008	Barge Canal	CSO 008 diversion	Define the water quality impacts from CSO

			008
CSO 014	Barge Canal	CSO 014 diversion	Define the water quality impacts from CSO 014

Notes:
Eighteenmile Creek in the vicinity of the City of Lockport is a Class D receiving stream
Barge Canal is a Class C receiving stream

A grab sample of the receiving water was collected over the period from the beginning of the storm event to 6 hours past rainfall termination, at a frequency of about 6 hours. Of the 67 wet weather events during the monitoring period, only the following four events lasted longer than 6 hours:

Date	WWTP Precipitation (in)	Duration (hr)
April 1, 2004	0.47	7.75
April 4, 2004	0.30	7.00
April 13, 2004	0.95	12.5
May 31, 2004	0.74	6.25

Water quality samples were collected from the locations presented in Table 3 when at least one of the CSOs being monitored was diverting. The goal was to sample active CSOs along with associated MS locations during at least three (3) storm events during the spring 2004 monitoring program.

The collected water samples were analyzed by the City's WWTP staff for the following water quality parameters:

- pH
- Dissolved oxygen
- BOD_5
- TSS and TDS
- TKN, and ammonia
- Total phosphorus

The first grab sample collected at each of the sampling stations during each of the monitored storm events was analyzed by a certified analytical testing laboratory for the following:

- Fecal coliform
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Mercury
- Nickel
- Zinc

- PCB-1242, PCB-1254, PCB-1221, PCB-1232, PCB-1248, PCB-1260, PCB-1016 (∝g/l)

In addition, one grab sample collected at stations MS-8 and MS-9 (i.e., immediately upstream and downstream of the largest overflow in the City's system – CSO 002), and CSO 002 was analyzed by a certified analytical testing laboratory for the following parameters:

- Dioxins (2,3,7,8 – TCDD)
- Aldrin, Dieldrin
- Chlordane
- DDT, DDD & DDE
- Endosulfans
- Endrin
- Heptachlor & Heptachlor epoxide
- Hexachlorocyclohexanes

Data from the sampling program is summarized in Tables 4 through 6, on Figures 1 and 2 and in Appendices G and H. Table 4 presents the fecal coliform analytical results for sample locations in the Barge Canal and in Eighteenmile Creek. The data is presented in ascending order to correlate with the direction of flow for each water body. Data collected at MS-1 indicate the presence of fecal coliform in the Barge Canal prior to entering the City limits. On May 24, 2004, the diversion at CSO 014 may have lead to an elevated fecal coliform reading collected at MS-2. Proceeding downstream, CSO 008 was not diverting at the time of sample collection and the fecal coliform concentrations at each subsequent downstream monitoring station (MS-3, 4 and 5) was reduced.

Data collected on May 24, 2004 from monitoring stations along Eighteenmile Creek also indicate the presence of fecal coliform upstream of the City limits. On this date, downstream fecal coliform counts were reduced when comparing samples collected at MS-6 and MS-8. Diversion from CSO 002 may have lead to a slightly increased fecal coliform reading collected at MS-9.

Samples collected and analyzed on the other four dates during the monitoring period indicate that diversion of CSO 002 did not have a significant impact of the fecal coliform count in the Barge Canal at MS-9 on three of the four other sample dates. The sample collected on May 22-23, 2004 indicated a nearly 9,000 #/100 mls increase in fecal coliform downstream of CSO 002.

This information is also presented graphically on Figures 1 and 2. Figure 1 presents analytical results of samples collected on a wet weather day with antecedent dry weather conditions (Wet-Dry). Figure 2 presents analytical results of samples collected on a wet weather day with antecedent wet weather conditions (Wet-Wet).

The results from metals testing is presented in terms of concentration in Table 5 and

Table 4

City of Lockport
Spring 2004 CSO Monitoring Program
Fecal Coliform Results (# / 100 mls)

Fecal Coliform		Apr 18 04	May 22 & 23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			3,960		3,960
	CSO 014			500,000		*
	MS 2			7,921		9,901
	CSO 008			*		
	MS 3			5,941		
	MS 4			3,960		
	MS 5			990		
18mile Creek	MS 6	990	13,861	20,000	>1,000 but <10,000	14,854
	MS 8	16,832	3,960	17,821	7,921	100,000
	CSO 002	800,000	1,200,000	500,000	1,900,000	300,000
	MS 9	21,000	12,871	20,792	7,921	>60,000 but <100,000
	MS 10	100,000	100,000	>60,000 but <100,000	260,000	250,000

* CSO not diverging at the time of sample

Sampling points are arranged in the direction of flow

Table 5

City of Lockport
Spring 2004 CSO Monitoring Program
Metals Results (concentration - μg/L)

Cadmium		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			ND		ND
	CSO 014			ND		ND
	MS 2			ND		ND
	CSO 008			ND		
	MS 3			ND		
	MS 4			ND		
	MS 5			ND		
18mile Creek	MS 6	ND	ND	ND	ND	ND
	MS 8	ND	ND	ND	ND	ND
	CSO 002	ND	ND	ND	ND	ND
	MS 9	ND	ND	ND	ND	ND
	MS 10	ND	ND	ND	ND	ND

Copper		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			ND		ND
	CSO 014			40.5		46.3
	MS 2			ND		ND
	CSO 008			26.6		
	MS 3			ND		
	MS 4			131		
	MS 5			ND		
18mile Creek	MS 6	ND	ND	ND	ND	ND
	MS 8	ND	ND	ND	ND	ND
	CSO 002	57.7	202	98	131	77.9
	MS 9	25.2	ND	ND	ND	ND
	MS 10	42.4	22.2	23.5	ND	46.7

Lead		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			ND		ND
	CSO 014			58.8		56
	MS 2			ND		ND
	CSO 008			74.3		
	MS 3			7.69		
	MS 4			71.9		
	MS 5			ND		
18mile Creek	MS 6	16.8	11.2	5.58	ND	ND
	MS 8	28.8	ND	11.2	5.67	ND
	CSO 002	92.6	280	154	71.9	47
	MS 9	39.3	ND	13.7	ND	19.6
	MS 10	83.3	22.8	21.6	14	69.5

Nickel		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			ND		ND
	CSO 014			ND		ND
	MS 2			ND		ND
	CSO 008			ND		
	MS 3			ND		
	MS 4			ND		
	MS 5			ND		
18mile Creek	MS 6	ND	ND	ND	ND	ND
	MS 8	ND	ND	ND	ND	ND
	CSO 002	ND	34.4	ND	ND	24
	MS 9	ND	ND	ND	ND	ND
	MS 10	ND	ND	ND	ND	ND

Sampling points are arranged in the direction of flow

Table 5 (cont)

City of Lockport
Spring 2004 CSO Monitoring Program
Metals Results (concentration - μg/L)

Chromium		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			ND		ND
	CSO 014			25.2		26
	MS 2			ND		ND
	CSO 008			12.8		
	MS 3			ND		
	MS 4			22.8		
	MS 5			ND		
18mile Creek	MS 6	ND	ND	ND	ND	ND
	MS 8	ND	ND	ND	ND	ND
	CSO 002	20.8	33.5	18.1	22.8	27.6
	MS 9	ND	ND	ND	ND	ND
	MS 10	17.3	11.1	ND	ND	16.3

Iron		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			1590		1340
	CSO 014			6010		5090
	MS 2			1690		1340
	CSO 008			4390		
	MS 3			1520		
	MS 4			5740		
	MS 5			893		
18mile Creek	MS 6	6030	725	3790	574	534
	MS 8	3610	1340	4270	1360	1710
	CSO 002	6940	12700	8020	5740	5030
	MS 9	5810	1450	4490	1460	2130
	MS 10	6200	2050	3380	1780	4700

Mercury		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			ND		ND
	CSO 014			ND		0.208
	MS 2			ND		ND
	CSO 008			ND		
	MS 3			ND		
	MS 4			1.03		
	MS 5			ND		
18mile Creek	MS 6	ND	ND	ND	ND	ND
	MS 8	ND	ND	ND	ND	ND
	CSO 002	0.322	2.68	0.468	1.03	ND
	MS 9	ND	ND	ND	ND	ND
	MS 10	ND	ND	ND	1.03	ND

Zinc		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1			42.6		29.7
	CSO 014			211		221
	MS 2			48.8		29.7
	CSO 008			443		
	MS 3			181		
	MS 4			436		
	MS 5			48		
18mile Creek	MS 6	70.4	275	68.1	23.7	34.6
	MS 8	64.9	43.1	71.6	87.9	35.2
	CSO 002	227	1010	330	436	315
	MS 9	98.5	35.2	75.5	41.9	84.8
	MS 10	205	151	102	72.6	188

Sampling points are arranged in the direction of flow

Table 6

City of Lockport
Spring 2004 CSO Monitoring Program
Metals Results (loading - lbs/d)

Cadmium		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1					
	CSO 014			ND		
	MS 2					
	CSO 008			ND		
	MS 3					
	MS 4					
	MS 5			ND		
18mile Creek	MS 6					
	MS 8		ND	ND	ND	ND
	CSO 002	ND	ND	ND	ND	
	MS 9		ND	ND	ND	
	MS 10					ND

Copper		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1					
	CSO 014			0.0123		
	MS 2					
	CSO 008			0.000941		
	MS 3					
	MS 4					
	MS 5			<0.901		
18mile Creek	MS 6					
	MS 8		<0.043	<0.0859	<0.0462	<0.0895
	CSO 002	0.264	0.00967	1.87	0.028	
	MS 9		<0.044	<0.467	<0.0505	
	MS 10					1.22

Lead		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1					
	CSO 014			0.0178		
	MS 2					
	CSO 008			0.00263		
	MS 3					
	MS 4					
	MS 5			<0.225		
18mile Creek	MS 6					
	MS 8		ND	0.0481	0.0131	<0.0224
	CSO 002	0.424	0.0134	2.94	0.015	
	MS 9		ND	0.32	<0.0126	
	MS 10					1.82

Nickel		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1					
	CSO 014			ND		
	MS 2					
	CSO 008			ND		
	MS 3					
	MS 4					
	MS 5			ND		
18mile Creek	MS 6					
	MS 8		ND	ND	ND	ND
	CSO 002	ND	0.00165	ND	ND	
	MS 9		ND	ND	ND	
	MS 10					ND

Result above SPDES permit action level

Sampling points are arranged in the direction of flow

Table 6 (cont)

City of Lockport
Spring 2004 CSO Monitoring Program
Metals Results (loading - lbs/d)

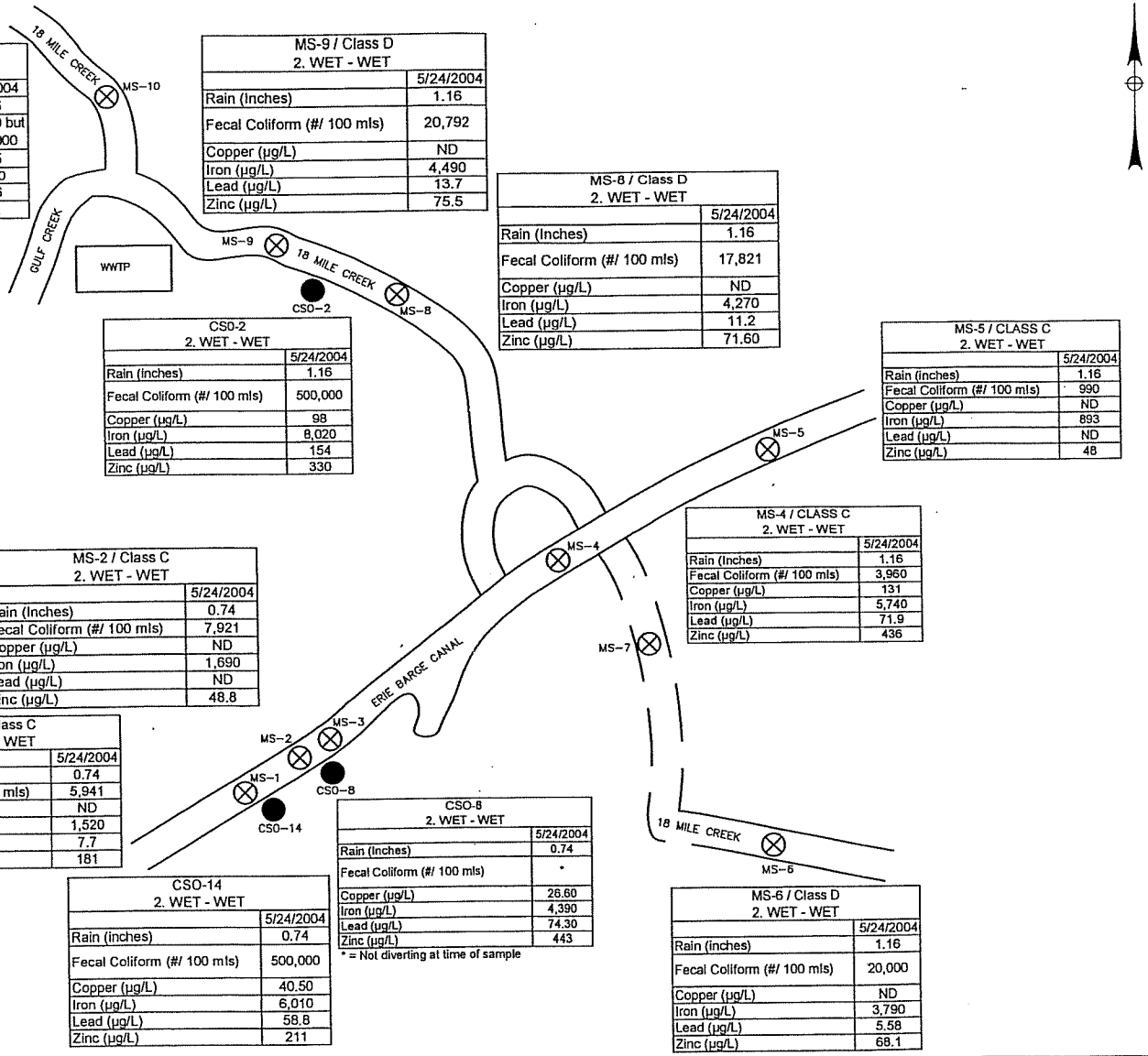
Chromium		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1					
	CSO 014			0.00765		
	MS 2					
	CSO 008			0.000453		
	MS 3					
	MS 4					
	MS 5			<0.451		
18mile Creek	MS 6					
	MS 8		<0.021	<0.0429	<0.0231	<0.0447
	CSO 002	0.095	0.0016	0.345	4.88	
	MS 9		<0.022	<0.234	<0.0252	
	MS 10					0.427

Iron		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1					
	CSO 014			1.82		
	MS 2					
	CSO 008			0.155		
	MS 3					
	MS 4					
	MS 5			40.3		
18mile Creek	MS 6					
	MS 8		2.87	18.3	3.14	7.65
	CSO 002	31.8	0.608	153	12.3	
	MS 9		3.17	105	3.69	
	MS 10					123

Mercury		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1					
	CSO 014			<0.00006		
	MS 2					
	CSO 008			<0.000007		
	MS 3					
	MS 4					
	MS 5			<0.009		
18mile Creek	MS 6					
	MS 8		ND	<0.00086	<0.000462	ND
	CSO 002	0.001	0.000126	0.0089	0.000221	
	MS 9		ND	<0.0047	<0.000505	
	MS 10					ND

Zinc		Apr 18 04	May 22&23 04	May 24 04	Jun 17 04	Jul 12 04
Canal	MS 1					
	CSO 014			0.064		
	MS 2					
	CSO 008			0.0157		
	MS 3					
	MS 4					
	MS 5			2.16		
18mile Creek	MS 6					
	MS 8		0.092	0.307	0.203	0.157
	CSO 002	1.039	0.0483	6.29	0.0934	
	MS 9		0.077	1.76	0.106	
	MS 10					4.92

Sampling points are arranged in the direction of flow



MS-10 / Class D 2. WET - WET	5/24/2004
Rain (inches)	1.16
Fecal Coliform (#/ 100 mls)	>60,000 but <100,000
Copper (µg/L)	23.5
Iron (µg/L)	3,380
Lead (µg/L)	21.6
Zinc (µg/L)	102

MS-9 / Class D 2. WET - WET	5/24/2004
Rain (Inches)	1.16
Fecal Coliform (#/ 100 mls)	20,792
Copper (µg/L)	ND
Iron (µg/L)	4,490
Lead (µg/L)	13.7
Zinc (µg/L)	75.5

MS-8 / Class D 2. WET - WET	5/24/2004
Rain (Inches)	1.16
Fecal Coliform (#/ 100 mls)	17,821
Copper (µg/L)	ND
Iron (µg/L)	4,270
Lead (µg/L)	11.2
Zinc (µg/L)	71.60

CS0-2 2. WET - WET	5/24/2004
Rain (inches)	1.16
Fecal Coliform (#/ 100 mls)	500,000
Copper (µg/L)	98
Iron (µg/L)	8,020
Lead (µg/L)	154
Zinc (µg/L)	330

MS-5 / CLASS C 2. WET - WET	5/24/2004
Rain (inches)	1.16
Fecal Coliform (#/ 100 mls)	990
Copper (µg/L)	ND
Iron (µg/L)	893
Lead (µg/L)	ND
Zinc (µg/L)	48

MS-4 / CLASS C 2. WET - WET	5/24/2004
Rain (Inches)	1.16
Fecal Coliform (#/ 100 mls)	3,960
Copper (µg/L)	131
Iron (µg/L)	5,740
Lead (µg/L)	71.9
Zinc (µg/L)	436

MS-1 / Class C 2. WET - WET	5/24/2004
Rain (inches)	0.74
Fecal Coliform (#/ 100 mls)	3,960
Copper (µg/L)	ND
Iron (µg/L)	1,590
Lead (µg/L)	ND
Zinc (µg/L)	42.60

MS-2 / Class C 2. WET - WET	5/24/2004
Rain (Inches)	0.74
Fecal Coliform (#/ 100 mls)	7,921
Copper (µg/L)	ND
Iron (µg/L)	1,690
Lead (µg/L)	ND
Zinc (µg/L)	48.8

MS-3 / Class C 2. WET - WET	5/24/2004
Rain (Inches)	0.74
Fecal Coliform (#/ 100 mls)	5,941
Copper (µg/L)	ND
Iron (µg/L)	1,520
Lead (µg/L)	7.7
Zinc (µg/L)	181

CSO-8 2. WET - WET	5/24/2004
Rain (Inches)	0.74
Fecal Coliform (#/ 100 mls)	*
Copper (µg/L)	26.60
Iron (µg/L)	4,390
Lead (µg/L)	74.30
Zinc (µg/L)	443

* = Not diverting at time of sample

CSO-14 2. WET - WET	5/24/2004
Rain (inches)	0.74
Fecal Coliform (#/ 100 mls)	500,000
Copper (µg/L)	40.50
Iron (µg/L)	6,010
Lead (µg/L)	58.8
Zinc (µg/L)	211

MS-6 / Class D 2. WET - WET	5/24/2004
Rain (inches)	1.16
Fecal Coliform (#/ 100 mls)	20,000
Copper (µg/L)	ND
Iron (µg/L)	3,790
Lead (µg/L)	5.58
Zinc (µg/L)	68.1

Revisions	Drawn By	App'd. By	Date

Designed By: Date:
Drawn By: Date:
Checked By: Date:

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CITY OF LOCKPORT

2004 WATER QUALITY MONITORING PROGRAM
WET WEATHER SAMPLING DATA

SCHEMATIC SITE PLAN

SCALE: NOT TO SCALE | DATE: JULY 2005

Drawing No. 2

SHEET 2 OF 2

converted to pounds in Table 6. Both tables also list the results of each metal analyzed at locations along both the Barge Canal and Eighteenmile Creek in terms of the direction of flow for each water body. The metals concentration data for copper, iron, lead and zinc are also presented on Figures 1 and 2.

The same analytical data is also presented in Appendix G and H. Appendix G summarizes the results based on concentration. In addition, a calculated concentration limit is presented in the Appendix G tables for the monitoring station locations depending on formulas applied to Class C and Class D streams (Barge Canal and Eighteenmile Creek MS locations, respectively).

The analytical results along the Barge Canal indicate that the May 24, 2004 sample at MS-3 exceeded the zinc calculated limit based on an assumed hardness value. The sample collected at MS-4 on the same day, exceeded the calculated limits for copper, lead and zinc based on an assumed hardness value.

The calculated limit for zinc was also exceeded in samples analyzed on April 18, May 22-23, and May 24, 2004 at MS-6 based on an assumed hardness value, indicating a high background concentration of zinc prior to reaching the City limits.

The copper samples collected on April 18, 2004 at MS-9 and MS-10 exceeded the calculated limit based on an assumed hardness value. The other metal samples analyzed did not exceed the calculated limits for Class C and Class D receiving streams based on the assumed hardness values for each monitoring station.

Table 6 includes the calculated loading (lbs/d) of the metals analyzed at locations along both the Barge Canal and Eighteenmile Creek in terms of the direction of flow for each water body. The loading data is calculated for the dates when flow data was recorded and sample concentration data was available. The City's State Pollutant Discharge Elimination System (SPDES) permit (NY 002 7057) identifies action levels based on loading for Outfall No. 001 (the WWTP discharge) for metals. Comparing the metals action levels to the loading data gathered during this monitoring period for CSOs 002, 008 and 014, one sample exceeded the action level for lead. The loading calculated for the May 24, 2004 sample at CSO 002 was 2.94 lb/d which exceeds the action level for this parameter of 1.0 lb/d. All other metals loading data at these three overflows are below the action levels listed in the SPDES permit.

Water quality analytical summary tables with loading calculations are presented in Appendix H. These tables include the results of the Pesticide, PCB and Dioxin testing. PCBs are reported as "non-detect" at all sampled locations during the five dates when water quality samples were analyzed.

The samples analyzed for pesticide and dioxin at MS-8, MS-9 and CSO 002 on May 24, 2004 were "non-detect" except the following:

Parameter	MS-8	CSO-002	MS-9
Dioxin (pg/L)	<1.3	<1.2	<1.6
Total TEQ (pg/L)	8.2	16.7	4.3

The City continues to conduct monthly and annual pollutant monitoring as required by their SPDES permit. The Wastewater Facility Operation Reports for January 2005 through August 2006 are included in Appendix L.

2.3.6 Effectiveness of 15 BMPs

The City of Lockport incorporates various BMPs at the WWTP and within the collection system for the overall benefit to water quality.

(1) CSO Maintenance/Inspection

A brief summary of CSO observations was presented in the MP Section II, Pages 10 to 12. Table 2 of that MP summarized observations thru July 2003. On-going observations have been provided to NYSDEC with the monthly WWTP Discharge Monitoring Report. An update to Table 2 is incorporated in the Interim report within Appendix B.

The City completes monthly CSO inspections and reports the findings to the NYSDEC. The reports for inspections from January 2003 through September 2006 are summarized in Table 2-1 (raw data sheets are included in Appendix M). The data indicates that CSO 007 was active three times prior to the storm sewer repair in the summer 2005 and has not been active during the monthly inspections since that time. In addition, CSO 015 was active one time during an inspection in April 2003 when a weir repair was made to correct the problem. CSO 015 was closed permanently after July 2003. CSO 014 was active once during an inspection in August 2006 when a blocked sewer line was cleaned and the overflow condition was eliminated.

(2) Maximum Use of Collection System for Storage

The City, through CSO observations before and after storm events has made a number of adjustments to weirs to maximize flow to the WWTP. Through these on-going efforts since 1995, the number of CSOs has been reduced from approximately 30 to 10. Efforts continue through observations and analyses of flow monitoring data to incorporate additional improvements.

A routine program of flushing and cleaning is in place. The program may vary from year to year to reflect actual conditions

with respect to leaves, grit, emergency repairs, etc. but a listing of typical accomplishments reported by the Sewer Foreman on an annual basis to avoid deposition of solids includes:

- vacuum 200± catch basins on NYSDOT highways within the City
- one month of dedicated clean-up of leaves, sandy, grit, pothole, patch, etc. each spring.
- rebuilding of 25 to 30 catch basins
- relining of manholes to prevent groundwater infiltration
- rebuilding of 12± manholes to avoid solids, entering around manhole ring
- leaf collection City-wide each fall
- tree route treatment and removal
- flushing of sewers
- relining
- structural replacement of sewers

(3) Industrial Pretreatment

A summary of the City's industrial pretreatment program and its Significant Industrial Users (SIUs) was included in the MP following page 5. Since that time the City has seen a decline in their industrial activities and a reduction in industrial wastewater contributions to the WWTP. A revised Table 1 from the MP (see Section 2.3.1) summarizes new information.

The Lockport Co-generation Facility coordinates with WWTP personnel to hold wastewater during wet weather events when CSOs may be active. Once the wet weather event subsides the facility releases their wastewater to the City sewer system.

On December 7, 2005, Delphi Thermal and Interior (Delphi) notified the City that due to economic impacts on their business, they changed their industrial pretreatment process to eliminate the chromate conversion coating process at their facility on October 3, 2005. Due to this change in operation, the Metal Finishing Standard for the Delphi discharge no longer applied within the City's Industrial Pretreatment Program.

Delphi proposed to discontinue use of the pretreatment system and discharge directly to the City collection system entering the Gulf Interceptor. The City, in cooperation with CHA, coordinated with Delphi and the NYSDEC to submit a new discharge form in

accordance with General Conditions 12.1 of the New York State Pollution Discharge Elimination System (SPDES) permits, 6NYCRR Part 754.4 (g) and 40 CFR 122.42. The City was required to submit the application and gain NYSDEC approval prior to accepting the discharge (see Appendix N for the permit application and the NYSDEC approval letter).

(4) Maximize Flow to POTW

The City has been proactive and successfully implemented capital projects with assistance of NYS Bond Act Grants (4) and NYS Environmental Facility Corporation (NYSEFC) Financial Assistance to Business (FAB) grants (2). These grants have allowed the City to either eliminate significant extraneous stormwater flows to the combined sewer system (thus allowing for more combined sewage capture by raising CSO weirs) or re-direct wastewater flows to the WWTP that may have otherwise been discharged direct to area streams. The construction of the fourth final settling tank (clarifier), made possible through a $1.4 million Bond Act Grant, has enhanced WWTP performance.

In addition, in September 2003 the City eliminated the pumped discharge from the Lincoln Avenue Pump Station at Outfall 32, redirecting it to the collection system.

Head works improvements specific to grit removal have recently been completed, new screening improvements are underway, and instrumentation upgrades will facilitate improved recording of hydraulic flow rates.

The elimination of the pumped discharge from the Lincoln Avenue pump station at outfall 32 and redirecting it to the collection system had the benefit of maximizing flow to POTW while eliminating a SSO, however this action has stimulated a more in-depth investigation into the collection area it serves.

Basement flooding has increased particularly during 2006 rainfall events. Resident complaints have expanded to adjoining streets historically unaffected by wet weather conditions. The City reportedly has written complaints with respect to sewers in this general area that could proceed with legal action.

The City, having lost some of the historical knowledge/background in this area in the form of past experiences in the memory of retired staff, turned to a review of past reports and to the modern

technology of in-system flow monitors to provide real-time flow data before and after storm events. Six monitors were placed at locations depicted on Figure 3 that follows from August 4, 2006 to September 22, 2006.

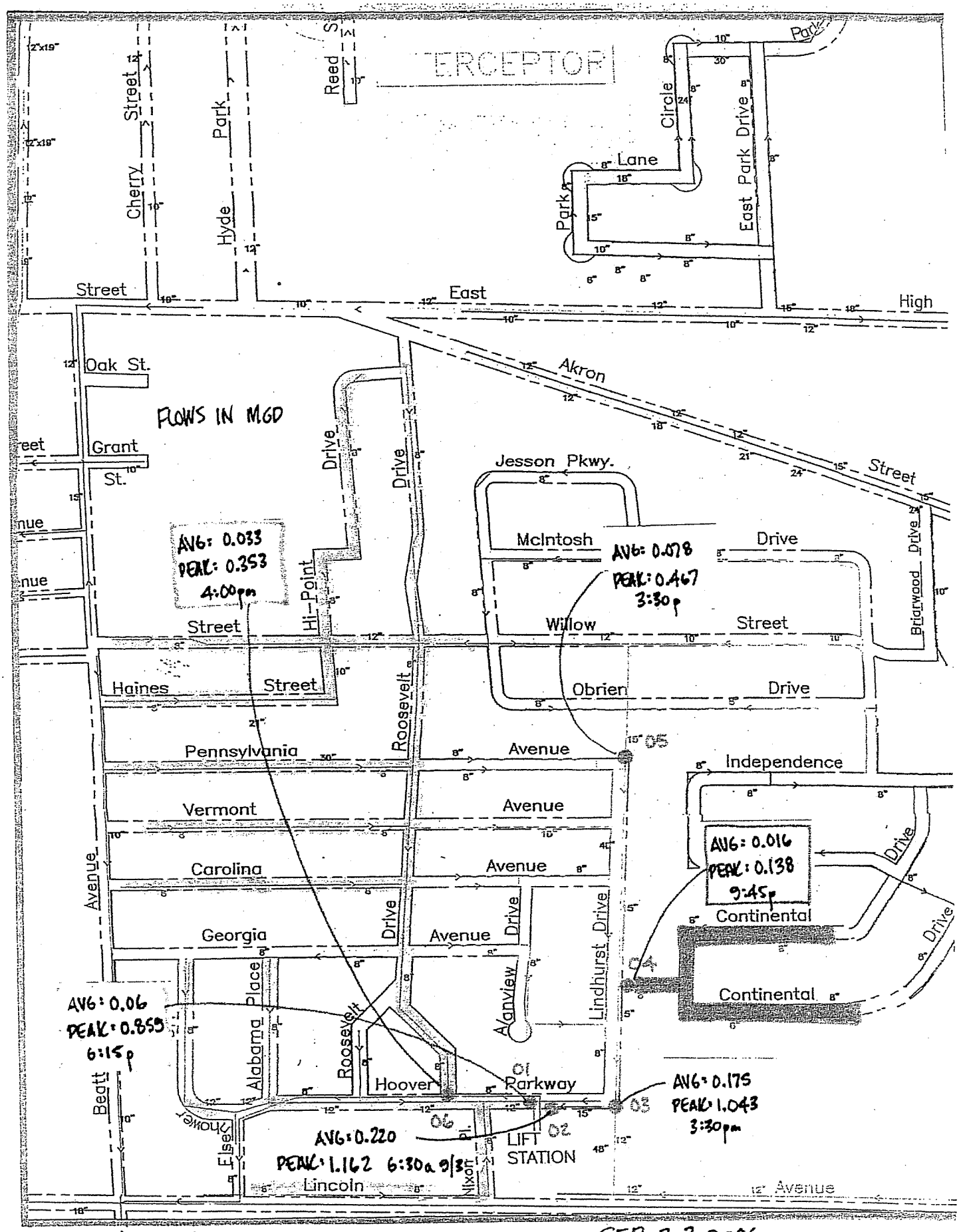
The new data confirms a very rapid filling of the sanitary sewers, to a surcharge condition, after significant rainfall suggesting direct inflow connections to the sanitary sewer system (roof leaders, catch basins, driveway drains, sump pumps, etc.) or a combination of pervious backfill overtop of sanitary sewers/laterals/manholes in poor condition (broken pipe, cracks, pipe separation, deteriorated manhole concrete, etc.).

In addition, a review of the flow monitoring data, measuring the wastewater contribution from the Town of Lockport in 2006, at the intersection of Lincoln and Beattie Avenues, shows a significant increase in peak flows over the previous four years. This information is currently being more fully evaluated.

The basement flooding appears to be impacted by a stormwater blockage adjacent to Lincoln Avenue leading to Donner Creek in the Town of Lockport. A six foot diameter storm sewer can not drain to its invert but instead retains five feet of flow releasing stormwater only from the top one foot. The City has met with the Town and NYSDEC to discuss clearing of Donner Creek to allow stormwater to drain effectively from the area. The City has also contacted their local senator to explain the seriousness of this issue.

NYSDEC is on-record, suggesting that an increase to stormwater flows to Donner Creek from the City must consider the stream's Class B status and other considerations. Mr. Robert Locey of NYSDEC has indicated that NYSDEC personnel representing Fish & Wildlife, Floodplain Control, Water Quality and Environmental Permitting (Stream Disturbance) will be consulted to identify clearing alternatives with a response forthcoming to the Town and the City on what clearing methods will be proposed to avoid nuisance high water while protecting the streams natural character.

Ultimately, this decision could have a significant impact on basement flooding in the southeast corridor of the City.



2.34" RAIN

SEP 2-3, 2006

FIGURE 3

(5) **Wet Weather Operation Plan**

This plan was submitted to NYSDEC directly by the City. This Plan will be modified and resubmitted once the City completes ongoing headworks improvements.

The current SPDES permit requires that a revised Wet Weather Operating Plan reflecting addition of the new equipment (degrit system, new screens, and fourth clarifier) be submitted by October 31, 2006 (see page 12 of 22 of the current SPDES permit). The new plan will seek to enhance procedures so as to operate unit processes to treat maximum flows while not appreciably diminishing effluent quality or destabilizing treatment upon return to normal operation.

(6) **Prohibition of Dry Weather Flows**

The City, during the initial water quality sampling, confirmed the direct discharge of approximately 22 homes, thought to be connected to the City sewers, to Eighteenmile Creek. These discharges were redirected to City sewers in three phases completed in Fall 2003, Spring 2004 and Summer 2004, respectively. Proactive efforts on Stevens Street, as follow-up to the Ohio/Simonds sewer separation project, has identified two suspect dry weather overflows that are now scheduled for elimination.

Expanded proactive efforts identified four dry weather overflows on Stevens Street. See Section 1.1 Background, Item 7, Direct Connections Eliminated.

(7) **Control of Floatables and Settleable Solids**

The City makes a concerted effort to sweep streets particularly in spring/early summer and fall. Street sweeping of the entire City is typically performed at least four times annually, thus reducing the volume of grit, litter, maple seeds, leaves, etc.

A previous concern identified by NYSDEC regarding floatables at CSO 003 was resolved in May 2000 through elimination of CSO 003.

The City continues with on-going efforts to quantify and pinpoint where the largest amount of floatables are located and the most appropriate means of capture.

(8) Combined Sewer Replacement

Various separation projects have been completed with NYSDEC approval since 1996, including the following:

City Streets	Funding	Completion
Vine-North	$119,000 Bond Act	October 2002
Ohio-Simonds	$459,000 Bond Act	July 2002

Other improvements are identified in Chapter 1, Section 11.

(9) Combined Sewer/Extension

Sewer extensions have been accomplished with separate sanitary and separate storm sewers. The City has, in fact, seen an overall reduction in wastewater flows from the Town of Lockport through a combination of their Inflow and Infiltration (I & I) reduction efforts and rerouting of wastewater flows to Niagara County Sewer District.

Wastewater flows from new combined sewers are not acceptable.

(10) Sewage Backups

The City is quick to respond to residential sewage backup complaints. Typically blockage problems such as tree roots are identified and removed correcting the problem. In some neighborhoods, the City is proactively investigating historical sewage backups and trying to pinpoint potential I & I sources.

Subparagraph (4), Maximize Flow to POTW, previously discussed sewage backup issues and ongoing investigative efforts in the Lincoln Avenue area.

The City has also recently purchased a Complaint Management System software package which works in conjunction with the City's GIS system and records telephone complaints (example sewer, water, crime, etc.). This sewer data now provides insight on

the more problematic areas and will be utilized more and more to establish proactive Operation and Maintenance (O&M) activities or additional investigations to confirm possible defects worthy of correction.

(11) Septage and Hauled Waste

The discharge of septage or hauled waste upstream of a CSO is prohibited.

(12) Control Run-off

The City requires developers to be compliant with the New York Standards for Erosion and Sediment Control and the quantity control requirements included in the New York State Stormwater Management Design Manual.

(13) Public Notification

Identification signs have been installed at or near CSOs, where practicable.

(14) Characterization and Monitoring

The City is currently characterizing the combined sewer system, to determine the frequency of overflows and identify the CSO impacts in accordance with the NYSDEC approved MP.

The flow monitoring efforts on-going to characterize the overflows are presented in Section 2.3.9 Expanded Monitoring.

(15) Annual Report

An annual report summarizing implementation of the above BMPs will be developed, if required.

The current SPDES permit requires that an Annual Report summarizing implementation of the BMPs be submitted on January 31st of each year along with a completed BMP checklist (see page 14 of 22). This section (2.3.6) provides a preview of the upcoming Annual Report to be dated January 31, 2007.

2.3.7 *Adequacy of Existing Data*

Quality flow and water quality monitoring data are essential to making sound, cost-effective, long-term engineering decisions related to the City's sewer system and CSO corrective actions. The City continues to review the data gathered during the Spring 2004 monitoring program and will be evaluating the needs for additional data efforts. If deemed necessary, a plan for Fall 2005 and/or Spring 2006 additional monitoring will be developed and submitted to NYSDEC for review.

The City and CHA have continued to gather additional data on the collection system as noted throughout this report (see 1.1 Background; Section 1) Records Review, 2) GIS Mapping, 5) CSO Reductions, 7) Direct Connections Eliminated, and 11) Financial Investment, as well as 2.3.6 Effectiveness of 15 BMPs; Section 3) Industrial Pretreatment, and 4) Maximize Flow to POTW, for representative examples).

Day to day data being gathered at the WWTP also provides insight on process operations since the completion of capital projects involving grit removal, new screening, SCADA upgrades, pump enhancements and addition of the fourth clarifier. This data is being supplemented by expanded monitoring (see Section 2.3.9).

2.3.8 *Wastewater Flows From Outside the City*

The City accepts wastewater from the Town of Lockport at nine separate locations along all four sides of the City as depicted on Figure 4 at the end of this section. The City elects to monitor these wastewater contributions for a brief period each year (typically one to two months) to assure fair and equitable changes for the flow contributed. This monitoring data, as presented in Appendix O, also offers insight into possible changes in flow volumes. An analysis of this data over the last five years yields the following observations:

- On an overall basis, Town connection point flows have trended downward or stayed relatively constant. That may suggest infiltration reductions or be the result of wastewater being permanently diverted to Niagara County Sewer District.
- The peak flows at Beattie took a significant increase in 2006. This is currently being investigated as discussed in Section 2.3.6, Item 4, Maximize Flow to POTW.

2.3.9 *Expanded Monitoring*

On August 4, 2006, the City initiated a seven week monitoring program in the Bel-Aire Gardens section of the City. This separate sewer system area is tributary to the Hoover Lift Station and contributes sanitary sewage to the City's collection system

on Lincoln Avenue.

A summary of the data collected at six monitoring locations during two separate greater than 2-inch rainfall events is presented in Appendix P. The new data confirms a very rapid filling of the sanitary sewers, to a surcharge condition, after significant rainfall suggesting direct inflow connections to the sanitary sewer system (roof leaders, catch basins, driveway drains, sump pumps, etc.) or a combination of pervious backfill overtop of sanitary sewers/laterals/manholes in poor condition (broken pipe, cracks, pipe separation, deteriorated manhole concrete, etc.).

One 2-inch rainfall event occurred from September 2 to 3, 2006. A rain gauge located at the Hoover Lift Station recorded 2.34 inches of rain during this monitoring period (10-minute raw precipitation data is presented in Appendix P). Average and peak flow recordings are presented below and on Figure 3.

Monitor	Average Flow (mgd)	Peak Flow (mgd)	Time of Peak Flow
01	0.060	0.859	6:15 pm (9/2)
02	0.220	1.162	6:30 am (9/3)
03	0.175	1.043	3:30 pm (9/2)
04	0.016	0.138	9:45 pm (9/2)
05	0.078	0..467	3:30 pm (9/2)
06	0.033	0.353	4:00 pm (9/2)

Peaking factors at these monitoring locations ranged from 5.3 to 14.3, indicating a significant inflow problem in this area.

A second 2-inch rainfall event was recorded from September 12 to 15, 2006. The rain gauge located at the Hoover Lift Station recorded 2.44 inches of rain during this monitoring period (10-minute raw precipitation data is presented in Appendix P). Average and peak flow recordings are presented below and on Figure 5.

Monitor	Average Flow (mgd)	Peak Flow (mgd)	Time of Peak Flow
01	0.096	0.661	5:45 pm
02	0.215	0.858	10:30 pm
03	0.132	0.651	8:30 am
04	0.017	0.146	4:45 pm
05	0.092	0.599	12:15 pm
06	0.030	0.341	9:00 am

Peaking factors at these monitoring locations ranged from 4.0 to 11.4, indicating a significant inflow problem in this area.

This information and additional investigation efforts in this area of the City are currently being more fully evaluated.

The City is conducting flow monitoring at CSO Outfalls 002, 007, 008, 014, 019, 023, 024, and 034 to quantify the volume of water diverted to the receiving streams during an overflow event and to identify the frequency of CSO activations. This monitoring will quantified volume of wastewater discharged at these specific CSO locations during wet weather events to demonstrate that the City is meeting the presumption approach of capturing for treatment no less than 85 percent by volume of the combined sewage collected in the Combined Sewer System (CSS) during precipitation events on a system-wide annual average basis.

The following table summarizes currently active CSOs that the City continues to monitor or observe:

Number	*Monitor*	*Observe*	*Notes*
CSO 002 OF	X		
CSO 005 OF		X	0 OF /16 events observed dating back to September 1997.
CSO 006 OF		X	May close after Richmond Ave. project.
CSO 007 OF	X		Overflow relieves small drainage area.
CSO 008 OF	X		
CSO 011 OF		X	0 OF /3 events observed following the completion of the Ohio-Simonds sewer separation project.
CSO 014 OF	X		
CSO 018 OF		X	1 OF/ 22 events observed. CSO has not activated since January 1998.
CSO 019 OF	X		
CSO 020 OF		X	0 OF / 23 events observed dating back to September 1997.
CSO 023 OF	X		
CSO 024 OF	X		
CSO 034 OF	X		

Flow monitors were installed on outfalls for CSOs 002, 007, 008, 014, 019, 023, 024, and 034 for a period of eight weeks beginning in September 2006. Summary flow data tables for the overflow monitors will be provided in an update report.

Observed CSOs

The City will observed CSOs 005, 006, 011, 018 and 020 for overflow activation during the eight week monitoring period beginning in September 2006. The observation log sheets will be provided in an update report.

Based on historical data and observations, if these overflows do not activate, the City plans to install temporary plugs on these overflows. The City will continue to monitor the overflows and determine if permanent elimination of the overflows is feasible following review of available observation data.

3.0 PRELIMINARY HYDRAULIC ANALYSIS

The City collection system is particularly complicated with a separate sanitary sewer system prior to CSO #14 and combined sewers at two separate levels. Combined sewers with typical depths of 5 to 10 feet deep in City streets comprise the first level while a deep tunnel system is the second level. They are interconnected by a series of drop shafts and drill holes.

A simplified description of how wastewater flows today based on active CSOs is as follows:

CSOs Tributary to Main Interceptor Heading Toward WWTP

CSO 014

Sanitary wastewater flows westward with the potential to divert to the Barge Canal at CSO 014 or enter the Main Interceptor Tunnel via 12 inch diameter drill hole. The tunnel is approximately 4 feet by 5 feet.

CSO 013

Combined sewers flow westward entering the Main Interceptor Tunnel via a 16 inch diameter drill hole; the CSO is eliminated.

CSO 012

Combined sewers flow westward entering the Main Interceptor Tunnel via a vertical shaft; the CSO is eliminated.

CSO 010

Combined sewers flow westward entering the Main Interceptor Tunnel via a 12 inch diameter drill hole; the CSO is eliminated.

CSO 009

Combined sewers flow westward with the potential to divert to the Barge Canal at CSO 009 or enter the Main Interceptor Tunnel via 12 inch diameter drill hole. The tunnel is approximately 4 feet by 5 feet.

CSO 008

Combined sewers flow eastward with the potential to divert to the Barge Canal at CSO 008 or enter the Main Interceptor Tunnel via 16 inch diameter drill hole. The tunnel is approximately 4 feet by 5 feet.

CSO 006

Combined sewers flow eastward with the potential to divert to the Barge Canal at CSO 006 or enter the Main Interceptor Tunnel via 16 inch diameter drill hole. The tunnel is approximately 4 feet by 5 feet.

CSO 002

Combined sewers flow from the Main Interceptor Tunnel transition back to combined sewers and flow northeasterly toward the WWTP and during high flow conditions have the potential to divert at CSO 002 to Eighteenmile Creek.

CSOs Tributary to Headrace Interceptor Heading Toward WWTP

CSO 007

Combined sewers flow northerly with the potential to divert to the Barge Canal at CSO 004 or enter the 42 inch diameter Headrace Interceptor.

CSO 005

Combined sewers flow northerly with the potential to divert to the Barge Canal at CSO 005 or enter the 18 inch diameter Headrace Interceptor.

CSO 015

Combined sewers flow from the Headrace Interceptor and flow northeasterly to join a 4 feet by 5 feet Headrace Interceptor Tunnel Section, but during high flows has the potential to divert at CSO 015.

CSO 016

Combined sewers flow southwesterly with the potential to divert to the Barge Canal at CSO 016 or enter the Headrace Interceptor Tunnel Section via a 16 inch diameter drill hole. The Headrace Tunnel is approximately 4 feet by 5 feet. The Headrace Interceptor then joins the South East Interceptor (described in later paragraphs).

CSOs Tributary to South East Interceptor Heading Toward WWTP

CSO 026

Combined sewers flow northerly entering the South East Interceptor Tunnel via an 8 inch drill hole; the CSO is eliminated.

CSO 025

Combined sewers flow westerly entering the South East Interceptor Tunnel via a 12 inch drill hole; the CSO is eliminated.

CSO 024

Combined sewers flow northerly with the potential to divert to the Eighteenmile Creek at CSO 024 or enter the South East Interceptor Tunnel via a 16 inch drill hole.

CSO 034

Combined sewers flow easterly with the potential to divert to the Eighteenmile Creek at CSO 034 or enter the South East Interceptor Tunnel via a 16 inch drill hole.

CSO 023

Combined sewers flow westerly with the potential to divert to the Eighteenmile Creek at CSO 023 or enter the South East Interceptor Tunnel via a 16 inch drill hole.

CSO 020

Combined sewers flow westerly with the potential to divert to the Eighteenmile Creek at CSO 020 or enter the South East Interceptor.

CSO 021

Combined sewers flow northerly with the potential to divert to the Eighteenmile Creek at CSO 020 or enter the South East Interceptor that proceeds westerly to join the Main Interceptor.

CSO 019

Combined sewers flows northward with the potential to divert to the Eighteenmile Creek at CSO 019 or enter the 30 inch diameter South East Interceptor.

CSOs Tributary to South West Interceptor Heading Toward Main Interceptor

CSO 011

Combined sewers flow easterly with the potential to divert to the Barge Canal at CSO 011 or enter the 4 feet by 4 feet South West Interceptor Tunnel via a 16 inch drill hole.

CSOs Tributary to Union Street Interceptor Heading Toward South West Interceptor

CSO 018

Combined sewers flow northwesterly with the potential to divert to the Barge Canal at CSO 018 or enter the 21 inch diameter Union Street Interceptor.

CSO 017

Combined sewers flow northwesterly with the potential to divert to the Barge Canal at CSO 018 or enter the 21 inch diameter Union Street Interceptor.

Stand Alone CSO

CSO 031

This CSO has been eliminated.

4.1.1 Eighty-five Percent (85%) Capture

Under the Presumption Approach, the LTCP for the City is to establish a program that will control at least 85% of the volume of combined sewage collected in the combined sewer system under annual average conditions.

Listed below are annual treated flow values as recorded at the City's WWTP since 2001:

2001 - 3.29632 billion gallons
2002 - 3.47006 billion gallons
2003 – 3.24044 billion gallons
2004 - 4.00640 billion gallons
2005 - 4.04180 billion gallons
2006 - 2.69594 billion gallons *

* - *treated Jan through Aug 2006*

The following example predicts that the City will meet 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 basis requirement of the presumption approach. The summary uses data collected during the May 2004 overflow monitoring program. This data was used since this was the month with the highest precipitation total (4.74 inches) and the most overflow activations (21) during the monitoring program.

CSO Overflow Volumes for May 2004:

CSO 002	2.685 million gallons
CSO 007	0.261 million gallons
CSO 008	0.033 million gallons
CSO 014	0.036 million gallons
CSO 023	0 gallons
CSO 024	0.2 million gallons *
CSO 034	0 gallons
Total	3.215 million gallons

* *estimated value since data recorded level only*

Since CSOs 005, 006, 011, 018, and 020 were not observed overflowing during the 2004 monitoring period, each overflow was assumed to contribute 0 gal to the overflow calculation. Although CSO 019 was not observed during the monitoring period, it is not believed that this overflow, if active, could cause the wastewater capture to go below 85%. To further the database, CSO 019 will be monitored during the on-going

expanded monitoring program.

As presented in Table 4-1, the WWTP captured 99% of the volume of the combined sewage collected in the CSS ((305.26 – 3.215) / 305.26 = 99%). Recognizing that this data is based on one month of monitoring, the City is collecting additional data through the on-going expanded monitoring program to confirm these findings.

Table 4-1
Percent Capture Calculation for May 2004

Date	Rainfall (inches)	OF @ CSO 002 (mgd)	OF @ CSO 007 (mgd)	OF @ CSO 008 (mgd)	OF @ CSO 014 (mgd)	OF @ CSO 023 (mgd)	OF @ CSO 024 (mgd)	OF @ CSO 034 (mgd)	Total CSO (mgd)	Avg. flow to WWTP (mgd)	Avg. Daily flow from Town (mgd)	Total Flow from CSS (mgd)
05/01	0.18									9.75	0.70	9.05
05/02	0.31									11.00	0.70	10.30
05/03	0.00									9.13	0.70	8.43
05/04	0.03									10.00	0.70	9.30
05/05	0.10									10.40	0.70	9.70
05/06	0.05									10.20	0.70	9.50
05/07	0.00									9.88	0.70	9.18
05/08	0.19									12.70	0.70	12.00
05/09	0.30	0.0005		0.0026					0.0031	10.70	0.70	10.00
05/10	0.04									10.50	0.70	9.80
05/11	0.00									8.88	0.70	8.18
05/12	0.00									9.11	0.70	8.41
05/13	0.00									8.24	0.70	7.54
05/14	0.02									9.37	0.70	8.67
05/15	0.17									8.35	0.70	7.65
05/16	0.00									7.72	0.70	7.02
05/17	0.02									8.19	0.70	7.49
05/18	0.00									8.09	0.70	7.39
05/19	0.00									8.84	0.70	8.14
05/20	0.30	0.169		0.0086					0.1776	10.40	0.70	9.70
05/21	0.01									9.28	0.70	8.58
05/22	0.42	0.0057	0.058	0.0008					0.0645	9.57	0.70	8.87
05/23	0.54		0.077	0.0012	0.036				0.1142	18.80	0.70	18.10
05/24	1.16	2.34	0.113	0.0116			0.20*		2.6646	20.00	0.70	19.30
05/25	0.08		0.0056	0.0004					0.006	13.90	0.70	13.20
05/26	0.02		0.0074	0.0008					0.0082	9.72	0.70	9.02
05/27	0.06		0.00005						0.00005	9.09	0.70	8.39
05/28	0.00			0.0004					0.0004	9.25	0.70	8.55
05/29	0.00									7.86	0.70	7.16
05/30	0.00									8.94	0.70	8.24
05/31	0.74	0.17		0.0068					0.1768	19.10	0.70	18.4
Total	**4.74**	**2.685**	**0.261**	**0.033**	**0.036**	**0.00**	**0.20***	**0.00**	**3.215**	**326.96**	**21.70**	**305.26**

** This is estimated value since CSO 024 was a level only monitor location.*

Percent Capture for May 2004 = (305.26-3.215)/305.26 = 99%

The City of Lockport went to "BAT" for water quality!

The City of Lockport wastewater treatment plant averages 13 mgd in low flow, but experiences over 60 mgd during wet weather.

City of Lockport, NY

The City of Lockport wastewater system serves a population of 34,000 with over 100 miles of sewers with 30 permitted Combined Sewer Overflows (CSOs) discharging into the NYS Barge Canal, Eighteenmile Creek, and its tributary, The Gulf.

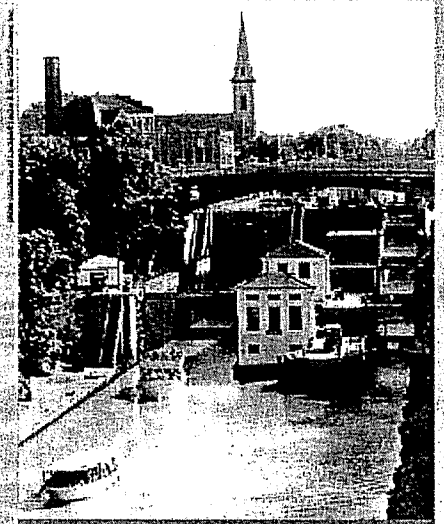
Wastewater flow to the NYS Barge Canal is a concern because this waterway serves as the City's emergency water supply source. CSO flow to the Eighteenmile Creek is of equal concern because it empties into Lake Ontario, an area identified by the International Joint Commission Water Quality Board as an Area of Concern.

Basic Observations

Existing drawings and reports were reviewed, field investigations performed, industrial discharges re-evaluated, and numerous CSO observations made during both dry weather and wet weather conditions. A major breakthrough came by confirming that a nearby swamp was increasing CSOs and hindering WWTP performance.

Affordability Focus

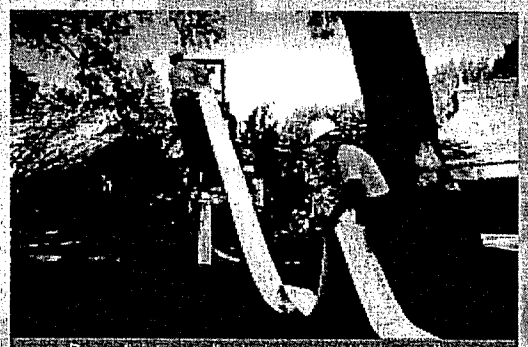
A widespread campaign for financial assistance was undertaken to fund the City's five highest priority projects and resulted in six separate grants totaling over $2.3 million. These capital expenditures plus proactive in-kind work by the City have reduced the number of CSOs from 30 to a more manageable 10.

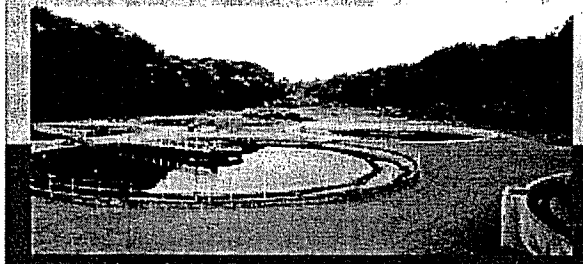

The locks on the NYS Barge Canal attract over 97,000 tourists to the City each year.

Teamwork and Technology

A Sewer Watch Observation Team of City staff and consultant personnel was established to observe CSOs during various storm or snowmelt events, and provided a strong base of knowledge for effective CSO decisions.

Technology ranged from very simple use of plastic bottles to confirm CSO activations to the highly sophisticated use of ground penetrating radar and seismic refraction techniques to precisely locate rock tunnels 30 to 50 feet below ground surface.


Sewer lining near the lock area avoided a public health risk for city residents and tourists.


A fourth final clarifier enhances wastewater treatment.

"Today, the City of Lockport is a better place in terms of public health, enhanced tourism, creation of construction jobs, and reduced operation costs thanks to these accomplishments."

-Gary Andes, Commissioner of Public Works, commenting on the Combined Sewer Overflow Program

Project
City of Lockport Wastewater System Improvements, Lockport, NY

Client
City of Lockport, NY

Entrant
CHA
Albany, NY

Lockport Wastewater System Improvements

City of Lockport, New York

Project Description

The City of Lockport wastewater system serves the City's population of 24,000 plus 10,000 more from outlying areas with over 100 miles of sewers and a Wastewater Treatment Plant (WWTP) permitted for an average daily flow of 22 million gallons per day (mgd). The collection system historically consisted of 30% separate sanitary and storm sewers and 70% combined sewers with 30 permitted Combined Sewer Overflows (CSOs) discharging into the NYS Barge Canal, Eighteenmile Creek, and its tributary creek, The Gulf.

The combined sewers of Lockport have unique characteristics. The top layer of sewers connect to the bottom layer via drop holes (vertical bored shafts) that enter a bottom layer of rock tunnels (typically 4 feet wide by 6 feet high) 20 to 50 feet below street level. The rock tunnels connect to interceptor sewers that convey 22 to 60+ mgd to the WWTP. The WWTP was originally designed with four final clarifiers. However, the challenge of difficult soils, limited space at the WWTP site, high groundwater, and limited funds had resulted in construction of only three clarifiers.

Wastewater flow to the NYS Barge Canal was of particular concern because this waterway serves as the City's emergency water supply source and contains three active locks that attract 37,000 tourists to the City each year. Combined Sewer Overflow (CSO) to the Eighteenmile Creek was of equal concern because it flows in proximity to hazardous waste sites and empties into Lake Ontario, which is identified by the International Joint Commission Water Quality Board as an Area of Concern (one of six in NYS). Specific goals for the area were established for the protection and enhancement of human health, fisheries, wildlife, aesthetics, and the economy.

Beginning in the 1990's the City of Lockport and Clough, Harbour & Associates LLP (CHA) went to "BAT" for water quality. The three elements of BAT were key to project success.

Basic observations

Record drawings of the City system were reviewed, field investigations performed, old reports read, industrial discharges re-evaluated, and numerous CSO observations made during both dry weather and wet weather conditions.

Sewers contributing to each CSO were verified and color coded into a new GIS mapping system. This verification resulted in a major breakthrough in determining that a nearby swamp was contributing to the City wastewater system during heavy rainfall and/or snow melt events.

An investigative soil boring program along the route proposed for a new storm sewer revealed petroleum products (a hazardous waste). NYS Department of Environmental Conservation (NYSDEC) was notified and re-routing of new storm sewer construction was implemented to avoid the hazardous waste and potential degradation to the NYS Barge Canal.

Affordability focus

A previous Facilities Plan, prepared for the City in 1982, focused on sewer separation at a cost of $40+ million, far in excess of what the City could afford.

An increased tax burden from a major capital improvement project had the potential to close down local businesses and force industry to look elsewhere. With an eye toward affordability, five high-priority projects were identified:

1) Construction of a fourth final clarifier: this work was originally part of the WWTP Upgrade Design of the 1970s, but was postponed due to inadequate funding. The new clarifier would provide for enhanced treatment during high flows.
2) Redirection of the local swamp to a dedicated storm sewer to avoid unnecessary overloading of the

WWTP by relatively clean stormwater.

3) Sewer separation for the Ohio-Simmonds area to eliminate a CSO and make cost-effective use of a previously abandoned sewer.
4) Construction of a drop hole at Richmond Ave. to connect shallow sewers to deep rock tunnels. This new drop hole would eliminate manhole surcharging that allowed raw sewage to reach the street surface. In addition, sanitary sewer lining was needed to eliminate raw sewage exfiltration through a rock wall of the active lock system, which attracts over 37,000 tourists to the City's historic downtown each year.
5) Sewer separations for the Vine-North area, and for the Exchange Street area, to eliminate CSOs.

A widespread campaign for financial assistance was undertaken to fund these projects and resulted in six separate grants totaling over $2.3 million.

These capital expenditures plus proactive in-kind work by the City have reduced the number of CSOs from 30 to a more manageable 10. A continuing CSO Monitoring Program has been approved by NYSDEC to establish background water quality in the receiving streams and to determine the true impact of the remaining CSOs.

Teamwork and technology

Teamwork

The success of this project came through close teamwork between the City Mayor(s), City Counsel, City Treasurer, Public Works Director, Director of Utilities, Industrial Pre-treatment Coordinator, Wastewater Treatment Plant Operators, Highway Crew, NYS Department of Environmental Conservation, NYS Environmental Facilities Corporation, and Clough, Harbour & Associates LLP.

A Sewer Watch Observation Team (SWOT) was established to observe actual flow conditions during rainfall and snowmelt events, sewer monitoring, brainstorming, mapping improvements, and so forth. The team became more and more knowledgeable about how the wastewater system performs under various storm or snowmelt events. These observations provided a strong base of knowledge for the decision to close six CSOs.

In the words of Gary Andes, Commissioner of Public Works for the City of Lockport:

> "With the extraordinary team effort between City personnel and our consultant, Clough Harbour and Associates, LLP (CHA), we established a common sense, step-by-step approach to sewer and CSO investigations. This approach resulted in several innovative solutions while maximizing the use of City forces and generated prioritized improvements based on greatest water quality benefit. CHA was instrumental in identifying and securing six different grant awards totaling over $2.3 million that allowed our prioritized improvements to proceed through planning, design and construction."

Technology

The technology employed ranged from simple to highly sophisticated.

An example of a simple technology was the use of plastic jugs tied with a string in CSOs. The jugs would be swept into the CSO if and when wastewater increased and the CSO activated. This low-cost technique was extremely effective in reducing the need for renting costly sewer monitoring equipment. This technique was presented at a NYSDEC sponsored conference, and has since been implemented by other communities investigating CSO activations.

Highly sophisticated technologies were also utilized on the project. Ground penetrating radar (GPR) and seismic refraction were incorporated to verify the precise alignment of surcharged sewers (which released domestic sewage to the ground surface during heavy rains or snowmelt) over deep rock tunnels to facilitate construction of a connecting vertical bore hole relief sewer to eliminate surcharges.

A second use of sophisticated technology was the use of a combination groundwater dewatering and rock anchor system to enable construction of the fourth clarifier under difficult soil, groundwater, and site conditions. Construction

had to proceed without disturbing two existing clarifiers, the outfall pipe, and The Gulf (a nearby stream) while depressing groundwater to facilitate construction access to the new clarifier foundation.

A third technology used was the use of new sewer lining in an aging sewer that was leaking domestic sewage to the face of the rock wall of the NYS Barge Canal where tourists enter and exit the lock area. This emergency measure helped avoid a serious public health issue.

The results of the City of Lockport Wastewater System Improvements were very well received by the client:

> "Today, the City of Lockport is a better place in terms of public health, enhanced tourism, creation of construction jobs, and reduced operation costs. I feel this project exemplifies how teamwork can produce sound technical solutions."
>
> -Gary Andes, Commissioner of Public Works