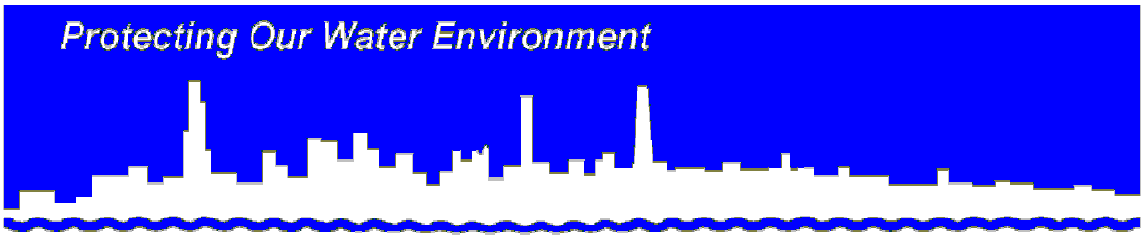

Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

REPORT NO. 11-19

MICROBIOLOGICAL REPORT OF BACKFLOW SAMPLES IN 2010

August 2011

Metropolitan Water Reclamation District of Greater Chicago
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MICROBIOLOGICAL REPORT OF

BACKFLOW SAMPLES IN 2010

Monitoring and Research Department
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August 2011

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DISCLAIMER

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MICROBIOLOGICAL REPORT OF BACKFLOW SAMPLES IN 2010

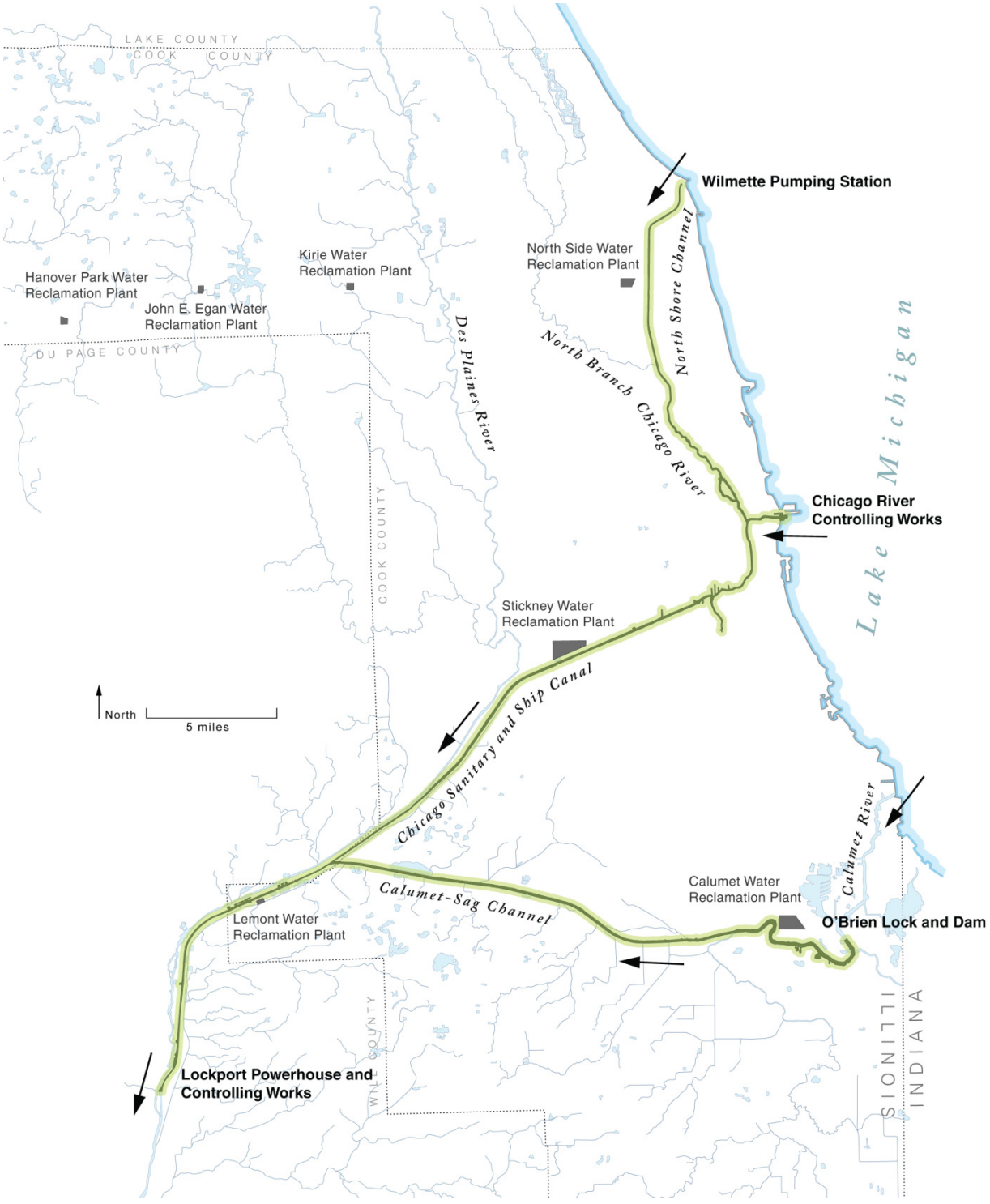
Introduction

The Metropolitan Water Reclamation District of Greater Chicago (District) was created in 1889 to protect the source of the City of Chicago's drinking water supply – Lake Michigan. The District collects and treats wastewater from more than 5 million people and the industrial equivalent of another 4.5 million people in Cook County. Treated effluent from four of the District's Water Reclamation Plants (WRPs) is discharged to the inland Chicago Area Waterway System (CAWS), tributary to the Des Plaines River which flows into the Illinois River and ultimately to the Mississippi River (Figure 1). The District has continued to safeguard the lake water resource not only through capital improvements such as the Tunnel and Reservoir Plan (TARP), but also through continuing water quality monitoring programs. The District operates TARP to collect and treat sewer overflows and provides storm water management for all of Cook County. TARP provides additional storage for sewage overflow during heavy precipitation that would otherwise discharge into the rivers. The ultimate storage upon completion of TARP will be 17.5 billion gallons. These efforts are crucial to protecting the Lake Michigan water quality while allowing the water in the inland CAWS to be used for recreational and commercial purposes.

Lake Michigan and the inland CAWS are separated by locks at the mouth of the Chicago River and the Calumet River, and by gate structures that control the amount of water withdrawn from the lake, and allow release of excess river water into the lake during extremely severe storm events. When the collection system receives excess flow which cannot be diverted into TARP, the CAWS water elevation rises to flood stage, and it becomes necessary to open the locks and reverse the flow to Lake Michigan. The District controls the CAWS water level through its operation of lakefront structures; the Wilmette Pumping Station (WPS); the sluice gates at the Chicago River Controlling Works (CRCW); and the sluice gates at the O'Brien Lock and Dam (OLD). The number of reversals from the CAWS to Lake Michigan have been reduced with the onset of TARP. The District conducts its operations to ensure that release of excess floodwaters into the lake is always a last resort, occurring only when all the District WRPs are operating at their maximum capacity and the CAWS water levels are approaching or exceeding flood stage. During the lake diversion events, the District conducts water quality monitoring to assess the effects of this backflow from the CAWS to the lake.

This report describes the results of microbiological analyses of samples collected during backflow events to Lake Michigan as a result of exceptionally large volumes of rainfall in 2010.

FIGURE 1: CHICAGO AREA WATERWAY SYSTEM



Microbiological Results of Backflow Samples in 2010

From January 1 through December 31, 2010, there was one rainstorm event severe enough to require reversal of the North Shore Channel (NSC) and Chicago River to Lake Michigan at WPS and CRCW. There were no reversals to Lake Michigan from the 95th and/or 122nd Street Pumping Stations, and none from the Calumet River to Lake Michigan at the OLD. However, there was discharge of combined sewer overflows (CSOs) from the two pumping stations to the Calumet River.

The fecal indicator bacteria *E. coli* (EC) and/or fecal coliform (FC), were analyzed in compliance with the backflow to Lake Michigan and Calumet River related monitoring requirement. Samples collected in NSC, Wilmette Harbor and Lake Michigan beaches were analyzed for EC using the Quanti-Tray/2000 (IDEXX Laboratories, Inc., Westbrook, ME). The Calumet River samples collected following the rainstorm events were analyzed for FC (Method 9222D *Standard Methods*, 18th edition). The backflow to Lake Michigan sampling locations are shown in Figures 2, 3 and 4. The relevant information about the discharges and the microbiological sampling results are described below.

DuSable Harbor/Chicago River Controlling Works. On July 23 and 24, 2010, the Chicago-land area experienced one of the most severe storms in recent history: a torrential downpour that saturated the region with more than 60 billion gallons of rain. As a result of this heavy rainfall of July 23 through July 24, 2010 there was a reversal from the Chicago River to Lake Michigan. Rain gauge data recorded for July 24, 2010 are shown in Table 1. Average precipitation for the central and north basin area was 5.31 and 4.15 inches on July 24, with a localized measurement of 3.46 inches at the North Side WRP. At North Francisco Avenue, 5.37 inches of rain was measured. Due to the significant rainfall the collection system and the North Side WRP received greater than maximum operational flow. On July 24 many CSOs occurred and system pumping stations directed part of the flow into the CAWS. On July 24 the North Side WRP had to discharge a portion of influent (combined storm water and sewage) to the North Shore Channel. As a result of the rainstorm's impact on the river system a reversal to Lake Michigan at the CRCW was necessary at 2:27 a.m. (0227, Military hours) which allowed the Chicago River to flow into the lake until 7:12 p.m. (1912 hours). The CRCW sluice gates and locks were open for a total of 16 hours and 45 minutes during which 5,784.6 million gallons (MG) of flow from the river passed into the lake. Shortly after the sluice gates were opened District staff collected water samples at approximately 30 minute intervals from the lake side of the DuSable Harbor sluice gates, and the Chicago River Inner Harbor sluice gates. A total of 14 samples were collected at the CRCW for EC analyses. Results are presented in Table 2. As part of the river reversal beach water quality monitoring, five lake shore sites adjacent to, north, and south of the CRCW were sampled on July 26. EC results for these samples are presented in Table 3.

FIGURE 2: SAMPLING LOCATIONS FOLLOWING BACKFLOW
TO LAKE MICHIGAN FROM WILMETTE PUMPING STATION

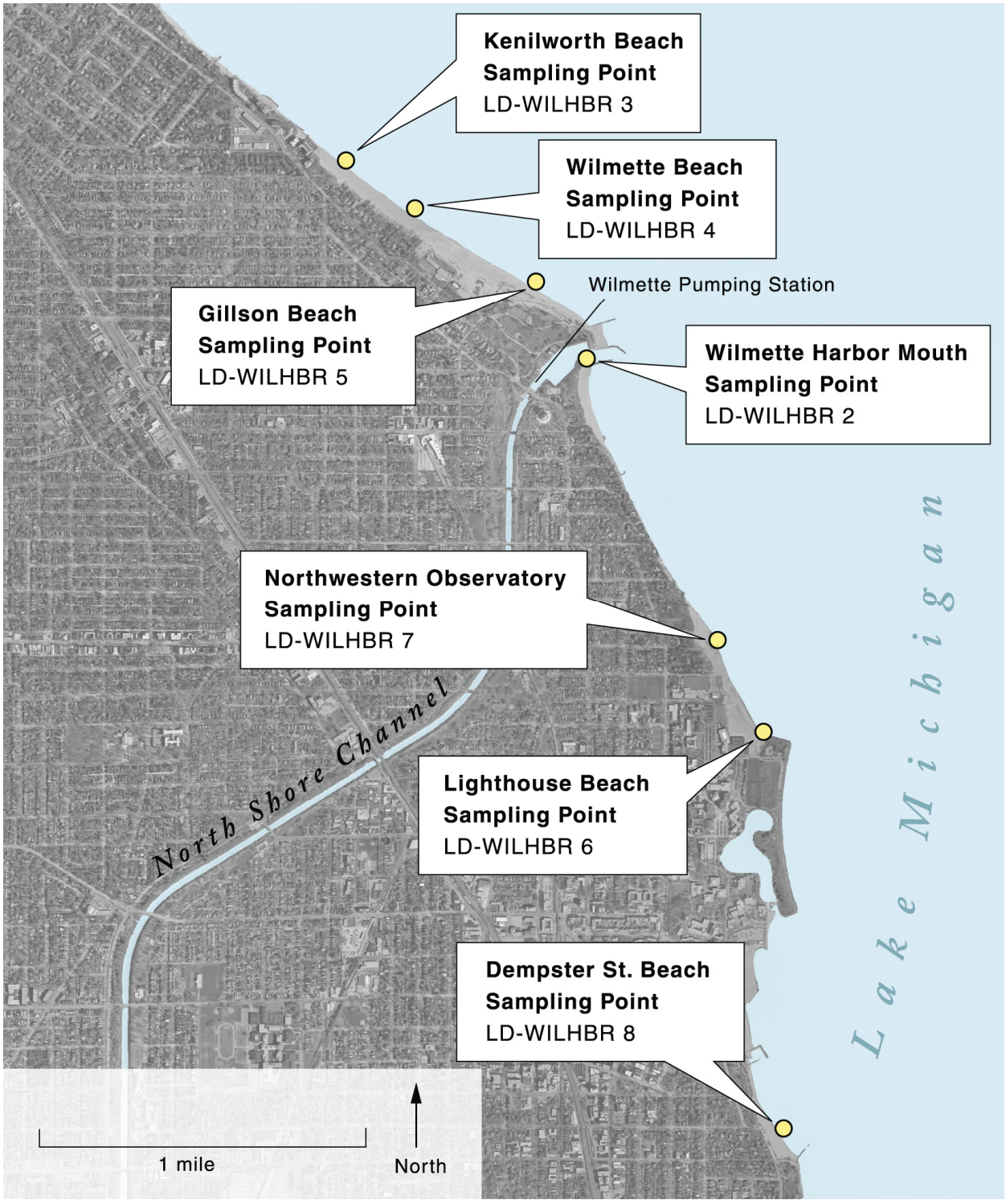


FIGURE 3: CHICAGO RIVER BACKFLOW TO
LAKE MICHIGAN SAMPLING LOCATIONS

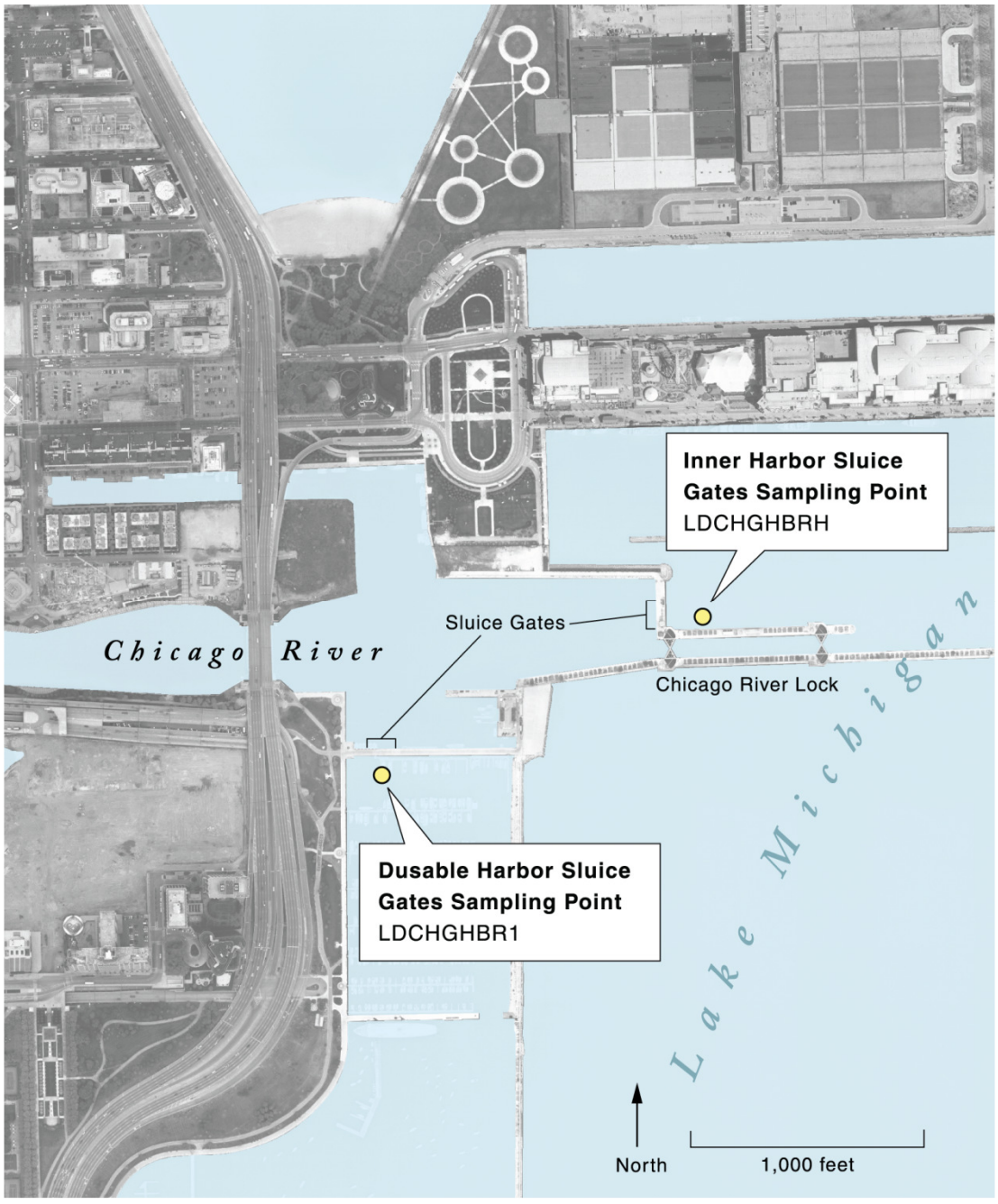


FIGURE 4: LAKE MICHIGAN BEACH SAMPLING LOCATIONS

TABLE 1: DISTRICT RAIN GAUGE DATA FOR JULY 24, 2010[1]

Gauge Number	Precipitation[1] (Inches)	Gauge Name	Address
1	3.68	Glenview	1333 Shermer Road, Glenview
2	3.46	North Side WRP	3500 Howard Street, Skokie
3	5.31	North Branch Pumping Station	4840 N. Francisco Ave, Chicago
4	Out[2]	Wilmette	613 Sheridan Road, Wilmette
Average	**4.15**	**North Basin Average**	
5	Out	West Side	6001 W. Pershing Road, Cicero
6	5.45	Springfield	1747 N. Springfield Ave, Chicago
7	5.77	Racine Ave. Pumping Station	3838 S. Racine, Chicago
8	4.72	MOB	100 E. Erie Street, Chicago
Average	**5.31**	**Central Basin Average**	
9	3.92	Melvina Ditch	8644 S. Natchez Ave., Burbank
10	3.49	87th & Western Pumping Station	87th St. & Western Ave., Chicago
11	4.87	95th Street Pumping Station	9525 S. Baltimore, Chicago
12	4.67	Calumet WRP	400 E. 130th Street, Chicago
Average	**3.36**	**South Basin Average**	

[1]Source: District website (http://apps.mwrd.org/cso/displayrain.aspx?passdate=7/24/2010).
[2]Out = out of service.

TABLE 2: CHICAGO RIVER CONTROLLING WORKS MONITORING AT LAKE MICHIGAN BACTERIA RESULTS, JULY 24, 2010

LIMS Number	Sample Date	Sample Time[1]	Sample Description/Sample Point	*E. coli*[2] MPN/100mL
6090861	7/24/2010	0600	Inner Harbor Sluice Gates/CHGHBRH	98,000
6090862	7/24/2010	0710	Inner Harbor Sluice Gates/CHGHBRH	17,700
6090889	7/24/2010	0810	Inner Harbor Sluice Gates/CHGHBRH	98,000
6090890	7/24/2010	0920	Inner Harbor Sluice Gates/CHGHBRH	62,900
6090891	7/24/2010	1120	Inner Harbor Sluice Gates/CHGHBRH	81,600
6090892	7/24/2010	1310	Inner Harbor Sluice Gates/CHGHBRH	98,000
6090893	7/24/2010	1500	Inner Harbor Sluice Gates/CHGHBRH	64,900
6090863	7/24/2010	0630	DuSable Harbor Sluice Gates/CHGHBR1	64,900
6090864	7/24/2010	0740	DuSable Harbor Sluice Gates/CHGHBR1	54,800
6090894	7/24/2010	0840	DuSable Harbor Sluice Gates/CHGHBR1	77,000
6090895	7/24/2010	1040	DuSable Harbor Sluice Gates/CHGHBR1	25,900
6090896	7/24/2010	1230	DuSable Harbor Sluice Gates/CHGHBR1	72,700
6090897	7/24/2010	1400	DuSable Harbor Sluice Gates/CHGHBR1	30,800
6090898	7/24/2010	1530	DuSable Harbor Sluice Gates/CHGHBR1	61,300

[1]Military Time.
[2]*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18th Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).

TABLE 3: CHICAGO RIVER HARBOR AREA BEACHES LAKE MICHIGAN MONITORING BACTERIA RESULTS, JULY 26, 2010

LIMS Number	Sample Date	Sample Time[1]	Sample Description/Sample Point	*E. coli*[2] MPN/100mL
6092256	7/26/2010	1015	31st Street Beach/CHGHBR7	<10[3]
6092259	7/26/2010	1030	12th Street Beach/CHGHBR6	<10
6092261	7/26/2010	1050	Monroe Harbor/CHGHBR5	<10
6092271	7/26/2010	1120	Oak Street Beach/CHGHBR4	<10
6092274	7/26/2010	1130	North Ave. Beach/CHGHBR3	<10

[1]Military Time.
[2]*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18th Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).
[3]Less than 10 MPN/100mL.

Wilmette Harbor. Also during the July 23-24, 2010 rainstorm event, the Wilmette Harbor sluice gate was opened to divert storm-related river flow from the NSC into Lake Michigan. The reversal commenced at 2:16 a.m. and continued for 17 hours and 4 minutes, until 7:20 p.m. (1920 hours), allowing 750.3 MG to flow from the NSC into Lake Michigan at Wilmette Harbor. During the reversal at Wilmette Harbor 12 water samples were collected from the lake side of the sluice gates at 30 minute intervals. The EC results from these samples are reported in Table 4. Post-reversal monitoring samples from seven lake shore sites adjacent to, north, and south of the Wilmette Harbor were sampled in the morning and again in the afternoon on July 25. EC results for these 14 samples are presented in Table 5.

Calumet Area Pumping Station. The OLD gates, located near 130th Street and Torrence Avenue, were not opened during the July 24 storm. However, storm-related flows required that the 95th Street Pumping Station pump commence at 7:00 a.m. (0700 hours) until 1:20 p.m. (1320 hours) on July 24, 2010. Sampling was initiated at the 95th Street bridge and at the Ewing Avenue bridge on the Calumet River as a monitoring precaution. These river samples were collected at 30 minute intervals from each location, and analyzed for FC bacteria. The results from these 26 samples are shown in Tables 6 and 7. Although no detectable water flow from the OLD was reported, six lake water samples along the lake shore north and south of the OLD were collected on July 24, and 25, 2010, and analyzed for EC. These results are presented in Table 8.

TABLE 4: WILMETTE HARBOR[1] LAKE MICHIGAN MONITORING BACTERIA RESULTS, JULY 24, 2010

LIMS Number	Sample Date	Sample Time[2]	*E coli*[3] MPN/100mL
6090836	7/24/2010	0315	173,000
6090837	7/24/2010	0345	199,000
6090838	7/24/2010	0415	112,000
6090839	7/24/2010	0445	98,000
6090840	7/24/2010	0515	86,600
6090841	7/24/2010	0545	98,000
6090842	7/24/2010	0615	105,000
6090843	7/24/2010	0645	105,000
6090844	7/24/2010	0715	81,600
6090845	7/24/2010	0745	81,600
6090846	7/24/2010	0815	81,600
6090847	7/24/2010	0845	15,500

[1]Sample Description/Sample Point - Wilmette Sluice Gate (WILHBR1).
[2]Military Time.
[3]*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18th Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).

TABLE 5: WILMETTE HARBOR AREA BEACHES LAKE MICHIGAN MONITORING BACTERIA RESULTS, JULY 25, 2010

LIMS Number	Sample Date	Sample Time[1]	Sample Description/Sample Point	*E. coli*[2] MPN/100mL
6091317	07/25/2010	1630	Wilmette Harbor Mouth/WILHBR2	20
6091251	07/25/2010	0740	Wilmette Harbor Mouth/WILHBR2	216
6091320	07/25/2010	1700	Kenilworth Beach/WILHBR3	189
6091252	07/25/2010	0815	Kenilworth Beach/WILHBR3	496
6091319	07/25/2010	1650	Wilmette Beach/WILHBR4	31
6091253	07/25/2010	0800	Wilmette Beach/WILHBR4	30
6091318	07/25/2010	1640	Gillson Beach/WILHBR5	10
6091254	07/25/2010	0745	Gillson Beach/WILHBR5	10
6091316	07/25/2010	1615	Lighthouse Beach/WILHBR6	1,350
6091255	07/25/2010	0730	Lighthouse Beach/WILHBR6	16,700
6091315	07/25/2010	1600	Northwestern Observatory/WILHBR7	1,660
6091256	07/25/2010	0720	Northwestern Observatory/WILHBR7	8,520
6091314	07/25/2010	1545	Dempster Street Beach/WILHBR8	528
6091258	07/25/2010	0705	Dempster Street Beach/WILHBR8	4,480

[1]Military Time.
[2]*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18th Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).

TABLE 6: CALUMET RIVER BACKFLOW MONITORING BACTERIA RESULTS – EWING AVENUE, JULY 24, 2010

LIMS Number	Sample Date	Sample Time[1]	Sample Description/Sample Point	*Fecal coliform*[2] CFU/100mL
6090900	7/24/2010	1045	Ewing Avenue/ CALHBR1	1,500 E[3]
6090901	7/24/2010	1115	Ewing Avenue/ CALHBR1	3,200
6090909	7/24/2010	1145	Ewing Avenue/ CALHBR1	6,600
6090910	7/24/2010	1215	Ewing Avenue/ CALHBR1	6,000
6090911	7/24/2010	1245	Ewing Avenue/ CALHBR1	1,400
6090912	7/24/2010	1315	Ewing Avenue/ CALHBR1	1,100
6090913	7/24/2010	1400	Ewing Avenue/ CALHBR1	4,000
6090915	7/24/2010	1415	Ewing Avenue/ CALHBR1	6,600
6090914	7/24/2010	1445	Ewing Avenue/ CALHBR1	5,000
6090917	7/24/2010	1515	Ewing Avenue/ CALHBR1	2,100
6090916	7/24/2010	1545	Ewing Avenue/ CALHBR1	5,000
6090918	7/24/2010	1615	Ewing Avenue/ CALHBR1	2,300
6090919	7/24/2010	1645	Ewing Avenue/ CALHBR1	90 E

[1]Military Time.
[2]*Fecal coliform*: Standard Methods for the Examination of Water & Wastewater, 18th Edition, 1992, Membrane Filtration Method 9222D (mFC Agar with Rosalic Acid).
[3]Estimate - Filtration result produced colony counts outside the procedures ideal counting range.

TABLE 7: CALUMET RIVER BACKFLOW MONITORING BACTERIA RESULTS – 95th STREET, JULY 24, 2010

LIMS Number	Sample Date	Sample Time[1]	Sample Description/Sample Point	*Fecal coliform*[2] CFU/100mL
6090921	7/24/2010	1030	95th St./CALHBR2	26,000
6090922	7/24/2010	1100	95th St./CALHBR2	1,600
6090923	7/24/2010	1130	95th St./CALHBR2	1,600
6090924	7/24/2010	1200	95th St./CALHBR2	4,000
6090925	7/24/2010	1230	95th St./CALHBR2	3,200
6090926	7/24/2010	1300	95th St./CALHBR2	2,600
6090927	7/24/2010	1330	95th St./CALHBR2	2,400
6090928	7/24/2010	1400	95th St./CALHBR2	6,400
6090929	7/24/2010	1430	95th St./CALHBR2	8,200
6090930	7/24/2010	1500	95th St./CALHBR2	9,000
6090931	7/24/2010	1530	95th St./CALHBR2	4,400
6090932	7/24/2010	1600	95th St./CALHBR2	3,300
6090933	7/24/2010	1630	95th St./CALHBR2	6,800

[1]Military Time.
[2]Fecal coliform: Standard Methods for the Examination of Water & Wastewater, 18th Edition, 1992, Membrane Filtration Method 9222D (mFC Agar with Rosalic Acid).

TABLE 8: CALUMET HARBOR AREA BEACHES MONITORING BACTERIA RESULTS, JULY 24 AND 25, 2010

LIMS Number	Sample Date	Sample Time[1]	Sample Description/Sample Point	*E. coli*[2] MPN/100mL
6090903	07/24/2010	1720	Calumet Beach/ CALHBR4	10
6090906	07/25/2010	0115	Calumet Beach/ CALHBR4	51
6090902	07/24/2010	1735	Iroquois Landing/ CALHBR3	<10[3]
6090905	07/25/2010	0130	Iroquois Landing/ CALHBR3	10
6090904	07/24/2010	1755	Rainbow Beach/ CALHBR5	10
6090907	07/25/2010	0155	Rainbow Beach/ CALHBR5	41

[1]Military Time.
[2]*Escherichia coli*: Standard Methods for the Examination of Water & Wastewater, 18th Edition, 1992, Most Probable Number (MPN) Method 9223B (Quanti-Tray/2000).
[3]Less than 10 MPN/100 mL.