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Water Management and Diversion Accounting Activities

# 2014 Annual Report

(October 2013 – September 2014)

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Hydrology and Hydraulics Section  
Design Branch  
Technical Services Division  
Chicago District  
October 2017



**US Army Corps  
of Engineers** ®

**2014 ANNUAL REPORT**  
**WATER MANAGEMENT AND DIVERSION ACCOUNTING ACTIVITIES**  
**(OCTOBER 2013 – SEPTEMBER 2014)**  
**GREAT LAKES AND OHIO RIVER DIVISION**  
**CHICAGO DISTRICT**

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## Chapter 1 – Introduction

Each year the Districts within LRD generate an annual report that provides pertinent information about the operation and activities of their reservoirs and similar projects within their boundaries for the reporting period, October 1 of the previous year through September 30 of the current year. This period is consistent with the USGS water year (WY) period. Although the Chicago District does not have any reservoirs within its boundaries, it is responsible for the Lake Michigan Diversion Accounting program. Accordingly, the Chicago District's annual report will reflect the implementation and activities of this program; the format for the report will deviate from that which is typically seen from the other Districts.

The Water Year (WY) 2014 Annual Report on Lake Michigan Diversion Accounting presents activities by the Corps of Engineers in accounting for the diversion from Lake Michigan by the State of Illinois. The accounting of the diversion is performed according to the guidelines established in the 1980 modified Supreme Court Decree concerning the diversion.

Presented in this report is the history of the diversion and its accounting, a description of the sources of the diversion, a description of the accounting procedures, and a summary of all significant activities that occurred during WY 2014.

Under the provisions of the U.S. Supreme Court Decree in the *Wisconsin, et al v. Illinois et al*, 388 U.S. 426, 87 S Ct. 1774 (1967) as modified 449 U.S. 48, 101 S. CT. 557 (1980), the Corps of Engineers monitors the measurement and computation of Lake Michigan diversion by the State of Illinois. The terms of the modified decree require the Corps of Engineers to prepare an annual report on the accounting of the Lake Michigan water diverted by the State of Illinois and actions taken by the involved agencies.

## Chapter 2 – History of the Diversion

Water was first diverted from Lake Michigan at Chicago into the Mississippi River Basin with the completion of the Illinois and Michigan (I&M) Canal in 1848. The I&M Canal was primarily for transportation and diverted up to 500 cubic feet per second (cfs).

Development of the Chicago sewer system led to severe sanitation problems in the Chicago River by the mid to late 1800's. The newly constructed sewers moved water and wastes into the Chicago River, which until 1900 drained to Lake Michigan. The water quality of Lake Michigan deteriorated and contaminated the city's primary water supply.

As a solution to the sanitation and flooding problems, the Chicago Sanitary and Ship Canal (CSSC) was built. The construction reversed the flow direction of the Chicago River, as shown in Figure 2-1. The CSSC was completed in 1900 by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC, formerly the Metropolitan Sanitary District of Greater Chicago, MSDGC). The Sanitary and Ship Canal followed the course of the older I&M Canal. This canal is much longer than the I&M Canal and can handle the Chicago River flow in addition to increased shipping. The Chicago River Controlling Works were constructed at the mouth of the Chicago River in the 1930s. The lock and sluice gates regulates the amount of Lake Michigan water allowed to pass into the river and restricts river flooding from entering Lake Michigan. The Lockport Lock and Dam controls the water level in the CSSC.

Between 1907 and 1910, the MWRDGC constructed a second canal called the North Shore Channel. It extended from Lake Michigan at Wilmette in a southerly direction 6.14 miles to the north branch of the Chicago River. The Wilmette Pumping Station, also known as the Wilmette Controlling Works, regulates the amount of Lake Michigan flow allowed down the channel through the use of one vertical lift gate, one 250 cfs pump (refurbished in 2002), and one 150 cfs pump (installed in 2010 during the rehabilitation of the structure). The MWRDGC uses the pumps to take discretionary flow from Lake Michigan due to the concern over Asian carp.

Construction of a third canal, the Calumet Sag Channel, was completed in 1922. The canal connects Lake Michigan through the Grand Calumet River to the CSSC. The Calumet Sag Channel was constructed to carry sewage from South Chicago, Illinois and East Chicago, Indiana. The Blue Island Lock and Dam controlled flow through the canal. The O'Brien Lock and Dam, which replaced the Blue Island Lock and Dam, was completed in 1967 and is located on the Calumet River. The O'Brien Lock and Dam regulates the flow of Lake Michigan waters down the Calumet Sag Channel.

Figure 2-1 shows the affected watershed. Figure 2-2 shows the location of the lakefront structures relative to the boundary of the diverted portion of the Lake Michigan watershed.

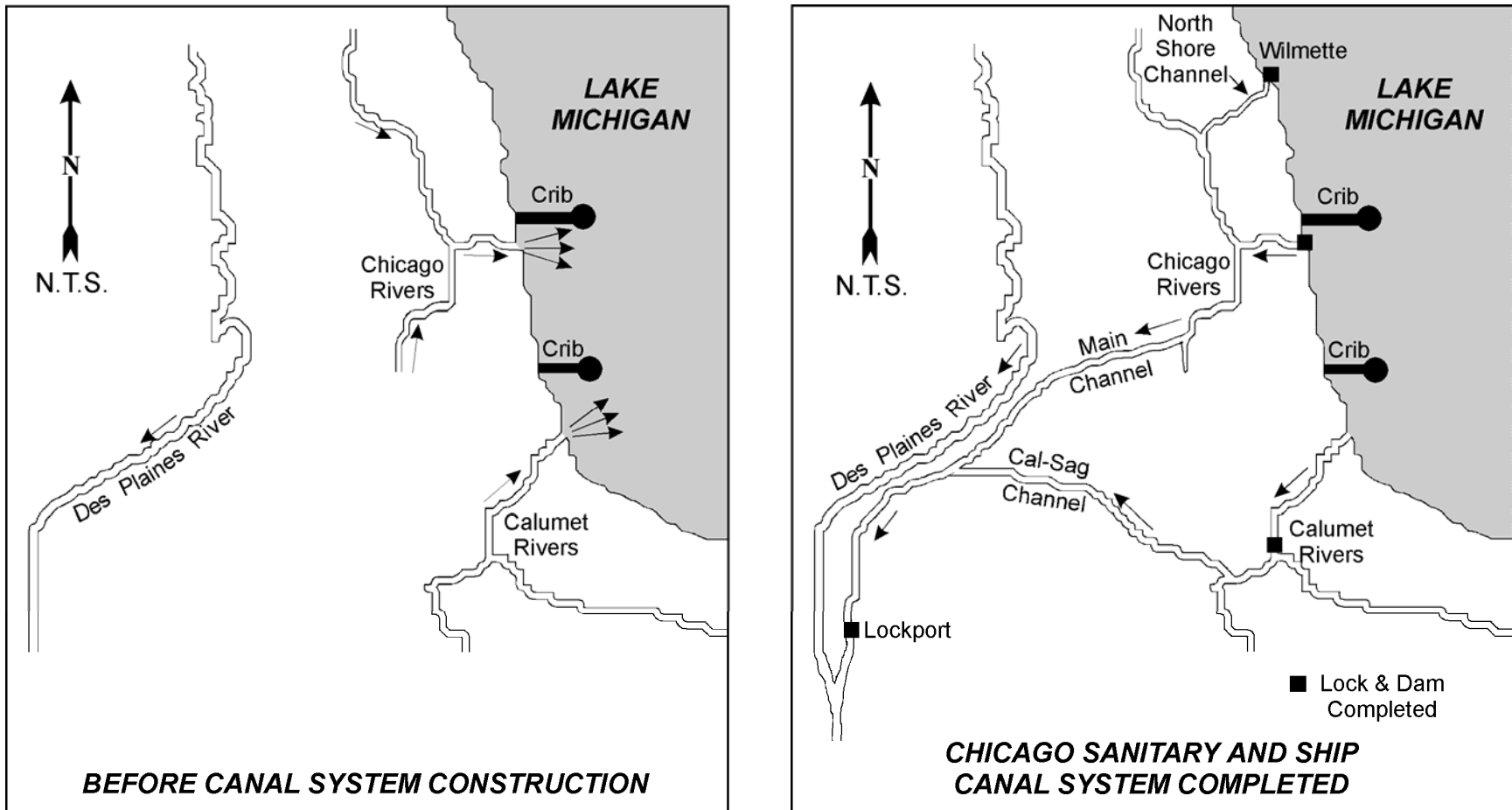


FIGURE 2-1 DEVELOPMENT OF THE CHICAGO SANITARY AND SHIP CANAL SYSTEM

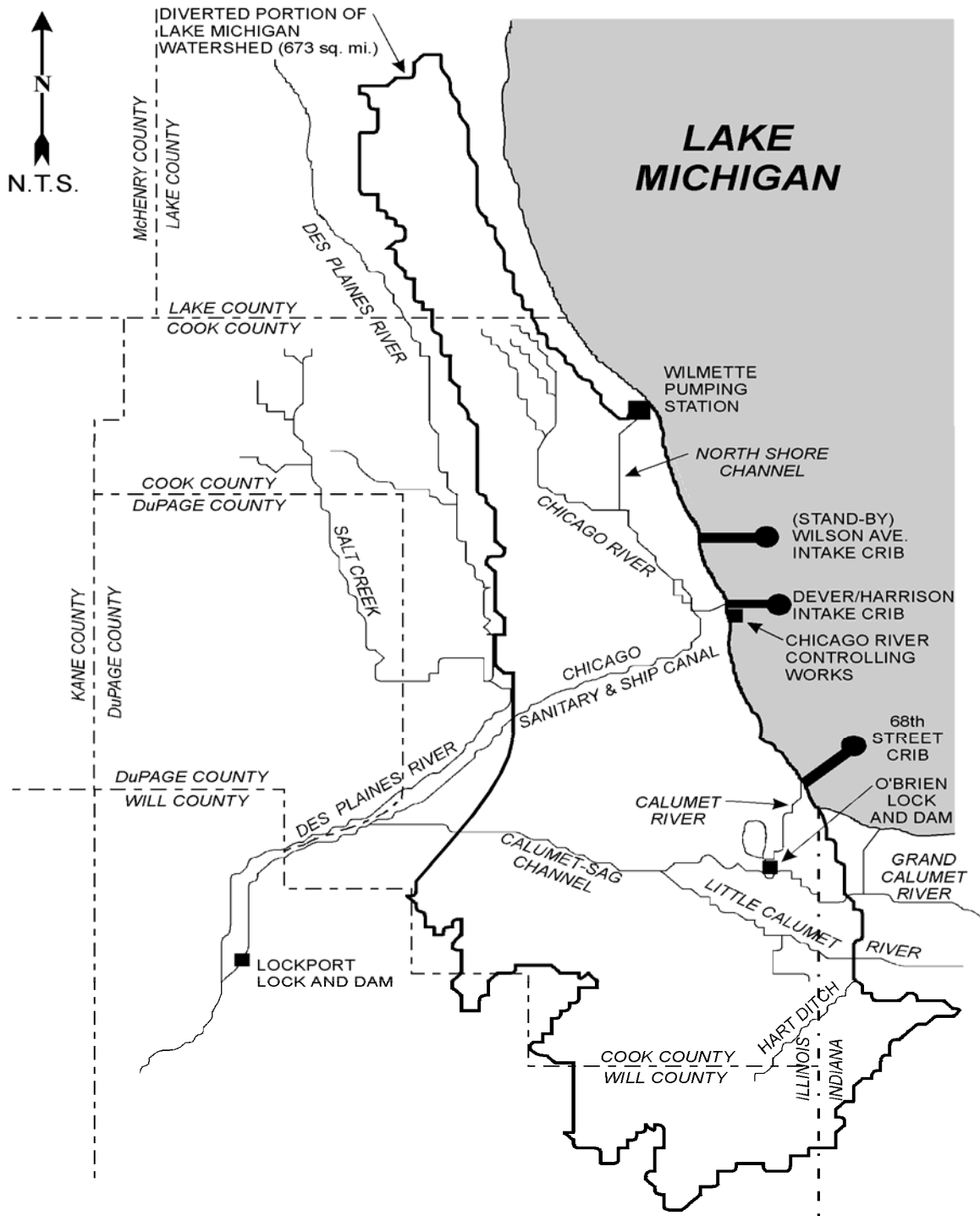


FIGURE 2-2 LOCATION PLAN - LAKE MICHIGAN DIVERSION AT CHICAGO

## Chapter 3 – Significant Hydrologic Events

During WY 2014, an average total of 40.53 inches of precipitation fell at the 25 Illinois State Water Survey (ISWS) raingages that make up the Lake Michigan Diversion Accounting raingage network (Westcott, 2015). The WY 2014 average total precipitation of 40.53 inches was about 110 percent of the 24-year (1990-2013) average of 36.68 inches for the 25 raingage network. Table 3-11 tabulates the recorded monthly rainfall data during WY 2014, and the deviation from the ISWS 24-year annual and monthly average precipitation.

Table 3-1 WY 2014 Monthly and Annual Precipitation (inches)  
Illinois State Water Survey Average Across the 25 Raingage Network

<u>Month</u>	2014	1990 - 2013	<u>Deviation</u>	<u>Average</u>
	<u>Precipitation</u>	<u>Precipitation</u>		
Oct-13	4.11	3.08	1.03	133%
Nov-13	2.26	2.68	-0.42	84%
Dec-13	1.39	2.10	-0.71	66%
Jan-14	2.65	2.09	0.56	127%
Feb-14	2.21	1.89	0.32	117%
Mar-14	1.60	2.41	-0.81	66%
Apr-14	2.92	3.68	-0.76	79%
May-14	4.49	4.01	0.48	112%
Jun-14	6.98	3.85	3.13	181%
Jul-14	3.33	3.66	-0.34	91%
Aug-14	5.92	4.20	1.72	141%
Sep-14	2.68	3.03	-0.35	88%
Annual	40.53	36.68	3.85	110%

There were 137 precipitation events in Water Year 2014. Of the 137 precipitation events, twelve included at least one site at which the storm total exceeded one-year recurrence interval and two included at least one site at which the storm total exceeded the twenty-five-year recurrence interval.

During WY 2014, one backflow event occurred, as described in Table 3-2.

Table 3-2 WY 2014 Backflows to Lake Michigan through Lakefront Structures

Date	O'Brien		CRCW		Wilmette P.S.		Total Backflow	
	(MG)	(cfs)	(MG)	(cfs)	(MG)	(cfs)	(MG)	(cfs)
6/30/2014	0.0	0.0	362.1	560.3	162.8	251.9	524.9	812.1

## Chapter 4 – Status of Accounting Reports

Lake Michigan diversion flow data is summarized in accounting reports prepared on an annual basis as flows are certified. Since implementation of the modified Supreme Court Decree of 1 December 1980 and before this report, the Corps of Engineers has certified diversion flows for WY 1981 through WY 2013. The computations for WY 2014 are currently underway, although are currently delayed pending the receipt of additional observational data from the State of Illinois. An anticipated time of completion is not available as of the time of publication of this report.

The running average diversion for the period WY 1981 through WY 2013 is 3,095 cfs, 105 cfs less than the 3,200 cfs 40 year average diversion specified by the modified decree. Also, the annual average diversion has exceeded the 3,680 cfs annual limit three times, once more than the maximum number of times allowed in the decree. Additionally, the absolute annual maximum of 3,840 cfs has been exceeded during the WY93 accounting period. The cumulative deviation, the sum of the differences between the annual average flows and 3,200 cfs, is 3,474 cfs-years at the end of WY 2013. The positive cumulative deviation indicates a cumulative flow surplus. The decree specifies a maximum allowable deficit of -2,000 cfs-years over the first 39 years of the 40-year averaging period.

Data collection and compilation for the WY 2014 accounting report were done by the Corps. Hydrologic and hydraulic modeling and diversion accounting for Water Year 2014 were also performed by the Corps. Data collection and compilation for this report began in Fiscal Year (FY) 2014.



## Chapter 5 – Data Collection Program

### a. Cooperative Streamgaging Program

Based on project needs, a sediment gage on the Des Plaines River near Hofmann Dam was discontinued and three stage gages on the Chicago Area Waterway System (CAWS) were reinstated.

## Chapter 6 – Activities for FY 2014

### a. LMDA Data Collection & Computations

During FY 2014, the annual and diversion accounting reports for WY 2010 and 2011 were finalized, reviewed, and published. Data collection for WY 2012 and WY2013 – specifically for meteorological, streamflow, water usage, and water reclamation plant pumpage data – began shortly thereafter. The computations for WY 2012 and WY 2013 began once the necessary data was received and processed.

### b. Supporting Studies

During FY 2014, a study on the inventory of green infrastructure and their potential impact on the runoff from the diversion watershed for Lake Michigan Diversion Accounting was initiated.

### c. Technical Review Committee

The third workshop for the 7<sup>th</sup> Technical Review Committee was held in October 2013. The technical committee completed their review and published their find report in April 2014. Report is available here:

<http://www.lrc.usace.army.mil/Missions/Lake-Michigan-Diversion-Accounting/Technical-Reports/>

### d. Water Control Manual

Updates to the water control manual for the Chicago Harbor Lock began in April 2014 and continued through the end of the fiscal year.