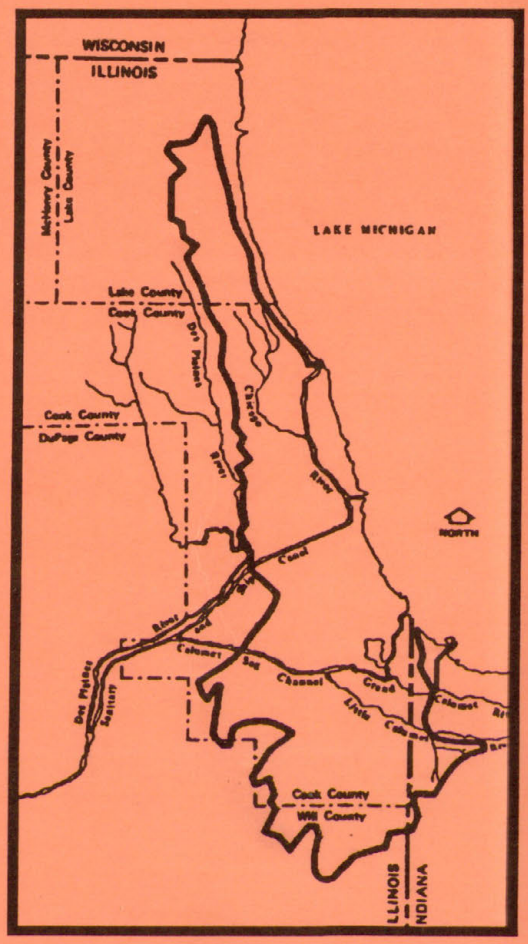
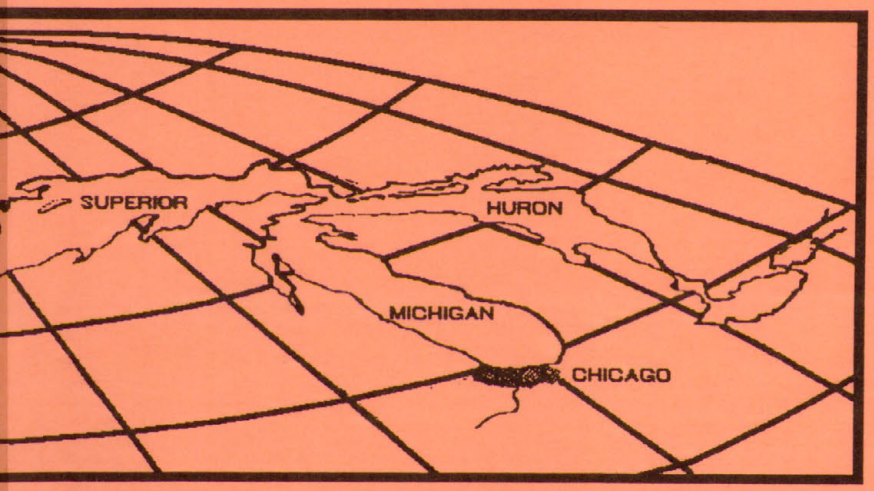
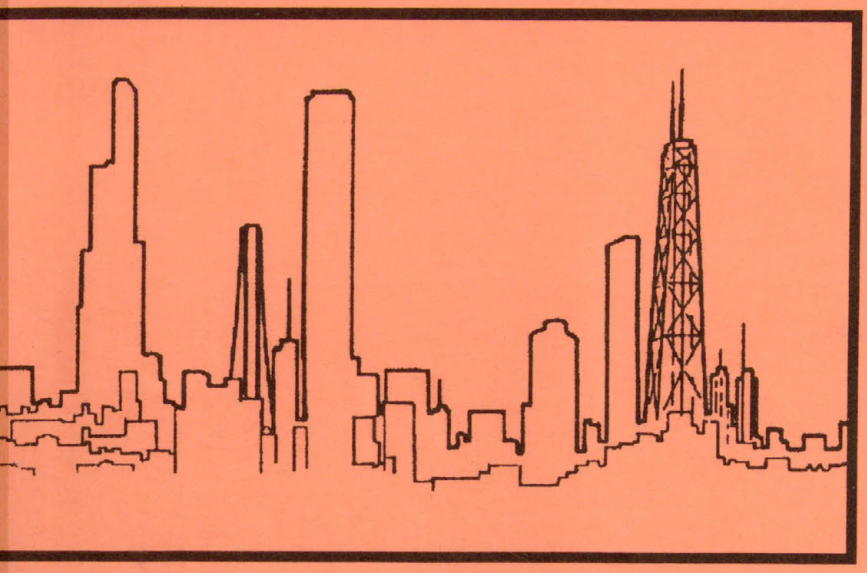
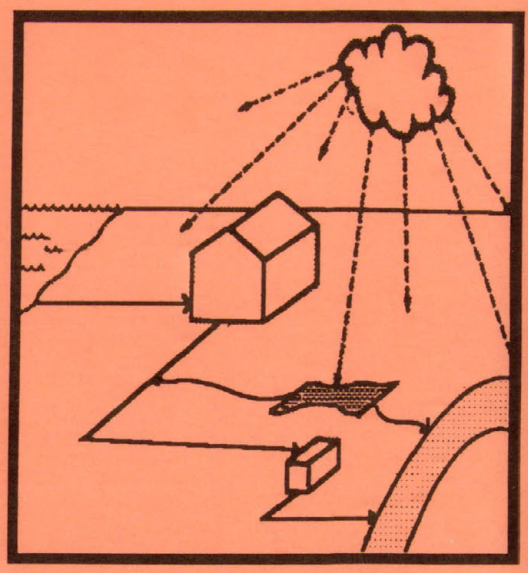
US Army Corps
Of Engineers
Chicago District

LAKE MICHIGAN DIVERSION ACCOUNTING WATER YEAR 1994 ANNUAL REPORT









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EXECUTIVE SUMMARY

This document is the Water Year (WY) 1994 Annual Report of the Chicago District, U. S. Army Corps of Engineers activities in the monitoring and review of the accounting of Lake Michigan diversion flows through Chicago, Illinois as directed by 1980 amendment to the U. S. Supreme Court Decree. Additionally, this report serves to summarize the Corps' major accomplishment with respect to the mission as mandated by the Water Resources Development Act of 1986, PL99-662, Section 1142. This act gave the Corps complete responsibility for diversion accounting effective 1 October 1987. This report provides an overview and audit of flow measurements and accounting computed by Christopher B. Burke Engineering under contract to the Corps of Engineers for WY 1991 and WY 1992, 1 October 1990 through 30 September 1992.

During WY 1994 and continuing into WY 1995 the District modified the hydrologic runoff models and hydraulic sewer models in order to utilize the DSS database as the sole database in all diversion accounting computations. This conversion to the DSS database will improve the efficiency of the diversion accounting by eliminating the need for data transformations between two different databases.

The Lake Michigan Diversion Accounting Reports for WY 1991 and WY 1992 have been completed. The State of Illinois diverted 3,555 cfs during WY 1991 and 3,409 cfs during WY 1992. These diversions are 355 cfs and 209 cfs greater than the 3,200 cfs 40 year average diversion specified in the modified decree. The running average of the diversion for WY 1981 through WY 1992 is 3,457 cfs, or 257 cfs over the annual allocation. The cumulative deviation is now -3,084 cfs-years. The negative sign indicates a cumulative flow deficit. The maximum allowable cumulative flow deficit specified in the decree is 2,000 cfs-years.

INTRODUCTION

The diversion of water from the Lake Michigan watershed is important to the Great Lake states and to the Canadian province of Ontario. The states and province that border the Great Lakes have concerns with diversions during periods of low lake levels and the long term effects of diversion. To insure these concerns are considered, the U.S. Army Corps of Engineers is responsible for the accounting of flow diverted from the Lake Michigan watershed.

The Water Year (WY) 1994 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 U.S. Supreme Court Decree concerning the diversion.

Presented in this report is the history of the diversion and its accounting, the certification of WY 1991 and WY 1992 diversion flows, 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 1994.

AUTHORITY FOR REPORT

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 by 449 U.S. 48, 101 S. CT. 557 (1980), the Corps of Engineers monitors the measurement and computation 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.

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 Illinois and Michigan 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.

A second problem during this time was an increase in the overbank flooding within the city. The sewer system expanded as more roads and buildings were built. This construction increased the rate and volume of runoff and resulted in increased flooding.

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 (figure 1). The Chicago Sanitary and Ship Canal 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 larger than the I & M Canal and can handle the Chicago River flow as well as increased shipping. The Chicago River Controlling Works were constructed at the mouth of the Chicago River in the 1930s. The lock and sluice gates regulate the amount of Lake Michigan water allowed to pass into the river and restricts river flooding entering Lake Michigan.

Between 1907 and 1910, the MWRDGC constructed a second sanitary canal called the North Shore Canal. This canal extends from Lake Michigan at Wilmette south 6.14 miles to the North Branch of the Chicago River. The Wilmette Controlling Works regulate the amount of Lake Michigan flow allowed down the channel.

Construction of a third canal, the Calumet Sag Canal, was completed in 1922. The canal connects Lake Michigan, through the Grand Calumet River, to the Sanitary and Ship Canal. This canal carried combined sewage overflows from South Chicago, Illinois and East Chicago, Indiana. The O'Brien Lock and Dam located on the Calumet River, regulates the flow of Lake Michigan waters down the canal. Figure 2 shows the affected watershed.

Upon completion of the Chicago Sanitary and Ship Canal in 1901, the Secretary of War issued a permit authorizing a diversion of 4,167 cfs. In 1908 and 1913, the United States brought actions to enjoin the MWRDGC from diverting more than the 4,167 cfs previously authorized in 1901. The two actions were consolidated and the Supreme Court entered a decree on 5 January 1925 allowing the Secretary of War to issue diversion permits. In March 1925, the permit issued limited the diversion to 8,500 cfs, about the average then being used.

In 1922, 1925, and 1926, several Great Lakes States filed similar original actions in the U.S. Supreme Court seeking to restrict the diversion at Chicago. A Special Master, appointed by the U.S. Supreme Court to hear the combined three suits, found the 1925 permit to be valid and recommended dismissal of the action. The U.S. Supreme Court, however, reversed the Special Master's finding. Subsequently, the Court instructed the Special Master to determine the steps necessary for Illinois and MWRDGC to reduce the diversion. Consequently, a 1930 decree reduced the allowable diversion (which did not include domestic pumpage) in three steps: to 6,500 cfs after 1 July 1930; to 5,000 cfs after 30 December 1935; and to 1,500 cfs after 31 December 1938.

Figure 1

Development of the Chicago Canal System

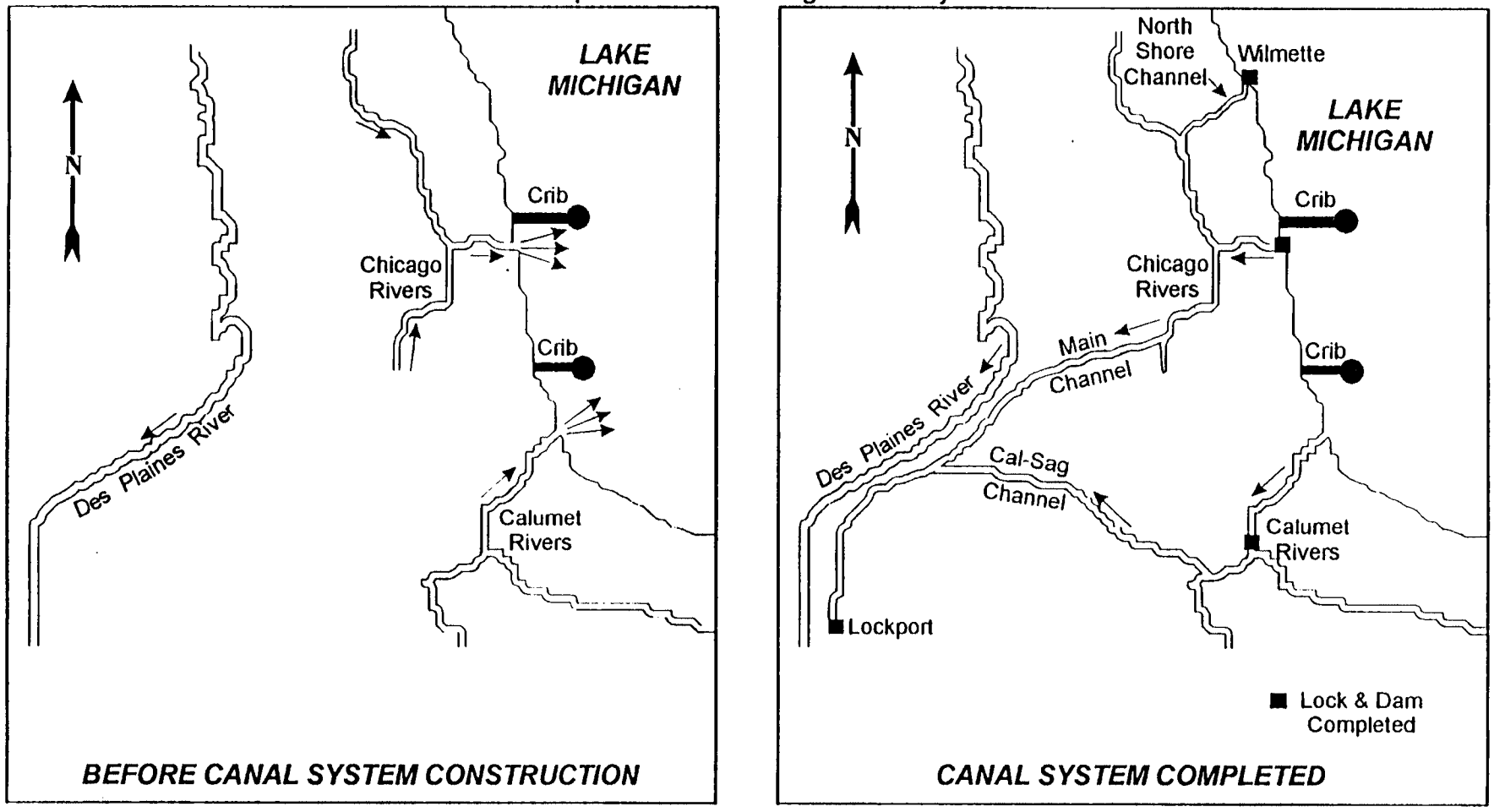
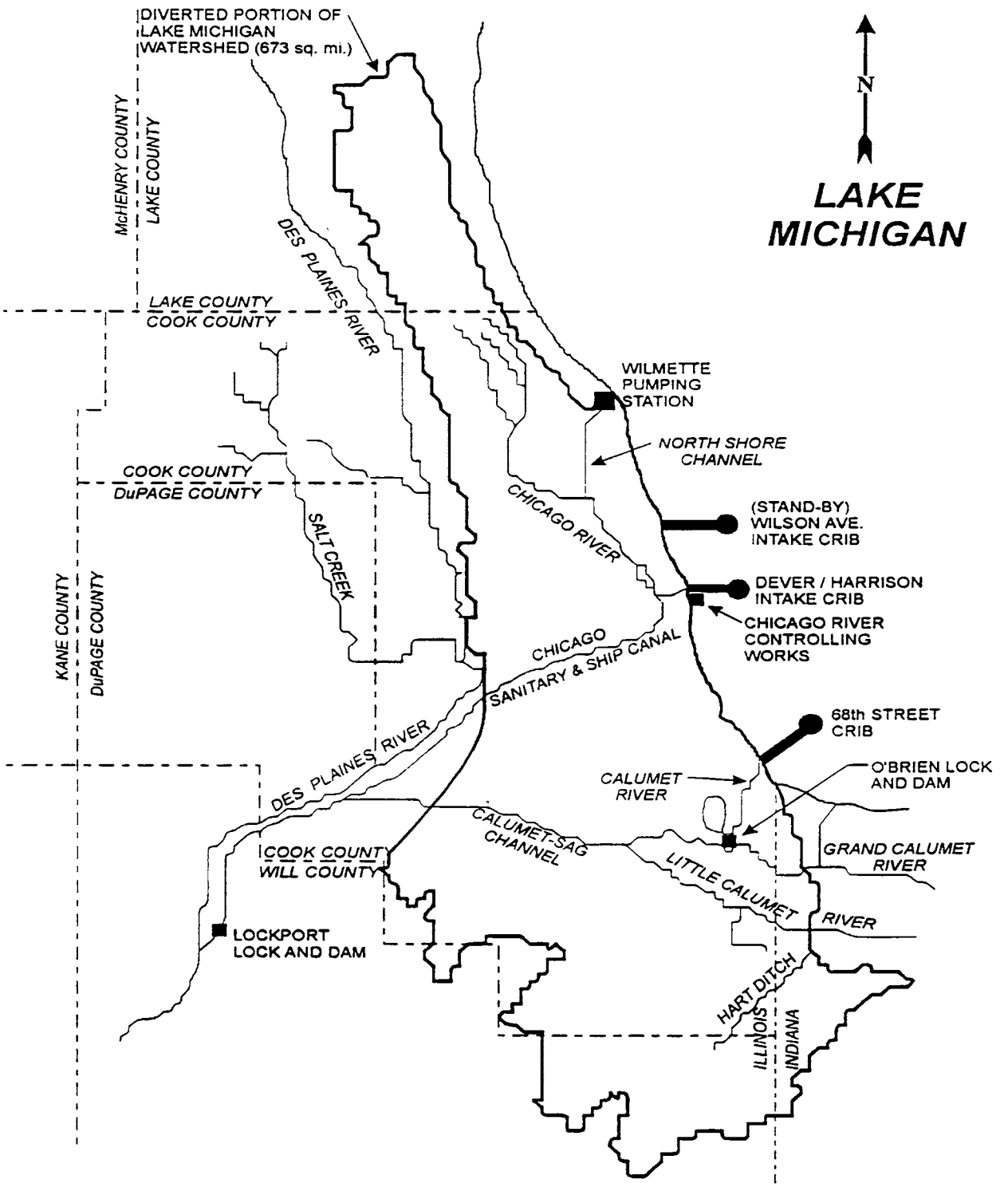


Figure 2

Location Plan - Lake Michigan Diversion at Chicago



In 1967, an additional Supreme Court Decree limited the diversion of Lake Michigan water by the State of Illinois and its municipalities, including domestic pumpage, to a five year average of 3,200 cfs effective 1 March 1970. The 1967 Supreme Court Decree gave full responsibility to the State of Illinois for diversion measurements and computations. The role of the Corps of Engineers, as specified in the decree, was to be one of "general supervision and direction."

The 1967 decree was modified on 1 December 1980. This modified decree changed the beginning of the accounting year from 1 March to 1 October. The modified decree also extended the period for the running average diversion from five years to forty years beginning with WY 1981.

The amended decree contains three provisions that affected the role of the Corps of Engineers in the diversion accounting program. First, although the State of Illinois was primarily responsible for measurement and computation of diversion flows, the decree allowed the Corps of Engineers to participate in the function, subject to agreement and cost sharing with the State of Illinois. Negotiations were held on cost sharing the computation of the diversion. No agreement was reached due to lack of funding. The measurement and computation of the diversion continued to be done by the Illinois Department of Transportation (IDOT) through its consultants, the Northeastern Illinois Planning Commission (NIPC), MWRDGC, and the United States Geological Survey (USGS).

Second, the supervisory role for the Corps of Engineers increased so the Corps of Engineers was responsible for auditing the computations and measurements performed by the State of Illinois.

Third, the modified decree states that the Chief of Engineers shall appoint a Three Member Technical Committee to determine the best current engineering practice and scientific knowledge for measuring the diversion and to make recommendations as appropriate. The decree states that "...the members should be selected on the basis of recognized experience and technical expertise in flow measurement or hydrology." A technical committee is to be reconvened at least once every five years. The first Technical Committee convened in June 1981 and completed its work in April 1982. The second Technical Committee convened in July 1986, and completed their final report in November 1987. The third Technical Committee completed their final report in August 1994.

The Water Resources Development Act of 1986 gave the Corps of Engineers responsibility for the computation of diversion flows as formerly done by the State of Illinois. The Corps of Engineers' new mission became effective 1 October 1987.

SIGNIFICANT HYDROLOGIC EVENTS

During WY 1994, a total of 25.71 inches of precipitation fell at the National Weather Service O'Hare Weather Station. This recorded precipitation for 1994 is 28% less than the long term (1951-1990) average of 35.82 inches. The recorded monthly rainfall data during WY 1994, and the deviation from long term annual and monthly average precipitation, are tabulated in Table 1.

TABLE 1

WY 1994 MONTHLY AND ANNUAL PRECIPITATION (INCHES)
NATIONAL WEATHER SERVICE O'HARE WEATHER STATION

Month	1994 Precipitation	1951-1990 Average Precipitation	Deviation	% of Average
Oct-93	2.19	2.41	-0.22	91
Nov-93	1.52	2.92	-1.40	52
Dec-93	1.00	2.47	-1.47	40
Jan-94	1.77	1.53	0.24	116
Feb-94	2.56	1.36	1.20	188
Mar-94	1.09	2.69	-1.60	41
Apr-94	2.20	3.64	-1.44	60
May-94	0.58	3.32	-2.74	17
Jun-94	6.09	3.78	2.31	161
Jul-94	1.62	3.66	-2.04	44
Aug-94	4.05	4.22	-0.17	96
Sep-94	1.04	3.82	-2.78	27
Annual	25.71	35.82	-10.11	72

OTHER SIGNIFICANT EVENTS

The Third Technical Committee completed its work with the final report released in August 1994. The committee's mission was to review the diversion accounting procedures and assure that the "best current engineering practice and scientific knowledge" is being applied by the Corps of Engineers in computing the diversion. The report was included as an appendix in the WY 1993 Annual Report.

A separate, detailed chronology of significant non-hydrologic events is included in appendix A of this Water Year 1994 Annual Report.

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 1990. The WY 1991 and WY 1992 Lake Michigan Diversion Accounting Reports are certified and included as appendices B and C of this Water Year 1994 Annual Report. The State of Illinois diverted 3,555 cfs during WY 1991 and 3,409 cfs during WY 1992. These diversions are 355 cfs and 209 cfs greater than the 3,200 cfs 40 year average diversion specified in the 1980 modified decree. Table 2 shows the accounting year, the certified flows, the running average flows, and the cumulative deviation from the allowable diversion of 3,200 cfs.

TABLE 2

STATUS OF THE STATE OF ILLINOIS DIVERSION
UNDER THE 1980 MODIFIED U.S. SUPREME COURT DECREE

Accounting Year	Certified Flow (cfs)	Running Average (cfs)	Cumulative Deviation (cfs)
1981	3,106	3,106	94
1982	3,087	3,097	207
1983	3,613	3,269	-206
1984	3,432	3,310	-438
1985	3,472	3,342	-710
1986	3,751	3,410	-1,261
1987	3,774	3,462	-1,835
1988	3,376	3,451	-2,011
1989	3,378	3,443	-2,189
1990	3,531	3,452	-2,520
1991	3,555	3,461	-2,875
1992	3,409	3,457	-3,084

The running average diversion for the period WY 1981 through WY 1992 is 3,457 cfs, 257 cfs greater than the 3,200 cfs 40 year average diversion specified by the modified decree. Also, the annual average diversion has twice exceeded the 3680 cfs annual limit, the maximum number of times allowed in the decree. None of the years have exceeded the absolute annual maximum of 3840 cfs. The cumulative deviation, the sum of the differences between the annual average flows and 3,200 cfs, is -3,084 cfs-years. The negative cumulative deviation indicates a cumulative flow deficit. The decree specifies a maximum allowable deficit of 2,000 cfs- years over the first 39 years of the 40 year averaging period.

Christopher B. Burke Engineering, under contract to the Corps of Engineers, computed the diversion and prepared the accounting reports for WY 1991 and WY 1992

with assistance and detailed review provided by the Corps of Engineers. Data collection and preparation, diversion computation, and report writing for the WY 1993 accounting report is being performed by the Corps. Data collection and preparation for this report began in Fiscal Year (FY) 1993. Certification of the WY 1993 accounting report is scheduled for FY 1996.

SOURCES OF DIVERSION

The Lake Michigan diversion consists of three primary components. These components are domestic pumpage from Lake Michigan used for water supply and not returned to Lake Michigan, stormwater runoff from the diverted Lake Michigan watershed, and direct diversions through the three lakefront control structures.

Domestic pumpage from Lake Michigan is used for water supply and its effluent is discharged to the canals by various Water Reclamation Plants (WRP's). Currently, the WRP's that divert domestic pumpage from the lake either discharge to the canal system or to the Des Plaines River and its tributaries. In the future as more communities convert to Lake Michigan water supply, water supply effluent may also b discharged to the Fox River. The Fox River is approximately 35 miles west of downtown Chicago.

Stormwater runoff that previously drained to Lake Michigan through the Chicago River and the Calumet River now drains to the Chicago Sanitary and Ship Canal (CSSC) and the Calumet Sag Channel, respectively. The Calumet Sag Channel drains to the CSSC, and the CSSC ultimately drains into the Illinois River and the Mississippi River. The drainage area of the diverted Lake Michigan watershed is approximately 673 square miles.

Direct diversion locations are at the Chicago River Controlling Works (CRCW), the O'Brien Lock and Dam, and the Wilmette Controlling Works. These controlling structures are located downtown, at the south end, and at the north end of the Chicago area, respectively.

The direct diversion consists of four components; lockage, discretionary flow, navigation makeup flow, and leakage. The lockage component is the flow used in locking vessels to and from the lake. The purpose of the discretionary diversion is to dilute effluent from sewage discharges. When large storms are forecast, the canal is drawn down before the storm to prevent flooding. If the runoff is not enough to refill the canal, navigation makeup water is passed. The leakage component is water estimated to pass, in an uncontrolled way, through or around the lakefront structures.

ACCOUNTING PROCEDURES

Diversion accounting uses both measured and estimated flows. A series of hydrologic and hydraulic computer models use various meteorological data to simulate flows not measured. These simulated flows as well as measured flows are used to compute the diversion. Along with the diversion calculation, a number of water budgets verify simulated flows and estimate the reliability of the computed diversion.

DIVERSION COMPUTATION

An acoustic velocity meter (AVM) was installed and has been operating at Romeoville (five miles upstream of the Lockport Powerhouse and three miles upstream of the Lockport Controlling Works) since 12 June 1984. The AVM directly measures total flow through the canal above both the Powerhouse and the Controlling Works. The overwhelming majority of the Lake Michigan diversion and some non-Lake Michigan flows pass through the AVM. The diversion accounting procedure uses the flow measured at Romeoville and deducts flows not accountable in the diversion. Diversion flows which bypass Lockport are added to yield the net computed diversion of water from Lake Michigan. This procedure represents the accounting technique as required by the modified Supreme Court Decree.

Water was diverted by the Federal government during the April-May 1992 Chicago tunnel flood in order to lower the river level and reduce hydrostatic pressure on the tunnel. This action was approved by the U.S. Army Corps of Engineers, North Central Division to facilitate efforts to cease the flow of river water entering the tunnel breach. The diverted water, while measured by the AVM, is not part of Illinois' diversion from Lake Michigan because it falls under the category of federal emergency uses. Consequently, it is deducted from the AVM record.

The flow measured at Romeoville was approximately 106% of the annual diversion during WY 1991 and 113% during WY 1992, the later flow being higher due to the Chicago tunnel flood. Approximately 97% of the diverted water was measured by the AVM during WY 1991 and 94% during WY 1992, the later diversion being reduced due to the influx of western suburbs using Lake Michigan water as their primary domestic water supply source. Most of these new users of Lake Michigan water in WY1992 do not discharge their sewage effluent to the canal system. As more communities are added, more water will be discharged outside the canal system, further lowering the percentage measured by the AVM.

Deductions from the Romeoville AVM flow include runoff from 217 square miles of the Des Plaines River watershed discharged to the canal, groundwater supply effluent and groundwater seepage into the Tunnel and Reservoir Plan (TARP) tunnels discharged to the canal, and Indiana water supply discharged to the canal through the Calumet River

system and the Calumet Sag Channel (see figure 1 for locations). The computer models of the Des Plaines watershed area estimate the runoff deduction. The groundwater pumpage deductions are obtained directly from pumping records. The Indiana water supply is computed from pumping records and a calculation to determine the portion of the water supply draining west to the Calumet Sag Channel.

The additions for diversion flow that do not flow through Romeoville are primarily Lake Michigan water supply pumpage effluent treated and released to the Des Plaines River or its tributaries. This flow is obtained directly through pumping records of the communities involved and accounts for 3.3% of the diversion in WY 1991 and 5.6% in WY 1992. As more communities convert to Lake Michigan water supply, the percentage will increase.

DIVERSION BUDGET CHECKS

Water budgets verify those flows not measured. Most of the budgets compare simulated flows to recorded flows and these comparisons indicate the accuracy of the diversion accounting. The four primary budgets are the budgets for the three major Water Reclamation Plants (WRP's) that serve the area involved in diversion accounting and the canal balance budget for the CSSC. The Upper Des Plaines pump station budget will also become a significant budget after measurement problems are resolved. The remaining budgets estimate runoff from stream gaged areas in the Lake Michigan watershed or are budgets of non-simulated flows such as water supply pumpage. The budgets are discussed in detail in the WY 1991 and WY 1992 accounting reports.

ACCOMPLISHMENTS DURING FY 1994

In each accounting year, various changes to the diversion procedures and other activities help to improve the accuracy and efficiency of the diversion accounting.

REVISION OF COMPUTER MODELS

Modifications were made to the hydrologic runoff models and hydraulic sewer routing models in order to incorporate the conversion to the DSS database. The modified models, used for the WY91 and WY92 accounting, eliminated much of the required data manipulation between two different databases. The modifications are discussed within the individual accounting reports.

THIRD TECHNICAL COMMITTEE

The third Three Member Technical Committee was convened during February 1993. The committee's mission was to review and assess the diversion accounting procedures and to assure that the "best current engineering practice and scientific knowledge" is applied by the Corps of Engineers in computing the diversion. Their work culminated in a report that constitutes appendix H of the WY 1993 Annual Report . The primary recommendations of the Third Technical Committee are summarized below.

a. Release diversion accounting and annual reports in a more timely fashion.

b. Consider recomputing the WY81 through WY83 accounting to reflect AVM based flows through the use of regression equations.

c. Prepare a detailed manual of procedures for diversion accounting.

d. Update the diversion accounting and AVM quality assurance plans.

e. Improve the accuracy and reliability of measured flows at the Upper Des Plaines pumping station.

ACTIVITIES FOR FY 1995 AND 1996

The activities for FY95 and FY96 address the recommendations of the Third Technical Committee.

ACCOUNTING REPORTS

The Accounting Reports for WY 1991 and WY 1992 were completed in FY 1995 and the Accounting Reports for WY 1993 will be completed in FY 1996. Thereafter, additional accounting reports are expected to be completed in the second fiscal year following the end of the water year for which the diversion is computed.

DIVERSION ACCOUNTING MANUAL

A manual will be finalized during FY 1996 to describe in detail the steps in the diversion accounting procedure. The manual will include any updates and modifications up to and including the WY 1992 Accounting Report. This manual is currently 90 percent complete and will be included as an appendix to the WY 1995 Annual Report.

FLOW MEASUREMENTS

Due to significant measurement problems that exist at the Upper Des Plaines pumping station, flow measurements will be conducted during WY 1996 to assess the accuracy of existing pump measurements. Based on the measurements, either the existing pumps will be recalibrated or additional measurement devices will be permanently installed to provide a consistently accurate and reliable means of measuring the flows. Accurate measurements are necessary so that the full advantage of this facility as a calibration point for the diversion models may be realized. The extent of the flow measurements taken, and therefore the immediate usefulness of this location as a calibration point, is subject to funding constraints.

FOURTH TECHNICAL COMMITTEE

The Fourth Technical Committee will be under contract in mid FY 1996. The Committee is expected to finish its work in early FY 1997.

SUMMARY AND CONCLUSIONS

SUMMARY

The Lake Michigan Diversion Accounting procedure continues to evolve and improve. Further improvements will occur during the WY 1993 diversion accounting. The implementation of the more efficient DSS database will allow for a more timely release of the WY 1993 accounting report and all future reports. A comprehensive manual will also be completed during FY 1996 to include all the improvements.

CONCLUSIONS

The Lake Michigan Diversion Accounting Reports for WY 1991 and WY 1992 have been completed as required by the Supreme Court Decree.

The State of Illinois diverted 3,555 cfs during WY 1991 and 3,409 during WY 1992. These flows are 355 cfs and 209 cfs greater than the 3,200 cfs limit specified in the decree. The running average of the diversion for WY 1981 through WY 1992 is 3,457 cfs, or 257 cfs over the annual allocation. The cumulative deviation is now -3,084 cfs-years. The negative sign indicates a cumulative flow deficit. The maximum allowable cumulative flow deficit specified in the decree is 2,000 cfs-years.

APPENDIX A

SIGNIFICANT EVENTS (NON HYDROLOGIC)

DATE	CORRESPONDENCE DESCRIPTION
15-Nov-93	Letter from IDOT to Chicago District requesting that, when the Diversion Accounting reports for Water Years 1986-89 are sent out, language in the letter of transmittal which mentions the excessive leakage at the federal lakefront structures is included
30-Nov-93	Letter from Chicago District to IDOT stating that Chicago District just received direction to disseminate the Lake Michigan Diversion Accounting reports for Water Years 1986-1989 with leakage through lakefront structures as part of the State of Illinois' diversion
08-Dec-93	Memo from CENCC-ED-HW to CENCD-PE-ED-HW enclosing Chicago District's Water Control Section Annual Report covering Water Year 1993
10-Dec-93	Letter from Chicago District to Solicitor General of the U.S. Department of Justice enclosing the Joint Annual Report for Water Years 1990-92 and discussing excess diversion
28-Dec-93	Letter from Chicago District to the Town of Schererville, Department of Public Works requesting daily treated municipal water supply pumpage for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Village of Riverwoods requesting monthly domestic water supply pumpage from Lake Michigan through Deerfield for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Texaco Refining and Marketing Inc. requesting daily values of treated storm water discharge into the Chicago Sanitary and Ship Canal from the Lockport facility for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Uno-Ven Corporation requesting monthly values (daily averages) of water removed from the Chicago Sanitary and Ship Canal and monthly values (daily averages) of water discharged to the canal during Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Whiting Filtration Plant requesting daily treated municipal water supply pumpage for Whiting during Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Underwriters Laboratories Inc. requesting daily surface runoff discharged to the North Branch Chicago River for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Thorn Creek Basin Sanitary District requesting daily measured discharge from the TCBSD Sewage Treatment Plant to Thorn Creek for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Calumet Flexicore Corp. requesting daily water discharges into the Grand Calumet River for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to City of Chicago Heights, Water Department requesting daily pumpage rates of Lake Michigan water supplied by Hammond, Indiana to the city of Chicago Heights and Lake Michigan water supply pumpage rates by the city of Chicago Heights to Glenwood for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Consumer Illinois Water Company, Will County Office requesting average daily discharges during Water Years 1991 and 1992 for the Consumer Illinois Water--Plum Creek, Willowbrook and University Park sewage treatment facilities

DATE	CORRESPONDENCE DESCRIPTION
28-Dec-93	Letter from Chicago District to Village of Deerfield requesting measured daily discharge from the Deerfield Sewage Treatment Plant to the North Branch Chicago River for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Homewood Department of Public Works requesting daily measured discharge from the Homewood Sewage Treatment Plant to Butterfield Creek for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Indiana Department of Environmental Management requesting total daily groundwater pumpages for Dyer and St. John during Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Indiana Department of Water Management requesting monthly average discharges for the Dyer, Schererville, Hammond and East Chicago for Water Years 1991 and 1992 sanitary treatment facilities
28-Dec-93	Letter from Chicago District to Indiana Department of Natural Resources requesting total daily withdrawals from Lake Michigan for Hammond and East Chicago for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Illinois Department of Transportation requesting Lake Michigan daily and/or yearly water supply values for all applicable entities contained in the LMO-2 monthly pumpage reports and annual Lake Michigan allocation and unaccounted-for-flow summaries and the Lake Michigan Water Supply Distribution Network Diagram for Water Years 1990, 1991 and 1992
28-Dec-93	Letter from Chicago District to Illinois Environmental Protection Agency requesting daily values of water discharged to Thorn Creek from Material Service Yard #41, to Summit Conduit from Material Service Yard #19 and daily discharge values for Marblehead Lime and Rhone-Poulenc Basic Chemical for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to North Shore Sanitary District requesting daily measured discharge form the NSSD Clavey Sewage Treatment Plant to the North Branch Chicago River for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Rhone-Poulenc Basic Chemical requesting daily measured discharge to Thorn Creek for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Acme Steel Company requesting daily river water discharges to MWRD sewers for Acme Steel facilities in Chicago and Riverdale for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Argonne National Laboratories requesting daily water withdrawals from the Sanitary and Ship Canal for Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Village of Glenview requesting monthly water supply for Glenview Naval Air Station during Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to LTV Steel requesting Calumet River water discharged to the Calumet Water Reclamation Plant by LTV Steel during Water Years 1991 and 1992

DATE	CORRESPONDENCE DESCRIPTION
28-Dec-93	Letter from Chicago District to Republic Engineering Steel requesting Calumet River withdrawals discharged to the Calumet Water Reclamation Plant via city sewers during Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Village of Libertyville, Department of Public Works requesting daily Lake Michigan water supply pumpage during Water Years 1991 and 1992
28-Dec-93	Letter from Chicago District to Metropolitan Water Reclamation District of Greater Chicago requesting monthly treatment plant reports for Stickney WRF, Northside WRF, Calumet WRF and Lemont WRF, date and quantity of all backflows to Lake Michigan, recycle flows for the 3 major MWRDGC facilities, estimates of leakage through the outfall structures that allow canal water to enter into the sewer system of the 3 major MWRDGC facilities, Upper Des Plaines Pumping Station flows, and the estimated quantity of water transferred to the Northside Water Reclamation Facility from the O'Hare and Egan facilities' watersheds
05-Jan-94	Memo from CENCC-ED-HW to CENCD-PE-ED-HW enclosing Chicago District's updated Water Control Section Annual Report covering Water Year 1993 with additional information as requested
11-Jan-94	Letter from Chicago District to Indiana Department of Natural Resources, Division of Water requesting total daily withdrawals from Lake Michigan for Hammond and East Chicago during Water Years 1991 and 1992
13-Jan-94	Letter from Chicago District to Kevin Oberg, USGS, requesting aggregate groundwater withdrawals with township, range, hydrologic and county identifiers
21-Jan-94	Letter from Chicago District to USGS enclosing information regarding the 3 lakefront control structures, construction drawings of the Chicago River Controlling Works, O'Brien Lock and Sluice Gates and the Wilmette Pumping Station and the MWRDGC recorded elevation data at these structures during USGS 1993 periods of measurement
21-Jan-94	Memo from CENCC-ED-HW for CENCD-PE-ED-HW enclosing ten copies of Lake Michigan Diversion Accounting Annual Report Water Years 1990-92 report
31-Jan-94	Letter from IDOT to Chicago District regarding priorities for USGS flow measurements
31-Jan-94	Letter from Chicago District to Consoer Townsend, Envirodyne Engineers, enclosing one copy of Lake Michigan Diversion Accounting Annual Report Water Years 1990-92 and expressing thanks to an employee of Consoer Townsend for his assistance
04-Feb-94	Letter from Chicago District to IDOT enclosing 2 copies of the Lake Michigan Diversion Accounting Annual Reports for Water Years 1990-1992
10-Feb-94	Letter from Chicago District to IDOT responding to IDOT's 20 January letter concerning the Chicago District's evaluation of the leakage of lakefront structures
11-Mar-94	Letter from Chicago District to IDOT replying to IDOT's 31 January letter regarding priorities for USGS flow measurements--this letter also addresses the issue of installing AVM's at the lakefront

DATE	CORRESPONDENCE DESCRIPTION
16-Mar-94	Letter from IDOT to Chicago District concerning flow measurements used in Lake Michigan Diversion Accounting
18-Mar-94	Letter from USGS to Chicago District providing the mean discharge measured at the Chicago River Controlling Works by the ADCP and the discharge estimated by the sluice-gate ratings
24-Mar-94	Letter from Philip Peterson, Assistant Attorney General, State of Wisconsin, to Chicago District regarding Lake Michigan Diversion Accounting Annual Report for Water Years 1990-92 and Wisconsin's concern that Illinois has diverted water in violation of the Supreme Court decree
04-Apr-94	Letter from Chicago District to IDOT replying to IDOT's 16 March letter concerning flow measurements used in Lake Michigan Diversion Accounting
11-Apr-94	Letter from Chicago District to USGS stating editorial and other suggestions for publication of the "Measurements of leakage from Lake Michigan control structures near Chicago, Illinois, April-October 1993" report
03-May-94	Memo from CENCC-ED-H to Office of the Chief Counsel, U.S. Army Corps of Engineers, regarding Lake Michigan Diversion Accounting - Annual Reports, Accounting Reports and Certification
04-May-94	Memo from CENCC-ED-H to CENCC-CO-O regarding funding of Three Member Technical Committee for Lake Michigan Diversion Accounting in FY 1996
05-May-94	Letter from Chicago District to Christopher B. Burke Engineering, LTD enclosing the final "Scope of Work" for Contract Number DACW23-94-D-0008 - Accounting Reports for WY 91 & WY 92 and diversion accounting manual
06-June-94	Letter from IDOT to Chicago District providing comments regarding the draft USGS report on measurement of leakage at the lakefront controlling structures
30-Jun-94	Memo from CENCC-ED-HW to CENCD-ED regarding Lake Michigan Diversion Accounting Draft Water Year 1990 Report
01-Jul-94	Letter from Kevin Oberg, USGS to Michael Heidersheidt, MWRDGC, regarding the possibility of USGS assisting MWRD in validating flow measured by AVMs in the turbine intakes at Lockport by using the ADCP
07-Jul-94	Memo from CENCD-PE-ED-HW with review comments regarding Findings of the Third Technical Committee for Review of Diversion Flow Measurements & Accounting Procedures - Draft July 1994 Report
07-Jul-94	Memo from CECW-EH-W to CENCC-ED-H regarding collection of project funds for operation of hydrologic programs
13-Jul-94	Facsimile from USGS to Chicago District stating editorial and other suggestions regarding the report "Findings of the Third Technical for Review of Diversion Flow Measurements and Accounting Procedures"

DATE	CORRESPONDENCE DESCRIPTION
15-Jul-94	Letter from Chicago District to State of Wisconsin, Assistant Attorney General, responding to Wisconsin's 24 March letter regarding two considerations which make Illinois' violation of the Supreme Court decree less serious than it would otherwise be
20-Jul-94	Letter from USGS to Chicago District regarding review comments of the draft report "Lake Michigan Diversion - Findings of the Third Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures"
20-Jul-94	Letter from Chicago District to Illinois Department of Transportation stating that Dan Injerd of IDOT's Chicago office had been given one draft copy of the Lake Michigan Diversion Accounting Water Year 1993 Annual Report and one draft copy of the Lake Michigan Diversion Accounting Water Year 1990 Report
02-Aug-94	Memo from CENCC-CO to CENCC-ED-HW regarding funds for the National Weather Service and the US Geological Survey
03-Aug-94	Memo from CENCC-ED-HW to CENCD-RM-FA regarding collection of project funds for operation of hydrologic programs
05-Aug-94	Letter from IDOT to Chicago District regarding Illinois comments on draft 1993 Diversion Accounting report
10-Aug-94	Memo from CENCD-PE-ED-WH to CENCC-ED-HW regarding review and approval of Lake Michigan Diversion Accounting draft report for 1990
17-Aug-94	Letter from Joseph Jacobazzi to LTC Slockbower regarding response to IDOT Diversion Accounting comments
22-Aug-94	Letter from Chicago District to IDOT responding to comments on draft 1993 Diversion Accounting report
24-Aug-94	Letter from USGS to Chicago District enclosing 15 copies of the report "Measurement of leakage from Lake Michigan through three control structures near Chicago, Illinois"
14-Sep-94	Letter from Daniel Injerd, IDOT, to Kevin Oberg, USGS, requesting that a USGS representative participate in IDOT's field trips--Michigan requested a briefing on Illinois' efforts to manage Lake Michigan diversion and that a USGS representative be available to discuss flow measurement at Romeoville and the lakefront
23-Sep-94	Memo from CENCC-ED-HW to CENCD-PE-ED-WH regarding cooperative stream gaging costs for FY95

APPENDIX B

LAKE MICHIGAN DIVERSION ACCOUNTING

WATER YEAR 1991 REPORT

Table Of Contents

List of Tables

List of Figures

Executive Summary

In compliance with the modified 1980 U.S. Supreme Court decree (hereinafter, the Decree), the WY91 diversion was computed using the best engineering technology available to date.

Given the complexity of the hydrologic cycle in the heavily urbanized Chicago metropolitan area, and given the number of human and other factors that cannot be adequately represented in numerical modeling procedures, the results of the simulations which compute diversion flows worked exceptionally well.

The WY91 diversion accountable to the State of Illinois is 3,555.3 cfs. This is 355.3 cfs greater than the 3,200 cfs average specified by the Decree. The 40 year running average, rounded to the nearest cfs, beginning with WY81 is 3,461 cfs and the cumulative deviation from the 3,200 cfs average is -2,875 cfs-years. The negative cumulative deviation indicates a water allocation deficit and the maximum allowable debt is 2,000 cfs-years.

Introduction

The diversion of water from the Lake Michigan watershed is of major importance to the Great Lakes states and to the Canadian province of Ontario. The states and province that border the Great Lakes have concerns with both diversions during periods of low lake levels, as well as the long term effects of diversion. To insure that the concerns of these interested parties are considered, the U. S. Army Corps of Engineers has been given the responsibility for the accounting of flow that is diverted from the Lake Michigan watershed.

The Corps of Engineers, Chicago District, is responsible for monitoring the measurements and the computation of the diversion of Lake Michigan water by the State of Illinois. The computations for Water Year 1983 (WY83), WY84 and WY85 (1 October 1984 through 30 September 1985) were completed by the Northeastern Illinois Planning Commission (NIPC) for the Illinois Department of Transportation (IDOT). Prior to the WY83 report, the calculations were made by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) (formerly known as the Metropolitan Sanitary District of Greater Chicago, (MSDGC)) for IDOT. The Corps reviewed, modified, and updated the WY84 and WY85 diversion accounting completed by NIPC. The computations for WY86 were performed jointly by NIPC (under contract to the Corps of Engineers) and the Corps of Engineers. Beginning in WY87, the computations were performed solely by the Corps of Engineers. This report represents the final Lake Michigan diversion accounting for WY91.

Authority for Report

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 Chicago District of the Corps of Engineers is responsible for monitoring the measurement and computation of diversion of Lake Michigan water by the State of Illinois. The Water Resources Development Act of 1986 (Section 1142 of PL 99-662) gave the Corps total responsibility for the computation of diversion flows as formerly done by the State of Illinois. The Corps' new mission became effective 1 October 1987.

History of the Diversion

Water has been diverted from Lake Michigan at Chicago into the Mississippi River Watershed since the completion of the Illinois and Michigan (I and M) Canal in

1848. At that time, diversion averaged about 500 cubic feet per second (cfs). The I and M Canal was built primarily to serve transportation needs providing a connecting watercourse between the Great Lakes and the Mississippi River system.

With the development of the Chicago metropolitan area, sewer and drainage improvements led to severe sanitation problems in 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.

A second problem that occurred during this time period was an increase in the overbank flooding within the city. As more roads were built and buildings constructed, the sewer system was correspondingly expanded. The increase in impervious area from the newly constructed roads and buildings increased the rate and volume of stormwater runoff and resulted in increased flooding.

As a solution to the sanitation and flooding problems, construction of the Chicago Sanitary and Ship Canal (CSSC) was undertaken. Construction of the CSSC allowed the flow direction of the Chicago River to be reversed (Figure 1). Construction of the Chicago Sanitary and Ship Canal was completed in 1900 by the MWRDGC. The CSSC followed the course of the older I and M Canal. The CSSC is much larger than the I and M canal and can handle the Chicago River flow, as well as increased shipping. In the 1930's, the Chicago River Controlling Works (CRCW) was constructed at the mouth of the Chicago River. The CRCW regulates the amount of Lake Michigan water allowed to pass into the river and restricts river flooding from entering Lake Michigan. The water levels in the CSSC are controlled by the Lockport Lock and Dam.

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 regulates the amount of Lake Michigan flow allowed down the channel.

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 O'Brien Lock and Dam, completed in 1967 and located on the Calumet River, regulates the flow of Lake Michigan waters down the Calumet Sag Channel. The O'Brien Lock and Dam replaced the Blue Island Lock and Dam. Figure 2 shows the affected watershed.

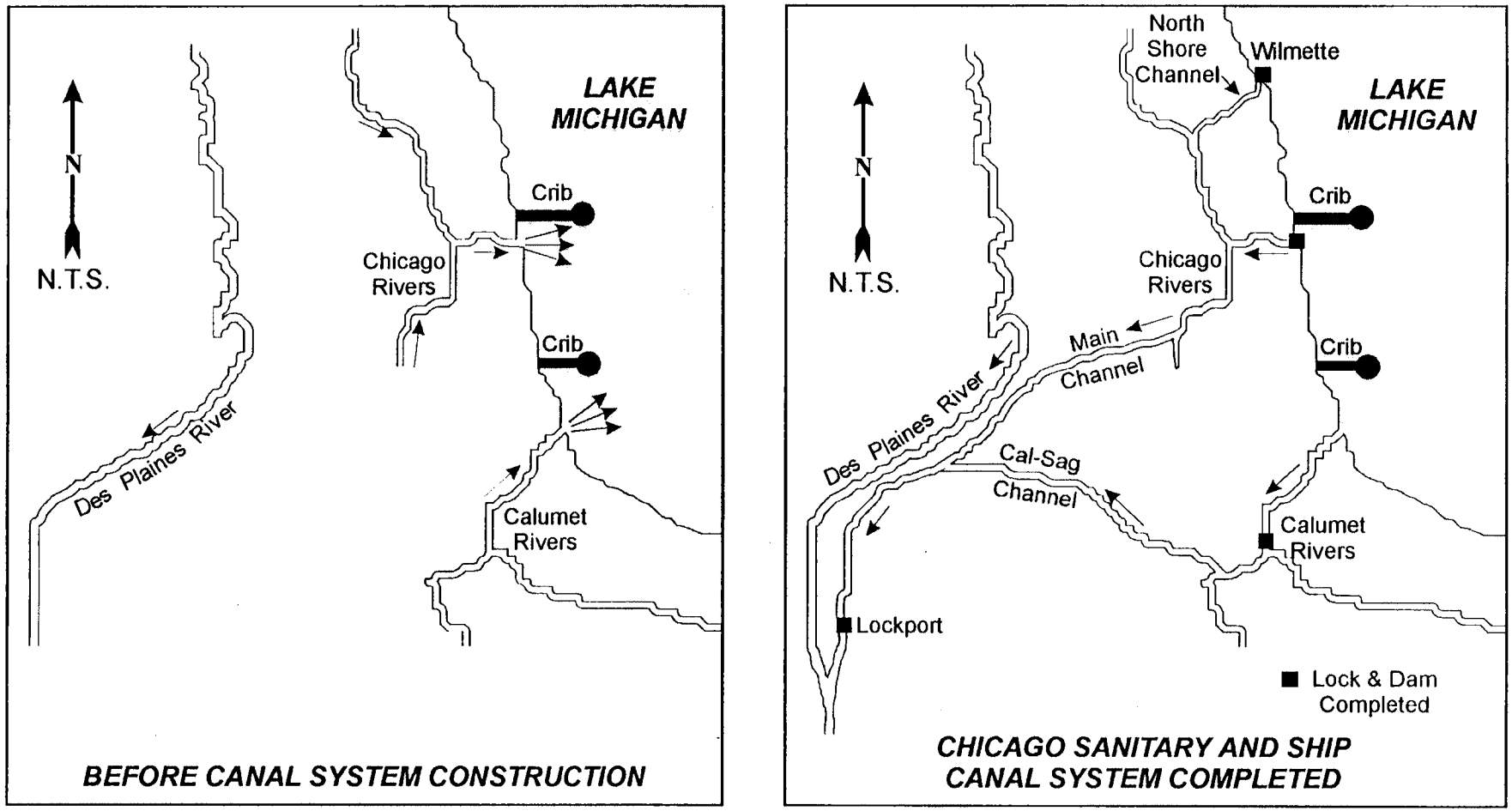


Figure 1

Development of the Chicago Sanitary and Ship Canal System

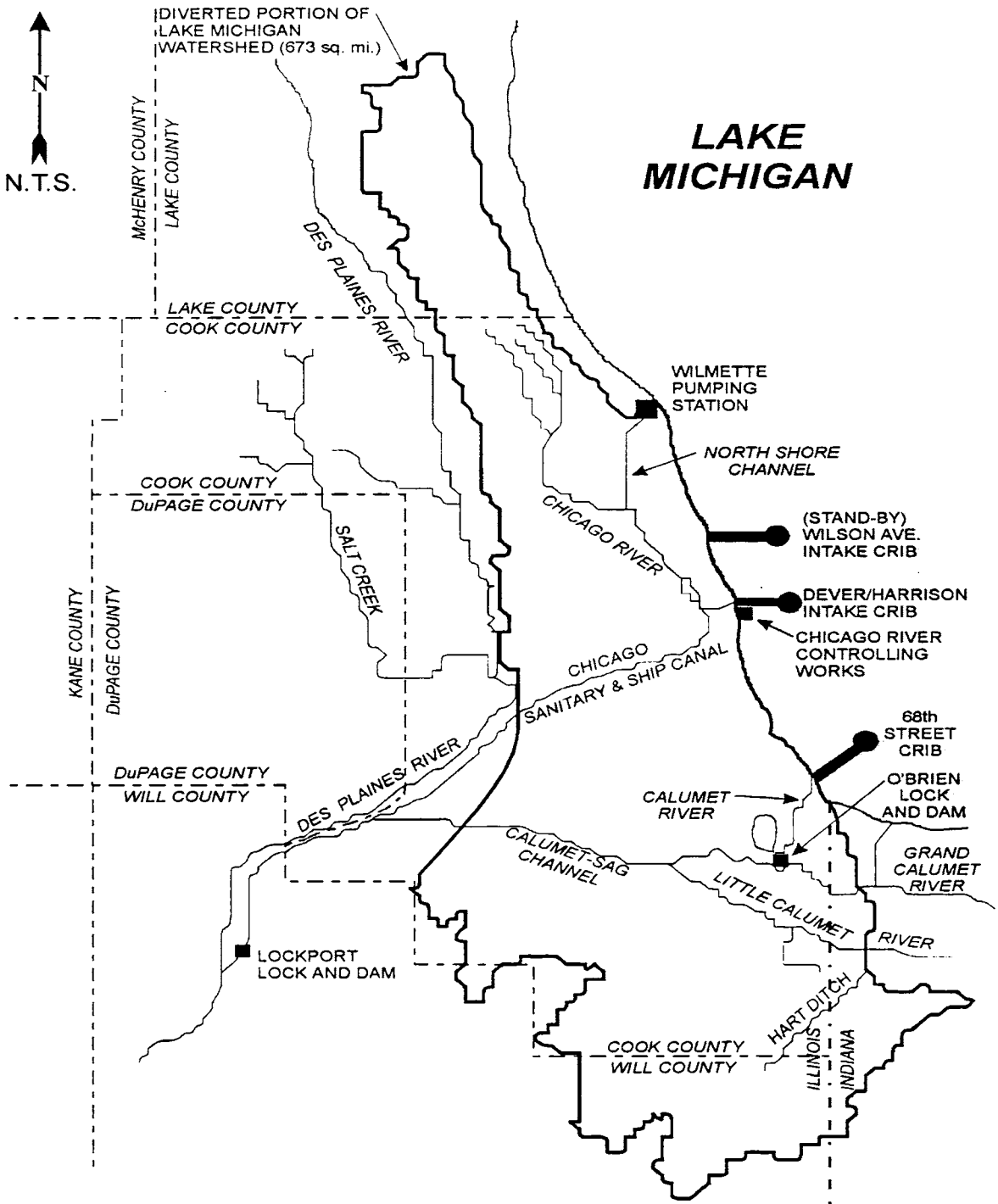


Figure 2

Location Plan - Lake Michigan Diversion at Chicago

Background of Lake Michigan Diversion Accounting

The Lake Michigan diversion accountable to Illinois is limited to 3,200 cubic feet per second (cfs) over a forty (40) year averaging period. During the forty (40) year period, the average diversion in any annual accounting period may not exceed 3,680 cfs except in any two accounting periods in which the average diversion may not exceed 3,840 cfs as a result of extreme hydrologic conditions. During the first thirty nine (39) year period, the maximum allowable cumulative difference between the calculated diversion and 3,200 cfs is 2,000 cfs-years. These limits apply to the period beginning with WY81.

Prior to the 1983 accounting report, diversion accounting was done by the MWRDGC in the form of monthly hydraulic reports. As required by Supreme Court Decree, the diversion was calculated by deducting non-diversion flows from the Lockport record measured by MWRDGC and adding those diversion flows not discharging to the CSSC. All of the deductible flows could not be measured, therefore MWRDGC used flow records from gaged areas to get typical flow values and then extrapolated to arrive at the total deduction.

The State of Illinois contracted with NIPC to revise the diversion accounting calculations. At the same time, the State of Illinois moved from monthly hydraulic reports to annual accounting reports. NIPC adapted computer models of the diverted Lake Michigan and the Des Plaines River watersheds previously developed for studies in Northeastern Illinois under Section 208 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), to calculate those flows that could not be measured. Like MWRDGC, NIPC deducted non-diversion flows from the Lockport record and added those flows not discharged to the canal to calculate the Lake Michigan diversion. However, NIPC modeled both the gaged and ungaged areas to calculate much of the deduction and addition flows. Then computational budgets were developed around each of the gaged areas to verify the models. The budgets aid in identifying problem areas in the procedure. The procedure developed by NIPC is a significant improvement over the previous approach, because of the more rigorous approach and because of the verification provided by the budgets.

As required by Supreme Court Decree, a three (3) member technical committee is convened every five (5) years to evaluate the diversion accounting program to ensure that the accounting is accomplished using the best current engineering practice and scientific knowledge.

The first technical committee was convened during the period when diversion accounting was done by MWRDGC. The committee was primarily concerned with the rating of the various components at the Lockport facility, the primary diversion measurement location (Espey et al, 1981). In response to the Committee's concerns, the Corps' Waterways Experiment Station (WES) revised the ratings of the two sets of Lockport sluice gates (Hart and McGee, 1985).

In response to the Committee's concerns, the State of Illinois installed an acoustic velocity meter (AVM) at Romeoville five (5) miles upstream of Lockport. The AVM is a highly accurate flow measuring device that proved to provide better flow measurements than the MWRDGC reported Lockport flows and the new Corps rating curves. The AVM became operational 12 June 1984. However, USGS did not publish the AVM flows until 1 October 1985. Because of significant equipment problems with the original AVM, a replacement AVM was installed in November 1988.

To provide flows during periods of malfunction, various regression analyses were performed to relate the MWRDGC reported Lockport flows to the AVM flows. Several sets of equations were proposed by the Corps of Engineers, the United States Geological Survey (USGS), Harza Engineering Co., and the Second Technical Committee. The report, *Chicago Sanitary and Ship Canal at Romeoville Acoustical Velocity Meter Backup System*, was completed September 1989 (USACE, 1989). The report documents the many efforts taken by various parties to develop useful regression equations. The regression equations that were ultimately used to estimate missing AVM flows from WY86 through WY91 were developed by the USGS in a report titled *Comparison, Analysis, and Estimation of Discharge Data from Two Acoustic Velocity Meters on the Chicago Sanitary and Ship Canal at Romeoville, Illinois* (USGS, 1994). This report is contained in the Lake Michigan Diversion Accounting WY93 Annual Report.

The second technical committee reviewed the NIPC hydrologic and hydraulic computer models and agreed that the approach was consistent with what was required by the decree (Espey et al, 1987). However, the committee felt that some of the parameters used in the models were out of date and in need of revision. To address the committee's concerns, the Corps hired a consultant (Christopher B. Burke Engineering, Ltd., (CBBEL)) in September of 1988 to review and update the modeling parameters. The final report (CBBEL, 1990) concerning the updating of modeling parameters was submitted to the Corps in October 1990.

The Water Resources Development Act of 1986 gave the Corps of Engineers the full responsibility for computation of the Illinois Lake Michigan diversion as of 1 October 1987. When the Corps' new responsibility became effective, the WY84

diversion accounting report, developed by NIPC, had not been certified. As a result, the Corps was responsible for the WY84 and all subsequent reports.

NIPC completed the WY84 diversion accounting report in April of 1987. It was subsequently reviewed by the Corps. The Corps found the report to be adequate with two exceptions. First, the 1984 accounting was completed with the modeling parameters questioned by the second technical committee. Second, the MWRDGC Lockport flows, which were adjusted using the WES rating curves, were used rather than the AVM flows. The Corps, knowing that the modeling parameters required updating and that AVM flows for the period prior to installation could be calculated accurately using regression equations, refrained from certifying the WY84 report until these issues were resolved.

NIPC completed the WY85 diversion accounting report in December of 1988 and the report was reviewed by the Corps. Like the WY84 report, the WY85 accounting was done with the modeling parameters questioned by the second technical committee. Additionally, NIPC used the AVM flows published by the USGS in their WY85 Water Resources Data for Illinois report. Since the publication of the WY85 USGS report, more reliable equations have been developed for calculating flows when the AVM was malfunctioning. These equations are periodically reviewed and updated as necessary.

Upon completion of the analysis of the modeling parameters by CBBEL, the WY84 and WY85 diversion flows were recalculated using the revised modeling parameters and the Romeoville AVM flows. The diversion flows were certified by the Corps of Engineers and transmitted to all interested parties in the Lake Michigan Diversion Accounting 1989 Annual Report (USACE, 1990).

The computation of Illinois' diversion from Lake Michigan for WY86 was undertaken as a joint effort between NIPC (under contract to the Corps of Engineers) and the Corps of Engineers. The computation of Illinois' diversion from Lake Michigan for WY87 through WY90 was performed solely by the Corps of Engineers. The WY86 through WY89 Diversion Accounting Reports are contained in the Lake Michigan Diversion Accounting Annual Report covering WY90 through WY92 (USACE, 1994).

The primary revision implemented for the WY90 diversion accounting was the incorporation of the new 25-gage precipitation network into the runoff simulation models. The 25-gage precipitation network replaces the previous 13-gage network. The new precipitation network has solved many of the problems associated with the old network, such as poor exposure and distribution patterns. The Illinois State Water Survey (ISWS) installed and maintains the precipitation network for the Corps

of Engineers. They also collect the data and adjust it if necessary. A description of the new 25-gage precipitation network can be found in the ISWS report titled *Installation and Operation of a Dense Raingage Network to Improve Precipitation Measurements for Lake Michigan Diversion Accounting: Water Year 1990* (ISWS, 1991). That report is contained in the Lake Michigan Diversion Accounting WY93 Annual Report.

In addition to the installation and use of the new 25-gage precipitation network was the subsequent modifications to the hydrologic runoff models and hydraulic sewer routing models. These models were revised in order to reflect the changes in the precipitation network. Many of the model changes were accomplished by Rust Environment and Infrastructure under contact with the Corps of Engineers. Their work culminated in a report titled *Diversion Accounting Update for the New 25-Gage Precipitation Network* (Rust,1993). That report is also contained in the Lake Michigan Diversion Accounting WY93 Annual Report.

Rust's work involved review and correction of map delineations of combined sewer special contributing areas, delineation of precipitation gage assigned areas for the 25-gage network, land-use/land-cover delineations, modifications to the hydraulic sewer routing model to reflect the revised precipitation network and land cover assignments, and an assessment of the model parameters used in the hydrologic runoff model, Hydrologic Simulation Program - FORTRAN (HSPF).

The Corps of Engineers modified the hydraulic sewer model, Special Contributing Area Loading Program (SCALP), in separate sewer areas in order to incorporate changes in the precipitation network. Since actual boundaries have not been mapped for those areas some assumptions as to the location of the separate sewer areas were made. This was necessary since effective areas have been applied for the separate sewer areas in the SCALP model. These assumptions will continue until a further study can be accomplished that will reflect actual boundaries for these separately sewered areas.

A study was also done by the Corps to improve the response of the HSPF hydrologic runoff models. Input on parameter improvements were received from NIPC and Rust. The study resulted in some minor parameter modifications to the HSPF runoff model to correct for past inconsistencies and improve parameter accuracy.

Diversion Accounting Procedures

The Lake Michigan diversion accountable to the State of Illinois is calculated by measuring the flow in the Chicago Sanitary and Ship Canal at Romeoville and deducting flows that do not constitute Lake Michigan diversion and are not accountable to the State of Illinois. Finally, additions are made to the Romeoville record for diversions that are not discharged to the canal. The deductions include groundwater water supply pumpage whose effluent is discharged to the canal, runoff from the Des Plaines River watershed that is discharged to the canal, Lake Michigan water supply pumpage from Indiana that is discharged to the canal, and water supply pumpage from Lake Michigan used for Federal facilities that is discharged to the canal. The additions to the Romeoville record include flows diverted from the canal upstream of Romeoville, and Lake Michigan water supply whose effluent is not discharged to the canal. This procedure represents the accounting method required by the Supreme Court Decree.

The diversion accounting results are presented as a series of columns that are listed in Table 1. Column 1 through Column 3 compute the total flow in the CSSC. Column 4 through Column 7 presents the deductions from the canal system flows with the total deduction being presented in Column 8. Column 9 presents the additions to the canal system record. Column 10 is the computed Lake Michigan diversion accountable to Illinois and is equal to the canal system flow minus the deductions plus the additions. Columns 11 through 13 are independent flow estimates for the three sources of diversion: water supply pumpage from Lake Michigan, runoff from the diverted Lake Michigan Watershed, and direct diversion through the lakefront structures. Column 11 through Column 13 are not used in the diversion calculation but are included as another estimate of the diversion for verification of the accounting flows in Column 10. The sum of Column 11 through Column 13 should theoretically equal the flow in Column 10.

In addition to the diversion calculations presented in the 13 columns, 14 computational budgets are prepared as input to the diversion calculation and to verify the estimated flows that cannot be measured. A summary of these budgets is presented in Table 2. Budgets 1 and 2 do not compare simulated to measured flows but are summations of critical water supply pumpage data. Budget 3 through Budget 6 partition stream gage records into runoff and sanitary/industrial discharge components to estimate a portion of the runoff from the diverted watershed that is used as input to Column 12, Runoff from the Diverted Lake Michigan Watershed. Budget 7 through Budget 13 compare simulated to measured flows at MWRDGC facilities. These budgets are for verification of the diversion accounting procedures and give an indication of the accuracy of the diversion accounting models. These

budgets simulate all of the deductible Des Plaines River watershed contained in Column 6 and the deductible groundwater seepage into TARP contained in Column 4. Budget 14 compares canal system inflows and outflows. It is used primarily as a verification of modeling results as well as an indicator of the accuracy and completeness of measured/reported flows.

Table 1

Description of the Diversion Accounting Columns

Column Number	Description
1	Chicago Sanitary and Ship Canal (CSSC) at Romeoville AVM Gage Record
2	Diversion from the CSSC above the Romeoville AVM Gage
3	Total Flow Through the CSSC
4	Groundwater Pumpage Discharged into the CSSC and Adjoining Channels
5	Water Supply Pumpage from Indiana Reaching the CSSC
6	Runoff from the Des Plaines River Watershed which Reaches the CSSC
7	Lake Michigan Pumpage by Federal Facilities which Discharge to the CSSC and Adjoining Channels
8	Total Deduction from the CSSC Romeoville AVM Gage Record
9	Lake Michigan Pumpage Which is not Discharged into the CSSC
10	Total Diversion Accountable to the State of Illinois
11	Pumpage from Lake Michigan Which is Accountable to the State of Illinois
12	Runoff from the Diverted Lake Michigan Watershed
13	Direct Diversions Through Lake Front Control Structures Which is Accountable to the State of Illinois

Table 2

Description of the Diversion Accounting Computational Budgets

Budget Number	Title	Description
1	Diverted Lake Michigan Pumpage	This budget sums the Lake Michigan water diverted by the State of Illinois in the form of Industrial and Municipal water supply. The results of this budget are used in Column 11.
2	Groundwater Discharged to the CSSC	This budget sums groundwater pumpages that are discharged to the CSSC. The results of this budget are used in Column 4.
3	North Branch Chicago River at Niles,IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
4	Little Calumet River at the IL-IN State Line	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
5	Thorn Creek at Thorton, IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
6	Little Calumet River at South Holland, IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
7	MWRDGC Northside Water Reclamation Plant	This budget performs hydrologic and hydraulic simulation of the service basin tributary to the MWRDGC Northside Water Reclamation Facility. The simulations estimates the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Northside service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
8	Upper Des Plaines Pumping Station	This budget performs hydrologic and hydraulic simulation of the MWRDGC Upper Des Plaines Pumping Station. This budget provides a calibration point to verify models of the Des Plaines River watershed
9	MWRDGC Mainstream TARP Pumping Station	This budget performs hydrologic and hydraulic simulation of the MWRDGC Mainstream TARP Pumping Station. The results of this simulation are used in Budgets 10 and 14 and Columns 6 and 12. The budget also provides internal verification of the accounting procedures.
10	MWRDGC Stickney Water Reclamation Facility	This budget performs hydrologic and hydraulic simulation of the service basin tributary to the MWRDGC Stickney Water Reclamation Facility. The simulations estimates the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Stickney service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
11	MWRDGC Calumet TARP Pumping Station	This budget performs hydrologic and hydraulic simulation of the MWRDGC Calumet TARP Pumping Station. The results of this simulation are used in Budgets 12 and 14 and Columns 6 and 12. The budget also provides internal verification of the accounting procedures.
12	MWRDGC Calumet Water Reclamation Facility	This budget performs hydrologic and hydraulic simulation of the service basin tributary to the MWRDGC Calumet Water Reclamation Facility. The simulations estimates the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Calumet service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
13	MWRDGC Lemont Water Reclamation Facility	This budget performs hydrologic and hydraulic simulation of the service basin tributary to the MWRDGC Lemont Water Reclamation Facility. The simulations estimates the runoff from portions of the Des Plaines River watershed within the Lemont service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Column 6.
14	Chicago Canal System	This budget performs a water balance of the Chicago Canal System which includes the CSSC and adjoining channels. This budget provides a verification point for the accounting procedures.

Revisions to the Lake Michigan Diversion Accounting Procedures

The primary revision to the WY91 diversion accounting procedure consisted of converting the computer models used in the accounting to utilize the Corps of Engineers' Data Storage System (DSS) instead of the outdated Time Storage System (TSS). Data stored in TSS databases were difficult to use and several of the computer models used in diversion accounting could not directly read in TSS datasets. The conversion to the DSS allows all of the models used in diversion accounting to utilize the same data, with no conversion between the old TSS and DSS systems. Specifically, the following computer models were updated to utilize the DSS database:

- The HSPF computer models were all updated to use DSS instead of TSS.
- The SCALP computer models were all updated to utilize DSS instead of TSS.
- The TNET computer models were updated to utilize the revised pathnames contained in the DSS files.

Additional revisions to the WY91 diversion accounting procedure included:

- The HSPF computer models were all updated to use Version 11.0 of HSPF. Version 11.0 of HSPF now explicitly includes the frozen ground routines used by the Corps of Engineers in previous diversion accounting reports.
- The WY91 report was updated to include links to the spreadsheet data contained in Tables 4,7 and 8 and Appendix A.

The results of the computer model updates were verified by recomputing the WY90 data and comparing the results. There were minor differences beyond the fifth decimal place (typically less than 0.5% of the total field's value) found that were due to the different level of precision used in the TSS database versus the DSS database. The only other difference that was discovered in the model updates was the frozen ground methodology adopted in Version 11.0 of HSPF differed slightly from the methodology previously used. Specifically, the frozen ground parameters were only applied to the pervious land cover segments in Version 11.0 of HSPF. Previously, the frozen ground parameters were applied to both the pervious and impervious land cover segments. The difference was determined to be minor and the Version 11.0 HSPF implementation of the frozen ground parameters was used for the WY91 results.

Accounting Results

The WY91 diversion accounting monthly summary is presented in Table 4. Table 4 shows the total WY91 Lake Michigan diversion accountable to the State of Illinois is 3,555.3 cfs (Column 10). This is 355.3 cfs greater than the 3,200 cfs average specified by the Decree. The 40 year running average (Table 3), rounded to the nearest cfs, beginning with WY81 is 3,461 cfs and the cumulative deviation from the 3,200 cfs average is -2,875 cfs-years. The negative cumulative deviation indicates a water allocation deficit. The maximum allowable deficit is 2,000 cfs-years. Tabular data on daily diversion flows is presented in Appendix A.

Table 3

Status of the State of Illinois' Diversion from Lake Michigan Under the 1980 Modified U.S. Supreme Court Decree

Accounting Year	Certified Flow (cfs)	Running Average (cfs)	Cumulative Deviation (cfs-years)
1981	3,106	3,106	94
1982	3,087	3,097	207
1983	3,613	3,269	- 206
1984	3,432	3,309	- 438
1985	3,472	3,342	- 710
1986	3,751	3,410	-1,261
1987	3,774	3,462	-1,835
1988	3,376	3,451	-2,011
1989	3,378	3,443	-2,189
1990	3,531	3,452	-2,520
1991	3,555	3,461	-2,875

Table 4
Lake Michigan Diversion Accounting - WY1991
Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF - FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Oct-90	3704.0	1.5	3705.5	116.9	27.8	196.5	2.1	343.1	105.5	**3467.9**	1689.4	1101.7	468.3
Nov-90	4419.3	0.7	4420.0	122.2	27.6	344.4	1.5	495.7	104.3	**4028.6**	1620.4	2301.0	93.2
Dec-90	3372.8	0.4	3373.2	123.1	27.8	215.4	1.9	368.2	95.2	**3100.2**	1616.2	1028.9	74.3
Jan-91	2743.8	1.2	2745.0	123.0	27.5	216.4	2.3	369.2	103.8	**2479.6**	1652.7	769.6	62.4
Feb-91	2746.0	1.1	2747.1	113.7	27.9	162.9	2.0	306.5	105.5	**2546.1**	1640.3	800.9	65.9
Mar-91	4062.7	0.6	4063.3	151.8	27.8	368.8	1.9	550.3	91.5	**3604.5**	1616.4	1703.4	106.2
Apr-91	4651.1	0.6	4651.7	132.7	28.4	403.9	2.2	567.2	101.6	**4186.1**	1623.3	1942.5	172.0
May-91	4234.9	0.8	4235.7	129.1	29.2	254.8	2.3	415.4	119.5	**3939.8**	1769.9	1459.5	285.0
Jun-91	3797.9	1.1	3799.0	88.1	33.3	66.2	2.5	190.1	138.9	**3747.8**	2141.3	345.5	883.6
Jul-91	4011.0	3.3	4014.3	90.7	32.6	24.5	2.9	150.7	162.4	**4026.0**	2391.8	130.7	1359.0
Aug-91	4209.4	2.7	4212.1	102.3	31.2	74.9	2.6	211.0	157.6	**4158.7**	2205.6	512.0	1283.1
Sep-91	3465.8	2.8	3468.6	101.4	29.5	70.2	2.2	203.3	113.1	**3378.4**	1860.8	400.6	776.5
Averages	3784.9	1.4	3786.3	116.3	29.2	199.9	2.2	347.6	116.6	**3555.3**	1819.0	1041.4	469.1

Computations:

1. Column 3 equals the sum of Columns 1 and 2.
2. Column 8 equals the sum of Columns 4 through 7.
3. Column 10 equals Column 3 minus Column 8 plus Column 9.

Deductions from the Romeoville Gage Record

Additions to the Romeoville Gage Record

Discussions of Results

The following is a discussion of the column functions and computational budgets. The discussion of the column functions describes the purpose of each column, as well as some observations on the WY91 values in the columns. The discussion of the computational budgets presents the purpose of each budget and the results of the budget flow balances. The results of the computational budgets are used in the diversion calculations where seven (7) budgets are used to verify the diversion simulation models. The columns are discussed first, followed by the discussion of the budgets.

Columns

The first ten (10) columns display the components of the diversion calculation and include the Romeoville flow, as well as the various deductions and additions to the Romeoville record. The final three (3) columns (Columns 11 through 13) display the three (3) diversion components (Lake Michigan pumpage accountable to Illinois, runoff from the diverted watershed, and direct diversion through the lakefront control structures). The sum of Columns 11 through 13 should theoretically equal the Romeoville based diversion calculation. A comparison of the sum of these three (3) columns to the calculated diversion (Column 10) is presented in the discussion of Column 11 through Column 13.

Column 1: Chicago Sanitary and Ship Canal (CSSC) at Romeoville, USGS AVM Gage Record

The discharge at Romeoville for WY91 was 3,784.9 cfs. For the ten (10) days when the AVM was inoperable in WY91, the flow at the Romeoville site was calculated from the USGS regression equations.

Column 2: Diversions from the CSSC Above the Gage

Argonne Laboratories and Uno-Ven Corporation were the only diversions from the CSSC upstream of the Romeoville gage in WY91. The average withdrawal upstream of the AVM for WY91 was 1.4 cfs.

Column 3: Total Flow Through the CSSC

Column 3 is the sum of Column 1 and Column 2 and represents the total flow entering the canal system. The average CSSC flow was 3,786.3 cfs for WY91.

Column 4: Groundwater Discharged to the CSSC And Adjoining Channels

Column 4 is groundwater supply pumpage by communities, industrial users and other private users whose effluent is discharged to the CSSC. The groundwater pumpage data is reported by the ISWS. It also includes the groundwater seepage into the TARP system that is discharged to the CSSC. This quantity is determined by summing all reported groundwater pumpages tributary to the CSSC, along with the estimated groundwater seepage into the Mainstream TARP (Budget 9) and Calumet TARP (Budget 11) systems. This total is then adjusted by subtracting the groundwater normally tributary to the canal that is contained in the combined sewer overflows that discharge to the Des Plaines River and other watercourses not tributary to the CSSC. This method prevents double accounting of the combined sewer overflow portion of the groundwater supply pumpage.

Using ISWS groundwater records, groundwater pumpages were assumed to reach the CSSC and adjoining channels if they were located in the diverted Lake Michigan watershed in Illinois or if they were located within MWRDGC Water Reclamation Plant (WRP) service boundaries in which their effluent was discharged into the CSSC and adjoining channels. Groundwater seepage into the Mainstream TARP and Calumet TARP systems was determined through simulation and is discussed in Budgets 9 and 11. The groundwater constituent of combined sewer overflows is determined entirely thorough simulation.

Groundwater pumpage from the Lake Michigan watershed whose effluent is discharged to the CSSC is a deduction, except to the extent that the groundwater sources are recharged by Lake Michigan. Current piezometric levels indicate that groundwater is discharging to the lake. Therefore, groundwater pumpage from within the Lake Michigan Watershed that reaches the canal continues to be a deduction. Research literature will be reviewed periodically to verify this assumption.

Column 4 represents a deduction from the Romeoville record and averaged 116.3 cfs. This is an increase of 14.0 cfs from WY90. Groundwater pumpage tributary to the canal is composed of 23.1 cfs of groundwater pumpage from the Lake Michigan watershed, 23.4 cfs of groundwater pumpage from outside of the Lake Michigan watershed, 48.6 cfs of groundwater seepage into the Mainstream

TARP system, and 21.4 cfs of groundwater seepage into the Calumet TARP system. The total of these components is 116.5 cfs. However, the deduction from the Romeoville gage record is 116.3 cfs, since 0.2 cfs of this groundwater supply pumpage was determined, through simulation, to be discharged to the Des Plaines River and other watercourses not tributary to the CSSC in the form of combined sewer overflows.

Column 5: Water Supply Pumpage from Indiana Reaching the CSSC

Column 5 represents the computation of Indiana water supply reaching the canal through the Grand Calumet and the Little Calumet Rivers. In the case of the Little Calumet River, a drainage divide exists east of the confluence with Hart Ditch. Therefore, flows from Hart Ditch, including virtually all dry weather flows, normally flow westward into Illinois. Under high flow conditions, the drainage divide may shift westward and a portion of the Hart Ditch flows may be diverted eastward to Burns Ditch and ultimately to Lake Michigan. However, it is believed that the occurrence in the shift in the drainage divide is infrequent and the flow that is diverted eastward is insignificant. Therefore, it is assumed that all effluent discharged into Hart Ditch and the Little Calumet River west of the divide flow westward. For WY91, total flow in the Little Calumet River was 96.8 cfs, with 5.9 cfs of that flow being determined to be Indiana water supply.

The Grand Calumet River has a summit. On one side of the summit, the flow is toward Lake Michigan. On the other side of the side of the summit, the flow is toward the Calumet Sag Channel which flows into the CSSC. However, the location of the summit is variable and highly influenced by Lake Michigan levels (USGS, 1984). Thus the calculation of this deduction from the Romeoville record is influenced by Lake Michigan levels. In the absence of a stream gaging station on the Grand Calumet River to measure westward flow into Illinois, flow is computed based on a statistical relationship of which the principal variable is lake levels. Beginning with the WY92 accounting, Grand Calumet River flow will be measured by a gage that was installed in 1991 that began officially measuring flows on 1 October 1991.

Flow in the Grand Calumet River is estimated to be in excess of 90% sanitary effluent. Therefore, it is assumed that the portion of this flow that is attributable to domestic water supply is equal to the sum of the daily water supply pumpage for East Chicago, Whiting, and Hammond (whose pumpage includes water supply for Munster, Highland, and Griffith). If the total water supply pumpage for these communities is greater than the flow in the Grand Calumet River, it is assumed that the flow consists entirely of effluent that originates from water supply.

The total Grand Calumet flow reaching Illinois in WY91 was computed as 23.3 cfs. It was determined that all of the 23.3 cfs was water supply pumpage. Therefore, the total WY91 Indiana water supply deduction, including the flow from the Little Calumet and Grand Calumet Rivers is 29.2 cfs.

Column 6: Runoff from the Des Plaines River Watershed Reaching the CSSC

The WY91 average discharge of Des Plaines River watershed runoff reaching the canal (Column 6) is 199.9 cfs. This deduction is determined almost entirely through simulation. The runoff is composed of two elements, surface runoff and subsurface runoff. Surface runoff that enters sewers is referred to as inflow, while subsurface runoff is referred to as infiltration. The infiltration and inflow discharged to the water reclamation plants is 110.9 cfs, the infiltration and inflow reaching the canal through combined sewer overflows is 13.5 cfs and the runoff from the Lower Des Plaines and Summit Conduit areas is 75.6 cfs. The deduction is also influenced by the O'Hare basin flow transfer that contributed 8.8 cfs of the 110.9 cfs runoff to the water reclamation facilities during WY91. The deductible Des Plaines River watershed runoff increased 8.3 cfs from WY90 to WY91. Increased runoff may be partially due to the improvements in the raingage network, as well as the subsequent changes to the hydrologic and hydraulic models.

Column 7: Lake Michigan Pumpage by Federal Facilities Which Discharge to the CSSC

Column 7 represents Lake Michigan diversions for Federal use, not chargeable to the State of Illinois, and is typically comprised of water supply pumpage used by federal facilities. Also included is emergency navigation makeup water used for federal purposes. Column 7 represents a deduction from the Romeoville record and the total amount of the WY91 deduction is 2.2 cfs.

Column 8: Total Deductions from the CSSC Romeoville Gage Record

Column 8 is the sum of Columns 4, 5, 6, and 7 and represents the total deduction from the Romeoville record. The total deduction for WY91 is 347.6 cfs.

Column 9: Lake Michigan Pumpage Not Discharged to the CSSC

This column represents water supply pumpage from Lake Michigan that is not discharged to the canal. The water supply pumpage not discharged to the canal is composed of two components:

- Lake Michigan water supply used by communities serviced by water reclamation facilities that do not discharge to the CSSC (115.1 cfs). This is an increase of 10.9 cfs from WY90.

- The sanitary portion of combined sewer overflows attributable to Lake Michigan domestic water supply that does not discharge to the CSSC (1.5 cfs).

The communities that make up the flow in the first component are suburbs whose treated effluent is discharged to the Des Plaines River and other watercourses not tributary to the CSSC. These communities include Elk Grove Village, Hoffman Estates, Mount Prospect, Schaumburg, Hanover Park, Rolling Meadows, Streamwood, Arlington Heights, Buffalo Grove, Palatine, Wheeling, Lincolnshire, Riverwoods, Libertyville, Illinois Beach State Park, Winthrop Harbor, Zion, Waukegan, 76 percent of North Chicago, and 38.2 percent of Des Plaines. It should also be noted that the Lake Michigan water supply component of the O'Hare flow transfer is subtracted from the total Lake Michigan water supply of the above communities since:

- The O'Hare flow transfer is treated at the Northside WRP which discharges sanitary effluent that is tributary to the CSSC.

- The entire Lake Michigan water supply component of the O'Hare flow transfer is from communities contained in the above list.

The Lake Michigan water supply for these communities is measured, while the sanitary portion of the CSO's is derived through simulation. Column 9 represents an addition to the Romeoville record and the total WY91 addition is 116.6 cfs. This is an increase of 10.9 cfs from WY90 to WY91.

Column 10: Total Diversion

Column 10 is equivalent to Column 3 with the deduction of Column 8 and the addition of Column 9. The total diversion for WY91 is 3,555.3 cfs. This amount is 355.3 cfs greater than Illinois's long term diversion allocation of 3,200 cfs. The 40-year running average diversion, rounded to the nearest cfs, beginning with WY81, is 3,461 cfs and the cumulative deviation from the 3,200 cfs allocation is -2,875 cfs. The negative deviation indicates that the cumulative diversion is greater than an average of 3,200 cfs for the period.

Column 11 Through Column 13: Lake Michigan Diversion Components

Columns 11 through 13 represent the three (3) Lake Michigan diversion components:

- Column 11 - Lake Michigan pumpage accountable to Illinois (1,819.0 cfs)
- Column 12 - Runoff from the diverted Lake Michigan watershed (1,041.4 cfs)
- Column 13 - Direct diversion through the lakefront structures (469.1 cfs)

The sum of the columns (3,329.5 cfs) should theoretically equal the total diversion as shown in Column 10 (3,555.3 cfs), with one exception. The Romeoville record receives effluent that is assumed to contain only 90% of the water supply pumpage, while Column 11 (Lake Michigan water supply pumpage accountable to Illinois) does not account for consumptive use. This is based on a consumptive loss (water supply pumpage that is consumed or lost prior to reaching the water reclamation facilities) estimate of 10% of the water supply pumpage (International Great Lake Diversion Consumptive Use Study Board, 1981).

Because the diversion estimate from Columns 11 - 13 is based on simulation, suspect ratings of the lakefront structures, and simple flow separation techniques, the estimate is not expected to be as accurate as the AVM based calculations. Consequently, a difference between estimates of 225.8 cfs or 6.4% is considered a good balance. However, this discrepancy becomes greater when consumptive use is accounted for in Column 11. The discrepancy in these two (2) estimates is related to the canal system balance in Budget 14, discussed in a subsequent section and potential sources of the discrepancy are addressed in that budget discussion.

Using the figures from these three (3) columns, 54.6% of the WY91 Illinois diversion is attributable to pumpage from Lake Michigan for domestic water supply. Runoff from the diverted Lake Michigan Watershed accounted for 31.3% of the diversion, and direct diversion through the lakefront structures accounted for 14.1% of the diversion. Water supply from Lake Michigan increased 64.3 cfs from WY90 to WY91. This is most likely due to the decrease in basin wide precipitation during WY91. Due to the increased fall runoff that occured in the southern portion of the diverted watershed (some raingages recorded annual rainfall depths of 4"-7" greater than normal), there was a 168.5 cfs increase in runoff from the Lake Michigan watershed that occurred between WY90 and WY91. A more detailed breakdown of these percentages is shown in Table 5 and Figure 3.

Table 5

Breakdown of the Diversion by the State of Illinois
Based on Columns 11 Through 13

Description	Average Flow (cfs)	Percentage of Total Flow
Lake Michigan Pumpage by the State of Illinois	1819.0	54.6%
Runoff from the Diverted Lake Michigan Watershed	1041.4	31.2%
Direct Diversions		
Lockages	88.7	2.7%
Leakages	31.1	0.9%
Navigation Makeup Flow	37.4	1.1%
Discretionary Flow	315.1	9.5%
Total Direct Diversions	472.3	14.2%

Note: The direct diversions shown in Table 5 do not agree with the results contained in Column 13 of Table 4 due to the different rounding methodologies employed. The direct diversions shown in Table 5 is the yearly average of each of the direct diversion components, while the yearly average value shown in Column 13 of Table 4 is the yearly average of each of the monthly averages.

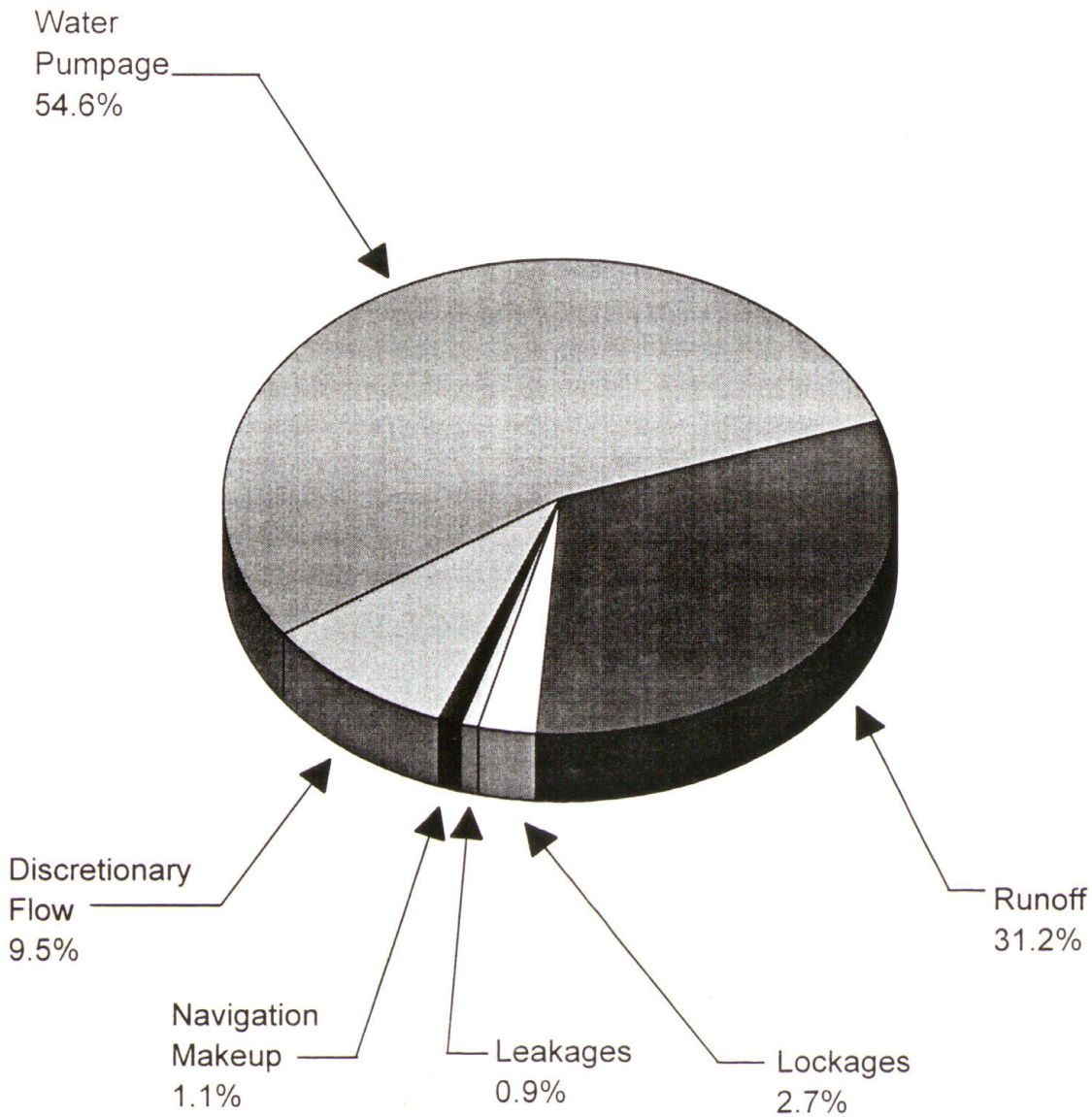


Figure 3

Component Breakdown of Illinois' Diversion Based Upon Columns 11 through 13

Budgets

The first two (2) budgets are used to sum the water supply for the area influenced by the diversion. The next four (4) budgets are of stream gage sites that are not simulated and are used as part of the calculation of the runoff from the diverted Lake Michigan watershed. The remaining seven (7) budgets compare measured and simulated flows and compute Column inputs used in the diversion computations.

Budget 1 and Budget 2: Water Supply Pumpage

Budgets 1 and 2 are summations of critical water supply pumpage data. Budget 1 sums Lake Michigan water supply diverted by the State of Illinois. The Lake Michigan water supply data is supplied by the state as daily values for primary users and monthly data for secondary users. Budget 2 sums groundwater pumpages in the Lake Michigan and Des Plaines River watersheds that are diverted to the CSSC. Groundwater pumpage data is recorded by the ISWS as a total annual withdrawal based on calendar years.

Budget 1: Diverted Lake Michigan Water Supply

Budget 1 represents the summation of Lake Michigan pumpage accountable to the State of Illinois. For WY91, the average annual Lake Michigan pumpage accountable to Illinois is 1,819.0 cfs. This is an increase of 64.3 cfs from WY90. As stated previously, this is most likely due to the decrease in precipitation, especially during the summer months when demand is usually higher.

Budget 2: Groundwater Diverted to the CSSC

Budget 2 is groundwater water supply pumpage by communities, industrial users, and other private users whose effluent is discharged to the canal. The groundwater pumpage data are reported by the ISWS on a calendar year basis. The groundwater quantity is determined by summing all reported groundwater sources in the area tributary to the CSSC, less groundwater not discharged to the CSSC in the form of combined sewer overflows.

Using the ISWS groundwater records, groundwater pumpages were assumed to reach the CSSC and adjoining channels if they were located in the diverted Lake Michigan watershed in Illinois, or if they were located within MWRDGC service

boundaries in which their effluent was discharged into the CSSC and adjoining channels.

The total groundwater pumpage by communities, industrial users, and other private users whose sanitary effluent is tributary to the canal is 46.5 cfs for WY91. It was determined through simulation that 0.2 cfs of this flow never reached the canal. Instead it was discharged to the Des Plaines River or other watercourses not tributary to the canal in the form of combined sewer overflows. The total groundwater pumpage reaching the canal represents an increase of 2.6 cfs from WY90 to WY91.

In addition to groundwater supply pumpage, there was also a significant amount of groundwater infiltration into the two TARP systems that ultimately reached the canal. Mainstream TARP and Calumet TARP accounted for 48.6 cfs and 21.4 cfs, respectively, of groundwater discharged to the canal during WY91.

Budgets 3 Through Budget 6: Stream Gaging Stations

The stream gage budgets are used to make estimates of runoff from portions of the diverted Lake Michigan watershed. Sanitary and other point source flows are subtracted from the stream gaging record to develop the runoff estimates. The runoff estimates are used in Column 12. The flows at the stream gaging sites are also part of Budget 14, the canal system budget.

Table 6 presents the estimated runoff from these budgets. It should be noted that Budgets 4 through 6 are a composite calculation of the runoff above the Little Calumet River at the South Holland gage. It should also be noted that the Little Calumet River is a losing stream (i.e. it recharges groundwater). The computations in deriving runoff account for this when recharge is significant (i.e., when groundwater recharge is computed).

Table 6

Stream Gage Flow Separation

Budget Number	Location	Stream Flow (cfs)	Sanitary Flow (cfs)	Runoff (cfs)
3	North Branch Chicago River at Niles, IL	115.2	18.7	96.5
4	Little Calumet River at IL-IN State Line	96.8	4.0	92.8
5	Thorn Creek at Thorton, IL	170.7	17.0	153.7
6	Little Calumet River at South Holland,IL	256.5	244.5	12.0

Budgets 7 Through Budget 13: MWRDGC Water Reclamation Facilities

The budgets for the water reclamation plants compare the simulated flows to the measured inflows at the MWRDGC facilities and perform verifications of the diversion accounting program. The simulated flows were developed from an estimated sanitary flow with a daily, weekly, and monthly flow variation, from hydrologic precipitation-based runoff models, and from hydraulic sewer routing models. The estimated sanitary flow input to the hydraulic simulation models is based on the population estimates for each plant's service basin. Per capita sanitary flows are determined based on the service basin's water supply minus an assumed 10 percent consumptive loss. Simulated flows were compared with recorded inflows at each facility to assess the accuracy of the simulations.

The discussion of the budgets will concentrate on the results of each simulation as the development of these models have been discussed in previous reports. A summary of the simulation results is presented in Table 7. At all four (4) water reclamation plants and the Upper Des Plaines Pump Station, the simulation results were maintained.

Budget 7: Northside Water Reclamation Facility

Budget 7 analyzes the water balance at the MWRDGC Northside Water Reclamation Facility (Figure 4). The balance for WY91 of the inflow to the Northside facility is very good. The simulated to adjusted recorded inflow ratio (S/R) for the Northside WRP is 0.94, indicating that the simulated inflow volume is slightly less than the adjusted observed inflow volume. The coefficient of correlation (R) of simulated to observed flow is 0.77, indicating that the model predicted the inflow hydrograph to the Northside facility well.

Budget 8: Upper Des Plaines Pump Station

Budget 8 analyzes the water balance at Upper Des Plaines Pump Station (UDPPS) (Figure 5). The pump station budget is used to verify simulated flows. Although it has no direct impact on the diversion calculation, it is intended to be used as a primary calibration point for the models that simulate the deductible runoff from the Des Plaines watershed contained in Column 6. This will be possible only after the existing measurement problems at that site are resolved. This has been discussed in the WY90 diversion report.

The balance at UDPPS for WY91 was reasonable. The simulated to recorded flow ratio (S/R) for the UDPPS is 1.04, indicating that the simulated inflow volume to UDPPS is greater than the recorded inflow volume. However, the daily S/R ratio shows a high degree of variability, indicating that the trends within the recorded and simulated inflow may not correspond very well. The coefficient of correlation (R) of simulated to recorded flow is 0.62, indicating the time series trends in the simulated inflow compared fairly well with the time series trends of recorded inflow. The improved coefficient of correlation is consistent with the results obtained in WY90. The improvement may be the result of removal of periods of questionable data (i.e. pen sticking, no ink, etc.) from the recorded data.

Table 7

WY 1991 Summary of Simulation Statistics

Budget No.	7	8	9	10	11	12	13	14
Description	Northside WRP (1)	Upper Des Plaines Pump Station (1),(3)	Mainstream TARP Pump Station (2)	Stickney WRP (1),(4)	Calumet TARP Pump Station (2)	Calumet WRP (1),(4)	Lemont WRP (1)	Chicago Canal System Balance (1)
Mean Recorded Flow, cfs	439.9	69.0	105.3	1,118.7	45.3	387.3	2.6	3,799.4
Max. Recorded Flow, cfs	764.1	127.1	255.1	2,366.0	135.1	583.0	6.8	17,539.0
Min. Recorded Flow, cfs	157.3	20.4	17.7	667.1	3.8	282.8	1.0	1,823.6
Mean Simulated Flow, cfs	405.0	69.8	97.4	1,146.1	28.1	386.9	1.9	3,439.4
Max. Simulated Flow, cfs	697.5	209.2	240.7	2,950.0	99.7	643.2	5.4	23,658.0
Min. Simulated Flow, cfs	313.3	43.6	40.5	870.5	4.4	304.8	1.3	1,667.9
Mean S/R	0.94	1.04	1.35	1.04	0.81	1.00	0.76	0.90
Max. S/R	2.27	2.93	9.30	1.65	3.39	1.41	3.34	2.20
Min. S/R	0.62	0.55	0.30	0.71	0.20	0.72	0.35	0.56
Correlation	0.77	0.62	0.56	0.83	0.71	0.84	0.76	0.83

(1) Based on daily values.
(2) Based on weekly values.
(3) Does not include days with missing records.
(4) Does not include pumpage from TARP.

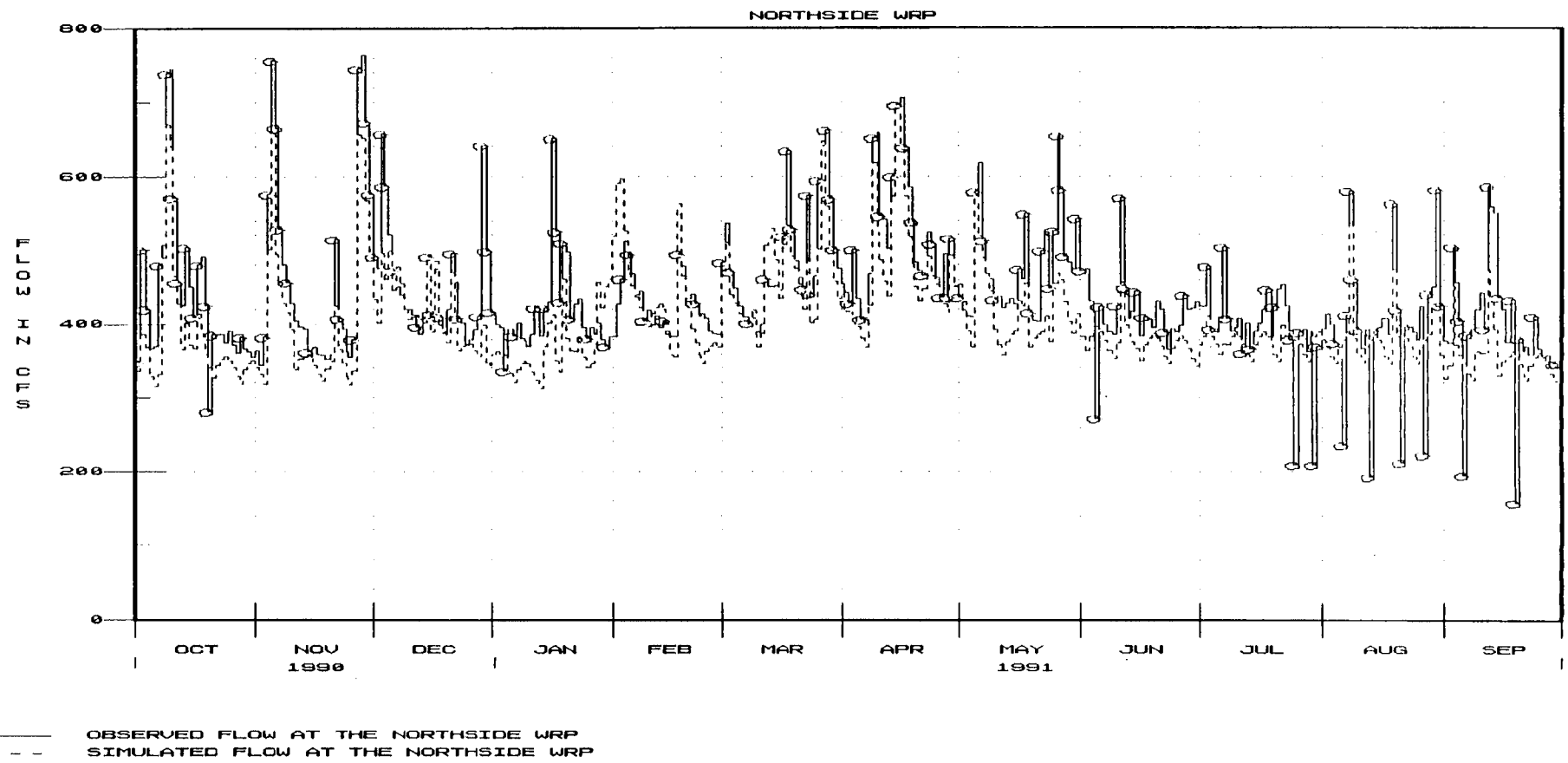

NORTHSIDE WRP
800
600
400
200
0
FLOW IN CFS
OCT
NOV
1990
DEC
JAN
FEB
MAR
APR
MAY
1991
JUN
JUL
AUG
SEP
OBSERVED FLOW AT THE NORTHSIDE WRP
SIMULATED FLOW AT THE NORTHSIDE WRP

Figure 4

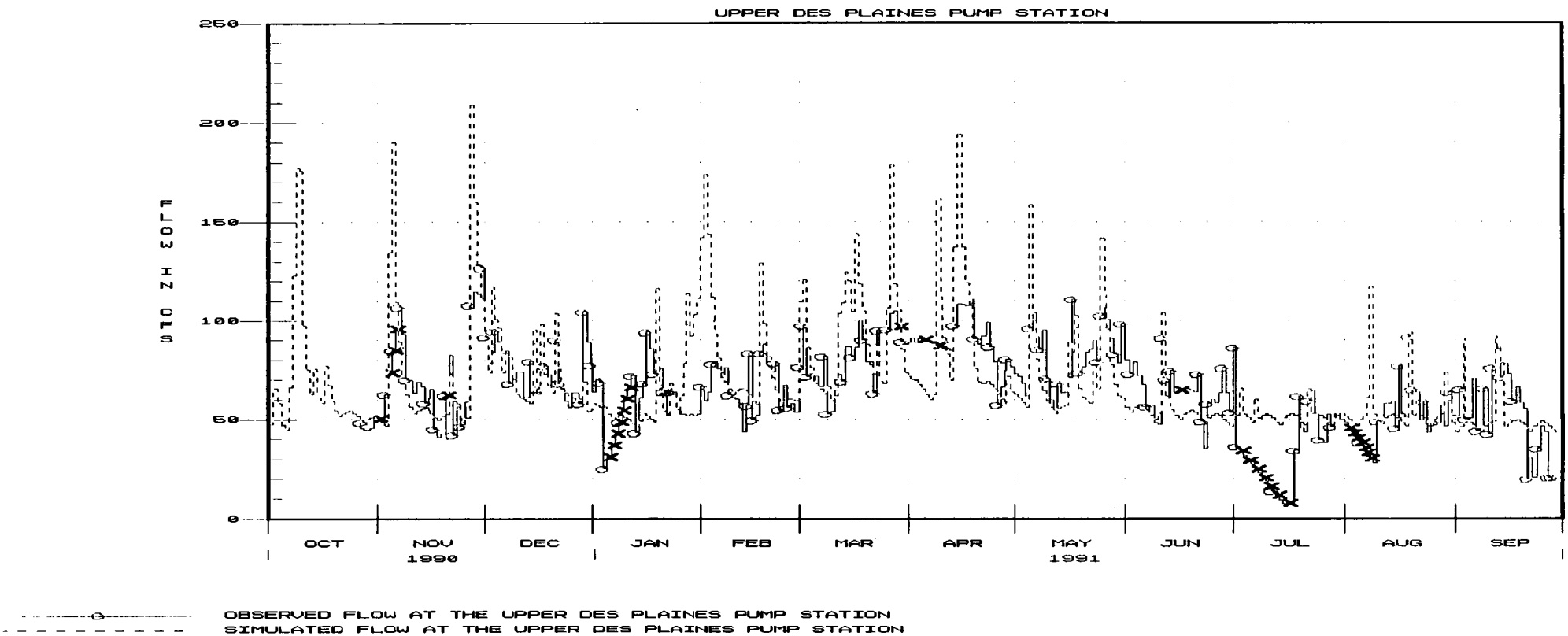


Figure 5

Budget 8 - Simulation of the MWRDGC Upper Des Plaines Pump Station

While the statistical results for WY91 at the Upper Des Plaines Pump Station have been maintained, this does not lead to the conclusion that flow measurement alternatives should not be investigated. This site has continued to experience its share of problems. During WY91, 73 days of records were unavailable that were attributable to meter malfunctions, problems with the recording charts which made data transformation undoable, and various other reasons. In view of the significant quantity of missing data (20.0 % missing data), the quantitative analyses of the simulation are of limited value. Second, the accuracy of the flow meters at the pump station is questionable and unmetered bypass flows are a frequent occurrence. Therefore, total flow may not be measured in storm events and the recycling of flow is possible. Further investigation of the accuracy of flow measurement at the pump station is required to verify and calibrate the simulation models that compute the deductible runoff from the Des Plaines watershed contained in Column 6.

Budget 9: Mainstream TARP Pumping Station

Budget 9 analyzes the water budget at the MWRDGC Mainstream TARP Pumping Station. The results of Budget 9 are used as a verification point for simulated flows. Budget 9 also is used for the purpose of computing a portion of Column 6 (Des Plaines River watershed runoff deduction). The deductible portion of Budget 9 includes groundwater seepage into the TARP tunnel walls and a small amount of Des Plaines River watershed runoff captured by Mainstream TARP as overflows. Until the Des Plaines TARP segment goes on-line, the Des Plaines River watershed runoff conveyed to the Stickney Water Reclamation Plant through TARP tunnels will remain very small. The modeling of Mainstream TARP is performed using the Tunnel Network (TNET) dynamic hydraulic model. A simplified map of Mainstream TARP is contained in Figure 6. A more in-depth description of Mainstream TARP and the simulation model is contained in the Water Year 1986 report which is an appendix to the Diversion Accounting Annual Report for WY90-92 (USACE, 1994).

In analyzing the balance at the Mainstream TARP Pumping Station, weekly flows were used rather than daily flows. While MWRDGC maintains daily pumpage records, days with no pumpage occur frequently. Therefore, it is not possible to compute a daily S/R ratio.

The balance for WY91 of the inflow to the Mainstream Pumping Station is fair. The simulated to recorded flow ratio (S/R) for the Mainstream Pumping Station is 1.35, indicating that the simulated inflow volume is greater than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.56, indicating that there still exists a need for improvement in the ability of the model to predict trends in the pump station flows.

From a review of the plot of the simulated versus recorded flow at the pump station (Figure 7), it appears that the model responds similarly to recorded pumpage record. However, the model is sometimes out of phase with the observed record. This could be the result of simulated pumpages occurring sooner and more frequently than actual pumpages. The TNET model pumps normally turn on sooner and pump more frequently in order to maintain computational stability during a simulation. Additionally, base flows appear to be overestimated in the simulation. This is probably due to overestimation of groundwater infiltration into the TARP tunnels.

In summary, it appears that the simulation of the Mainstream TARP system is reasonable. However, there is concern regarding the estimation of pumpage volume and the difference in simulated and recorded pumpage time series. A review of MWRDGC information regarding Mainstream TARP indicates that bypass flows are discharged to TARP, when available, via drop shaft 11 (DSN 11). Coordination with MWRDGC established that this is a frequent occurrence. This may account for the simulation of a pumpage volume that is greater than the recorded pumpage volume. Records concerning the dates and pumpages back to TARP were not maintained for WY91. Therefore, data necessary to evaluate the impact of pumping back into TARP is not available. Therefore, it was decided that the model would not be adjusted to correct for double accounting of flows.

Budget 10: Stickney Water Reclamation Facility

Budget 10 analyzes the water balance at the MWRDGC Stickney Water Reclamation Facility (Figure 8). Simulated Mainstream TARP pumpages from Budget 9 are no longer combined with simulated interceptor inflow to the Stickney Water Reclamation Facility to derive the total simulated inflow to the Stickney Facility. Instead, only simulated interceptor inflows are compared with recorded interceptor inflows to assess the accuracy of the simulation. The decision to not include TARP pumpages in the treatment plant budgets was based on the fact that the TARP systems are already analyzed in separate budgets. Including TARP pumpages in the treatment plant budgets is detrimental to the statistical results of the treatment plant budgets, since the TARP models generally do not respond as well. When simulations of interceptor flows are treated separately, the response of the hydrologic runoff models (HSPF) and the hydraulic sewer routing models (SCALP) can be better isolated and not diluted by the TARP model results, which are analyzed separately on their own merits and contained in their own budgets (Budgets 9 and 11).

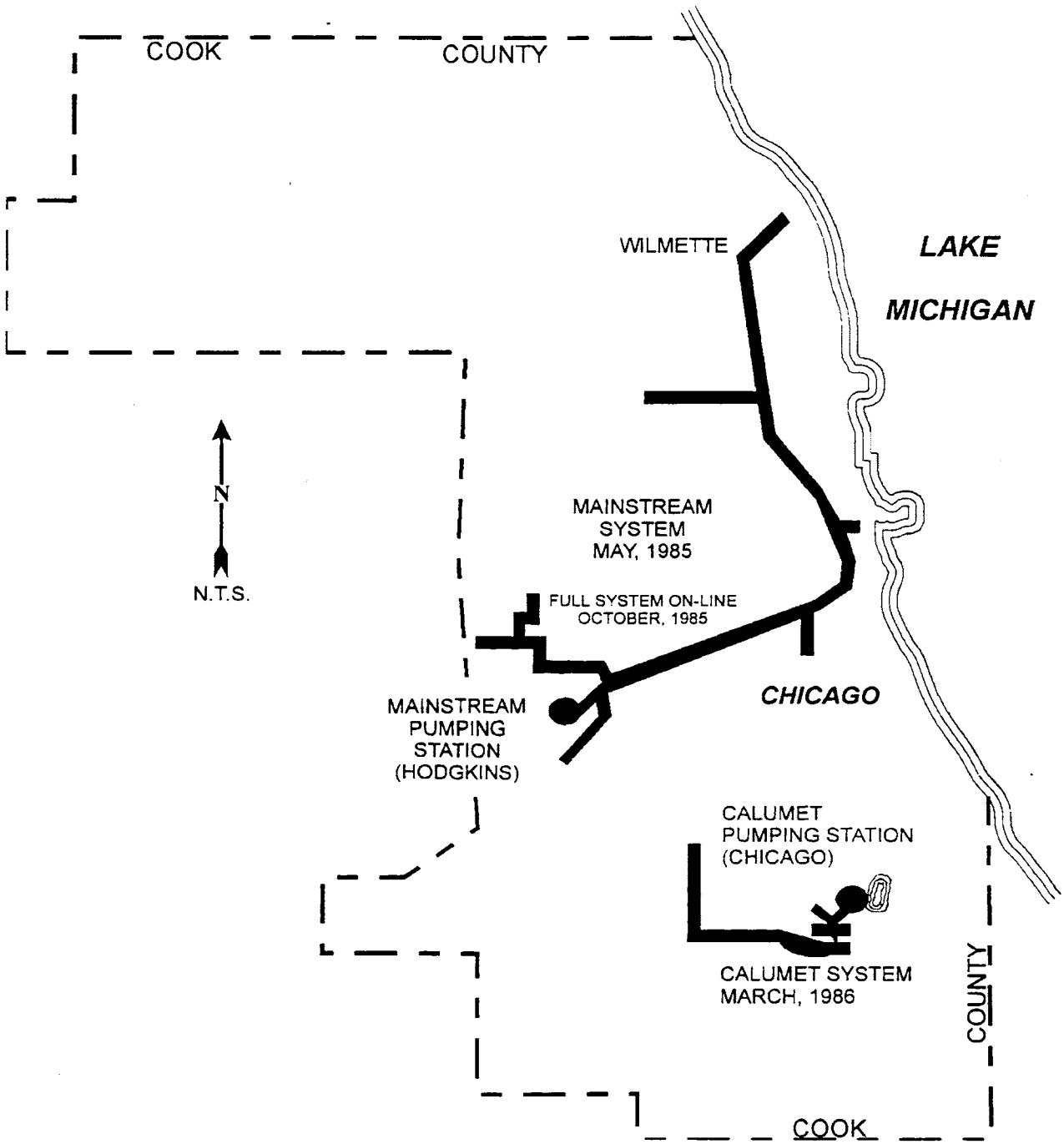


Figure 6

Map of Mainstream and Calumet TARP

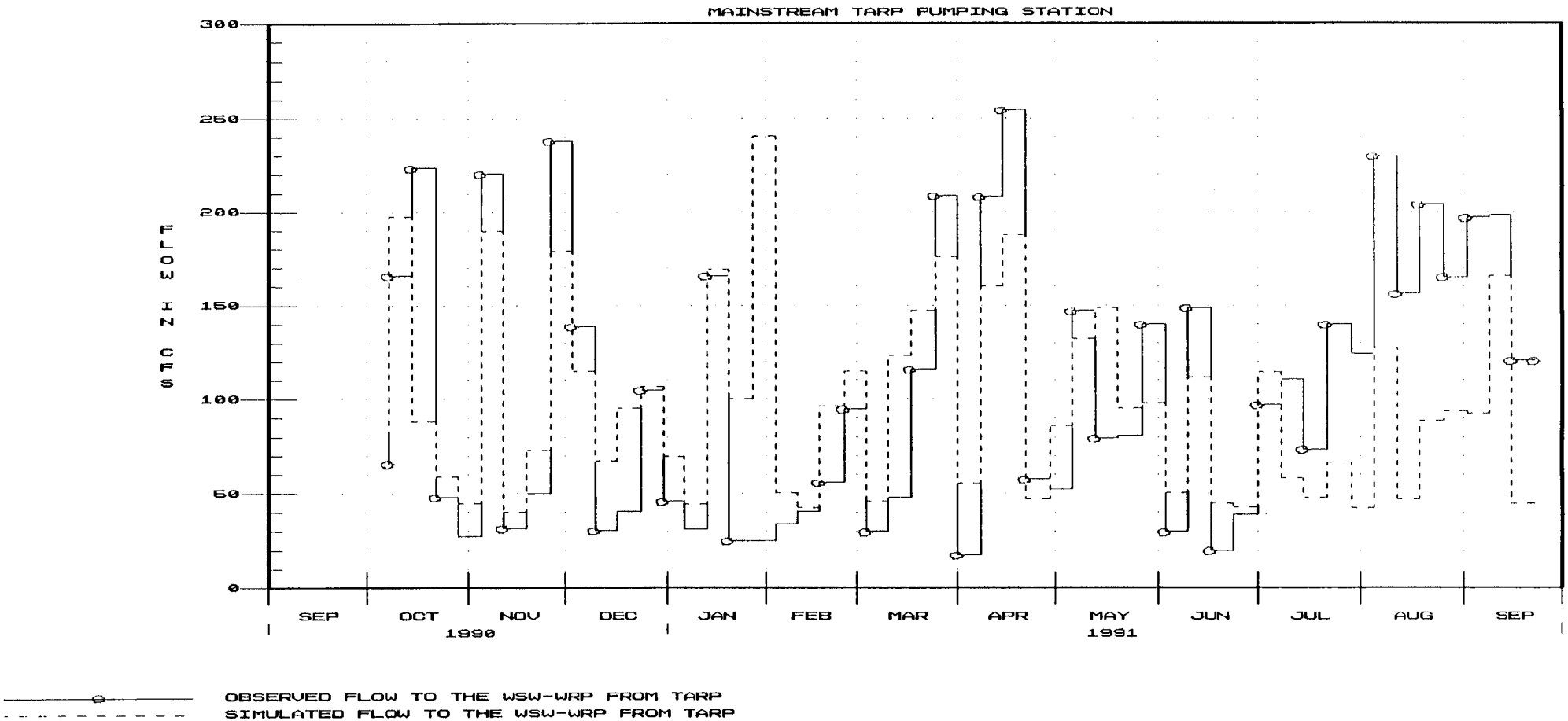


Figure 7

Budget 9 - Simulation of the MWRDGC Mainstream TARP Pumping Station

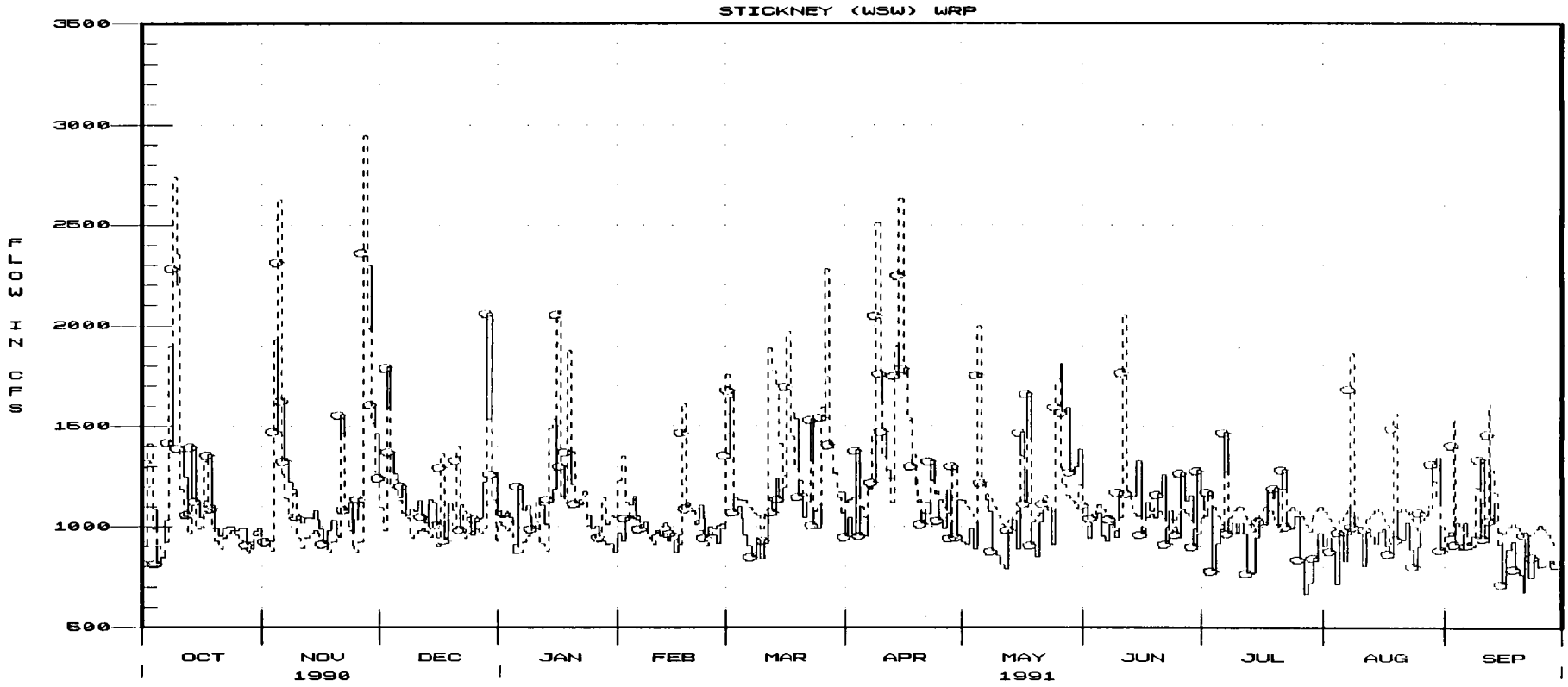

STICKNEY (WSW) WRP
3500
3000
2500
2000
1500
1000
500
FLOW IN CFS
OCT
NOV
1990
DEC
JAN
FEB
MAR
APR
MAY
1991
JUN
JUL
AUG
SEP
OBSERVED FLOW AT THE STICKNEY WRP (NO TARP)
SIMULATED FLOW AT THE STICKNEY WRP (NO TARP)

Figure 8

Overall, the balance for WY91 of the inflow to the Stickney facility is very good. The simulated to recorded flow ratio (S/R) for the Stickney is 1.04, indicating that the simulated interceptor inflow volume is slightly greater than the recorded interceptor inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.83, indicating that the model predicted the interceptor inflow hydrograph to the Stickney facility well.

Budget 11: Calumet TARP Pumping Station

Budget 11 analyzes the water budget at the MWRDGC Calumet TARP Pumping Station (Figure 9). The results of Budget 11 are used as a verification point for simulated flows. The modeling of Calumet TARP is performed using the Tunnel Network (TNET) dynamic hydraulic model. A simplified map of Calumet TARP is contained in Figure 6. A more in-depth description of Calumet TARP and the simulation model is contained in the Water Year 1987 report contained in the Diversion Accounting Annual Report for WY90-92 (USACE, 1994).

In analyzing the balance at the Calumet TARP Pumping Station, weekly flows were used instead of daily flows. While MWRDGC maintain daily pumpage records, days with no pumpage occur frequently. Therefore, it is not possible to compute a daily S/R ratio.

The balance for WY91 of the inflow to the Calumet TARP Pumping Station is fair. The simulated to recorded flow ratio (S/R) for the Calumet TARP Pumping Station is 0.81 indicating that the simulated inflow volume is less than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.71, indicating that there still is a need for improvement in the agreement between the trends of the simulated and observed Calumet TARP pumpages.

From a review of the plot of the simulated versus recorded flow at the pump station (Figure 9) it appears that the model responds similarly to the recorded pumpage record, except that the recorded pumpage often lagged behind the simulated pumpages for WY91.

Volume matching between the simulated and recorded Calumet TARP pumpages also was more difficult for WY91 as evidenced by the 0.81 S/R ratio. Because of the instability of the TARP model, as well as uncertainties in the Calumet TARP system, it was difficult to improve on this ratio. However, as the system is presently modeled, this does not impact the computed diversion, since all Des Plaines River watershed areas whose overflows are modeled as tributary to Calumet TARP are also modeled such that "non-captured" overflows flow to rivers that are tributary to the CSSC. Therefore, whether or not these Des Plaines River

watershed runoff flows enter the tunnel or not, they are presently included in the Des Plaines River watershed runoff deduction in Column 6. This assumption will remain until separately sewered areas are modeled such that actual areas are used instead of effective areas in the hydraulic models. This has been discussed in the WY90 diversion accounting report.

Budget 12: Calumet Water Reclamation Facility

Budget 12 analyzes the water balance at the MWRDGC Calumet Water Reclamation Facility (Figure 10). Simulated Calumet TARP pumpages from Budget 11 are no longer combined with simulated interceptor inflows to the Calumet Water Reclamation Facility to derive the total simulated inflow to the Calumet Facility. Instead, only simulated interceptor inflows are compared with recorded inflows to assess the accuracy of the simulation. This was revised for the same reasons as outlined previously in the discussion for Budget 10.

The annual simulated to recorded flow ratio (S/R) and the coefficient of correlation for the Calumet Water Reclamation Facility are considered very good to excellent. The S/R ratio is 1.00 indicating that the simulated Calumet interceptor flow volume matched the recorded interceptor flow volume. The coefficient of correlation was 0.84 indicating a good correlation between simulated and recorded interceptor flows.

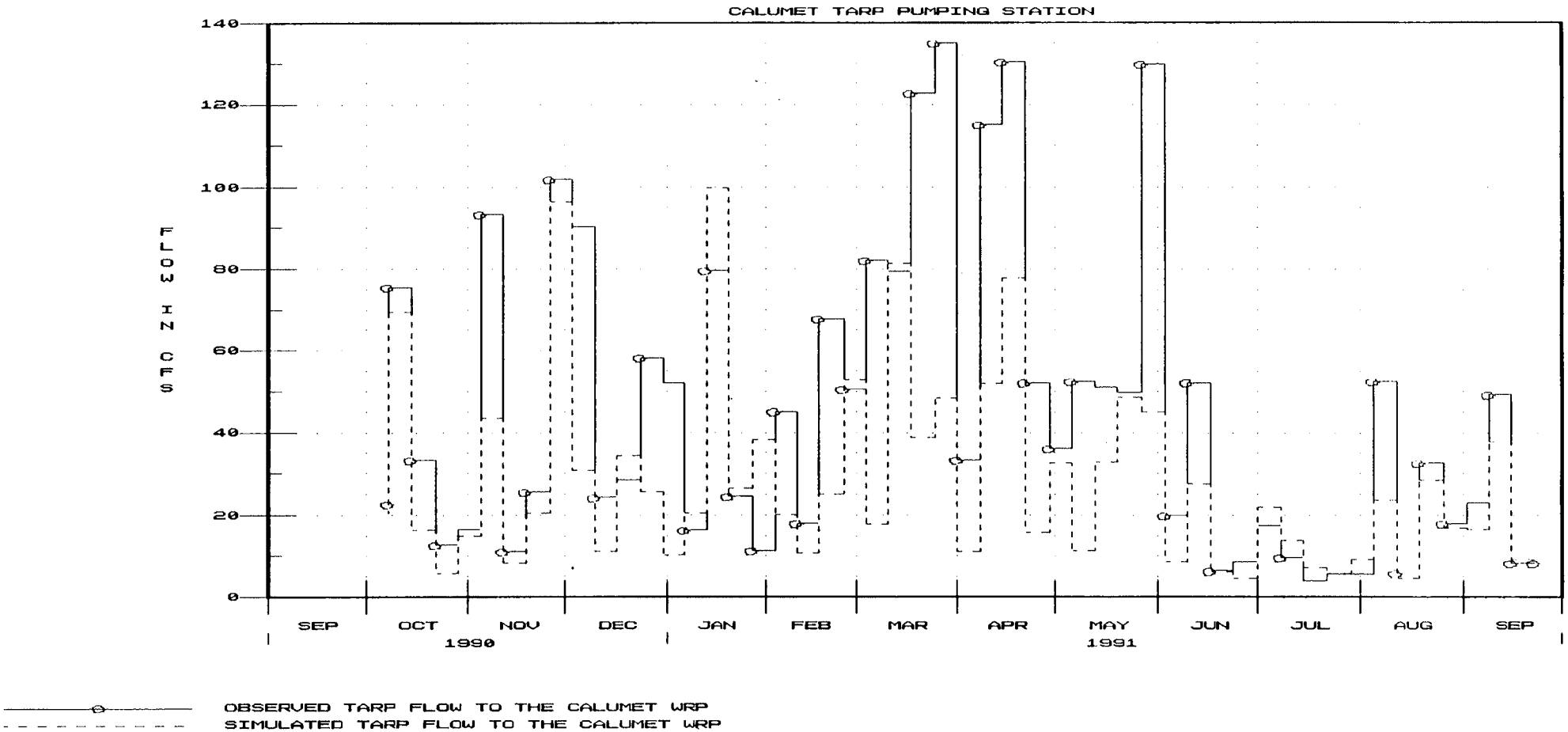


Figure 9

Budget 11 - Simulation of the MWRDGC Calumet TARP Pumping Station

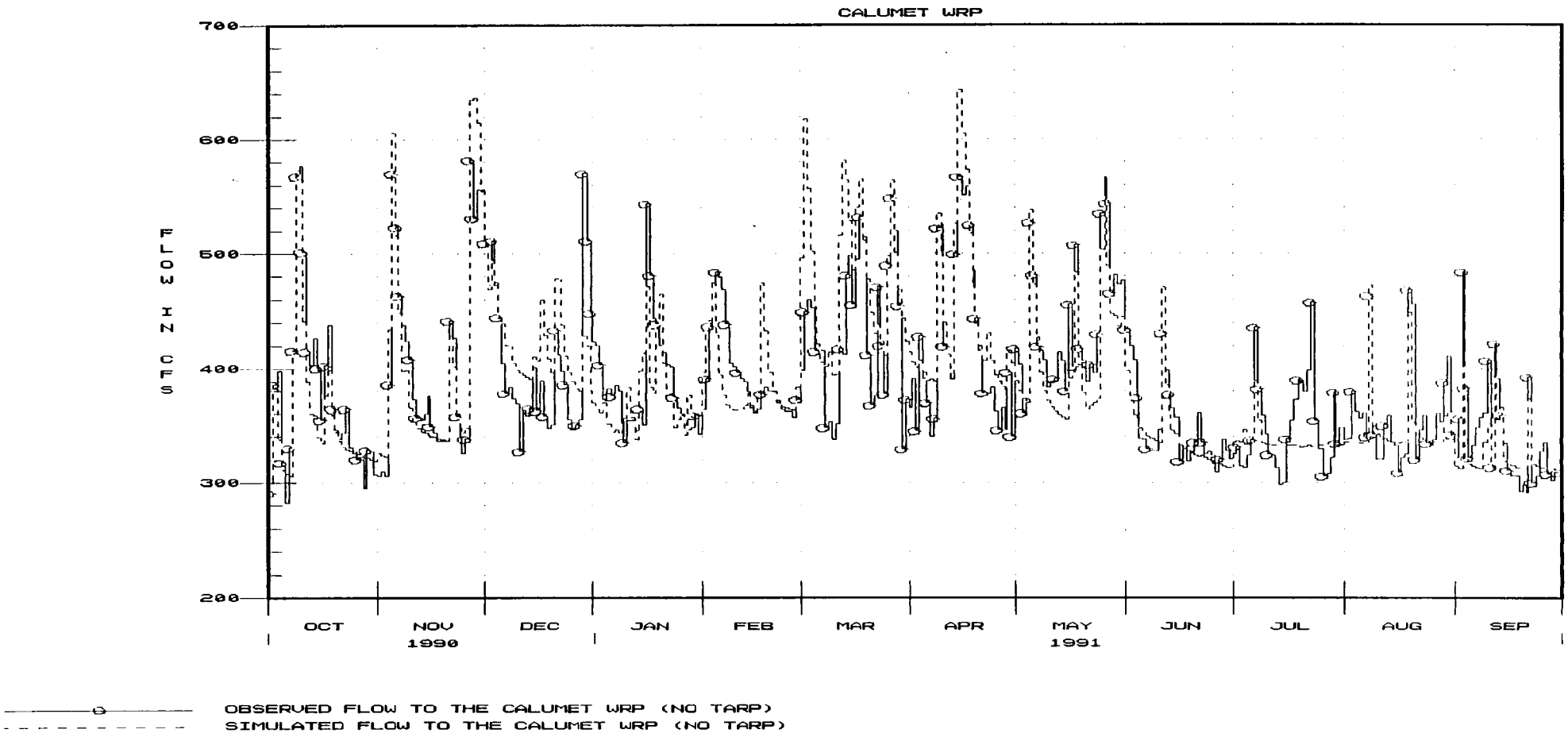

CALUMET WRP
700
600
500
400
300
200
CFS IN 1000
OCT
NOV
1990
DEC
JAN
FEB
MAR
APR
MAY
1991
JUN
JUL
AUG
SEP
OBSERVED FLOW TO THE CALUMET WRP (NO TARP)
SIMULATED FLOW TO THE CALUMET WRP (NO TARP)

Figure 10

Budget 13: Lemont Water Reclamation Facility

Budget 13 analyzes the water balance at the MWRDGC Lemont Water Reclamation Facility (Figure 11). Overall, the balance for WY91 of the inflow to the Lemont facility is fair. The simulated to recorded flow ratio (S/R) for the Lemont is 0.76, indicating that the simulated inflow volume was somewhat less than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.76, indicating that the model predicted the inflow hydrograph to the Lemont facility fairly well.

Budget 14: CSSC System Balance

Budget 14 compares the inflows and outflows to the CSSC system (Figure 12). The inflow components include direct diversions through the lakefront structures, stormwater runoff discharged to the canal system, and domestic water supply whose effluent discharges to the canal system. The outflows from the canal system include the discharge past the Romeoville AVM, backflows through the lakefront structures and withdrawals upstream of Romeoville by Argonne National labs and Uno-Ven Corporation. The individual components are presented in Table 8 for WY91.

Overall, the balance for WY91 between the inflows to the canal system and the outflows from the canal system is fair. The S/R (inflow/outflow) for the canal system is 0.90, indicating that the inflow to the canal system is less than the outflow from the canal system. The average measured/simulated inflow was 3,439.4 cfs while the average measured/simulated outflow was 3,799.5 cfs. This is a difference of 360.1 cfs (9.5%) for WY91, as compared to 489.0 cfs (13.0%) for the previous water year, WY90.

The coefficient of correlation (R) of inflow to outflow is 0.83, indicating that the time series trends of inflow to outflow are fairly well correlated. The coefficient of correlation is based on daily flows. Therefore, timing between inflows and measured outflows at Romeoville is a major issue, especially during changes in flow that occur at the beginning or end of a day. This is the result of travel time from inflow locations downstream to the Romeoville AVM site. Therefore, variability in the coefficient of correlation from year to year may be attributed to the variability in the timing of significant flow changes during a particular year.

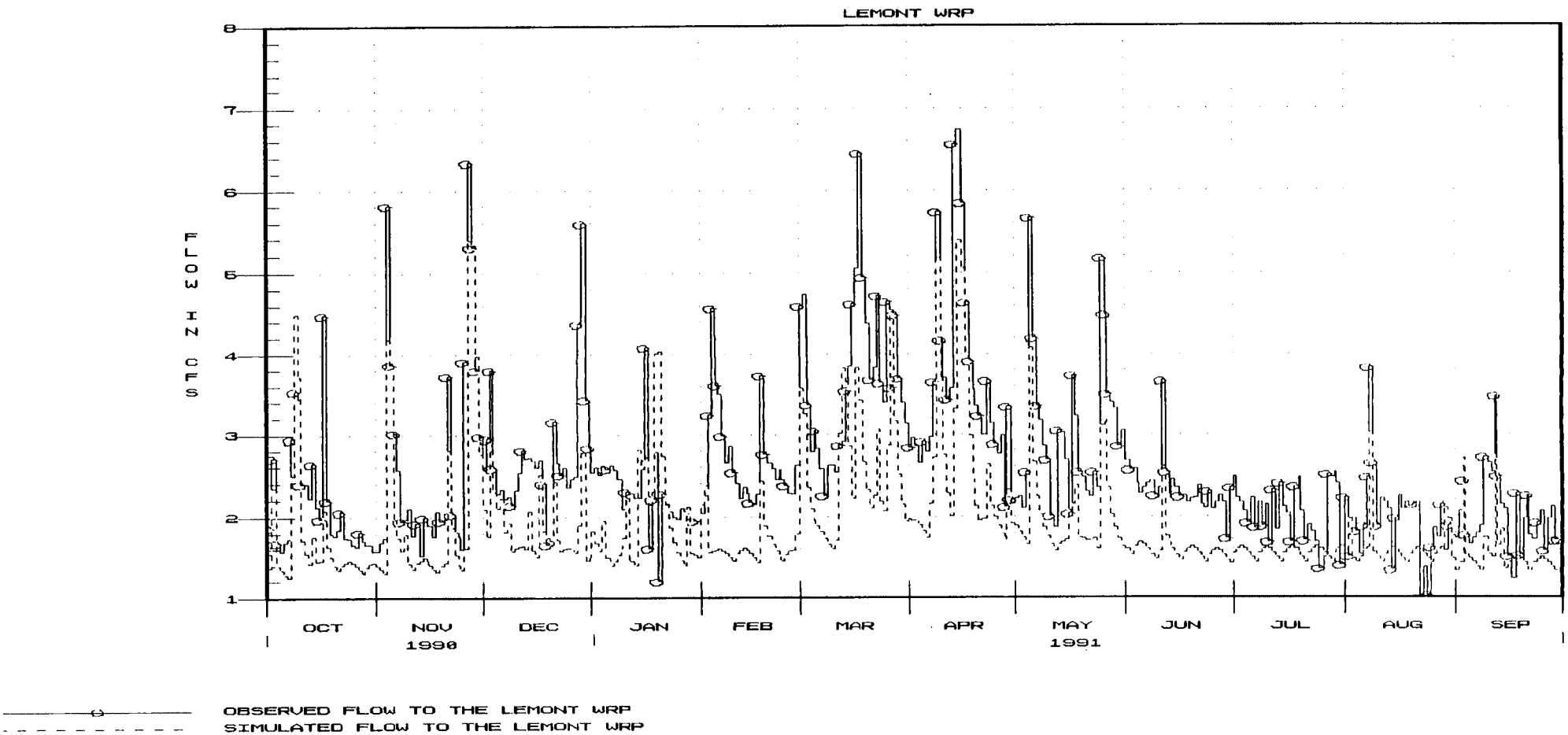


Figure 11

Budget 13 - Simulation of the MWRDGC Lemont Water Reclamation Facility

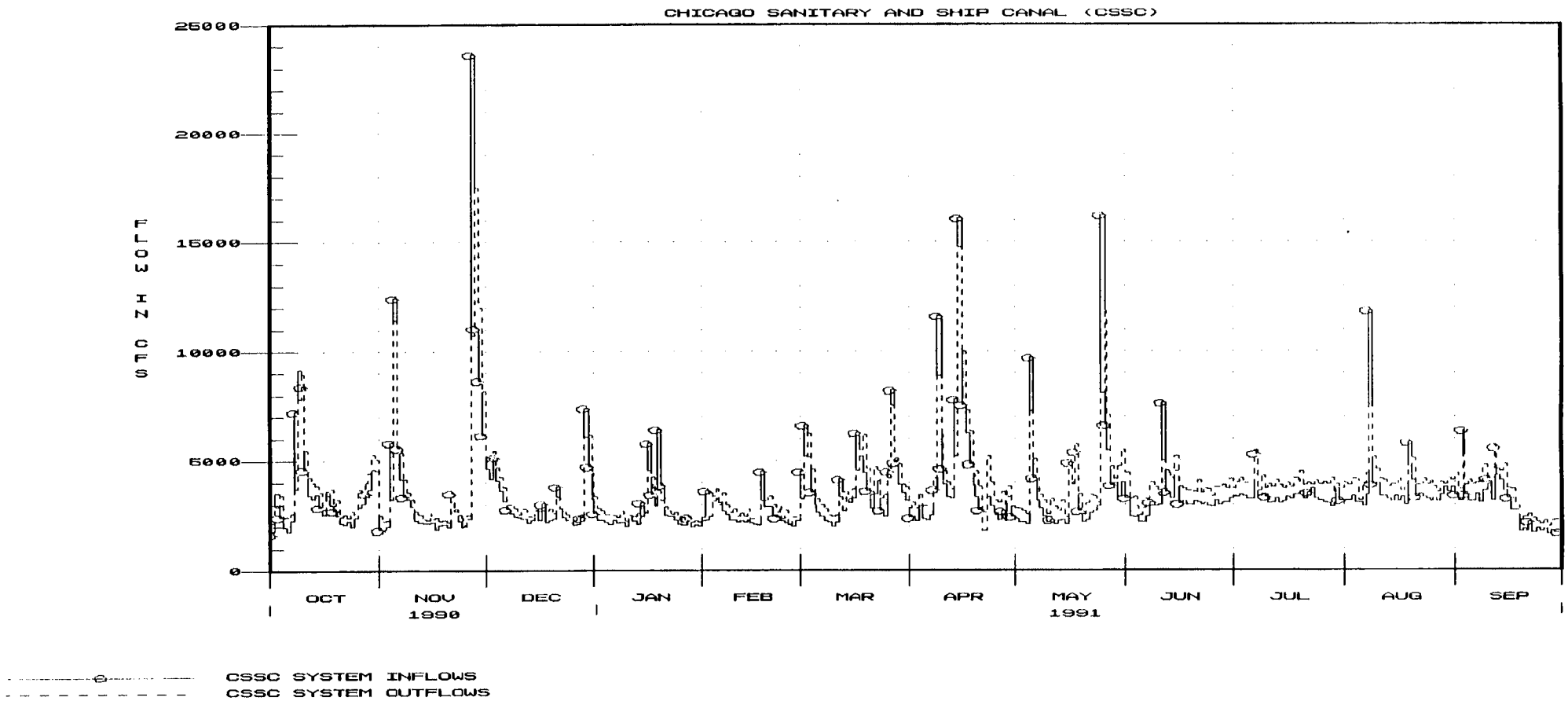


Figure 12

Budget 14 - CSSC System Balance

Table 8

WY 1991 Summary of Flow Components for the CSSC System Balance

INFLOWS (cfs)	
Lake Controlling Structures (measured)	
- Wilmette Controlling Works	39.1
- Chicago River Controlling Works	229.6
- O'Brien Lock and Dam	203.6
Streamflows (measured)	
- North Branch Chicago River at Niles	115.2
- Little Calumet River at South Holland	256.5
Streamflow (estimated)	
- Grand Calumet River at Holman Ave.	23.3
MWRDGC Water Reclamation Facilities (measured)	
- Northside	439.9
- Stickney	1,223.8
- Calumet	432.5
- Calumet TARP Pumpage to River	0.0
- Lemont	2.6
Other Point Sources (measured)	6.7
Summit Conduit (simulated)	10.7
Combined Sewer Overflows (simulated)	246.9
Direct Runoff to CSSC (simulated)	209.0
TOTAL INFLOWS (cfs)	**3,439.4**

OUTFLOWS (cfs)	
Cal-Sag Flow Transferred to Calumet WRP as Steel Mill Blow-down	1.8
Lake Front Backflows	0.0
Argonne Laboratory	0.7
Uno-Ven Corporation	6.8
USGS AVM Record	3,790.2
TOTAL OUTFLOWS (cfs)	**3,799.5**

DIFFERENCE (cfs)	-360.1

Based on the fact that the inflow is well correlated with the outflow, it appears that there is a moderately variable to constant underreported or unreported inflow. Possible sources of the canal system flow imbalance may include underreporting of the lakefront flows through the sluice gates and locks as well as unaccounted for flow sources. The underreporting of the lakefront flows could be the result of both inaccurate rating curves for the lakefront control structures and leakage through those structures. Flow meter measurements at the lakefront direct diversion points were done to assess if leakage is significant. This study (USGS, 1994) showed that lakefront leakage flows are greatly underreported. Unaccounted flows could also include unreported discharges to the canal.

Summary

In compliance with the modified 1980 U.S. Supreme Court decree, the WY91 diversion was computed using the best engineering technology available to date.

Overall, the simulations that comprise a significant portion of the diversion accounting computations worked well. The two most significant budgets to the diversion accounting computations, Budget 7, Northside Water Reclamation Facility, and Budget 10, Stickney Water Reclamation Facility, performed very well. Together, Budgets 7 and 10 compute the majority of the deductible Des Plaines River watershed runoff. These budgets have simulated to recorded ratios of 0.94 and 1.04 and correlations of 0.77 and 0.83, respectively. Given the complexity of the hydrologic cycle in the heavily urbanized Chicago metropolitan area, and given the number of human and other factors that cannot be adequately represented in numerical modeling procedures, the results of these two (2) budgets are good. Additionally, results for Budget 12, the Calumet WRP, were also very good. This budget also models a portion of the deductible Des Plaines River watershed runoff. The S/R ratio was 1.00 while the coefficient of correlation was 0.84.

The WY91 diversion accountable to the State of Illinois is 3,555.3 cfs. This is 355.3 cfs greater than the 3,200 cfs average specified by the Decree. The 40 year running average beginning with WY81 and rounded to the nearest cfs is 3,461 cfs, and the cumulative deviation from the 3,200 cfs average is -2,875 cfs-years. The negative cumulative deviation indicates a water allocation deficit and the maximum allowable deficit is 2,000 cfs-years.

References

1. Barkau, Robert L. 1991. *Modeling of the Chicago Tunnel and Canal System.* Prepared for Christopher B. Burke Engineering Ltd. as part of reference 2.

2. Christopher B. Burke Engineering, Ltd. 1991. *Data Collection and Model Revisions.* Prepared for the U.S. Army Corps of Engineers, Chicago.

3. Christopher B. Burke Engineering, Ltd. 1990. *Infiltration and Inflow Study and Diversion Accounting Model Modification.* Prepared for the U.S. Army Corps of Engineers, Chicago.

4. Espey, William H., Harry H. Barnes, and Svein Vigander. 1981. *Lake Michigan Diversion Findings of the Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures.* Prepared for the U.S. Army Corps of Engineers, Chicago.

5. Espey, William H., Harry H. Barnes, and David Westfall. 1987. *Lake Michigan Diversion Findings of the Second Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures.* Prepared for the U.S. Army Corps of Engineers, Chicago.

6. Hart, Dale E., and Richard G. McGee. 1985. *Final Report - Lockport Power Plant Sluice Gate and Control Works Discharge Evaluation.* Waterways Experiment Station. Vicksburg, MS.

7. Illinois State Water Survey. 1991, *Installation and Operation of a Dense Raingage Network to Improve Precipitation Measurements for Lake Michigan Diversion Accounting: Water Year 1990.*

8. International Joint Commission. 1981. *Great Lakes Diversions and Consumptive Uses, Annex F, Consumptive Use.*

9. Keifer Engineering. 1982. *Input Data CRSM for Existing Conditions - Mainstream System.* Prepared for the U.S. Army Corps of Engineers, Chicago.

10. Kleinbaum, David G., and Lawrence L Kupper. 1978. *Applied Regression Analysis and Other Multivariable Methods.* Wadsworth Publishing Company.

11. Metropolitan Water Reclamation District of Greater Chicago. 1984. *1984 Facility Planning Study - MSDGC Update Supplement and Summary.*

12. Metropolitan Water Reclamation District of Greater Chicago. 1989. *1988 Annual Report of the Maintenance and Operations Department.*

13. Neubauer, Ronald A. 1990. Request for TARP Information from the Army Corps of Engineers. Memorandum to Mr. William Eyre, Supervising Civil Engineer, Metropolitan Water Reclamation District of Greater Chicago.

14. Northeastern Illinois Planning Commission. 1985. *Lake Michigan Diversion Accounting Manual of Procedures.*

15. Kleinbaum, David G., and Lawrence L Kupper. 1978. *Applied Regression Analysis and Other Multivariable Methods.* Wadsworth Publishing Company.

16. Rust Environment & Infrastructure. 1993. *Diversion Accounting Update for the New 25-Gage Precipitation Network.*

17. Steel, Robert G. D., and James H. Torrie. 1980. *Principles and Procedures of Statistics - A Biometrical Approach.* McGraw-Hill, Inc.

18. U.S. Army Corps of Engineers. 1990. *Lake Michigan Diversion Accounting 1989 Annual Report Including WY84 and WY85 Accounting.*

19. U.S. Army Corps of Engineers. 1990. *Current Meter Measurements of Discretionary and Leakage Flows at the Chicago River Controlling Works, O'Brien Lock and Dam, and the Wilmette Controlling Works.*

20. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1993 Annual Report.*

21. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Annual Report, Water Years 1990-92.*

22. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1986 Report.*

23. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1987 Report.*

24. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1988 Report.*

25. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1989 Report.*

26. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1990 Report.*

27. U.S. Geological Survey. 1984. *Streamflow and Water Quality of the Grand Calumet River, Lake County, Indiana, and Cook County, Illinois.*

28. U.S. Geological Survey. 1992. *Water Resources Data, Illinois, Water Year 1991, Volume 2, Illinois River Basin.*

29. U.S. Geological Survey. 1994. *Comparison, Analysis, and Estimation of Discharge Data from Two Acoustic Velocity Meters on the Chicago Sanitary Ship Canal at Romeoville, Illinois.*

30. U.S. Geological Survey. 1994. *Measurements of Leakage through Chicago River Controlling Works and Other Control Structures Near Chicago Illinois.*

31. Wisconsin et. al., v. Illinois et. al., Michigan v. Illinois et. al. New York v. Illinois et. al. U.S. 2, 3, and 4, Original 1 - 18, 1980.

Appendix A

Summary of Daily Diversion Flows

Computations:

1. Column 3 equals the sum of Columns 1 and 2.
2. Column 8 equals the sum of Columns 4 through 7.
3. Column 10 equals Column 3 minus Column 8 plus Column 9.

Deductions from the Romeoville Gage Record

Additions to the Romeoville Gage Record

Lake Michigan Diversion Accounting - WY1991
October 1990 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Oct-90	2063.0	1.4	2064.4	98.8	27.6	44.3	2.0	172.7	104.9	**1996.6**	1768.5	104.4	86.0
02-Oct-90	2157.0	1.5	2158.5	81.6	27.5	25.8	2.1	137.0	105.0	**2126.5**	1790.5	89.4	116.0
03-Oct-90	2949.0	1.4	2950.4	116.3	27.5	315.0	2.0	460.8	107.5	**2597.1**	1743.3	1295.6	77.0
04-Oct-90	3466.0	1.2	3467.2	191.6	27.6	69.7	2.0	290.9	104.5	**3280.8**	1722.3	460.3	86.0
05-Oct-90	2458.0	1.8	2459.8	46.5	27.4	25.8	2.2	101.9	105.3	**2463.2**	1751.7	147.6	106.0
06-Oct-90	2456.0	1.4	2457.4	115.0	27.6	33.7	2.1	178.4	103.4	**2382.4**	1779.0	145.8	137.0
07-Oct-90	2619.0	1.3	2620.3	72.2	27.6	68.0	1.8	169.6	104.0	**2554.7**	1656.8	237.5	141.0
08-Oct-90	3756.0	1.3	3757.3	113.9	27.5	962.3	1.9	1105.6	119.0	**2770.7**	1687.8	6359.6	107.0
09-Oct-90	7840.0	1.3	7841.3	238.9	27.5	1224.4	2.2	1493.0	121.6	**6469.9**	1683.8	7342.7	89.0
10-Oct-90	8990.0	1.2	8991.2	189.7	27.5	936.0	2.1	1155.3	118.3	**7954.2**	1694.8	6461.4	76.0
11-Oct-90	5527.0	1.5	5528.5	272.7	27.4	287.3	2.2	589.6	103.3	**5042.2**	1704.8	2243.4	104.0
12-Oct-90	4276.0	1.6	4277.6	331.3	27.5	208.9	2.2	569.9	103.0	**3810.7**	1691.0	1281.4	142.0
13-Oct-90	4043.0	1.6	4044.6	120.3	27.5	121.9	1.9	271.6	102.2	**3875.2**	1656.8	732.0	149.0
14-Oct-90	3867.0	1.6	3868.6	114.6	27.6	212.0	2.1	356.3	104.1	**3616.4**	1637.5	978.3	118.0
15-Oct-90	3599.0	1.7	3600.7	122.3	27.6	109.3	2.1	261.3	103.9	**3443.3**	1687.1	564.1	103.0
16-Oct-90	2827.0	1.8	2828.8	46.5	27.3	75.1	2.0	150.9	106.5	**2784.4**	1697.8	378.9	111.0
17-Oct-90	3449.0	2.0	3451.0	78.2	28.2	370.2	2.1	478.7	106.6	**3078.9**	1717.9	1587.5	97.0
18-Oct-90	3757.0	1.9	3758.9	319.2	28.0	203.4	2.1	552.7	103.7	**3309.9**	1662.1	870.8	65.0
19-Oct-90	3028.0	1.9	3029.9	53.7	27.8	106.8	2.1	190.4	102.6	**2942.1**	1671.6	456.7	112.0
20-Oct-90	3253.0	2.0	3255.0	46.5	27.6	80.6	2.0	156.7	102.3	**3200.6**	1655.5	353.7	198.0
21-Oct-90	2457.0	2.0	2459.0	55.0	27.6	67.7	2.0	152.3	101.2	**2407.9**	1616.1	281.5	116.0
22-Oct-90	2546.0	1.3	2547.3	126.2	27.5	73.6	2.2	229.5	102.9	**2420.7**	1669.6	279.3	107.0
23-Oct-90	2441.0	1.8	2442.8	54.4	27.5	56.1	2.1	140.1	103.2	**2405.9**	1674.5	197.0	79.0
24-Oct-90	2713.0	1.0	2714.0	46.5	27.5	52.9	2.0	128.9	103.5	**2688.6**	1705.7	188.7	88.0
25-Oct-90	2422.0	0.9	2422.9	128.4	27.5	64.7	2.1	222.7	103.6	**2303.8**	1662.1	216.1	553.0
26-Oct-90	3678.0	1.1	3679.1	54.2	27.4	49.5	1.9	133.0	104.8	**3650.9**	1658.1	152.2	1010.0
27-Oct-90	3326.0	1.0	3327.0	46.5	27.6	47.4	2.0	123.5	102.4	**3305.9**	1644.7	134.8	1089.0
28-Oct-90	4013.0	1.0	4014.0	106.2	27.7	56.7	2.1	192.7	102.3	**3923.6**	1693.8	179.6	1779.0
29-Oct-90	4479.0	1.1	4480.1	55.0	27.4	44.7	2.1	129.2	104.1	**4455.0**	1667.8	132.1	1914.0
30-Oct-90	5319.0	1.2	5320.2	82.7	27.6	48.1	2.3	160.7	105.7	**5265.2**	1660.1	146.8	2808.0
31-Oct-90	5051.0	1.3	5052.3	98.1	27.6	50.4	2.4	178.5	105.5	**4979.3**	1658.7	154.7	2755.0
Averages	3704.0	1.5	3705.5	116.9	27.6	196.5	2.1	343.1	105.5	**3467.9**	1689.4	1101.7	468.3

Lake Michigan Diversion Accounting - WY1991
November 1990 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Nov-90	2500.0	0.8	2500.8	46.5	27.5	39.4	1.5	114.9	101.9	**2487.8**	1668.5	118.5	131.0
02-Nov-90	2287.0	0.8	2287.8	85.0	27.6	43.7	1.7	158.0	103.4	**2233.2**	1662.0	140.1	160.0
03-Nov-90	2333.0	0.7	2333.7	90.1	27.5	43.2	1.4	162.2	101.4	**2272.9**	1642.0	146.6	117.0
04-Nov-90	3249.0	0.6	3249.6	102.7	27.7	970.5	1.6	1102.5	114.1	**2261.2**	1580.8	4179.0	85.0
05-Nov-90	11422.0	0.5	11422.5	215.8	27.6	1416.9	1.2	1661.5	118.6	**9879.6**	1637.2	10550.0	66.0
06-Nov-90	5704.0	0.6	5704.6	247.4	27.6	370.5	1.6	647.1	103.1	**5160.6**	1645.6	3071.0	64.0
07-Nov-90	5408.0	0.6	5408.6	291.3	27.6	263.0	1.6	583.5	102.8	**4927.9**	1652.2	1743.5	55.0
08-Nov-90	4174.0	0.8	4174.8	207.5	27.6	176.7	1.6	413.4	104.1	**3865.5**	1653.4	1017.9	76.0
09-Nov-90	3589.0	0.7	3589.7	62.9	27.7	184.1	1.4	276.1	104.1	**3417.7**	1624.3	906.6	77.0
10-Nov-90	3249.0	0.6	3249.6	120.1	27.6	114.7	1.4	263.8	103.3	**3089.1**	1607.1	581.1	81.0
11-Nov-90	2728.0	0.5	2728.5	71.5	27.7	89.6	1.4	190.2	99.8	**2638.1**	1582.0	414.4	69.0
12-Nov-90	2584.0	0.6	2584.6	46.5	27.7	76.5	1.4	152.1	102.2	**2534.7**	1628.6	324.4	80.0
13-Nov-90	2383.0	0.7	2383.7	69.4	27.4	72.5	1.4	170.7	105.4	**2318.4**	1650.4	294.3	84.0
14-Nov-90	2320.0	0.6	2320.6	104.5	27.7	76.5	1.4	210.1	103.3	**2213.8**	1639.5	291.7	70.0
15-Nov-90	2685.0	0.9	2685.9	53.7	27.7	65.2	1.6	148.2	102.2	**2639.9**	1651.9	227.6	53.0
16-Nov-90	2355.0	0.7	2355.7	95.6	27.6	70.9	1.5	195.6	101.8	**2261.9**	1630.3	238.8	260.0
17-Nov-90	2409.0	0.6	2409.6	88.2	27.7	67.7	1.5	185.1	100.9	**2325.4**	1607.2	219.7	75.0
18-Nov-90	2277.0	0.6	2277.6	53.9	27.5	59.6	1.4	142.4	101.2	**2236.4**	1574.6	182.3	80.0
19-Nov-90	2305.0	0.7	2305.7	83.6	27.6	63.2	1.5	175.9	103.1	**2232.9**	1635.5	182.9	243.0
20-Nov-90	2205.0	0.9	2205.9	98.8	27.6	65.4	1.6	193.4	103.6	**2116.1**	1639.1	202.5	160.0
21-Nov-90	3538.0	0.7	3538.7	174.3	27.7	408.6	1.6	612.2	105.0	**3031.5**	1652.4	1246.7	58.0
22-Nov-90	2813.0	0.5	2813.5	112.6	27.5	148.9	1.5	290.5	101.4	**2624.4**	1578.5	557.9	57.0
23-Nov-90	2542.0	0.6	2542.6	53.3	27.6	99.6	1.3	181.8	97.6	**2458.4**	1549.3	337.5	69.0
24-Nov-90	2434.0	0.5	2434.5	53.5	27.6	74.0	1.4	156.5	99.3	**2377.3**	1550.9	239.5	55.0
25-Nov-90	2082.0	0.5	2082.5	112.9	27.7	75.5	1.7	217.8	100.2	**1964.9**	1572.8	245.6	64.0
26-Nov-90	2518.0	0.7	2518.7	53.9	27.5	62.7	1.6	145.7	102.7	**2475.7**	1619.8	358.0	64.0
27-Nov-90	10732.0	0.8	10732.8	166.7	27.6	3048.1	1.6	3244.0	132.3	**7621.1**	1620.3	22347.0	33.0
28-Nov-90	17530.0	0.8	17530.8	159.9	27.6	1020.8	1.5	1209.8	106.6	**16427.6**	1624.0	9011.0	53.0
29-Nov-90	12032.0	0.7	12032.7	223.1	27.7	617.9	1.5	870.2	102.6	**11265.1**	1616.7	6011.0	164.0
30-Nov-90	8191.0	0.6	8191.6	321.7	27.6	446.3	1.4	797.0	102.4	**7497.0**	1613.9	3641.8	92.0
Averages	4419.3	0.7	4420.0	122.2	27.6	344.4	1.5	495.7	104.3	**4028.6**	1620.4	2301.0	93.2

Lake Michigan Diversion Accounting - WY1991
December 1990 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Dec-90	5160.0	0.6	5160.6	323.2	27.6	335.0	1.9	687.7	94.5	**4567.4**	1584.4	2157.5	51.0
02-Dec-90	4992.0	0.5	4992.5	212.9	27.5	233.1	1.9	475.4	93.6	**4610.7**	1584.4	1440.3	69.0
03-Dec-90	5474.0	0.5	5474.5	164.7	27.5	496.0	2.0	690.2	102.7	**4887.0**	1601.9	2661.0	69.0
04-Dec-90	4701.0	0.5	4701.5	230.4	30.4	323.7	2.0	586.5	95.7	**4210.7**	1628.0	1567.6	79.0
05-Dec-90	4288.0	0.5	4288.5	111.6	27.5	248.9	2.0	390.0	96.6	**3995.1**	1644.9	1273.0	75.0
06-Dec-90	3775.0	0.5	3775.5	120.9	27.5	237.2	2.0	387.6	97.0	**3484.9**	1644.9	1030.4	73.0
07-Dec-90	3007.0	0.6	3007.6	93.0	27.6	195.8	2.0	318.4	95.1	**2784.3**	1640.1	923.1	71.0
08-Dec-90	2983.0	0.5	2983.5	109.9	27.6	223.6	1.7	362.8	95.7	**2716.4**	1607.3	814.7	72.0
09-Dec-90	2878.0	0.4	2878.4	58.8	27.5	150.0	1.8	238.1	93.6	**2733.9**	1593.9	601.5	63.0
10-Dec-90	2552.0	0.4	2552.4	132.9	27.5	138.3	1.9	300.6	94.0	**2345.8**	1640.2	565.5	74.0
11-Dec-90	2791.0	0.5	2791.5	59.3	27.6	114.5	2.0	203.4	95.4	**2683.5**	1630.8	462.2	67.0
12-Dec-90	2825.0	0.6	2825.6	52.2	27.9	109.5	2.0	191.6	96.2	**2730.2**	1650.2	422.7	66.0
13-Dec-90	2472.0	0.5	2472.5	131.2	28.0	121.6	2.1	282.9	95.4	**2285.0**	1628.4	447.8	74.0
14-Dec-90	2461.0	0.5	2461.5	60.1	27.6	107.8	1.9	197.4	95.3	**2359.4**	1616.1	377.8	63.0
15-Dec-90	2876.0	0.4	2876.4	57.6	27.9	187.3	2.0	274.8	95.5	**2697.1**	1606.9	787.7	72.0
16-Dec-90	2701.0	0.4	2701.4	127.3	27.5	130.5	2.0	287.3	92.3	**2506.4**	1558.6	527.3	71.0
17-Dec-90	2750.0	0.5	2750.5	160.8	27.8	379.2	1.9	569.7	98.4	**2279.2**	1630.3	1218.8	142.0
18-Dec-90	2732.0	0.4	2732.4	119.4	27.7	190.2	1.9	339.2	95.3	**2488.5**	1628.3	573.1	67.0
19-Dec-90	2815.0	0.4	2815.4	51.6	27.7	144.0	1.9	225.2	95.1	**2685.3**	1630.7	436.9	70.0
20-Dec-90	2618.0	0.4	2618.4	60.7	27.9	125.7	2.0	216.3	94.8	**2496.9**	1610.5	365.1	74.0
21-Dec-90	3354.0	0.5	3354.5	295.6	27.6	453.0	1.8	778.0	99.4	**2675.9**	1608.2	1899.7	254.0
22-Dec-90	2798.0	0.4	2798.4	98.1	27.7	203.6	1.9	331.3	92.0	**2559.1**	1578.6	1070.0	61.0
23-Dec-90	2718.0	0.4	2718.4	56.3	27.8	153.2	1.9	239.2	93.7	**2572.9**	1577.9	549.7	64.0
24-Dec-90	2580.0	0.4	2580.4	132.4	27.8	143.8	1.9	305.9	91.7	**2366.2**	1588.1	467.6	54.0
25-Dec-90	2157.0	0.4	2157.4	52.2	27.8	115.1	1.7	196.8	93.3	**2053.9**	1562.3	342.9	51.0
26-Dec-90	2344.0	0.4	2344.4	52.1	27.8	104.9	1.8	186.6	93.0	**2250.8**	1606.2	292.7	58.0
27-Dec-90	2453.0	0.3	2453.3	52.6	28.0	97.1	2.2	179.9	94.3	**2367.7**	1654.2	265.4	63.0
28-Dec-90	2569.0	0.2	2569.2	135.3	27.4	159.6	1.9	324.2	95.4	**2340.4**	1649.6	367.3	90.0
29-Dec-90	6089.0	0.3	6089.3	159.7	27.8	810.2	2.0	999.7	97.8	**5187.4**	1648.3	4550.5	50.0
30-Dec-90	6182.0	0.2	6182.2	249.3	27.5	151.3	1.9	430.0	94.5	**5846.7**	1608.3	2469.1	46.0
31-Dec-90	4461.0	0.3	4461.3	95.1	27.6	93.9	1.7	218.3	94.2	**4337.2**	1659.6	966.6	51.0
Averages	3372.8	0.4	3373.2	123.1	27.8	215.4	1.9	368.2	95.2	**3100.2**	1616.2	1028.9	74.3

Lake Michigan Diversion Accounting - WY1991
January 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Jan-91	3384.0	1.2	3385.2	86.4	27.9	107.7	2.3	224.3	102.6	**3263.5**	1593.7	668.1	49.0
02-Jan-91	2871.0	1.1	2872.1	52.3	27.3	90.8	2.3	172.7	102.9	**2802.3**	1674.5	477.3	67.0
03-Jan-91	2764.0	1.3	2765.3	104.4	27.6	91.4	2.3	225.7	103.6	**2643.2**	1662.0	421.5	84.0
04-Jan-91	2560.0	1.1	2561.1	93.9	27.6	153.0	2.4	276.9	100.8	**2385.0**	1670.0	457.9	58.0
05-Jan-91	2542.0	1.2	2543.2	54.0	27.5	82.3	2.4	166.2	103.3	**2480.3**	1646.3	291.2	58.0
06-Jan-91	2534.0	1.1	2535.1	137.3	27.6	84.4	2.4	251.7	100.1	**2383.5**	1629.5	312.6	75.0
07-Jan-91	2416.0	1.2	2417.2	46.5	27.6	63.8	2.4	140.3	101.9	**2378.8**	1655.3	235.7	77.0
08-Jan-91	2696.0	1.3	2697.3	55.0	27.6	64.2	2.4	149.2	103.1	**2651.2**	1680.8	213.3	70.0
09-Jan-91	2394.0	1.2	2395.2	85.7	27.5	80.1	2.4	195.7	103.3	**2302.8**	1664.6	250.5	70.0
10-Jan-91	2283.0	1.2	2284.2	95.9	27.5	98.8	2.4	224.6	102.7	**2162.3**	1647.4	264.9	71.0
11-Jan-91	2522.0	1.2	2523.2	164.8	27.6	297.4	2.3	492.1	102.8	**2133.9**	1639.3	577.2	87.0
12-Jan-91	2443.0	1.2	2444.2	87.1	27.4	93.1	2.2	209.8	103.4	**2337.8**	1629.0	262.3	71.0
13-Jan-91	2623.0	1.1	2624.1	53.9	27.6	69.3	2.3	153.1	101.3	**2572.3**	1628.8	200.7	49.0
14-Jan-91	2469.0	1.2	2470.2	190.0	27.5	480.1	2.4	700.0	106.2	**1876.4**	1671.4	1381.7	67.0
15-Jan-91	2638.0	1.2	2639.2	200.0	27.5	289.3	2.4	519.2	103.2	**2223.2**	1659.3	1064.0	79.0
16-Jan-91	4558.0	1.2	4559.2	300.1	27.5	333.0	2.5	663.1	105.2	**4001.3**	1644.1	3794.4	63.0
17-Jan-91	4296.0	1.2	4297.2	164.7	27.5	162.5	2.3	357.0	103.4	**4043.6**	1660.4	982.2	58.0
18-Jan-91	3296.0	1.1	3297.1	63.1	27.5	196.8	2.2	289.6	101.8	**3109.3**	1650.9	696.2	44.0
19-Jan-91	3631.0	1.2	3632.2	183.5	27.5	1365.0	2.3	1578.3	115.4	**2169.3**	1616.7	4407.2	45.0
20-Jan-91	3211.0	1.1	3212.1	346.0	27.6	559.0	2.3	934.9	103.9	**2381.1**	1588.5	1727.2	59.0
21-Jan-91	2893.0	1.2	2894.2	259.3	27.5	298.7	2.3	587.8	103.4	**2409.8**	1662.4	727.7	62.0
22-Jan-91	2697.0	1.3	2698.3	63.4	27.7	213.0	2.3	306.4	102.5	**2494.4**	1666.4	467.7	48.0
23-Jan-91	2583.0	1.1	2584.1	96.7	27.4	229.5	2.2	355.8	104.9	**2333.2**	1659.7	536.1	54.0
24-Jan-91	2672.0	1.3	2673.3	142.7	27.5	125.8	2.5	298.5	103.8	**2478.6**	1672.9	343.5	76.0
25-Jan-91	2330.0	1.1	2331.1	55.0	27.6	86.7	2.3	171.6	103.7	**2263.2**	1687.7	256.8	68.0
26-Jan-91	2418.0	1.2	2419.2	63.6	27.5	101.0	2.5	194.6	100.8	**2325.4**	1634.2	287.2	50.0
27-Jan-91	2162.0	1.2	2163.2	135.6	27.7	144.3	2.3	309.9	101.3	**1954.6**	1624.3	369.0	50.0
28-Jan-91	2483.0	1.2	2484.2	144.0	27.4	318.1	2.4	491.9	105.5	**2097.8**	1678.2	807.4	40.0
29-Jan-91	2207.0	1.2	2208.2	102.3	27.6	139.8	2.3	272.0	107.2	**2043.4**	1682.7	368.0	58.0
30-Jan-91	2275.0	1.2	2276.2	101.4	27.5	144.0	2.3	275.2	107.0	**2108.0**	1682.8	512.3	67.0
31-Jan-91	2206.0	1.1	2207.1	84.3	27.4	144.6	2.1	258.4	107.6	**2056.3**	1670.6	494.8	59.0
Averages	2743.8	1.2	2745.0	123.0	27.5	216.4	2.3	369.2	103.8	**2479.6**	1652.7	769.6	62.4

Lake Michigan Diversion Accounting - WY1991
February 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Feb-91	2274.0	1.2	2275.2	232.2	27.9	365.0	2.0	627.1	112.0	**1760.1**	1671.7	1067.7	61.0
02-Feb-91	2301.0	1.1	2302.1	352.4	27.8	491.1	1.9	873.2	116.9	**1545.8**	1636.0	2693.1	72.0
03-Feb-91	2455.0	1.0	2456.0	349.2	28.0	302.1	2.0	681.3	109.7	**1884.4**	1613.9	1932.0	96.0
04-Feb-91	3153.0	1.1	3154.1	102.6	27.8	175.7	2.1	308.2	106.7	**2952.6**	1679.1	1414.7	88.0
05-Feb-91	3756.0	1.0	3757.0	69.5	28.0	133.7	2.1	233.3	105.1	**3628.8**	1672.6	1243.7	78.0
06-Feb-91	3029.0	1.1	3030.1	134.5	28.0	128.5	2.2	293.2	105.3	**2842.2**	1663.5	1070.3	62.0
07-Feb-91	3521.0	1.1	3522.1	67.2	27.9	108.7	2.2	206.0	104.2	**3420.3**	1638.5	815.0	47.0
08-Feb-91	3017.0	1.2	3018.2	53.0	27.9	102.3	1.9	185.1	104.2	**2937.3**	1636.4	624.0	42.0
09-Feb-91	2657.0	1.2	2658.2	55.0	27.8	101.0	1.9	185.7	101.4	**2573.9**	1627.2	550.4	57.0
10-Feb-91	2800.0	1.1	2801.1	128.3	28.0	114.1	1.8	272.2	102.7	**2631.6**	1620.7	563.7	59.0
11-Feb-91	2474.0	1.0	2475.0	53.0	27.9	100.1	2.1	183.1	104.3	**2396.2**	1641.6	433.0	63.0
12-Feb-91	2614.0	1.2	2615.2	90.7	28.2	106.7	1.9	227.5	105.8	**2493.5**	1637.9	382.2	71.0
13-Feb-91	2487.0	1.2	2488.2	83.8	27.8	105.0	1.8	218.4	104.8	**2374.6**	1626.8	487.4	70.0
14-Feb-91	2807.0	1.1	2808.1	53.2	27.9	98.5	2.0	181.6	104.3	**2730.8**	1641.5	526.2	74.0
15-Feb-91	2352.0	1.2	2353.2	81.1	27.9	102.5	1.9	213.4	105.1	**2244.9**	1638.4	371.3	86.0
16-Feb-91	2369.0	1.0	2370.0	106.6	27.7	101.8	2.3	238.4	102.9	**2234.5**	1631.3	320.3	45.0
17-Feb-91	2375.0	1.1	2376.1	63.7	28.1	98.2	2.1	192.1	101.4	**2285.4**	1628.7	338.0	48.0
18-Feb-91	3215.0	1.2	3216.2	159.2	27.8	530.7	2.2	719.9	112.7	**2609.0**	1666.9	2720.4	55.0
19-Feb-91	3183.0	1.1	3184.1	277.5	28.0	275.2	2.3	583.0	105.7	**2706.8**	1642.9	1069.9	63.0
20-Feb-91	3376.0	1.2	3377.2	60.0	27.8	165.2	2.1	255.1	104.4	**3226.5**	1648.4	682.6	47.0
21-Feb-91	2984.0	1.2	2985.2	52.4	27.9	127.9	1.9	210.1	104.8	**2879.9**	1663.3	534.1	70.0
22-Feb-91	2665.0	1.1	2666.1	61.7	27.9	109.6	2.0	201.2	105.5	**2570.4**	1622.6	509.6	54.0
23-Feb-91	2886.0	1.1	2887.1	133.1	27.9	114.0	1.7	276.7	102.4	**2712.8**	1612.8	494.3	74.0
24-Feb-91	2377.0	1.1	2378.1	52.9	27.9	93.7	2.2	176.7	103.1	**2304.5**	1599.4	369.4	87.0
25-Feb-91	2770.0	1.2	2771.2	52.9	28.0	90.4	2.1	173.4	105.7	**2703.5**	1647.5	317.0	64.0
26-Feb-91	2137.0	1.2	2138.2	142.0	27.8	104.4	2.0	276.2	105.0	**1967.0**	1639.5	329.2	64.0
27-Feb-91	2437.0	1.1	2438.1	53.2	27.9	86.1	2.0	169.2	104.5	**2373.4**	1640.0	252.4	79.0
28-Feb-91	2418.0	1.1	2419.1	63.1	27.8	129.5	2.1	222.5	104.6	**2301.2**	1638.2	313.7	68.0
Averages	2746.0	1.1	2747.1	113.7	27.9	162.9	2.0	306.5	105.5	**2546.1**	1640.3	800.9	65.9

Lake Michigan Diversion Accounting - WY1991
March 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Mar-91	3271.0	0.5	3271.5	124.0	27.7	633.2	1.9	786.8	96.8	**2581.5**	1605.1	2561.8	49.0
02-Mar-91	5217.0	0.7	5217.7	265.5	27.7	647.6	1.8	942.6	91.7	**4366.8**	1599.1	4104.4	58.0
03-Mar-91	6226.0	0.5	6226.5	307.7	27.8	331.5	1.8	668.8	87.5	**5645.2**	1596.0	2986.5	64.0
04-Mar-91	4644.0	0.5	4644.5	68.7	27.8	201.4	1.9	299.8	90.6	**4435.3**	1659.4	1526.3	62.0
05-Mar-91	3496.0	0.5	3496.5	61.4	27.7	152.2	1.9	243.2	89.7	**3343.0**	1656.9	915.4	63.0
06-Mar-91	3268.0	0.5	3268.5	57.7	27.7	125.8	2.0	213.2	90.4	**3145.7**	1650.7	751.4	77.0
07-Mar-91	2991.0	0.5	2991.5	139.1	27.7	126.0	1.9	294.7	88.6	**2785.4**	1649.6	677.4	66.0
08-Mar-91	2813.0	0.5	2813.5	51.9	27.8	105.3	1.9	186.9	90.1	**2716.7**	1655.6	509.7	56.0
09-Mar-91	2500.0	0.5	2500.5	126.1	27.7	122.4	1.8	278.0	87.6	**2310.1**	1593.3	616.0	64.0
10-Mar-91	2480.0	0.5	2480.5	74.8	27.8	99.8	1.9	204.3	87.8	**2364.0**	1591.9	419.9	60.0
11-Mar-91	2530.0	0.6	2530.6	52.2	27.8	113.5	2.0	195.5	89.8	**2424.9**	1638.4	423.5	64.0
12-Mar-91	3351.0	0.5	3351.5	172.8	27.8	460.8	1.9	663.3	94.6	**2782.8**	1629.9	2558.6	147.0
13-Mar-91	2714.0	0.6	2714.6	277.7	27.8	646.2	1.9	953.6	96.2	**1857.2**	1621.0	2112.2	119.0
14-Mar-91	3615.0	0.5	3615.5	292.2	27.7	579.7	1.9	901.5	88.8	**2812.8**	1647.7	1803.8	67.0
15-Mar-91	3238.0	0.5	3238.5	213.9	27.7	438.8	2.0	682.4	92.6	**2648.7**	1646.4	1305.8	56.0
16-Mar-91	3706.0	0.6	3706.6	69.4	27.7	283.7	1.8	382.6	89.4	**3413.4**	1624.4	1080.0	60.0
17-Mar-91	4587.0	0.6	4587.6	107.8	27.9	858.8	2.0	996.5	97.7	**3688.8**	1579.2	3836.4	68.0
18-Mar-91	5515.0	0.7	5515.7	238.9	27.7	507.6	1.9	776.1	94.5	**4834.1**	1627.1	2903.3	32.0
19-Mar-91	6177.0	0.6	6177.6	239.5	27.8	360.7	1.7	629.7	90.5	**5638.4**	1642.0	1993.0	30.0
20-Mar-91	4690.0	0.7	4690.7	179.5	27.8	264.0	1.5	472.8	89.3	**4307.2**	1610.4	1251.7	58.0
21-Mar-91	3466.0	0.8	3466.8	69.6	27.6	192.9	1.6	291.7	90.4	**3265.5**	1621.5	847.2	80.0
22-Mar-91	4698.0	0.6	4698.6	56.7	27.9	289.2	1.9	375.7	89.8	**4412.7**	1599.6	758.5	767.0
23-Mar-91	4589.0	0.8	4589.8	204.0	27.8	356.9	1.9	590.6	91.6	**4090.8**	1591.9	1263.9	401.0
24-Mar-91	3295.0	0.7	3295.7	57.8	27.6	207.1	1.8	294.3	86.9	**3088.3**	1560.6	733.5	71.0
25-Mar-91	3433.0	0.7	3433.7	83.3	27.8	172.3	2.1	285.5	90.2	**3238.4**	1631.6	592.0	64.0
26-Mar-91	4238.0	0.7	4238.7	211.8	27.8	510.7	2.0	752.3	93.9	**3580.3**	1622.3	2105.9	70.0
27-Mar-91	7506.0	0.7	7506.7	200.8	27.8	1353.4	1.9	1583.9	106.0	**6028.8**	1630.1	6336.7	301.0
28-Mar-91	5119.0	0.6	5119.6	169.1	27.7	464.1	1.8	662.7	90.2	**4547.1**	1602.8	2386.2	40.0
29-Mar-91	4853.0	0.5	4853.5	237.0	27.9	359.1	1.9	625.9	88.7	**4316.3**	1597.4	1574.6	53.0
30-Mar-91	3928.0	0.5	3928.5	238.0	27.8	275.3	1.9	543.0	87.6	**3473.1**	1569.6	1109.2	73.0
31-Mar-91	3789.0	0.5	3789.5	56.9	27.9	193.4	1.7	279.9	86.6	**3596.2**	1557.0	759.3	52.0
Averages	4062.7	0.6	4063.3	151.8	27.8	368.8	1.9	550.3	91.5	**3604.5**	1616.4	1703.4	106.2

Lake Michigan Diversion Accounting - WY1991
April 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Apr-91	2855.0	0.4	2855.4	57.6	28.1	165.9	2.2	253.8	98.5	**2700.1**	1592.2	629.6	65.0
02-Apr-91	3081.0	0.5	3081.5	51.7	28.1	147.4	2.2	229.4	99.8	**2951.9**	1632.6	529.6	84.0
03-Apr-91	2842.0	0.5	2842.5	134.9	28.2	150.8	2.2	316.1	99.2	**2625.6**	1612.8	511.8	77.0
04-Apr-91	3447.0	0.6	3447.6	59.6	28.2	160.0	2.2	250.0	100.9	**3298.5**	1636.4	504.6	70.0
05-Apr-91	2940.0	0.6	2940.6	52.0	28.1	131.6	2.2	213.9	100.7	**2827.4**	1637.8	493.0	83.0
06-Apr-91	2931.0	0.6	2931.6	150.0	28.1	137.8	2.2	318.1	100.2	**2713.7**	1647.4	483.8	109.0
07-Apr-91	2979.0	0.8	2979.8	72.5	28.3	142.2	2.2	245.2	97.5	**2832.1**	1689.5	625.6	108.0
08-Apr-91	4245.0	0.6	4245.6	126.7	28.2	372.6	2.2	529.7	101.9	**3817.8**	1642.7	1670.0	603.0
09-Apr-91	8869.0	0.5	8869.5	179.3	28.1	1904.2	2.2	2113.8	114.1	**6869.8**	1632.9	10025.0	634.0
10-Apr-91	6170.0	0.5	6170.5	112.6	28.2	486.0	2.2	629.0	102.5	**5644.0**	1620.8	1704.3	221.0
11-Apr-91	4522.0	0.5	4522.5	195.9	28.3	344.7	2.2	571.1	99.5	**4050.9**	1615.4	999.0	81.0
12-Apr-91	4030.0	0.6	4030.6	228.4	28.1	270.8	2.2	529.5	101.0	**3602.1**	1626.5	830.6	215.0
13-Apr-91	3704.0	0.5	3704.5	169.4	28.1	197.4	2.2	397.1	97.8	**3405.2**	1574.9	627.1	141.0
14-Apr-91	5229.0	0.5	5229.5	146.5	28.2	1172.6	2.2	1349.5	106.2	**3986.2**	1547.9	5376.8	203.0
15-Apr-91	14762.0	0.5	14762.5	268.2	28.3	2151.0	2.2	2449.7	117.8	**12430.6**	1627.4	14729.0	29.0
16-Apr-91	10028.0	0.5	10028.5	185.7	28.2	783.7	2.2	999.8	104.6	**9133.3**	1628.4	4531.4	53.0
17-Apr-91	7340.0	0.6	7340.6	183.6	28.8	555.7	2.2	770.3	101.3	**6671.6**	1622.1	3282.8	215.0
18-Apr-91	6354.0	0.6	6354.6	196.6	28.6	408.1	2.2	635.5	101.0	**5820.1**	1632.8	2166.6	107.0
19-Apr-91	4259.0	0.6	4259.6	245.8	32.9	317.0	2.2	597.9	101.6	**3763.3**	1627.0	1396.5	137.0
20-Apr-91	4502.0	0.5	4502.5	252.8	28.4	253.7	2.2	537.1	98.5	**4063.9**	1583.0	1053.1	116.0
21-Apr-91	3816.0	0.5	3816.5	59.6	28.2	182.7	2.2	272.7	97.9	**3641.7**	1560.8	744.4	160.0
22-Apr-91	1813.0	0.8	1813.8	51.8	28.3	160.7	2.2	243.0	100.1	**1670.9**	1661.0	635.3	117.0
23-Apr-91	5200.0	0.6	5200.6	122.7	28.3	271.3	2.2	424.5	101.6	**4877.7**	1654.3	870.6	268.0
24-Apr-91	4036.0	1.0	4037.0	108.0	28.1	179.1	2.2	317.4	100.5	**3820.1**	1641.4	652.3	114.0
25-Apr-91	3176.0	0.7	3176.7	52.0	28.2	147.0	2.2	229.4	100.1	**3047.4**	1647.8	499.2	146.0
26-Apr-91	3108.0	0.7	3108.7	73.9	28.2	134.7	2.2	239.0	100.8	**2970.5**	1639.5	433.8	166.0
27-Apr-91	3569.0	0.6	3569.6	114.7	28.3	158.1	2.2	303.3	100.1	**3366.4**	1599.5	461.4	187.0
28-Apr-91	2990.0	0.8	2990.8	52.6	28.1	120.0	2.2	202.9	100.6	**2888.5**	1605.2	361.2	185.0
29-Apr-91	3845.0	0.8	3845.8	157.9	28.2	340.9	2.2	529.2	99.8	**3416.4**	1622.8	986.4	293.0
30-Apr-91	2892.0	0.9	2892.9	116.9	28.2	168.7	2.2	316.0	100.4	**2677.3**	1637.0	459.3	172.0
Averages	4651.1	0.6	4651.7	132.7	28.4	403.9	2.2	567.2	101.6	**4186.1**	1623.3	1942.5	172.0

Lake Michigan Diversion Accounting - WY1991
May 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-May-91	2875.0	0.8	2875.8	61.1	28.6	126.9	2.3	218.9	115.8	**2772.7**	1643.1	379.6	119.0
02-May-91	2788.0	0.8	2788.8	52.4	28.6	107.9	2.0	190.9	116.4	**2714.3**	1652.4	330.9	141.0
03-May-91	2733.0	0.7	2733.7	148.6	28.5	111.7	2.2	291.0	115.0	**2557.7**	1642.0	329.9	144.0
04-May-91	2541.0	0.8	2541.8	53.1	28.6	84.7	2.4	168.8	113.6	**2486.6**	1591.1	243.0	209.0
05-May-91	7281.0	0.7	7281.7	207.0	28.7	987.5	2.3	1225.5	128.5	**6184.7**	1564.8	6972.8	1194.0
06-May-91	5081.0	0.8	5081.8	257.1	28.6	304.4	1.8	591.9	115.4	**4605.3**	1615.3	1835.2	89.0
07-May-91	4239.0	0.8	4239.8	244.1	28.7	212.5	2.3	487.6	117.4	**3869.6**	1663.6	980.4	129.0
08-May-91	3467.0	0.9	3467.9	52.0	28.5	125.7	2.2	208.4	116.5	**3376.0**	1656.5	558.2	149.0
09-May-91	3209.0	0.6	3209.6	52.6	28.7	98.6	2.3	182.2	115.6	**3143.0**	1700.5	429.2	177.0
10-May-91	2561.0	0.8	2561.8	52.7	28.7	83.0	2.3	166.7	115.8	**2510.9**	1703.0	330.9	185.0
11-May-91	3240.0	0.7	3240.7	137.3	28.6	88.8	2.1	256.8	117.4	**3101.3**	1761.5	340.1	186.0
12-May-91	2918.0	0.7	2918.7	53.4	28.9	66.5	2.2	151.0	115.0	**2882.7**	1794.6	246.2	205.0
13-May-91	2706.0	1.0	2707.0	55.0	28.9	61.5	2.4	147.8	117.3	**2676.5**	1910.2	218.8	188.0
14-May-91	3212.0	0.7	3212.7	134.2	29.0	73.0	2.4	238.6	118.0	**3092.1**	1918.4	266.3	152.0
15-May-91	2441.0	0.6	2441.6	53.8	28.7	53.8	2.4	138.7	117.9	**2420.8**	1970.6	193.3	178.0
16-May-91	4784.0	0.7	4784.7	151.0	28.8	380.6	2.3	562.7	125.3	**4347.3**	1862.4	1577.2	1113.0
17-May-91	4059.0	0.4	4059.4	236.8	31.1	523.8	2.2	793.9	120.6	**3386.1**	1700.6	1488.5	226.0
18-May-91	5735.0	0.4	5735.4	291.7	39.1	358.8	2.3	691.9	121.0	**5164.5**	1603.6	1915.1	967.0
19-May-91	3516.0	0.5	3516.5	97.6	29.9	142.7	2.1	272.3	117.4	**3361.6**	1623.8	607.9	224.0
20-May-91	2571.0	0.6	2571.6	60.9	28.9	92.0	2.4	184.2	120.9	**2508.3**	1741.1	356.8	198.0
21-May-91	3069.0	0.6	3069.6	53.0	28.7	68.9	2.5	153.1	121.2	**3037.7**	1808.0	263.7	180.0
22-May-91	3467.0	0.8	3467.8	136.1	28.8	71.9	2.5	239.3	115.8	**3344.3**	1829.7	400.3	190.0
23-May-91	3383.0	0.8	3383.8	61.2	28.9	80.8	2.4	173.3	116.8	**3327.3**	1772.4	419.2	190.0
24-May-91	3102.0	0.9	3102.9	109.8	28.6	116.6	2.5	257.5	118.4	**2963.8**	1858.0	912.7	207.0
25-May-91	8097.0	0.6	8097.6	188.5	28.6	1907.7	2.2	2127.0	132.3	**6102.9**	1716.9	13582.0	369.0
26-May-91	11880.0	0.8	11880.8	307.2	29.0	589.4	2.3	927.9	121.3	**11074.2**	1650.1	3778.4	86.0
27-May-91	7084.0	0.8	7084.8	251.2	28.6	315.7	2.3	597.8	123.6	**6610.6**	1870.7	2350.1	185.0
28-May-91	4760.0	0.9	4760.9	69.1	29.0	176.1	2.4	276.6	125.4	**4609.7**	2119.7	955.1	183.0
29-May-91	4203.0	1.2	4204.2	111.4	28.8	210.5	2.5	353.2	125.7	**3976.7**	1980.2	1137.4	163.0
30-May-91	4760.0	1.3	4761.3	77.6	28.7	116.2	2.4	224.9	123.7	**4660.1**	1996.7	833.5	199.0
31-May-91	5520.0	1.3	5521.3	184.3	28.9	159.6	2.5	375.3	119.8	**5265.8**	1944.0	1010.8	711.0
Averages	4234.9	0.8	4235.7	129.1	29.2	254.8	2.3	415.4	119.5	**3939.8**	1769.9	1459.5	285.0

Lake Michigan Diversion Accounting - WY1991
June 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Jun-91	4475.0	1.3	4476.3	151.6	30.5	103.2	2.6	287.9	136.0	**4324.4**	1800.2	642.9	374.0
02-Jun-91	3324.0	1.3	3325.3	62.1	31.7	68.8	2.5	165.1	134.4	**3294.6**	1780.9	404.8	219.0
03-Jun-91	3360.0	1.2	3361.2	53.1	37.2	57.8	2.5	150.6	135.9	**3346.5**	1846.8	305.7	173.0
04-Jun-91	2893.0	1.1	2894.1	136.7	40.5	66.7	2.5	246.4	136.3	**2784.0**	1808.4	310.2	383.0
05-Jun-91	2534.0	1.1	2535.1	55.0	37.1	47.2	2.5	141.8	136.2	**2529.5**	1843.1	214.0	179.0
06-Jun-91	2841.0	1.2	2842.2	55.0	30.6	43.7	2.4	131.7	135.8	**2846.3**	1914.1	192.9	194.0
07-Jun-91	3267.0	1.2	3268.2	148.5	30.7	58.0	2.5	239.7	137.8	**3166.3**	1955.1	242.1	580.0
08-Jun-91	4025.0	0.8	4025.8	46.5	30.8	37.8	2.5	117.6	135.9	**4044.1**	2030.8	161.9	1101.0
09-Jun-91	3776.0	1.1	3777.1	54.4	31.2	36.0	2.4	124.0	136.1	**3789.2**	2028.7	140.6	1091.0
10-Jun-91	3552.0	1.1	3553.1	46.5	31.2	33.8	2.4	113.9	139.0	**3578.2**	2040.9	124.8	786.0
11-Jun-91	5023.0	1.0	5024.0	200.6	30.9	761.9	2.5	995.9	144.0	**4172.1**	1842.7	4687.5	711.0
12-Jun-91	4563.0	1.0	4564.0	283.7	30.5	125.3	2.4	441.9	138.7	**4260.8**	1813.6	469.1	842.0
13-Jun-91	4426.0	1.2	4427.2	96.3	30.3	67.0	2.5	196.1	140.0	**4371.1**	1943.3	241.9	1071.0
14-Jun-91	4222.0	1.1	4223.1	53.5	30.9	45.2	2.5	132.1	140.0	**4231.0**	2208.1	169.5	949.0
15-Jun-91	5220.0	0.9	5220.9	79.6	30.9	61.3	2.4	174.2	142.0	**5188.7**	2044.3	273.1	2002.0
16-Jun-91	3865.0	0.8	3865.8	103.7	30.7	43.6	2.4	180.4	137.0	**3822.4**	1966.7	211.5	1110.0
17-Jun-91	3730.0	1.2	3731.2	54.0	30.9	30.8	2.4	118.1	138.0	**3751.1**	2096.3	139.5	1085.0
18-Jun-91	3625.0	0.9	3625.9	77.9	31.2	32.3	2.4	143.8	137.2	**3619.3**	2236.1	132.6	1079.0
19-Jun-91	3654.0	1.0	3655.0	108.7	31.1	36.7	2.5	179.0	140.5	**3616.5**	2315.9	151.1	1060.0
20-Jun-91	3603.0	1.2	3604.2	46.5	31.4	23.2	2.4	103.5	139.0	**3639.7**	2432.1	95.5	1063.0
21-Jun-91	4145.0	1.0	4146.0	46.5	40.5	21.4	2.5	110.9	140.2	**4175.3**	2405.5	95.1	918.0
22-Jun-91	3557.0	0.7	3557.7	126.0	54.8	35.3	2.5	218.6	139.0	**3478.1**	1883.4	214.4	975.0
23-Jun-91	3754.0	0.8	3754.8	55.2	38.4	19.6	2.4	115.6	137.0	**3776.2**	1998.3	101.8	1121.0
24-Jun-91	3697.0	0.8	3697.8	46.5	31.7	17.8	2.5	98.5	139.7	**3739.0**	2297.9	81.1	1099.0
25-Jun-91	3403.0	1.1	3404.1	136.5	29.3	32.1	2.5	200.4	140.4	**3344.1**	2416.6	139.1	1105.0
26-Jun-91	3802.0	1.3	3803.3	46.5	31.2	15.3	2.7	95.7	140.7	**3848.3**	2626.8	79.1	1054.0
27-Jun-91	3809.0	1.4	3810.4	46.5	31.3	14.0	2.6	94.4	141.3	**3857.3**	2751.9	73.3	975.0
28-Jun-91	3866.0	1.3	3867.3	123.8	31.4	25.9	2.8	183.9	144.9	**3828.3**	2727.0	126.5	1004.0
29-Jun-91	3724.0	1.4	3725.4	54.4	31.4	12.1	2.7	100.6	143.4	**3768.2**	2749.7	75.9	1078.0
30-Jun-91	4203.0	1.3	4204.3	46.5	40.0	10.8	2.7	100.0	141.7	**4246.0**	2435.2	67.7	1127.0
Averages	3797.9	1.1	3799.0	88.1	33.3	66.2	2.5	190.1	138.9	**3747.8**	2141.3	345.5	883.6

Lake Michigan Diversion Accounting - WY1991
July 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Jul-91	3760.0	3.6	3763.6	113.7	32.5	22.6	3.2	172.0	160.2	**3751.8**	2536.0	121.4	1235.0
02-Jul-91	4055.0	3.7	4058.7	55.0	33.1	10.2	3.1	101.4	163.2	**4120.5**	2629.6	87.4	1350.0
03-Jul-91	4219.0	3.2	4222.2	116.9	32.4	54.1	3.2	206.6	167.6	**4183.2**	2438.9	233.8	1201.0
04-Jul-91	3960.0	3.4	3963.4	115.9	31.9	39.6	3.0	190.4	156.0	**3929.0**	2067.8	227.4	1345.0
05-Jul-91	3965.0	3.6	3968.6	53.8	31.9	10.2	2.8	98.7	157.6	**4027.5**	2290.1	92.6	1404.0
06-Jul-91	4001.0	3.9	4004.9	53.8	32.2	9.8	3.1	98.9	162.5	**4068.5**	2505.5	49.9	1336.0
07-Jul-91	5457.0	3.6	5460.6	332.0	32.2	226.9	2.9	594.0	159.8	**5026.4**	2229.2	1366.5	1582.0
08-Jul-91	3650.0	3.7	3653.7	137.7	35.4	21.8	3.1	198.0	159.1	**3614.8**	2127.5	183.9	1322.0
09-Jul-91	4303.0	3.4	4306.4	54.4	31.8	10.1	2.8	99.1	157.7	**4365.0**	2123.2	58.4	1265.0
10-Jul-91	3718.0	3.4	3721.4	46.5	31.7	9.3	2.9	90.4	162.0	**3793.0**	2324.2	41.1	1392.0
11-Jul-91	3948.0	3.5	3951.5	129.0	32.2	40.0	3.2	204.4	164.4	**3911.5**	2311.3	108.2	1164.0
12-Jul-91	3787.0	3.2	3790.2	55.0	31.7	9.6	2.8	99.1	162.5	**3853.6**	2266.1	32.8	1247.0
13-Jul-91	4115.0	3.0	4118.0	53.9	41.6	9.4	2.8	107.7	158.5	**4168.8**	2139.2	33.2	1513.0
14-Jul-91	3877.0	2.7	3879.7	127.3	33.5	22.8	2.7	186.3	160.6	**3854.0**	2191.3	83.6	1499.0
15-Jul-91	3760.0	3.1	3763.1	54.2	32.4	9.2	3.0	98.8	164.8	**3829.1**	2406.5	25.4	1382.0
16-Jul-91	4002.0	3.2	4005.2	46.5	32.4	8.8	3.1	90.8	166.9	**4081.3**	2613.3	25.6	1330.0
17-Jul-91	3783.0	3.4	3786.4	134.7	32.4	23.9	2.9	193.9	169.7	**3762.2**	2648.1	79.0	1284.0
18-Jul-91	4244.0	3.3	4247.3	54.1	32.4	9.2	3.2	98.9	168.8	**4317.2**	2766.1	24.4	1335.0
19-Jul-91	4021.0	3.3	4024.3	53.9	32.4	9.2	2.8	98.3	170.6	**4096.6**	2876.3	32.0	1333.0
20-Jul-91	4527.0	3.3	4530.3	142.6	32.4	25.4	2.9	203.3	167.7	**4494.7**	2899.6	81.1	1353.0
21-Jul-91	3878.0	3.2	3881.2	46.5	32.6	8.8	2.9	90.8	164.3	**3954.7**	2420.7	34.3	1314.0
22-Jul-91	3995.0	3.3	3998.3	89.1	31.6	33.9	2.8	157.4	160.2	**4001.1**	2504.6	640.8	884.0
23-Jul-91	3887.0	3.2	3890.2	164.4	31.9	30.5	2.9	229.7	163.5	**3824.0**	2401.9	126.4	1553.0
24-Jul-91	4066.0	3.1	4069.1	53.8	32.4	9.3	2.9	98.4	163.1	**4133.8**	2422.9	21.4	1335.0
25-Jul-91	3931.0	3.1	3934.1	54.1	32.0	9.2	2.7	98.0	160.1	**3996.2**	2340.5	14.6	1389.0
26-Jul-91	4032.0	2.9	4034.9	134.1	32.2	24.9	2.6	193.8	163.5	**4004.6**	2293.0	74.4	1384.0
27-Jul-91	3924.0	3.0	3927.0	46.5	32.2	8.8	2.9	90.4	163.0	**3999.6**	2259.8	12.5	1431.0
28-Jul-91	4212.0	3.0	4215.0	46.5	32.2	8.8	2.9	90.4	159.9	**4284.5**	2189.1	11.0	1274.0
29-Jul-91	3580.0	3.0	3583.0	55.0	30.4	9.3	2.7	97.4	159.1	**3644.7**	2170.7	30.9	1348.0
30-Jul-91	3956.0	3.1	3959.1	135.6	31.7	24.1	2.9	194.3	156.7	**3921.5**	2291.6	81.6	2069.0
31-Jul-91	3728.0	3.3	3731.3	53.9	32.1	9.2	2.9	98.1	161.7	**3794.9**	2462.7	16.4	1277.0
Averages	4011.0	3.3	4014.3	90.7	32.6	24.5	2.9	150.7	162.4	**4026.0**	2391.8	130.7	1359.0

Lake Michigan Diversion Accounting - WY1991
August 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	1	2	3	4	5	6	7	8	9	10	11	12	13
01-Aug-91	3985.0	3.0	3988.0	54.0	31.1	9.2	2.6	96.9	160.2	4051.3	2558.0	12.7	1343.0
02-Aug-91	3895.0	3.0	3898.0	123.6	31.3	26.8	2.5	184.2	181.4	3875.2	2647.1	58.9	1377.0
03-Aug-91	4175.0	2.5	4177.5	46.5	34.6	9.0	2.5	92.6	158.7	4243.6	2300.4	58.0	1383.0
04-Aug-91	4192.0	2.5	4194.5	55.0	30.4	9.3	2.5	97.2	156.4	4253.7	2162.1	31.6	1445.0
05-Aug-91	3198.0	2.5	3200.5	133.2	30.5	23.8	2.5	190.0	158.0	3168.5	2249.1	70.0	1276.0
06-Aug-91	3933.0	2.7	3935.7	53.8	30.6	9.2	2.6	96.2	160.3	3999.8	2274.4	13.9	1289.0
07-Aug-91	4415.0	2.7	4417.7	54.1	30.5	18.5	2.5	105.6	151.1	4463.2	2123.5	18.5	1577.0
08-Aug-91	7561.0	2.6	7563.6	222.8	30.5	1205.1	2.5	1460.9	162.5	6265.2	1887.8	9219.5	941.0
09-Aug-91	5145.0	2.6	5147.6	325.3	31.1	73.6	2.5	432.5	154.3	4869.4	1906.6	543.7	1197.0
10-Aug-91	4614.0	2.8	4616.8	53.6	30.1	16.2	2.5	102.4	152.6	4667.0	1939.1	126.9	1433.0
11-Aug-91	4162.0	2.8	4164.8	53.6	30.5	13.4	2.5	100.0	153.4	4218.2	1968.6	87.7	1405.0
12-Aug-91	4150.0	2.8	4152.8	53.7	30.6	11.7	2.6	98.6	153.5	4207.7	2135.7	55.3	1362.0
13-Aug-91	3834.0	2.8	3836.8	130.5	30.7	24.7	2.8	188.7	157.4	3805.5	2222.0	104.2	1358.0
14-Aug-91	3941.0	2.9	3943.9	55.1	30.6	9.9	2.8	98.4	157.9	4003.4	2273.5	42.3	1301.0
15-Aug-91	3945.0	2.8	3947.8	46.5	30.7	9.1	2.8	89.1	160.8	4019.5	2296.2	36.9	1325.0
16-Aug-91	4178.0	2.8	4180.8	134.7	30.7	25.1	2.5	193.0	158.6	4146.4	2260.5	94.2	1162.0
17-Aug-91	3646.0	2.6	3648.6	46.5	30.6	19.2	2.2	98.5	153.7	3703.8	2057.4	73.9	1426.0
18-Aug-91	3952.0	2.6	3954.6	46.5	30.5	8.9	2.4	88.3	153.2	4019.5	2063.6	40.2	1305.0
19-Aug-91	4736.0	2.7	4738.7	274.6	45.2	236.0	2.3	558.1	158.9	4339.5	1924.1	2513.0	895.0
20-Aug-91	5090.0	2.6	5092.6	169.8	30.2	33.5	2.4	235.7	154.6	5011.5	1909.8	564.0	1388.0
21-Aug-91	3883.0	2.7	3885.7	46.5	30.2	10.1	2.5	89.3	154.9	3951.3	2024.8	138.6	1391.0
22-Aug-91	3883.0	2.7	3885.7	46.5	30.3	9.6	2.5	88.9	157.2	3954.0	2160.5	74.1	1347.0
23-Aug-91	4189.0	2.6	4191.6	141.0	30.6	25.4	2.7	199.7	159.0	4150.9	2178.4	111.4	1367.0
24-Aug-91	3956.0	2.6	3958.6	54.2	30.3	9.4	2.7	96.6	155.1	4017.1	2175.1	43.2	1442.0
25-Aug-91	4091.0	2.9	4093.9	53.7	30.8	9.2	2.5	96.2	157.0	4154.7	2241.5	36.5	1346.0
26-Aug-91	3828.0	2.8	3830.8	53.8	30.7	9.2	2.6	96.3	159.9	3894.4	2524.2	31.0	1322.0
27-Aug-91	3595.0	2.9	3597.9	122.1	30.8	21.7	2.7	177.3	163.5	3584.1	2594.1	77.5	1268.0
28-Aug-91	4042.0	2.8	4044.8	46.5	30.8	8.8	2.7	88.8	162.8	4118.8	2604.4	26.0	1270.0
29-Aug-91	3920.0	2.8	3922.8	84.7	30.7	300.5	2.7	418.6	165.3	3669.5	2578.7	668.7	728.0
30-Aug-91	4212.0	2.7	4214.7	248.4	30.7	98.3	2.7	380.1	160.5	3995.1	2180.2	733.5	763.0
31-Aug-91	4145.0	2.6	4147.6	140.2	30.4	27.6	2.6	200.8	152.7	4099.5	1952.7	167.6	1345.0
Averages	4209.4	2.7	4212.1	102.3	31.2	74.9	2.6	211.0	157.6	4158.7	2205.6	512.0	1283.1

Lake Michigan Diversion Accounting - WY1991
September 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1991	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Sep-91	4429.0	2.8	4431.8	46.5	29.6	10.2	2.2	88.5	111.4	**4454.7**	1869.3	61.3	1399.0
02-Sep-91	3680.0	2.9	3682.9	46.5	29.6	9.5	2.2	87.8	115.2	**3710.3**	1961.0	41.7	1310.0
03-Sep-91	5335.0	3.0	5338.0	179.2	30.0	636.3	2.3	847.8	127.2	**4617.4**	1962.8	3774.7	1018.0
04-Sep-91	3876.0	2.9	3878.9	255.2	29.4	61.0	2.1	347.7	113.0	**3644.2**	1892.3	485.8	1180.0
05-Sep-91	4148.0	2.8	4150.8	46.5	29.3	16.1	2.3	94.2	112.4	**4169.0**	1905.4	105.5	1193.0
06-Sep-91	3929.0	2.9	3931.9	46.5	29.4	12.9	2.1	90.9	113.8	**3954.8**	1965.8	51.7	1289.0
07-Sep-91	3985.0	3.0	3988.0	61.7	29.5	13.9	2.1	107.2	114.8	**3995.6**	2107.0	42.4	1248.0
08-Sep-91	4051.0	2.9	4053.9	100.8	29.8	20.0	2.2	152.8	115.1	**4016.2**	2017.9	59.3	907.0
09-Sep-91	4807.0	3.0	4810.0	71.4	29.6	199.3	2.3	302.6	116.4	**4623.8**	2145.2	722.2	1235.0
10-Sep-91	3940.0	2.9	3942.9	254.6	29.5	92.5	2.4	379.0	116.5	**3680.4**	1975.4	399.7	1610.0
11-Sep-91	4210.0	2.8	4212.8	46.5	29.4	12.7	2.3	90.9	118.4	**4240.3**	1920.7	38.0	1209.0
12-Sep-91	5705.0	2.9	5707.9	180.7	29.5	417.9	2.3	630.4	119.3	**5196.8**	1850.8	2764.9	1059.0
13-Sep-91	4641.0	2.9	4643.9	321.6	29.4	204.9	2.2	558.1	115.9	**4201.7**	1882.0	1270.2	1489.0
14-Sep-91	4510.0	2.9	4512.9	176.5	29.5	130.2	2.1	338.3	112.4	**4287.0**	1836.3	804.5	949.0
15-Sep-91	4875.0	3.0	4878.0	54.4	29.3	21.6	2.1	107.4	111.3	**4881.9**	1857.2	234.7	1070.0
16-Sep-91	3764.0	2.8	3766.8	46.5	29.4	16.6	2.0	94.5	111.7	**3784.0**	1873.5	114.9	1595.0
17-Sep-91	3670.0	2.8	3672.8	68.8	29.4	17.1	2.0	117.3	112.1	**3667.6**	1864.9	82.3	1041.0
18-Sep-91	2966.0	2.5	2968.5	122.1	29.5	25.5	2.1	179.2	110.2	**2899.5**	1793.0	105.7	915.0
19-Sep-91	2300.0	2.6	2302.6	46.5	29.4	11.8	2.2	89.9	107.5	**2320.2**	1750.1	39.4	170.0
20-Sep-91	2428.0	2.6	2430.6	46.5	29.7	11.2	2.1	89.5	112.7	**2453.8**	1784.4	30.4	128.0
21-Sep-91	2436.0	2.5	2438.5	121.8	29.5	24.6	2.0	177.9	107.6	**2368.2**	1767.8	79.4	156.0
22-Sep-91	2576.0	2.5	2578.5	78.8	29.5	19.2	2.0	129.5	108.4	**2557.4**	1712.3	269.2	117.0
23-Sep-91	2362.0	2.7	2364.7	109.1	29.4	21.9	2.2	162.6	115.3	**2317.4**	1781.6	98.1	103.0
24-Sep-91	2216.0	2.5	2218.5	62.3	29.6	13.2	2.1	107.2	115.3	**2226.6**	1750.3	46.3	256.0
25-Sep-91	2146.0	2.9	2148.9	54.4	29.4	10.6	2.1	96.5	109.6	**2162.0**	1732.0	46.2	103.0
26-Sep-91	2283.0	2.6	2285.6	46.5	29.6	9.9	2.2	88.2	110.5	**2307.9**	1753.0	34.2	89.0
27-Sep-91	2009.0	2.5	2011.5	120.6	29.6	23.2	2.2	175.6	108.0	**1943.9**	1758.6	82.5	92.0
28-Sep-91	2281.0	2.5	2283.5	55.0	29.6	9.8	2.0	96.4	109.6	**2296.7**	1760.7	30.3	128.0
29-Sep-91	2328.0	2.5	2330.5	54.6	29.6	9.6	2.0	95.8	109.0	**2343.7**	1742.0	26.1	152.0
30-Sep-91	2087.0	2.8	2089.8	121.1	29.6	22.7	2.2	175.6	111.1	**2026.3**	1850.5	76.6	86.0
Averages	3465.8	2.8	3468.6	101.4	29.5	70.2	2.2	203.3	113.1	**3378.4**	1860.8	400.6	776.5

APPENDIX C

LAKE MICHIGAN DIVERSION ACCOUNTING

WATER YEAR 1992 REPORT

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List of Tables

List of Figures

Executive Summary

In compliance with the modified 1980 U.S. Supreme Court decree (hereinafter, the Decree), the WY92 diversion was computed using the best engineering technology available to date.

Given the complexity of the hydrologic cycle in the heavily urbanized Chicago metropolitan area, and given the number of human and other factors that cannot be adequately represented in numerical modeling procedures, the results of the simulations which compute diversion flows worked exceptionally well.

The WY92 diversion accountable to the State of Illinois is 3,408.7 cfs. This is 208.7 cfs greater than the 3,200 cfs average specified by the Decree. The 40 year running average, rounded to the nearest cfs, beginning with WY81 is 3,457 cfs and the cumulative deviation from the 3,200 cfs average is -3,084 cfs-years. The negative cumulative deviation indicates a water allocation deficit and the maximum allowable debt is 2,000 cfs-years.

Introduction

The diversion of water from the Lake Michigan watershed is of major importance to the Great Lakes states and to the Canadian province of Ontario. The states and province that border the Great Lakes have concerns with both diversions during periods of low lake levels, as well as the long term effects of diversion. To insure that the concerns of these interested parties are considered, the U. S. Army Corps of Engineers has been given the responsibility for the accounting of flow that is diverted from the Lake Michigan watershed.

The Corps of Engineers, Chicago District, is responsible for monitoring the measurements and the computation of the diversion of Lake Michigan water by the State of Illinois. The computations for Water Year 1983 (WY83), WY84 and WY85 (1 October 1984 through 30 September 1985) were completed by the Northeastern Illinois Planning Commission (NIPC) for the Illinois Department of Transportation (IDOT). Prior to the WY83 report, the calculations were made by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) (formerly known as the Metropolitan Sanitary District of Greater Chicago, (MSDGC)) for IDOT. The Corps reviewed, modified, and updated the WY84 and WY85 diversion accounting completed by NIPC. The computations for WY86 were performed jointly by NIPC (under contract to the Corps of Engineers) and the Corps of Engineers. Beginning in WY87, the computations were performed solely by the Corps of Engineers. This report represents the final Lake Michigan diversion accounting for WY92.

Authority for Report

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 Chicago District of the Corps of Engineers is responsible for monitoring the measurement and computation of diversion of Lake Michigan water by the State of Illinois. The Water Resources Development Act of 1986 (Section 1142 of PL 99-662) gave the Corps total responsibility for the computation of diversion flows as formerly done by the State of Illinois. The Corps' new mission became effective 1 October 1987.

History of the Diversion

Water has been diverted from Lake Michigan at Chicago into the Mississippi River Watershed since the completion of the Illinois and Michigan (I and M) Canal in

1848. At that time, diversion averaged about 500 cubic feet per second (cfs). The I and M Canal was built primarily to serve transportation needs providing a connecting watercourse between the Great Lakes and the Mississippi River system.

With the development of the Chicago metropolitan area, sewer and drainage improvements led to severe sanitation problems in 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.

A second problem that occurred during this time period was an increase in the overbank flooding within the city. As more roads were built and buildings constructed, the sewer system was correspondingly expanded. The increase in impervious area from the newly constructed roads and buildings increased the rate and volume of stormwater runoff and resulted in increased flooding.

As a solution to the sanitation and flooding problems, construction of the Chicago Sanitary and Ship Canal (CSSC) was undertaken. Construction of the CSSC allowed the flow direction of the Chicago River to be reversed (Figure 1). Construction of the Chicago Sanitary and Ship Canal was completed in 1900 by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). The CSSC followed the course of the older I and M Canal. The CSSC is much larger than the I and M canal and can handle the Chicago River flow, as well as increased shipping. In the 1930's, the Chicago River Controlling Works (CRCW) was constructed at the mouth of the Chicago River. The CRCW regulates the amount of Lake Michigan water allowed to pass into the river and restricts river flooding from entering Lake Michigan. The water levels in the CSSC are controlled by the Lockport Lock and Dam.

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 regulates the amount of Lake Michigan flow allowed down the channel.

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 O'Brien Lock and Dam, which was completed in 1967, is located on the Calumet River and regulates the flow of Lake Michigan waters down the Calumet Sag Channel. The O'Brien Lock and Dam replaced the Blue Island Lock and Dam. Figure 2 shows the affected watershed.

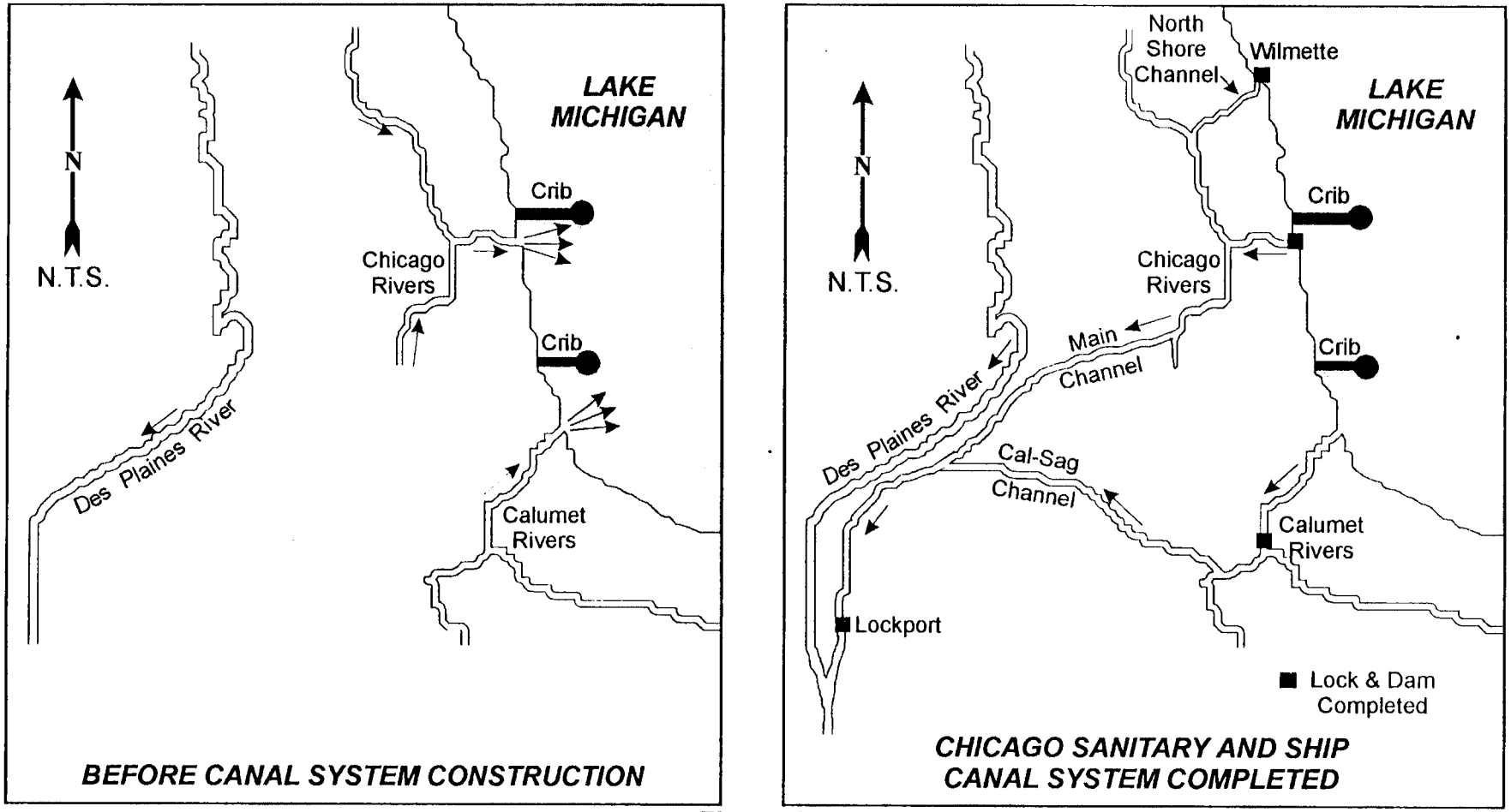

Figure 1

Development of the Chicago Sanitary and Ship Canal System

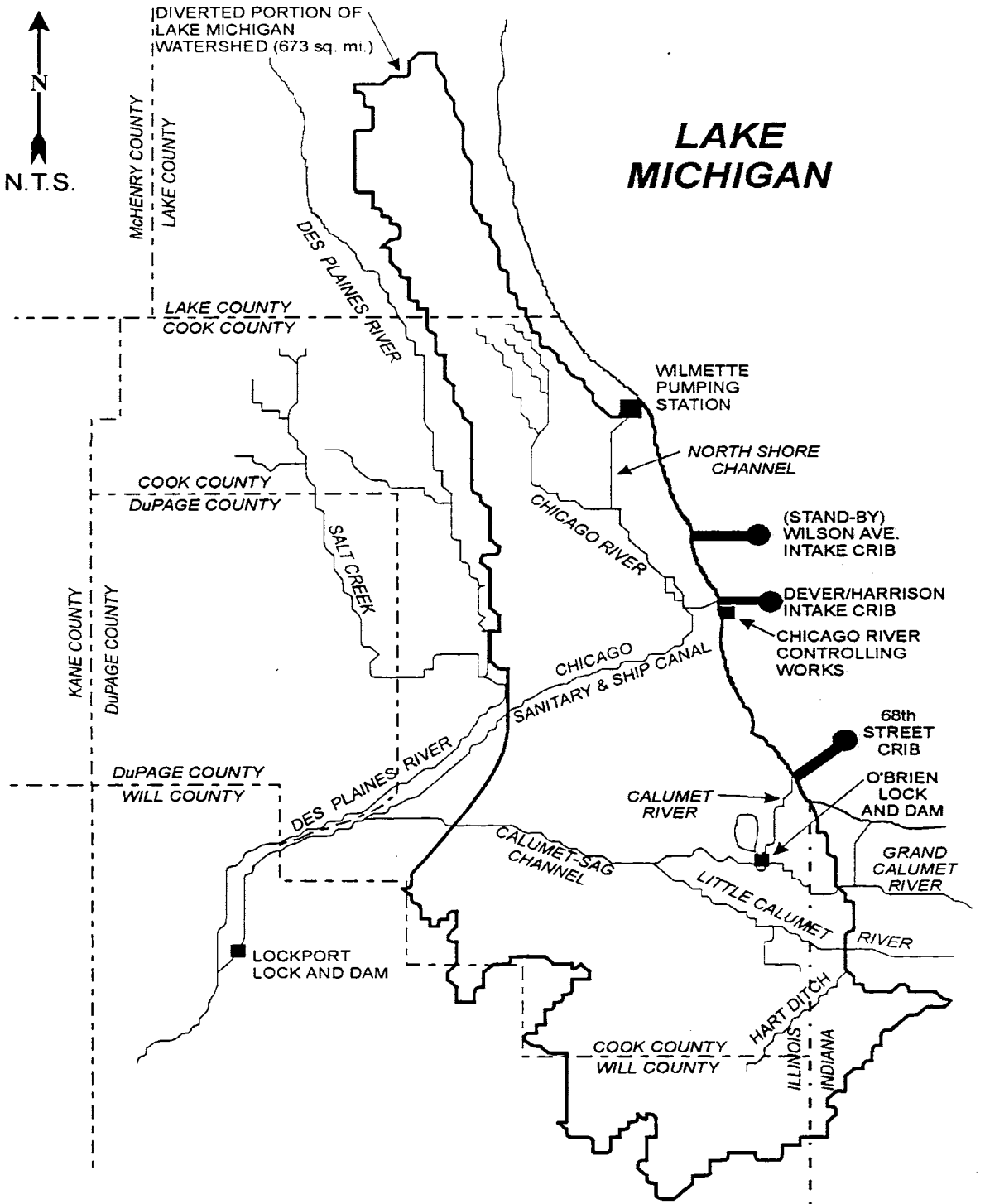

Figure 2

Location Plan - Lake Michigan Diversion at Chicago

Background of Lake Michigan Diversion Accounting

The Lake Michigan diversion accountable to Illinois is limited to 3,200 cubic feet per second (cfs) over a forty (40) year averaging period. During the forty (40) year period, the average diversion in any annual accounting period may not exceed 3,680 cfs except in any two accounting periods in which the average diversion may not exceed 3,840 cfs as a result of extreme hydrologic conditions. During the first thirty nine (39) year period, the maximum allowable cumulative difference between the calculated diversion and 3,200 cfs is 2,000 cfs-years. These limits apply to the period beginning with WY81.

Prior to the 1983 accounting report, diversion accounting was done by the MWRDGC in the form of monthly hydraulic reports. As required by Supreme Court Decree, the diversion was calculated by deducting non-diversion flows from the Lockport record measured by MWRDGC and adding those diversion flows not discharging to the CSSC. All of the deductible flows could not be measured, therefore MWRDGC used flow records from gaged areas to get typical flow values and then extrapolated to arrive at the total deduction.

The State of Illinois contracted with NIPC to revise the diversion accounting calculations. At the same time, the State of Illinois moved from monthly hydraulic reports to annual accounting reports. NIPC adapted computer models of the diverted Lake Michigan and the Des Plaines River watersheds previously developed for studies in Northeastern Illinois under Section 208 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), to calculate those flows that could not be measured. Like MWRDGC, NIPC deducted non-diversion flows from the Lockport record and added those flows not discharged to the canal to calculate the Lake Michigan diversion. However, NIPC modeled both the gaged and ungaged areas to calculate much of the deduction and addition flows. Then computational budgets were developed around each of the gaged areas to verify the models. The budgets aid in identifying problem areas in the procedure. The procedure developed by NIPC is a significant improvement over the previous approach, because of the more rigorous approach and because of the verification provided by the budgets.

As required by Supreme Court Decree, a three (3) member technical committee is convened every five (5) years to evaluate the diversion accounting program to ensure that the accounting is accomplished using the best current engineering practice and scientific knowledge.

The first technical committee was convened during the period when diversion accounting was done by MWRDGC. The committee was primarily concerned with the rating of the various components at the Lockport facility, the primary diversion measurement location (Espey et. al., 1981). In response to the Committee's concerns, the Corps' Waterways Experiment Station (WES) revised the ratings of the two sets of Lockport sluice gates (Hart and McGee, 1985).

In response to the Committee's concerns, the State of Illinois installed an acoustic velocity meter (AVM) at Romeoville five (5) miles upstream of Lockport. The AVM is a highly accurate flow measuring device that proved to provide better flow measurements than the MWRDGC reported Lockport flows and the new Corps rating curves. The AVM became operational 12 June 1984. However, USGS did not publish the AVM flows until 1 October 1985. Because of significant equipment problems with the original AVM, a replacement AVM was installed in November 1988.

To provide flows during periods of malfunction, various regression analyses were performed to relate the MWRDGC reported Lockport flows to the AVM flows. Several sets of equations were proposed by the Corps of Engineers, the United States Geological Survey (USGS), Harza Engineering Co., and the Second Technical Committee. The report, *Chicago Sanitary and Ship Canal at Romeoville Acoustical Velocity Meter Backup System*, was completed September 1989 (USACE, 1989). The report documents the many efforts taken by various parties to develop useful regression equations. The regression equations that were ultimately used to estimate missing AVM flows from WY86 through WY92 were developed by the USGS in a report titled *Comparison, Analysis, and Estimation of Discharge Data from Two Acoustic Velocity Meters on the Chicago Sanitary and Ship Canal at Romeoville, Illinois* (USGS, 1994). This report is contained in the Lake Michigan Diversion Accounting WY93 Annual Report.

The second technical committee reviewed the NIPC hydrologic and hydraulic computer models and agreed that the approach was consistent with what was required by the decree (Espey et. al., 1987). However, the committee felt that some of the parameters used in the models were out of date and in need of revision. To address the committee's concerns, the Corps hired a consultant (Christopher B. Burke Engineering, Ltd., (CBBEL)) in September of 1988 to review and update the modeling parameters. The final report (CBBEL, 1990) concerning the updating of modeling parameters was submitted to the Corps in October 1990.

The Water Resources Development Act of 1986 gave the Corps of Engineers the full responsibility for computation of the Illinois Lake Michigan diversion as of 1 October 1987. When the Corps' new responsibility became effective, the WY84

diversion accounting report, developed by NIPC, had not been certified. As a result, the Corps was responsible for the WY84 and all subsequent reports.

NIPC completed the WY84 diversion accounting report in April of 1987. It was subsequently reviewed by the Corps. The Corps found the report to be adequate with two exceptions. First, the 1984 accounting was completed with the modeling parameters questioned by the second technical committee. Second, the MWRDGC Lockport flows, which were adjusted using the WES rating curves, were used rather than the AVM flows. The Corps, knowing that the modeling parameters required updating and that AVM flows for the period prior to installation could be calculated accurately using regression equations, refrained from certifying the WY84 report until these issues were resolved.

NIPC completed the WY85 diversion accounting report in December of 1988 and the report was reviewed by the Corps. Like the WY84 report, the WY85 accounting was done with the modeling parameters questioned by the second technical committee. Additionally, NIPC used the AVM flows published by the USGS in their WY85 Water Resources Data for Illinois report. Since the publication of the WY85 USGS report, more reliable equations have been developed for calculating flows when the AVM was malfunctioning. These equations are periodically reviewed and updated as necessary.

Upon completion of the analysis of the modeling parameters by CBBEL, the WY84 and WY85 diversion flows were recalculated using the revised modeling parameters and the Romeoville AVM flows. The diversion flows were certified by the Corps of Engineers and transmitted to all interested parties in the Lake Michigan Diversion Accounting 1989 Annual Report (USACE, 1990).

The computation of Illinois' diversion from Lake Michigan for WY86 was undertaken as a joint effort between NIPC (under contract to the Corps of Engineers) and the Corps of Engineers. The computation of Illinois' diversion from Lake Michigan for WY87 through WY90 was performed solely by the Corps of Engineers. The WY86 through WY89 Diversion Accounting Reports are contained in the Lake Michigan Diversion Accounting Annual Report covering WY90 through WY92 (USACE, 1994).

The primary revision implemented for the WY90 diversion accounting was the incorporation of the new 25-gage precipitation network into the runoff simulation models. The 25-gage precipitation network replaces the previous 13-gage network. The new precipitation network has solved many of the problems associated with the old network, such as poor exposure and distribution patterns. The Illinois State Water Survey (ISWS) installed and maintains the precipitation network for the Corps

of Engineers. They also collect the data and adjust it if necessary. A description of the new 25-gage precipitation network can be found in the ISWS report titled *Installation and Operation of a Dense Raingage Network to Improve Precipitation Measurements for Lake Michigan Diversion Accounting: Water Year 1990* (ISWS, 1991). That report is contained in the Lake Michigan Diversion Accounting WY93 Annual Report.

In addition to the installation and use of the new 25-gage precipitation network was the subsequent modifications to the hydrologic runoff models and hydraulic sewer routing models. These models were revised in order to reflect the changes in the precipitation network. Many of the model changes were accomplished by Rust Environment and Infrastructure under contact with the Corps of Engineers. Their work culminated in a report titled *Diversion Accounting Update for the New 25-Gage Precipitation Network* (Rust,1993). That report is also contained in the Lake Michigan Diversion Accounting WY93 Annual Report.

Rust's work involved review and correction of map delineations of combined sewer special contributing areas, delineation of precipitation gage assigned areas for the 25-gage network, land-use/land-cover delineations, modifications to the hydraulic sewer routing model to reflect the revised precipitation network and land cover assignments, and an assessment of the model parameters used in the hydrologic runoff model, Hydrologic Simulation Program - FORTRAN (HSPF).

The Corps of Engineers modified the hydraulic sewer model, Special Contributing Area Loading Program (SCALP), in separate sewer areas in order to incorporate changes in the precipitation network. Since actual boundaries have not been mapped for those areas some assumptions as to the location of the separate sewer areas were made. This was necessary since effective areas have been applied for the separate sewer areas in the SCALP model. These assumptions will continue until a further study can be accomplished that will reflect actual boundaries for these separately sewered areas.

A study was also done by the Corps to improve the response of the HSPF hydrologic runoff models. Input on parameter improvements were received from NIPC and Rust. The study resulted in some minor parameter modifications to the HSPF runoff model to correct for past inconsistencies and improve parameter accuracy.

Diversion Accounting Procedures

The Lake Michigan diversion accountable to the State of Illinois is calculated by using the AVM measured flow in the Chicago Sanitary and Ship Canal at Romeoville and deducting flows that do not constitute Lake Michigan diversion and are not accountable to the State of Illinois. Finally, additions are made to the Romeoville record for diversions that are not discharged to the canal. The deductions include groundwater water supply pumpage whose effluent is discharged to the canal, runoff from the Des Plaines River watershed that is discharged to the canal, Lake Michigan water supply pumpage from Indiana that is discharged to the canal, and water supply pumpage from Lake Michigan used for Federal facilities that is discharged to the canal. The additions to the Romeoville record include flows diverted from the canal upstream of Romeoville, and Lake Michigan water supply whose effluent is not discharged to the canal. This procedure represents the accounting method required by the Supreme Court Decree.

The diversion accounting results are presented as a series of columns that are listed in Table 1. Column 1 through Column 3 compute the total flow in the CSSC. Column 4 through Column 7 presents the deductions from the canal system flows with the total deduction being presented in Column 8. Column 9 presents the additions to the canal system record. Column 10 is the computed Lake Michigan diversion accountable to Illinois and is equal to the canal system flow minus the deductions plus the additions. Columns 11 through 13 are independent flow estimates for the three sources of diversion: water supply pumpage from Lake Michigan, runoff from the diverted Lake Michigan Watershed, and direct diversion through the lakefront structures. Column 11 through Column 13 are not used in the diversion calculation but are included as another estimate of the diversion for verification of the accounting flows in Column 10. The sum of Column 11 through Column 13 should theoretically equal the flow in Column 10.

In addition to the diversion calculations presented in the 13 columns, 14 computational budgets are prepared as input to the diversion calculation and to verify the estimated flows that cannot be measured. A summary of these budgets is presented in Table 2. Budgets 1 and 2 do not compare simulated to measured flows but are summations of critical water supply pumpage data. Budget 3 through Budget 6 partition stream gage records into runoff and sanitary/industrial discharge components to estimate a portion of the runoff from the diverted watershed that is used as input to Column 12, Runoff from the Diverted Lake Michigan Watershed. Budget 7 through Budget 13 compare simulated to measured flows at MWRDGC facilities. These budgets simulate all the deductible Des Plaines River Watershed

contained in Column 6 and the deductible groundwater seepage into TARP contained in Column 4. These budgets also are used for verification of the diversion accounting procedures and give an indication of the accuracy of the diversion accounting models. Budget 14 compares canal system inflows and outflows. It is used primarily as a verification of modeling results as well as an indicator of the accuracy and completeness of measured/reported flows.

Table 1

Description of the Diversion Accounting Columns

Column Number	Description
1	Chicago Sanitary and Ship Canal (CSSC) at Romeoville AVM Gage Record
2	Diversion from the CSSC above the Romeoville AVM Gage
3	Total Flow Through the CSSC
4	Groundwater Pumpage Discharged into the CSSC and Adjoining Channels
5	Water Supply Pumpage from Indiana Reaching the CSSC
6	Runoff from the Des Plaines River Watershed which Reaches the CSSC
7	Lake Michigan Pumpage by Federal Facilities which Discharge to the CSSC and Adjoining Channels
8	Total Deduction from the CSSC Romeoville AVM Gage Record
9	Lake Michigan Pumpage Which is not Discharged into the CSSC
10	Total Diversion Accountable to the State of Illinois
11	Pumpage from Lake Michigan Which is Accountable to the State of Illinois
12	Runoff from the Diverted Lake Michigan Watershed
13	Direct Diversions Through Lake Front Control Structures Which is Accountable to the State of Illinois

Table 2

Description of the Diversion Accounting Computational Budgets

Budget Number	Title	Description
1	Diverted Lake Michigan Pumpage	This budget sums the Lake Michigan water diverted by the State of Illinois in the form of Industrial and Municipal water supply. The results of this budget are used in Column 11.
2	Groundwater Discharged to the CSSC	This budget sums groundwater pumpages that are discharged to the CSSC. The results of this budget are used in Column 4.
3	North Branch Chicago River at Niles,IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
4	Little Calumet River at the IL-IN State Line	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
5	Thorn Creek at Thorton, IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
6	Little Calumet River at South Holland, IL	This budget performs a simple separation of stream flow into sanitary and runoff portions. The results of this budget are used in Budget 14 and Column 12.
7	MWRDGC Northside Water Reclamation Plant	This budget performs hydrologic and hydraulic simulation of the service basin tributary to the MWRDGC Northside Water Reclamation Facility. The simulations estimates the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Northside service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
8	Upper Des Plaines Pumping Station	This budget performs hydrologic and hydraulic simulation of the MWRDGC Upper Des Plaines Pumping Station. This budget provides a calibration point to verify models of the Des Plaines River watershed
9	MWRDGC Mainstream TARP Pumping Station	This budget performs hydrologic and hydraulic simulation of the MWRDGC Mainstream TARP Pumping Station. The results of this simulation are used in Budgets 10 and 14 and Columns 6 and 12. The budget also provides internal verification of the accounting procedures.
10	MWRDGC Stickney Water Reclamation Facility	This budget performs hydrologic and hydraulic simulation of the service basin tributary to the MWRDGC Stickney Water Reclamation Facility. The simulations estimates the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Stickney service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
11	MWRDGC Calumet TARP Pumping Station	This budget performs hydrologic and hydraulic simulation of the MWRDGC Calumet TARP Pumping Station. The results of this simulation are used in Budgets 12 and 14 and Columns 6 and 12. The budget also provides internal verification of the accounting procedures.
12	MWRDGC Calumet Water Reclamation Facility	This budget performs hydrologic and hydraulic simulation of the service basin tributary to the MWRDGC Calumet Water Reclamation Facility. The simulations estimates the runoff from portions of the Lake Michigan and Des Plaines River watersheds within the Calumet service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Columns 6 and 12.
13	MWRDGC Lemont Water Reclamation Facility	This budget performs hydrologic and hydraulic simulation of the service basin tributary to the MWRDGC Lemont Water Reclamation Facility. The simulations estimates the runoff from portions of the Des Plaines River watershed within the Lemont service basin that is diverted to the CSSC in the form of inflow-infiltration. The budget provides an internal verification of the accounting procedures. The results of this budget are used in Budget 14 and Column 6.
14	Chicago Canal System	This budget performs a water balance of the Chicago Canal System which includes the CSSC and adjoining channels. This budget provides a verification point for the accounting procedures.

Revisions to the Lake Michigan Diversion Accounting Procedures

The primary revision to the WY92 diversion accounting procedure consisted of using the measured flow data for the Grand Calumet River instead of the regression equation that had previously been used. The Grand Calumet River data are used in Column 5 of the diversion accounting proceedures.

Accounting Results

The WY92 diversion accounting monthly summary is presented in Table 4. Table 4 shows the total WY92 Lake Michigan diversion accountable to the State of Illinois is 3,408.7 cfs (Column 10). This is 208.7 cfs greater than the 3,200 cfs average specified by the Decree. The 40 year running average (Table 3), rounded to the nearest cfs, beginning with WY81 is 3,457 cfs and the cumulative deviation from the 3,200 cfs average is -3,084 cfs-years. The negative cumulative deviation indicates a water allocation deficit. The maximum allowable deficit is 2,000 cfs-years. Tabular data on daily diversion flows is presented in Appendix A.

Table 3

Status of the State of Illinois' Diversion from Lake Michigan Under the 1980 Modified U.S. Supreme Court Decree

Accounting Year	Certified Flow (cfs)	Running Average (cfs)	Cumulative Deviation (cfs-years)
1981	3,106	3,106	94
1982	3,087	3,097	207
1983	3,613	3,269	- 206
1984	3,432	3,309	- 438
1985	3,472	3,342	- 710
1986	3,751	3,410	-1,261
1987	3,774	3,462	-1,835
1988	3,376	3,451	-2,011
1989	3,378	3,443	-2,189
1990	3,531	3,452	-2,520
1991	3,555	3,461	-2,875
1992	3,409	3,457	-3,084

Table 4

Lake Michigan Diversion Accounting - WY1992
Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Oct-91	4098.1	0.5	4098.6	151.1	27.9	362.4	1.8	543.2	118.4	**3673.8**	1711.0	2058.8	173.2
Nov-91	3501.1	0.4	3501.5	143.6	30.3	309.1	1.5	484.5	98.9	**3115.9**	1644.4	1450.6	84.4
Dec-91	3185.9	0.9	3186.8	122.6	30.0	247.7	1.8	402.1	102.9	**2887.6**	1633.3	1037.6	66.8
Jan-92	2458.0	2.2	2460.2	90.5	24.6	130.4	1.9	247.4	111.5	**2324.3**	1645.3	455.0	69.6
Feb-92	2835.2	1.7	2836.9	104.2	28.1	180.2	1.6	314.1	127.8	**2650.6**	1633.9	818.2	69.5
Mar-92	3131.5	1.5	3133.0	122.5	32.4	212.9	1.8	369.6	157.0	**2920.4**	1614.2	983.3	83.5
Apr-92	5193.6	1.7	5195.3	95.2	39.3	168.5	1755.0	2058.0	192.3	**3329.6**	1607.5	659.9	164.7
May-92	5052.9	2.8	5055.7	69.1	35.8	40.2	2161.8	2306.9	283.9	**3032.7**	1852.8	135.4	194.1
Jun-92	3591.0	2.5	3593.5	74.0	29.7	50.0	2.4	156.1	345.8	**3783.2**	2110.1	331.1	662.7
Jul-92	4339.7	2.5	4342.2	122.6	31.4	121.6	2.0	277.6	268.5	**4333.1**	2049.8	610.5	1282.0
Aug-92	3957.1	2.6	3959.7	101.7	25.5	63.5	2.1	192.8	260.5	**4027.4**	2048.5	425.8	1138.3
Sep-92	4974.2	0.5	4974.7	125.3	29.5	232.6	1.7	389.1	240.1	**4825.7**	1870.6	1214.6	1423.7
Averages	3859.9	1.7	3861.6	110.2	30.4	176.6	328.0	645.2	192.3	**3408.7**	1785.1	848.4	451.0

Computations:

1. Column 3 equals the sum of Columns 1 and 2.
2. Column 8 equals the sum of Columns 4 through 7.
3. Column 10 equals Column 3 minus Column 8 plus Column 9.

Deductions from the Romeoville Gage Record

Additions to the Romeoville Gage Record

Discussions of Results

The following is a discussion of the column functions and computational budgets. The discussion of the column functions describes the purpose of each column, as well as some observations on the WY92 values in the columns. The discussion of the computational budgets presents the purpose of each budget and the results of the budget flow balances. The results of the computational budgets are used in the diversion calculations where seven (7) budgets are used to verify the diversion simulation models. The columns are discussed first, followed by the discussion of the budgets.

Columns

The first ten (10) columns display the components of the diversion calculation and include the Romeoville flow, as well as the various deductions and additions to the Romeoville record. The final three (3) columns (Columns 11 through 13) display the three (3) diversion components (Lake Michigan pumpage accountable to Illinois, runoff from the diverted watershed, and direct diversion through the lakefront control structures). The sum of Columns 11 through 13 should theoretically equal the Romeoville based diversion calculation. A comparison of the sum of these three (3) columns to the calculated diversion (Column 10) is presented in the discussion of Column 11 through Column 13.

Column 1: Chicago Sanitary and Ship Canal (CSSC) at Romeoville, USGS AVM Gage Record

The discharge at Romeoville for WY92 was 3,859.9 cfs. For the ten (10) days when the AVM was inoperable, the flow at the Romeoville site was calculated from the USGS regression equations.

Column 2: Diversions from the CSSC Above the Gage

Argonne Laboratories and Uno-Ven Corporation were the only diversions from the CSSC upstream of the Romeoville gage in WY92. The average withdrawal upstream of the AVM for WY92 was 1.7 cfs.

Column 3: Total Flow Through the CSSC

Column 3 is the sum of Column 1 and Column 2 and represents the total flow entering the canal system. The average CSSC flow was 3,861.6 cfs for WY92.

Column 4: Groundwater Discharged to the CSSC And Adjoining Channels

Column 4 is groundwater pumpage by communities, industrial users and other private users whose effluent is discharged to the CSSC. The groundwater pumpage data is reported by the ISWS. It also includes the groundwater seepage into the TARP system that is discharged to the CSSC. This quantity is determined by summing all reported groundwater pumpages tributary to the CSSC, along with the estimated groundwater seepage into the Mainstream TARP (Budget 9) and Calumet TARP (Budget 11) systems. This total is then adjusted by subtracting the groundwater normally tributary to the canal that is contained in the combined sewer overflows that discharge to the Des Plaines River and other watercourses not tributary to the CSSC. This method prevents double accounting of the combined sewer overflow portion of the groundwater supply pumpage.

Using ISWS groundwater records, groundwater pumpages were assumed to reach the CSSC and adjoining channels if they were located in the diverted Lake Michigan watershed in Illinois or if they were located within MWRDGC Water Reclamation Plant (WRP) service boundaries in which their effluent was discharged into the CSSC and adjoining channels. Groundwater seepage into the Mainstream TARP and Calumet TARP systems was determined through simulation and is discussed in Budgets 9 and 11. The groundwater constituent of combined sewer overflows is determined entirely thorough simulation.

Groundwater pumpage from the Lake Michigan watershed whose effluent is discharged to the CSSC is a deduction, except to the extent that the groundwater sources are recharged by Lake Michigan. Current piezometric levels indicate that groundwater is discharging to the lake. Therefore, groundwater pumpage from within the Lake Michigan Watershed that reaches the canal continues to be a deduction. Research literature will be reviewed periodically to verify this assumption.

Column 4 represents a deduction from the Romeoville record and averaged 110.2 cfs. This is a decrease of 6.1 cfs from WY91. Groundwater pumpage tributary to the canal is composed of 20.2 cfs of groundwater pumpage from the Lake Michigan watershed, 16.8 cfs of groundwater pumpage from outside of the Lake Michigan watershed, 52.3 cfs of groundwater seepage into the Mainstream TARP

system, and 21.1 cfs of groundwater seepage into the Calumet TARP system. The total of these components is 110.4 cfs. However, the deduction from the Romeoville gage record is 110.2 cfs, since 0.2 cfs of this groundwater supply pumpage was determined, through simulation, to be discharged to the Des Plaines River and other watercourses not tributary to the CSSC in the form of combined sewer overflows.

Column 5: Water Supply Pumpage from Indiana Reaching the CSSC

Column 5 represents the computation of Indiana water supply reaching the canal through the Grand Calumet and the Little Calumet Rivers. In the case of the Little Calumet River, a drainage divide exists east of the confluence with Hart Ditch. Therefore, flows from Hart Ditch, including virtually all dry weather flows, normally flow westward into Illinois. Under high flow conditions, the drainage divide may shift westward and a portion of the Hart Ditch flows may be diverted eastward to Burns Ditch and ultimately to Lake Michigan. However, it is believed that the occurrence in the shift in the drainage divide is infrequent and the flow that is diverted eastward is insignificant. Therefore, it is assumed that all effluent discharged into Hart Ditch and the Little Calumet River west of the divide flow westward. For WY92, total flow in the Little Calumet River was 64.8 cfs, with 5.9 cfs of that flow being determined to be Indiana water supply.

The Grand Calumet River has a summit. On one side of the summit, the flow is toward Lake Michigan. On the other side of the side of the summit, the flow is toward the Calumet Sag Channel which flows into the CSSC. However, the location of the summit is variable and highly influenced by Lake Michigan levels (USGS, 1984). Thus the calculation of this deduction from the Romeoville record is influenced by Lake Michigan levels. Beginning with the WY92 accounting, Grand Calumet River flow was measured by a gage that was installed in 1991 that began officially measuring flows on 1 October 1991.

Flow in the Grand Calumet River is estimated to be in excess of 90% sanitary effluent. Therefore, it is assumed that the portion of this flow that is attributable to domestic water supply is equal to the sum of the daily water supply pumpage for East Chicago, Whiting, and Hammond (whose pumpage includes water supply for Munster, Highland, and Griffith). If the total water supply pumpage for these communities is greater than the flow in the Grand Calumet River, it is assumed that the flow consists entirely of effluent that originates from water supply.

The total Grand Calumet flow reaching Illinois in WY92 was measured as 24.9 cfs. It was determined that 24.5 cfs was water supply pumpage. Therefore, the total WY92 Indiana water supply deduction, including the flow from the Little

Calumet and Grand Calumet Rivers is 30.4 cfs. This is the same as the Indiana water supply deduction for WY92 which was 30.4 cfs.

Column 6: Runoff from the Des Plaines River Watershed Reaching the CSSC

The WY92 average discharge of Des Plaines River watershed runoff reaching the canal (Column 6) is 176.6 cfs. This deduction is determined almost entirely through simulation. The runoff is composed of two elements, surface runoff and subsurface runoff. Surface runoff that enters sewers is referred to as inflow, while subsurface runoff is referred to as infiltration. The infiltration and inflow discharged to the water reclamation plants is 101.4 cfs, the infiltration and inflow reaching the canal through combined sewer overflows is 11.3 cfs and the runoff from the Lower Des Plaines and Summit Conduit areas is 63.7 cfs. The deduction is also influenced by the O'Hare basin flow transfer that contributed 8.7 cfs of the 101.4 cfs of runoff to the water reclamation facilities during WY92. The deductible Des Plaines River watershed runoff decreased 23.3 cfs from WY91 to WY92. Decreased runoff may be partially due to the reduced rainfall volumes that occurred in the southern portion of the diverted watershed.

Column 7: Lake Michigan Pumpage by Federal Facilities Which Discharge to the CSSC

Column 7 represents Lake Michigan diversions for Federal use, not chargeable to the State of Illinois, and is typically comprised of water supply pumpage used by federal facilities. Also included is emergency navigation makeup water used for federal purposes. Column 7 represents a deduction from the Romeoville record and the total amount of the WY92 deduction is 328.0 cfs.

The deduction for WY92 is much greater due to the release of water during the old freight tunnel flooding that occurred on 13 April 1992. The Chicago River flowed through a punctured freight tunnel, which flooded approximately 23 buildings and 40 miles of the freight tunnel system in downtown Chicago. The Chicago River was drawn down to reduce the water pressure so that the collapsed tunnel could be sealed. The increase in diversion associated with this effort appears in this column. The deduction for WY92 of 328.0 cfs which consists of 1.9 cfs of water supply to Federal Facilities and 326.1 cfs for the emergency drawdown of the Chicago River System.

Column 8: Total Deductions from the CSSC Romeoville Gage Record

Column 8 is the sum of Columns 4, 5, 6, and 7 and represents the total deduction from the Romeoville record. The total deduction for WY92 is 645.2 cfs.

Column 9: Lake Michigan Pumpage Not Discharged to the CSSC

This column represents water supply pumpage from Lake Michigan that is not discharged to the canal. The water supply pumpage not discharged to the canal is composed of two components:

- Lake Michigan water supply used by communities serviced by water reclamation facilities that do not discharge to the CSSC (190.9 cfs). This is an increase of 75.8 cfs from WY91. The large increase in the WY92 value is due to the addition of two (2) water supply agencies, Central Lake County Joint Action Water Agency and the DuPage Water Commission. The WY93 water supply value will even greater because these agencies were not fully operational until the latter part of WY92.

- The sanitary portion of combined sewer overflows attributable to Lake Michigan domestic water supply that does not discharge to the CSSC (1.4 cfs).

The communities that make up the flow in the first component are suburbs whose treated effluent is discharged to the Des Plaines River and other watercourses not tributary to the CSSC. The water supply agencies or communities are:

- Northwest Suburban Joint Action Water Agency (NWJAWA) - Member communities include Elk Grove Village, Hanover Park, Hoffman Estates, Mount Prospect, Rolling Meadows, Schaumburg and Streamwood.

- Northwest Water Commission - Member communities include Arlington Heights, Buffalo Grove, Palatine, Prospect Heights and Wheeling.

- Central Lake County Joint Action Water Agency (CLCJAWA) - Member communities include Grayslake, Gurnee, Lake County Public Works Department (Vernon Hills and Wildwood-Gages Lake), Libertyville, Mundeline, Round Lake, Round Lake Park and Round Lake Beach.

- Lake County Public Water District - Member communities include Illinois Beach State Park, Winthrop Harbor and Zion.

- DuPage Water Commission - Member communities include Addison, Bensenville, Bloomingdale, Carol Stream, Citizen's Utilities (Arrowhead, Country Club Highlands, Lombard Heights and Valley View), Clarendon Hills, Darien, Downers Grove, Elmhurst, Glen Ellyn, Glendale Heights, Hinsdale, Itasca, Lisle, Lombard, Naperville, Oak Brook, Roselle, Villa Park, Westmont, Wheaton, Willowbrook, Wood Dale, Woodridge, DuPage County Water Works (Farmington, Glen Ellyn Heights, Hinsdale, Lake in the Woods, Rosewood Trace, Steeple Run).

- Lincolnshire

- Riverwoods

- Waukegan

- Lake County - Bradley Road

- North Chicago - 76 percent

- Des Plaines - 38.2 percent

The communities of Lake Bluff and Knollwood-Roundout (who receive their water from CLCJAWA) are not included in Column 9, as they discharge their effluent into the Chicago River System.

It should also be noted that the Lake Michigan water supply component of the O'Hare flow transfer is subtracted from the total Lake Michigan water supply of the above communities since:

- The O'Hare flow transfer is treated at the Northside WRP which discharges sanitary effluent that is tributary to the CSSC.

- The entire Lake Michigan water supply component of the O'Hare flow transfer is from communities contained in the above list.

The Lake Michigan water supply for these communities is measured, while the sanitary portion of the CSO's is derived through simulation. Column 9 represents an addition to the Romeoville record and the total WY92 addition is 192.3 cfs. This is an increase of 75.7 cfs from WY91 to WY92 and is primarily due to the startup of the two (2) water agencies, CLCJAWA and the DuPage Water Commission.

Column 10: Total Diversion

Column 10 is equivalent to Column 3 with the deduction of Column 8 and the addition of Column 9. The total diversion for WY92 is 3,408.7 cfs. This amount is 208.7 cfs greater than Illinois's long term diversion allocation of 3,200 cfs. The 40-year running average diversion, rounded to the nearest cfs, beginning with WY81, is 3,457 cfs and the cumulative deviation from the 3,200 cfs allocation is -3,084 cfs. The negative deviation indicates that the cumulative diversion is greater than an average of 3,200 cfs for the period.

Column 11 Through Column 13: Lake Michigan Diversion Components

Columns 11 through 13 represent the three (3) Lake Michigan diversion components:

- Column 11 - Lake Michigan pumpage accountable to Illinois (1,785.1 cfs)
- Column 12 - Runoff from the diverted Lake Michigan watershed (848.4 cfs)
- Column 13 - Direct diversion through the lakefront structures (451.0 cfs)

The sum of the columns (3,084.5 cfs) should theoretically equal the total diversion as shown in Column 10 (3,408.7 cfs), with one exception. The Romeoville record receives effluent that is assumed to contain only 90% of the water supply pumpage, while Column 11 (Lake Michigan water supply pumpage accountable to Illinois) does not account for consumptive use. This is based on a consumptive loss (water supply pumpage that is consumed or lost prior to reaching the water reclamation facilities) estimate of 10% of the water supply pumpage (International Great Lake Diversion Consumptive Use Study Board, 1981).

Because the diversion estimate from Columns 11 - 13 is based on simulation, suspect ratings of the lakefront structures, and simple flow separation techniques, the estimate is not expected to be as accurate as the AVM based calculations. Consequently, a difference between estimates of 324.2 cfs or 9.5% is a good balance. However, this discrepancy becomes greater when consumptive use is accounted for in Column 11. The discrepancy in these two (2) estimates is related to the canal system balance in Budget 14, discussed in a subsequent section and potential sources of the discrepancy are addressed in that budget discussion.

Using the figures from these three (3) columns, 57.9% of the WY92 Illinois diversion is attributable to pumpage from Lake Michigan for domestic water supply.

Runoff from the diverted Lake Michigan Watershed accounted for 27.5% of the diversion, and direct diversion through the lakefront structures accounted for 14.6% of the diversion. Water supply from Lake Michigan decreased 33.9 cfs from WY91 to WY92. This is most likely due to the overall increase in basin wide precipitation between WY91 and WY92. Due to the reduced volume of rainfall occurring in the southern portion of the diverted watershed between WY91 and WY92, there was a 193.0 cfs decrease in runoff from the Lake Michigan watershed that occurred between WY91 and WY92. A more detailed breakdown of these percentages is shown in Table 5 and Figure 3.

Table 5

Breakdown of the Diversion by the State of Illinois
Based on Columns 11 Through 13

Description	Average Flow (cfs)	Percentage of Total Flow
Lake Michigan Pumpage by the State of Illinois	1785.1	57.9%
Runoff from the Diverted Lake Michigan Watershed	848.4	27.5%
Direct Diversions		
Lockages	82.7	2.7%
Leakages	32.6	1.1%
Navigation Makeup Flow	43.4	1.4%
Discretionary Flow	293.0	9.5%
Total Direct Diversions	451.7	14.6%

Note: The direct diversions shown in Table 5 do not agree with the results contained in Column 13 of Table 4 due to the different rounding methodologies employed. The direct diversions shown in Table 5 is the yearly average of each of the direct diversion components, while the yearly average value shown in Column 13 of Table 4 is the yearly average of each of the monthly averages.

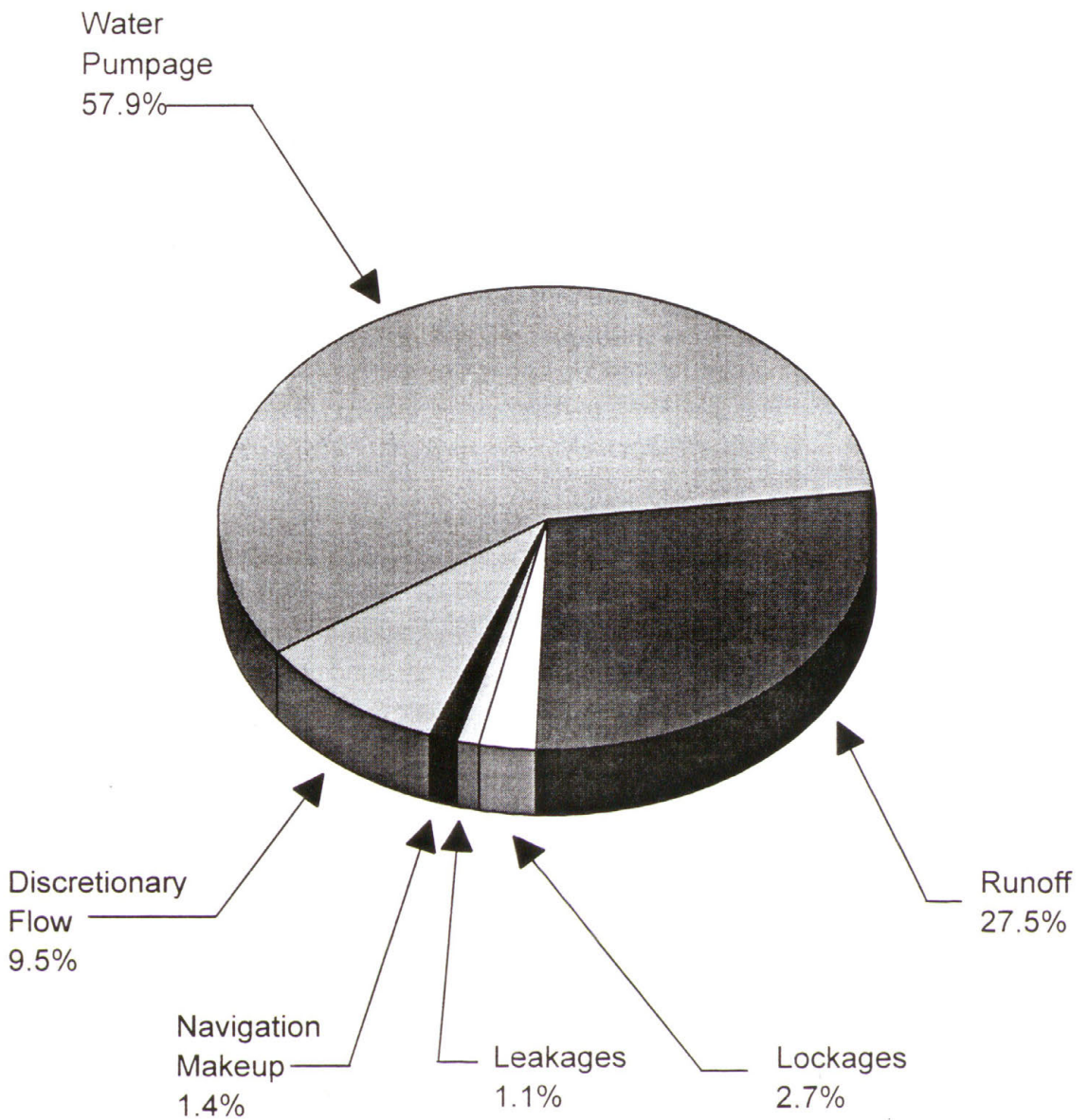

Figure 3

Component Breakdown of Illinois' Diversion Based Upon Columns 11 through 13

Budgets

The first two (2) budgets are used to sum the water supply for the area influenced by the diversion. The next four (4) budgets are of stream gage sites that are not simulated and are used as part of the calculation of the runoff from the diverted Lake Michigan watershed. The remaining seven (7) budgets compare measured and simulated flows and compute Column inputs used in the diversion computations.

Budget 1 and Budget 2: Water Supply Pumpage

Budgets 1 and 2 are summations of critical water supply pumpage data. Budget 1 sums Lake Michigan water supply diverted by the State of Illinois. The Lake Michigan water supply data is supplied by the state as daily values for primary users and monthly data for secondary users. Budget 2 sums groundwater pumpages in the Lake Michigan and Des Plaines River watersheds that are diverted to the CSSC. Groundwater pumpage data is recorded by the ISWS as a total annual withdrawal based on calendar years.

Budget 1: Diverted Lake Michigan Water Supply

Budget 1 represents the summation of Lake Michigan pumpage accountable to the State of Illinois. For WY92, the average annual Lake Michigan pumpage accountable to Illinois is 1785.1 cfs. This is a decrease of 33.9 cfs from WY91.

Budget 2: Groundwater Diverted to the CSSC

Budget 2 is groundwater water supply pumpage by communities, industrial users, and other private users whose effluent is discharged to the canal. The groundwater pumpage data are reported by the ISWS on a calendar year basis. The groundwater quantity is determined by summing all reported groundwater sources in the area tributary to the CSSC, less groundwater not discharged to the CSSC in the form of combined sewer overflows.

Using the ISWS groundwater records, groundwater pumpages were assumed to reach the CSSC and adjoining channels if they were located in the diverted Lake Michigan watershed in Illinois, or if they were located within MWRDGC service boundaries in which their effluent was discharged into the CSSC and adjoining channels.

The total groundwater pumpage by communities, industrial users, and other private users whose sanitary effluent is tributary to the canal is 37.0 cfs for WY92. It was determined through simulation that 0.2 cfs of this flow never reached the canal. Instead it was discharged to the Des Plaines River or other watercourses not tributary to the canal in the form of combined sewer overflows. The total groundwater pumpage reaching the canal represents a decrease of 9.5 cfs from WY91 to WY92.

In addition to groundwater supply pumpage, there was also a significant amount of groundwater infiltration into the two TARP systems that ultimately reached the canal. Mainstream TARP and Calumet TARP accounted for 52.3 cfs and 21.1 cfs, respectively, of groundwater discharged to the canal during WY92.

Budgets 3 Through Budget 6: Stream Gaging Stations

The stream gage budgets are used to make estimates of runoff from portions of the diverted Lake Michigan watershed. Sanitary and other point source flows are subtracted from the stream gaging record to develop the runoff estimates. The runoff estimates are used in Column 12. The flows at the stream gaging sites are also part of Budget 14, the canal system budget.

Table 6 presents the estimated runoff from these budgets. It should be noted that Budgets 4 through 6 are a composite calculation of the runoff above the Little Calumet River at the South Holland gage. It should also be noted that the Little Calumet River is a losing stream (i.e. it recharges groundwater). The computations in deriving runoff account for this when recharge is significant (i.e., when groundwater recharge is computed).

Table 6

Stream Gage Flow Separation

Budget Number	Location	Stream Flow (cfs)	Sanitary Flow (cfs)	Runoff (cfs)
3	North Branch Chicago River at Niles, IL	103.2	18.8	84.4
4	Little Calumet RIver at IL-IN State Line	64.7	4.1	60.6
5	Thorn Creek at Thorton, IL	101.9	16.7	85.2
6	Little Calumet River at South Holland,IL	167.4	159.3	8.1

Budgets 7 Through Budget 13: MWRDGC Water Reclamation Facilities

The budgets for the water reclamation plants compare the simulated flows to the measured inflows at the MWRDGC facilities and perform verifications of the diversion accounting program. The simulated flows were developed from an estimated sanitary flow with a daily, weekly, and monthly flow variation, from hydrologic precipitation-based runoff models, and from hydraulic sewer routing models. The estimated sanitary flow input to the hydraulic simulation models is based on the population estimates for each plant's service basin. Per capita sanitary flows are determined based on the service basin's water supply minus an assumed 10 percent consumptive loss. Simulated flows were compared with recorded inflows at each facility to assess the accuracy of the simulations.

The discussion of the budgets will concentrate on the results of each simulation as the development of these models have been discussed in previous reports. A summary of the simulation results is presented in Table 7. At all four (4) water reclamation plants and the Upper Des Plaines Pump Station, the simulation results were maintained. This is the result of the new 25-gage precipitation network first utilized for the WY90 diversion accounting, improvements and updates in the land cover delineations, and modifications to the hydrologic and hydraulic models .

Budget 7: Northside Water Reclamation Facility

Budget 7 analyzes the water balance at the MWRDGC Northside Water Reclamation Facility (Figure 4). The balance for WY92 of the inflow to the Northside facility is very good. The simulated to adjusted recorded inflow ratio (S/R) for the Northside WRP is 0.95, indicating that the simulated inflow volume is slightly less than the adjusted observed inflow volume. The coefficient of correlation (R) of simulated to observed flow is 0.82, indicating that the model predicted the inflow hydrograph to the Northside facility well.

Budget 8: Upper Des Plaines Pump Station

Budget 8 analyzes the water balance at Upper Des Plaines Pump Station (UDPPS) (Figure 5). The pump station budget is used to verify simulated flows. Although it has no direct impact on the diversion calculation, it is intended to be used as a primary calibration point for the models that simulate the deductible runoff from the Des Plaines watershed contained in Column 6. This will be possible only after the existing measurement problems at that site are resolved. This has been discussed in the WY90 diversion report.

The balance at UDPPS for WY92 was reasonable. The simulated to recorded flow ratio (S/R) for the UDPPS is 1.0, indicating that the simulated inflow volume to UDPPS matches the recorded inflow volume. However, the daily S/R ratio shows a high degree of variability, indicating that the trends within the recorded and simulated inflow may not correspond very well. The coefficient of correlation (R) of simulated to recorded flow is 0.72, indicating the time series trends in the simulated inflow compared well with the time series trends of recorded inflow. The improved coefficient of correlation is consistent with the results obtained in WY90 and WY91. The improvement may be the direct result of the revised raingage network and subsequent modifications to the hydrologic and hydraulic models.

Table 7

WY 1992 Summary of Simulation Statistics

Budget No.	7	8	9	10	11	12	13	14
Description	Northside WRP (1)	Upper Des Plaines Pump Station (1),(3)	Mainstream TARP Pump Station (2)	Stickney WRP (1),(4)	Calumet TARP Pump Station (2)	Calumet WRP (1),(4)	Lemont WRP (1)	Chicago Canal System Balance (1)
Mean Recorded Flow, cfs	433.3	72.7	92.2	1,051.9	36.2	368.8	2.5	3,870.5
Max. Recorded Flow, cfs	744.6	137.0	300.0	2,194.4	156.5	574.4	6.6	10,657.0
Min. Recorded Flow, cfs	162.6	23.9	18.8	661.9	4.0	264.9	1.0	2,084.4
Mean Simulated Flow, cfs	404.9	71.0	101.0	1,141.1	27.4	385.5	1.9	3,451.6
Max. Simulated Flow, cfs	656.5	179.0	257.3	2,698.9	89.6	605.8	5.3	17,790.0
Min. Simulated Flow, cfs	305.9	42.4	39.7	842.8	3.2	297.7	1.3	1,721.5
Mean S/R	0.95	1.00	1.51	1.09	0.89	1.05	0.79	0.88
Max. S/R	2.38	3.07	5.75	1.96	2.18	1.33	1.64	2.24
Min. S/R	0.63	0.59	0.41	0.66	0.23	0.78	0.43	0.63
Correlation	0.82	0.72	0.65	0.76	0.89	0.87	0.77	0.89

(1) Based on daily values.
(2) Based on weekly values.
(3) Does not include days with missing records.
(4) Does not include pumpage from TARP.

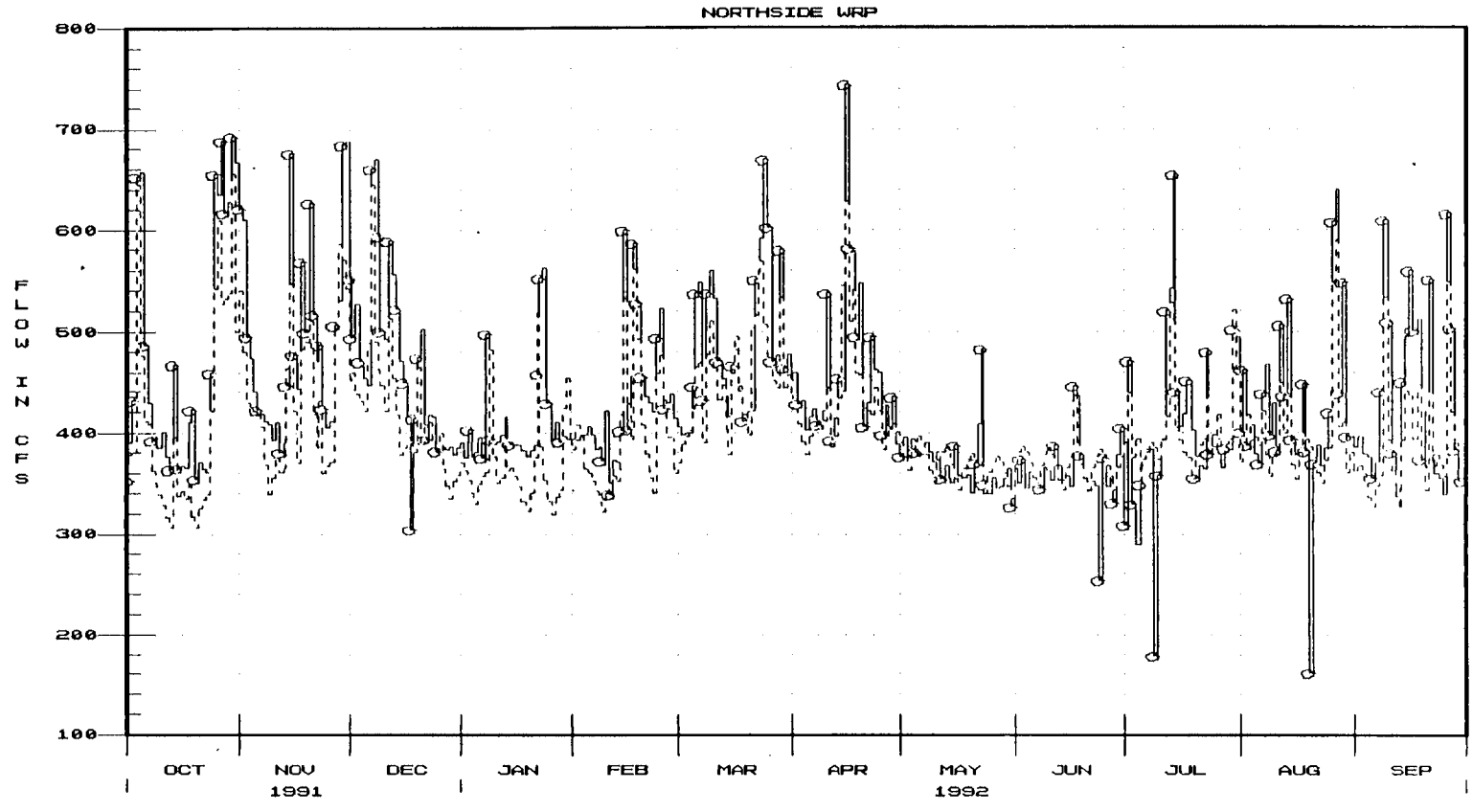

Figure 4

Budget 7 - Simulation of the MWRDGC Northside Water Reclamation Facility

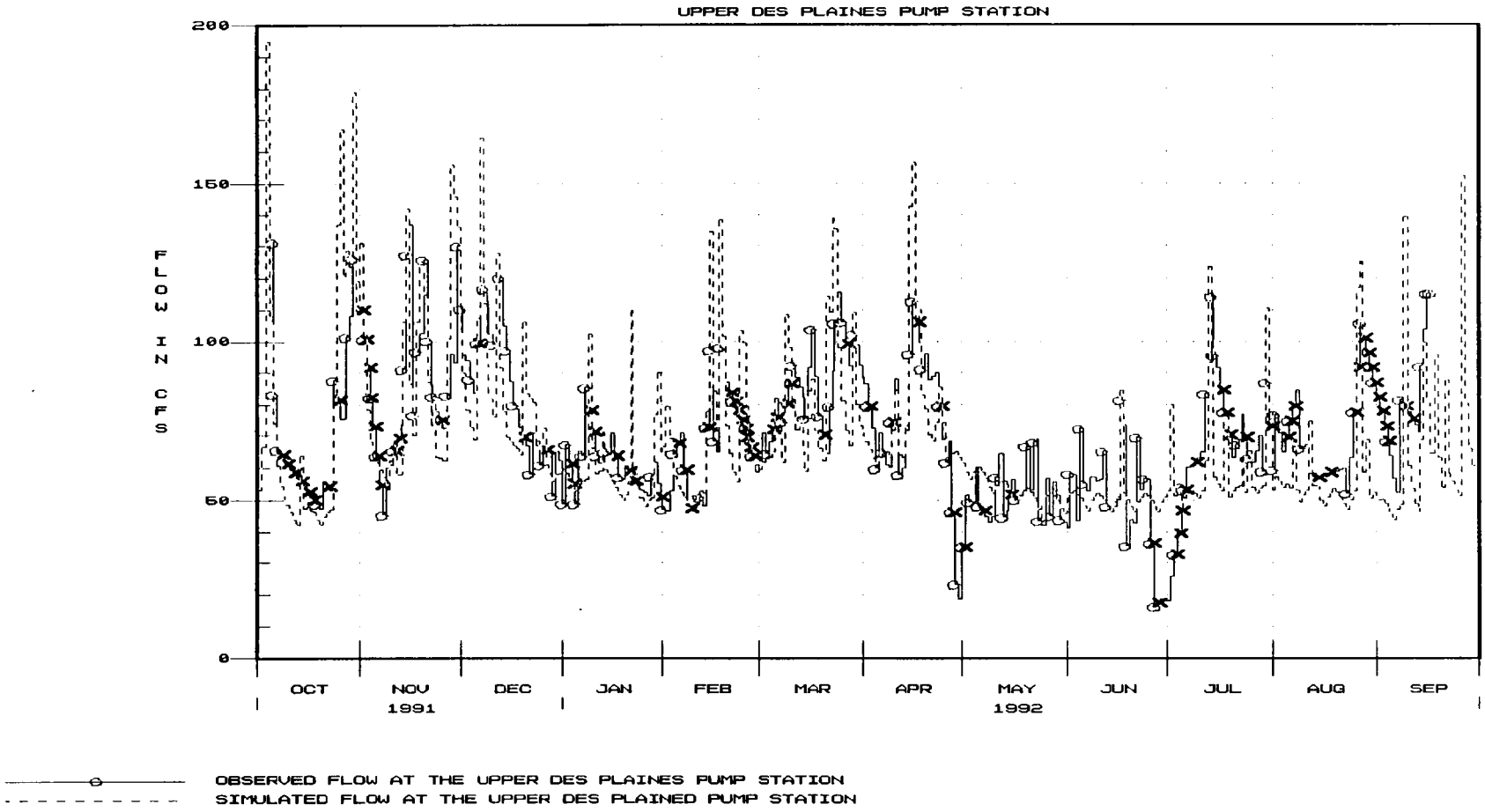

Figure 5

Budget 8 - Simulation of the MWRDGC Upper Des Plaines Pump Station

While the statistical results for WY92 at the Upper Des Plaines Pump Station have been maintained, this does not lead to the conclusion that flow measurement alternatives should not be investigated. This site has continued to experience its share of problems. During WY92, 125 days of records were unavailable that were attributable to meter malfunctions, problems with the recording charts which made data transformation impossible and various other reasons. In view of the significant quantity of missing data (34.2 % missing data), the quantitative analyses of the simulation are of limited value. Second, the accuracy of the flow meters at the pump station is questionable and unmetered bypass flows are a frequent occurrence. Therefore, total flow may not be measured in storm events and the recycling of flow is possible. Further investigation of the accuracy of flow measurement at the pump station is required to verify and calibrate the simulation models that compute the deductible runoff from the Des Plaines watershed contained in Column 6.

Budget 9: Mainstream TARP Pumping Station

Budget 9 analyzes the water budget at the MWRDGC Mainstream TARP Pumping Station. The results of Budget 9 are used as a verification point for simulated flows. Budget 9 also is used for the purpose of computing a portion of Column 6 (Des Plaines River watershed runoff deduction). The deductible portion of Budget 9 includes groundwater seepage into the TARP tunnel walls and a small amount of Des Plaines River watershed runoff captured by Mainstream TARP as overflows. Until the Des Plaines TARP segment goes on-line, the Des Plaines River watershed runoff conveyed to the Stickney Water Reclamation Plant through TARP tunnels will remain very small. The modeling of Mainstream TARP is performed using the Tunnel Network (TNET) dynamic hydraulic model. A simplified map of Mainstream TARP is contained in Figure 6. A more in-depth description of Mainstream TARP and the simulation model is contained in the Water Year 1986 report which is an appendix to the Diversion Accounting Annual Report for WY90-92 (USACE, 1994).

In analyzing the balance at the Mainstream TARP Pumping Station, weekly flows were used rather than daily flows. While MWRDGC maintains daily pumpage records, days with no pumpage occur frequently. Therefore, it is not possible to compute a daily S/R ratio.

The balance for WY92 of the inflow to the Mainstream Pumping Station is fair. The simulated to recorded flow ratio (S/R) for the Mainstream Pumping Station is 1.51, indicating that the simulated inflow volume is greater than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.65, indicating that there still exists a need for improvement in the ability of the model to predict trends in the pump station flows.

From a review of the plot of the simulated versus recorded flow at the pump station (Figure 7), it appears that the model responds similarly to recorded pumpage record. However, the model is sometimes out of phase with the observed record. This could be the result of simulated pumpages occurring sooner and more frequently than actual pumpages. The TNET model pumps normally turn on sooner and pump more frequently in order to maintain computational stability during a simulation. Additionally, base flows appear to be overestimated in the simulation. This is probably due to overestimation of groundwater infiltration into the TARP tunnels.

In summary, it appears that the simulation of the Mainstream TARP system is reasonable. However, there is concern regarding the estimation of pumpage volume and the difference in simulated and recorded pumpage time series. A review of MWRDGC information regarding Mainstream TARP indicates that bypass flows are discharged to TARP, when available, via drop shaft 11 (DSN 11). Coordination with MWRDGC established that this is a frequent occurrence. This may account for the simulation of a pumpage volume that is greater than the recorded pumpage volume. Records concerning the dates and pumpages back to TARP were not maintained for WY92. Therefore, data necessary to evaluate the impact of pumping back into TARP is not available. Therefore, it was decided that the model would not be adjusted to correct for double accounting of flows.

Budget 10: Stickney Water Reclamation Facility

Budget 10 analyzes the water balance at the MWRDGC Stickney Water Reclamation Facility (Figure 8). Simulated Mainstream TARP pumpages from Budget 9 are no longer combined with simulated interceptor inflow to the Stickney Water Reclamation Facility to derive the total simulated inflow to the Stickney Facility. Instead, only simulated interceptor inflows are compared with recorded interceptor inflows to assess the accuracy of the simulation. The decision to not include TARP pumpages in the treatment plant budgets was based on the fact that the TARP systems are already analyzed in separate budgets. Including TARP pumpages in the treatment plant budgets is detrimental to the statistical results of the treatment plant budgets, since the TARP models generally do not respond as well. When simulations of interceptor flows are treated separately, the response of the hydrologic runoff models (HSPF) and the hydraulic sewer routing models (SCALP) can be better isolated and not diluted by the TARP model results, which are analyzed separately on their own merits and contained in their own budgets (Budgets 9 and 11).

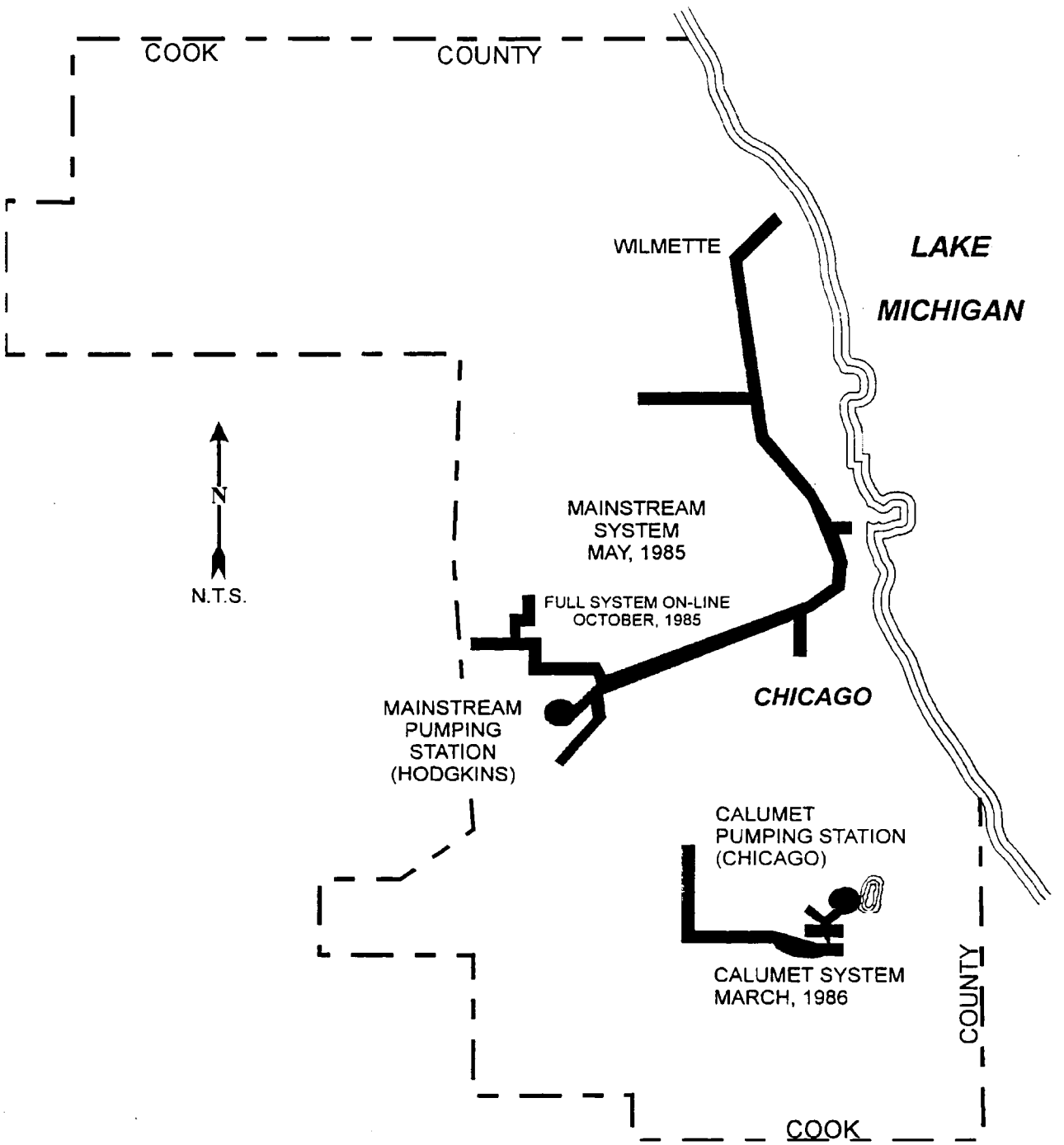

Figure 6

Map of Mainstream and Calumet TARP

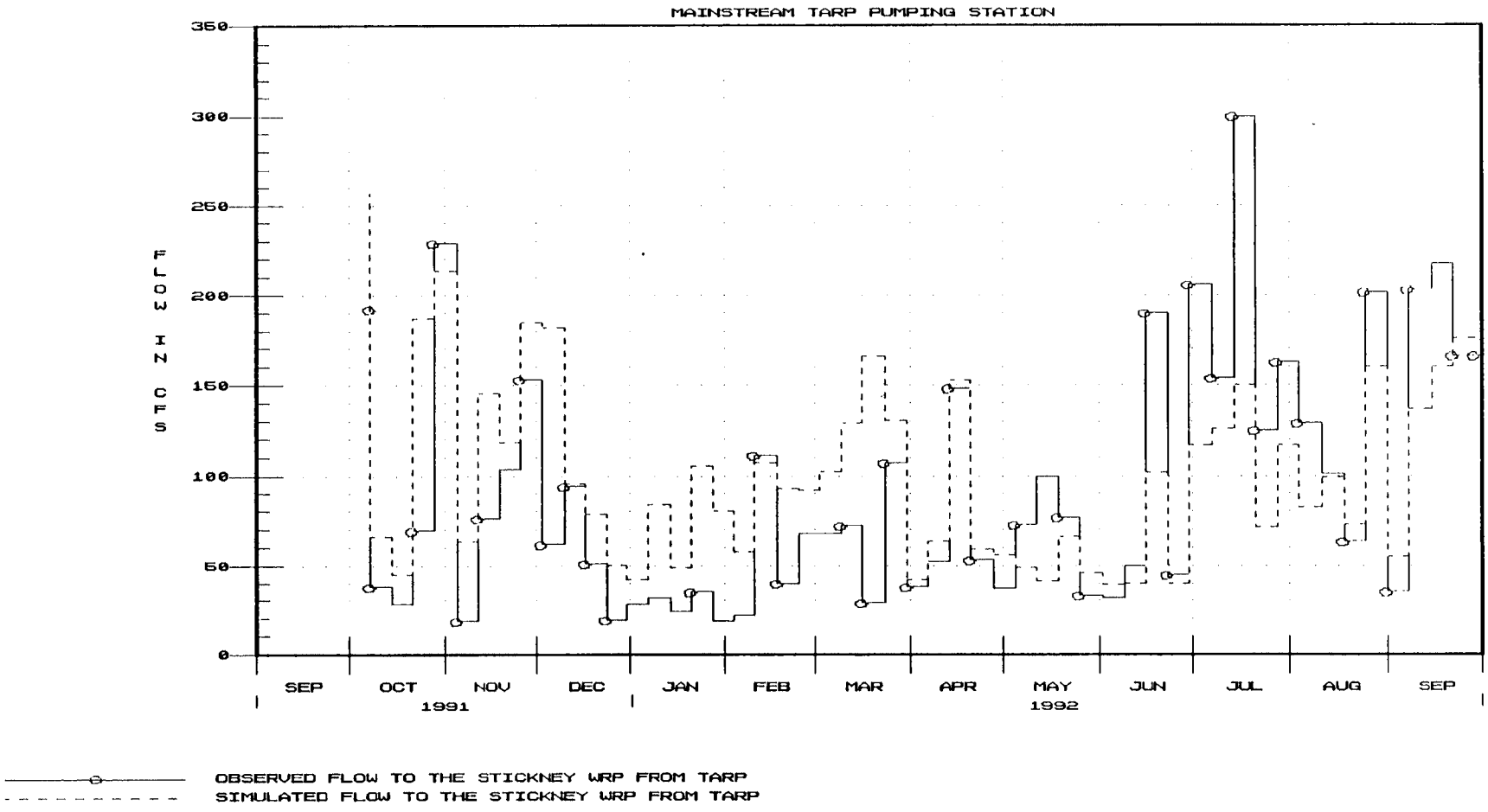
MAINSTREAM TARP PUMPING STATION
FLOW IN CFS
350
300
250
200
150
100
50
0
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
1991
1992
OBSERVED FLOW TO THE STICKNEY WRP FROM TARP
SIMULATED FLOW TO THE STICKNEY WRP FROM TARP

Figure 7

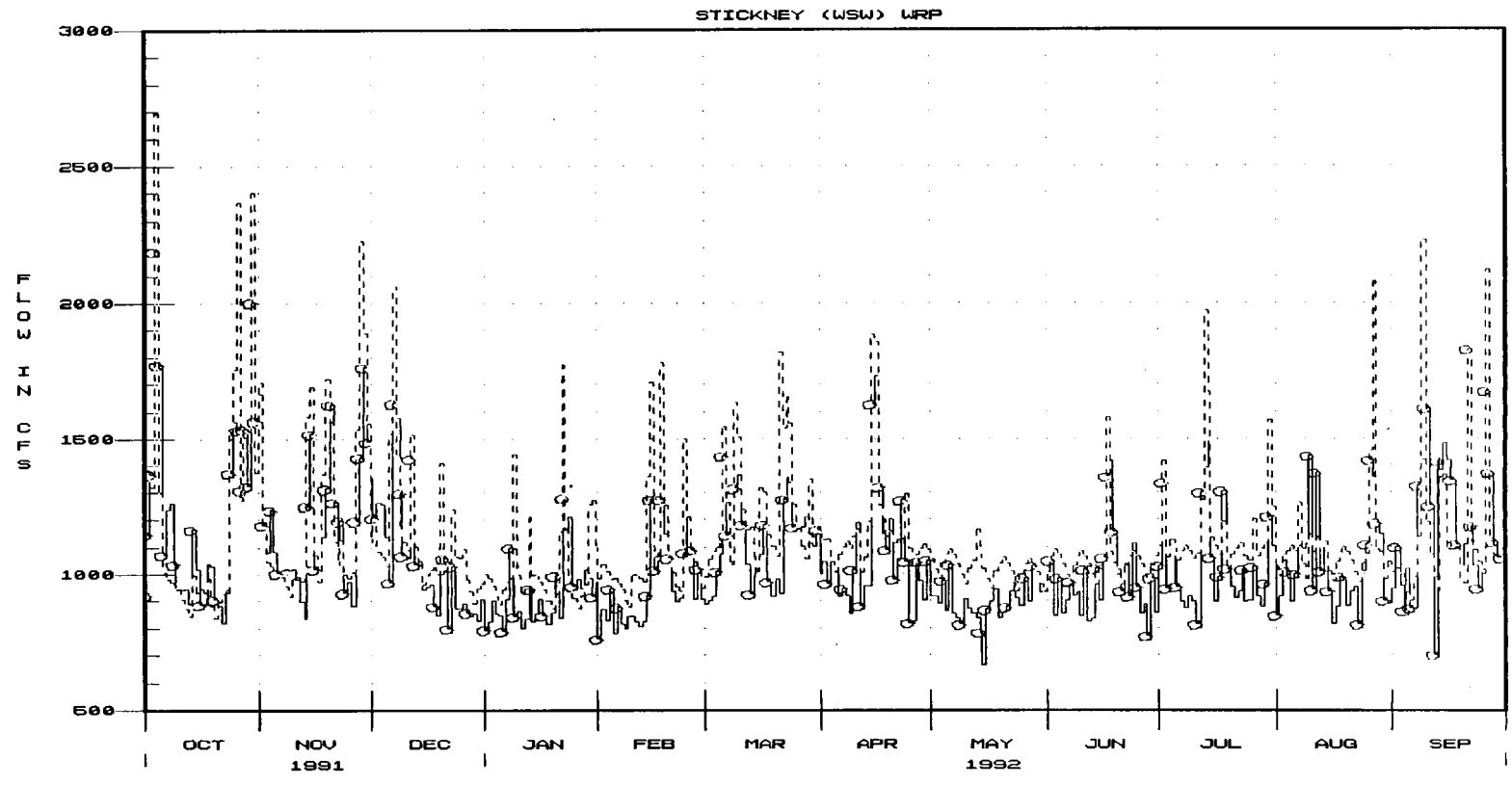
STICKNEY (WSW) WRP
CFS FLOW IN
3000
2500
2000
1500
1000
500
OCT
NOV
1991
DEC
JAN
FEB
MAR
APR
MAY
1992
JUN
JUL
AUG
SEP
OBSERVED FLOW TO THE STICKNEY WRP (NO TARP FLOWS)
SIMULATED FLOW TO THE STICKNEY WRP (NO TARP FLOWS)

Figure 8

Overall, the balance for WY92 of the inflow to the Stickney facility is very good. The simulated to recorded flow ratio (S/R) for the Stickney is 1.09, indicating that the simulated interceptor inflow volume is greater than the recorded interceptor inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.76, indicating that the model predicted the interceptor inflow hydrograph to the Stickney facility fairly well.

Budget 11: Calumet TARP Pumping Station

Budget 11 analyzes the water budget at the MWRDGC Calumet TARP Pumping Station (Figure 9). The results of Budget 11 are used as a verification point for simulated flows. The modeling of Calumet TARP is performed using the Tunnel Network (TNET) dynamic hydraulic model. A simplified map of Calumet TARP is contained in Figure 6. A more in-depth description of Calumet TARP and the simulation model is contained in the Water Year 1987 report contained in the Diversion Accounting Annual Report for WY90-92 (USACE, 1994).

In analyzing the balance at the Calumet TARP Pumping Station, weekly flows were used instead of daily flows. While MWRDGC maintain daily pumpage records, days with no pumpage occur frequently. Therefore, it is not possible to compute a daily S/R ratio.

The balance for WY92 of the inflow to the Calumet TARP Pumping Station is fair. The simulated to recorded flow ratio (S/R) for the Calumet TARP Pumping Station is 0.89 indicating that the simulated inflow volume is less than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.89, indicating that there is a good agreement between the trends of the simulated and observed Calumet TARP pumpages.

From a review of the plot of the simulated versus recorded flow at the pump station (Figure 9) it appears that the model responds similarly to the recorded pumpage record, except that the recorded pumpage often lagged behind the simulated pumpages for WY92.

Volume matching between the simulated and recorded Calumet TARP pumpages also was more difficult for WY92 as evidenced by the 0.89 S/R ratio. Because of the instability of the TARP model, as well as uncertainties in the Calumet TARP system, it was difficult to improve on this ratio. However, as the system is presently modeled, this does not impact the computed diversion, since all Des Plaines River watershed areas whose overflows are modeled as tributary to Calumet TARP are also modeled such that "non-captured" overflows flow to rivers that are tributary to the CSSC. Therefore, whether or not these Des Plaines River

watershed runoff flows enter the tunnel or not, they are presently included in the Des Plaines River watershed runoff deduction in Column 6. This assumption will remain until separately sewered areas are modeled such that actual areas are used instead of effective areas in the hydraulic models. This has been discussed in the WY90 diversion accounting report.

Budget 12: Calumet Water Reclamation Facility

Budget 12 analyzes the water balance at the MWRDGC Calumet Water Reclamation Facility (Figure 10). Simulated Calumet TARP pumpages from Budget 11 are no longer combined with simulated interceptor inflows to the Calumet Water Reclamation Facility to derive the total simulated inflow to the Calumet Facility. Instead, only simulated interceptor inflows are compared with recorded inflows to assess the accuracy of the simulation. This was revised for the same reasons as outlined previously in the discussion for Budget 10.

The annual simulated to recorded flow ratio (S/R) and the coefficient of correlation for the Calumet Water Reclamation Facility are considered good. The S/R ratio is 1.05 indicating that the simulated Calumet interceptor flow volume was slightly higher than the recorded interceptor flow volume. The coefficient of correlation was 0.87 indicating a good correlation between simulated and recorded interceptor flows.

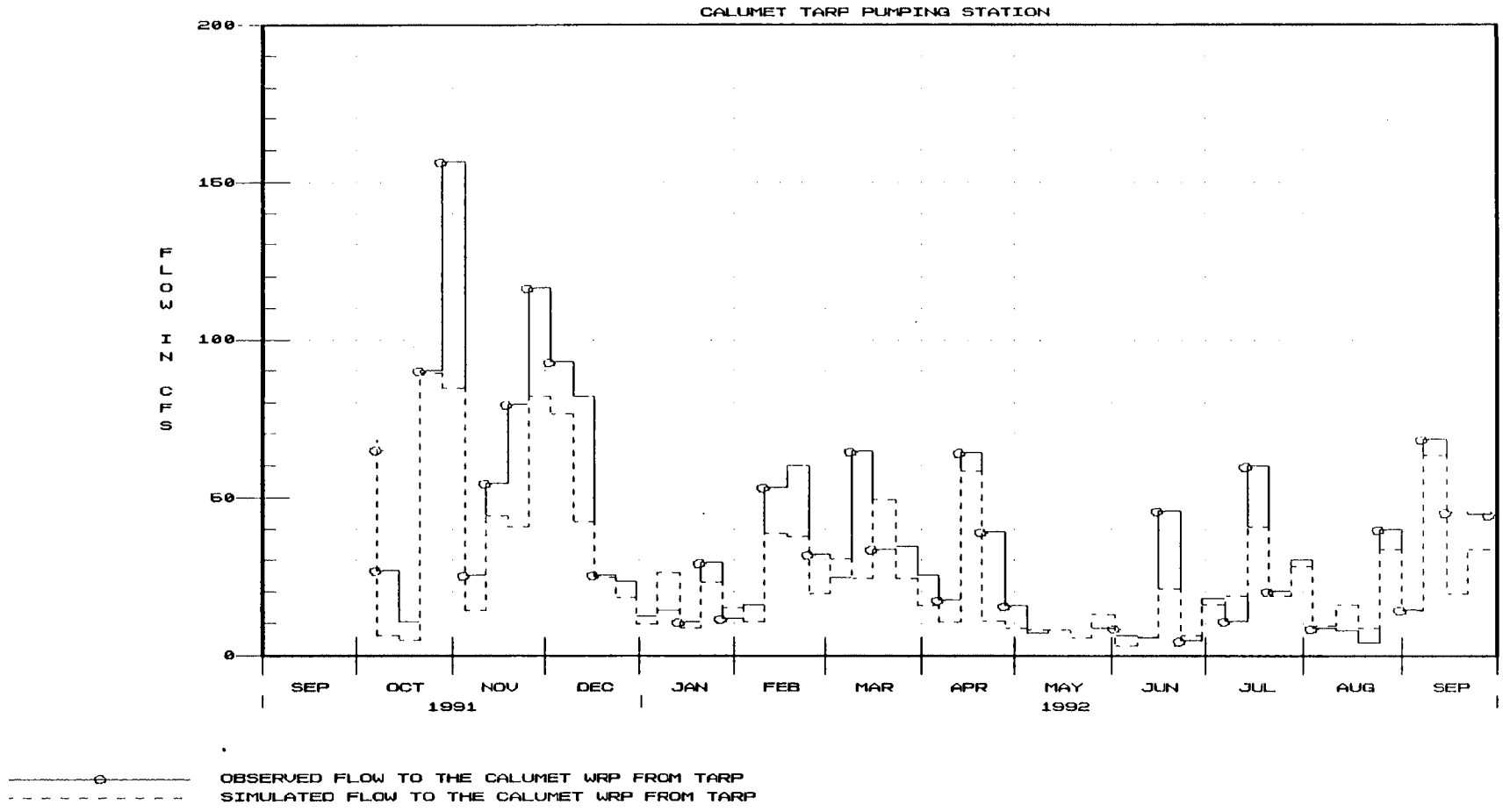

Figure 9

Budget 11 - Simulation of the MWRDGC Calumet TARP Pumping Station

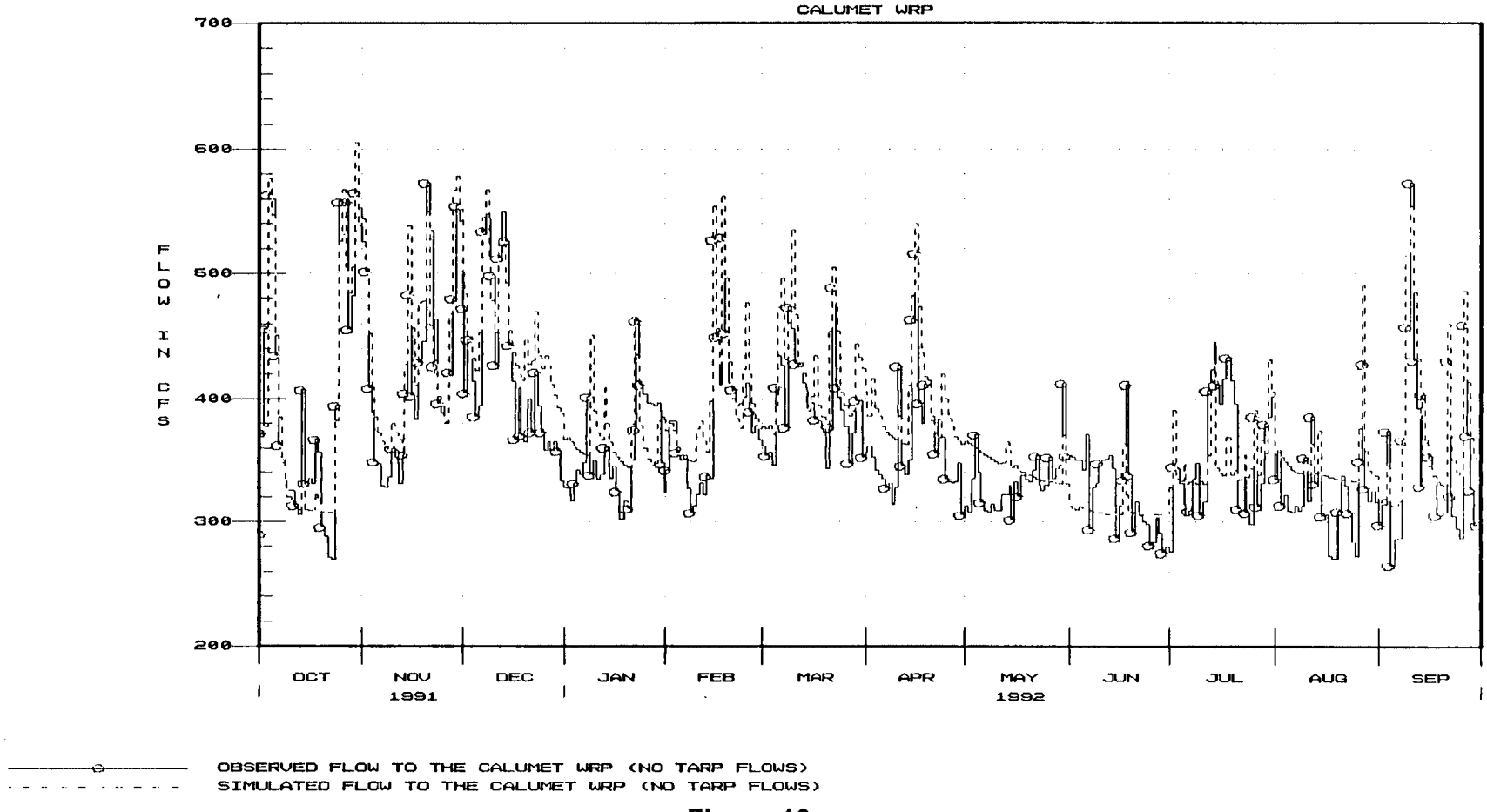

Figure 10

Budget 12 - Simulation of the MWRDGC Calumet Water Reclamation Facility

Budget 13: Lemont Water Reclamation Facility

Budget 13 analyzes the water balance at the MWRDGC Lemont Water Reclamation Facility (Figure 11). Overall, the balance for WY92 of the inflow to the Lemont facility is fair. The simulated to recorded flow ratio (S/R) for the Lemont is 0.79, indicating that the simulated inflow volume was somewhat less than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.77, indicating that the model predicted the inflow hydrograph to the Lemont facility fairly well.

Budget 14: CSSC System Balance

Budget 14 compares the inflows and outflows to the CSSC system (Figure 12). The inflow components include direct diversions through the lakefront structures, stormwater runoff discharged to the canal system, and domestic water supply whose effluent discharges to the canal system. The outflows from the canal system include the discharge past the Romeoville AVM, backflows through the lakefront structures and withdrawals upstream of Romeoville by Argonne National labs and Uno-Ven Corporation. The individual components are presented in Table 8 for WY92.

Overall, the balance for WY92 between the inflows to the canal system and the outflows from the canal system is fair. The S/R (inflow/outflow) for the canal system is 0.88, indicating that the inflow to the canal system is less than the outflow from the canal system. The average measured/simulated inflow was 3,451.6 cfs while the average measured/simulated outflow was 3,870.6 cfs. This is a difference of 419.0 cfs (10.8%) for WY92, as compared to 360.1 cfs (9.5%) for the previous water year, WY91.

The coefficient of correlation (R) of inflow to outflow is 0.89, indicating that the time series trends of inflow to outflow are well correlated. The coefficient of correlation is based on daily flows. Therefore, timing between inflows and measured outflows at Romeoville is a major issue, especially during changes in flow that occur at the beginning or end of a day. This is the result of travel time from inflow locations downstream to the Romeoville AVM site. Therefore, variability in the coefficient of correlation from year to year may be attributed to the variability in the timing of significant flow changes during a particular year.

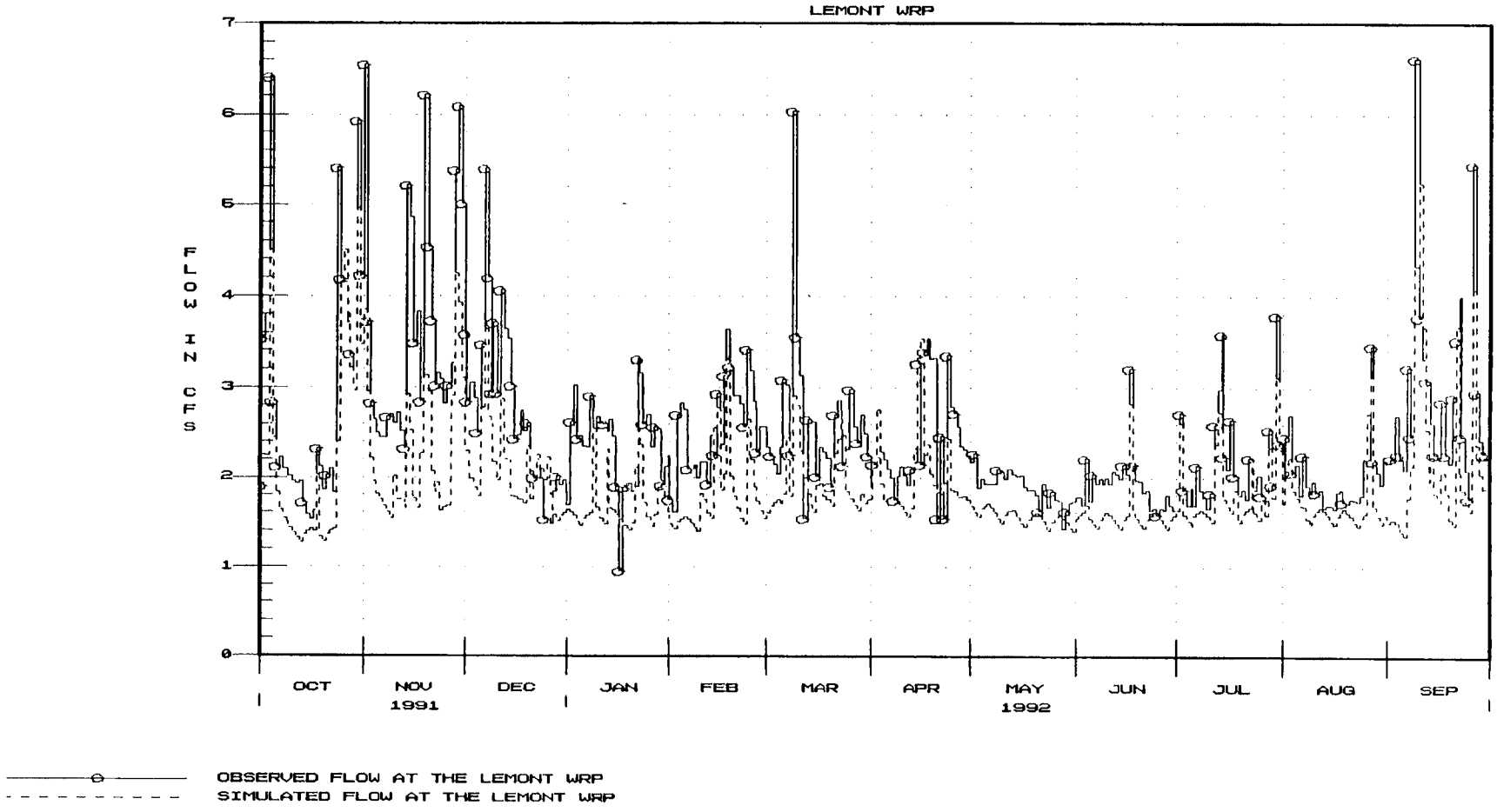

Figure 11

Budget 13 - Simulation of the MWRDGC Lemont Water Reclamation Facility

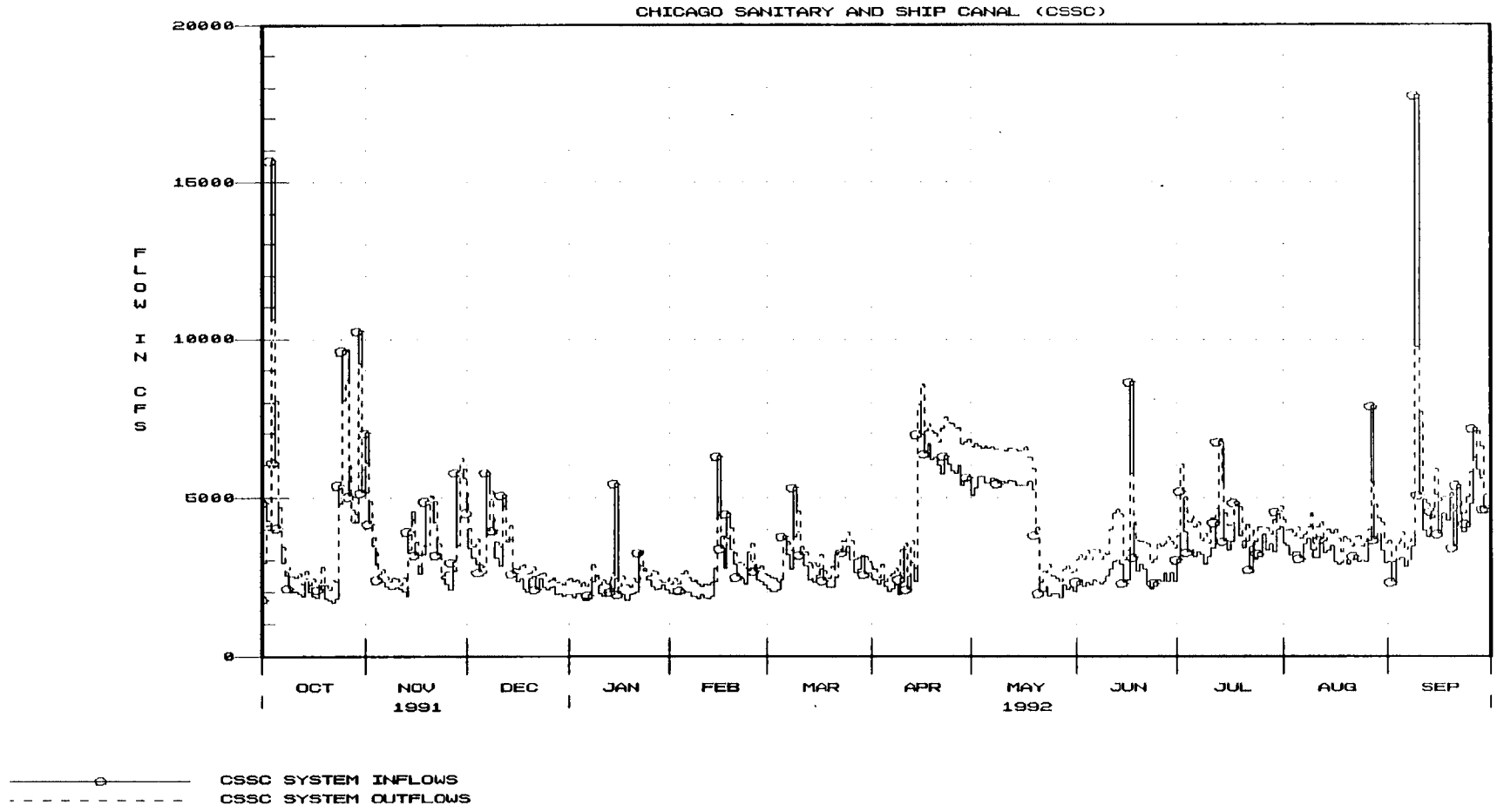

Figure 12

Budget 14 - CSSC System Balance

Table 8

WY 1992 Summary of Flow Components for the CSSC System Balance

INFLOWS (cfs)	
Lake Controlling Structures (measured)	
- Wilmette Controlling Works	41.2
- Chicago River Controlling Works	218.3
- O'Brien Lock and Dam	192.2
Streamflows (measured)	
- North Branch Chicago River at Niles	103.2
- Little Calumet River at South Holland	167.4
- Grand Calumet River at Holman Ave.	24.9
MWRDGC Water Reclamation Facilities (measured)	
- Northside	442.2
- Stickney	1,144.9
- Calumet	405.0
- Calumet TARP Pumpage to River	0.0
- Lemont	2.5
Other Point Sources (measured)	333.2
Summit Conduit (simulated)	11.1
Combined Sewer Overflows (simulated)	197.9
Direct Runoff to CSSC (simulated)	167.6
TOTAL INFLOWS (cfs)	**3,451.6**

OUTFLOWS (cfs)	
Cal-Sag Flow Transferred to Calumet WRP as Steel Mill Blow-down	2.5
Lake Front Backflows	0.0
Argonne Laboratory	0.5
Uno-Ven Corporation	7.1
USGS AVM Record	3,860.5
TOTAL OUTFLOWS (cfs)	**3,870.6**

DIFFERENCE (cfs)	-419.0

Based on the fact that the inflow is well correlated with the outflow, it appears that there is a moderately variable to constant underreported or unreported inflow. Possible sources of the canal system flow imbalance may include underreporting of the lakefront flows through the sluice gates and locks as well as unaccounted for flow sources. The underreporting of the lakefront flows could be the result of both inaccurate rating curves for the lakefront control structures and leakage through those structures. Flow meter measurements at the lakefront direct diversion points were done to assess if leakage is significant. This study (USGS, 1994) showed that lakefront leakage flows are greatly underreported. Unaccounted flows could also include unreported discharges to the canal.

Summary

In compliance with the modified 1980 U.S. Supreme Court decree, the WY92 diversion was computed using the best engineering technology available to date.

Overall, the simulations that comprise a significant portion of the diversion accounting computations worked well. The two most significant budgets to the diversion accounting computations, Budget 7, Northside Water Reclamation Facility, and Budget 10, Stickney Water Reclamation Facility, performed very well. Together, Budgets 7 and 10 compute the majority of the deductible Des Plaines River watershed runoff. These budgets have simulated to recorded ratios of 0.95 and 1.09 and correlations of 0.82 and 0.76, respectively. Given the complexity of the hydrologic cycle in the heavily urbanized Chicago metropolitan area, and given the number of human and other factors that cannot be adequately represented in numerical modeling procedures, the results of these two (2) budgets are good. Additionally, results for Budget 12, the Calumet WRP, were also very good. This budget also models a portion of the deductible Des Plaines River watershed runoff. The S/R ratio was 1.05 while the coefficient of correlation was 0.87.

The WY92 diversion accountable to the State of Illinois is 3,408.7 cfs. This is 208.7 cfs greater than the 3,200 cfs average specified by the Decree. The 40 year running average beginning with WY81 and rounded to the nearest cfs is 3,457 cfs, and the cumulative deviation from the 3,200 cfs average is -3,084 cfs-years. The negative cumulative deviation indicates a water allocation deficit and the maximum allowable deficit is 2,000 cfs-years.

References

1. Barkau, Robert L. 1991. *Modeling of the Chicago Tunnel and Canal System.* Prepared for Christopher B. Burke Engineering Ltd. as part of reference 2.

2. Christopher B. Burke Engineering, Ltd. 1991. *Data Collection and Model Revisions.* Prepared for the U.S. Army Corps of Engineers, Chicago.

3. Christopher B. Burke Engineering, Ltd. 1990. *Infiltration and Inflow Study and Diversion Accounting Model Modification.* Prepared for the U.S. Army Corps of Engineers, Chicago.

4. Espey, William H., Harry H. Barnes, and Svein Vigander. 1981. *Lake Michigan Diversion Findings of the Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures.* Prepared for the U.S. Army Corps of Engineers, Chicago.

5. Espey, William H., Harry H. Barnes, and David Westfall. 1987. *Lake Michigan Diversion Findings of the Second Technical Committee for Review of Diversion Flow Measurements and Accounting Procedures.* Prepared for the U.S. Army Corps of Engineers, Chicago.

6. Hart, Dale E., and Richard G. McGee. 1985. *Final Report - Lockport Power Plant Sluice Gate and Control Works Discharge Evaluation.* Waterways Experiment Station. Vicksburg, MS.

7. Illinois State Water Survey. 1991, *Installation and Operation of a Dense Raingage Network to Improve Precipitation Measurements for Lake Michigan Diversion Accounting: Water Year 1990.*

8. International Joint Commission. 1981. *Great Lakes Diversions and Consumptive Uses, Annex F, Consumptive Use.*

9. Keifer Engineering. 1982. *Input Data CRSM for Existing Conditions - Mainstream System.* Prepared for the U.S. Army Corps of Engineers, Chicago.

10. Kleinbaum, David G., and Lawrence L Kupper. 1978. *Applied Regression Analysis and Other Multivariable Methods.* Wadsworth Publishing Company.

11. Metropolitan Water Reclamation District of Greater Chicago. 1984. *1984 Facility Planning Study - MSDGC Update Supplement and Summary.*

12. Metropolitan Water Reclamation District of Greater Chicago. 1989. *1988 Annual Report of the Maintenance and Operations Department.*

13. Neubauer, Ronald A. 1990. Request for TARP Information from the Army Corps of Engineers. Memorandum to Mr. William Eyre, Supervising Civil Engineer, Metropolitan Water Reclamation District of Greater Chicago.

14. Northeastern Illinois Planning Commission. 1985. *Lake Michigan Diversion Accounting Manual of Procedures.*

15. Kleinbaum, David G., and Lawrence L Kupper. 1978. *Applied Regression Analysis and Other Multivariable Methods.* Wadsworth Publishing Company.

16. Rust Environment & Infrastructure. 1993. *Diversion Accounting Update for the New 25-Gage Precipitation Network.*

17. Steel, Robert G. D., and James H. Torrie. 1980. *Principles and Procedures of Statistics - A Biometrical Approach.* McGraw-Hill, Inc.

18. U.S. Army Corps of Engineers. 1990. *Lake Michigan Diversion Accounting 1989 Annual Report Including WY84 and WY85 Accounting.*

19. U.S. Army Corps of Engineers. 1990. *Current Meter Measurements of Discretionary and Leakage Flows at the Chicago River Controlling Works, O'Brien Lock and Dam, and the Wilmette Controlling Works.*

20. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1993 Annual Report.*

21. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Annual Report, Water Years 1990-92.*

22. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1986 Report.*

23. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1987 Report.*

24. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1988 Report.*

25. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1989 Report.*

26. U.S. Army Corps of Engineers. 1994. *Lake Michigan Diversion Accounting Water Year 1990 Report.*

27. U.S. Army Corps of Engineers. 1995. *Lake Michigan Diversion Accounting Water Year 1991 Report.*

28. U.S. Geological Survey. 1984. *Streamflow and Water Quality of the Grand Calumet River, Lake County, Indiana, and Cook County, Illinois.*

29. U.S. Geological Survey. 1992. *Water Resources Data, Illinois, Water Year 1991, Volume 2, Illinois River Basin.*

30. U.S. Geological Survey. 1994. *Comparison, Analysis, and Estimation of Discharge Data from Two Acoustic Velocity Meters on the Chicago Sanitary Ship Canal at Romeoville, Illinois.*

31. U.S. Geological Survey. 1994. *Measurements of Leakage through Chicago River Controlling Works and Other Control Structures Near Chicago Illinois.*

32. Wisconsin et. al., v. Illinois et. al., Michigan v. Illinois et. al. New York v. Illinois et. al. U.S. 2, 3, and 4, Original 1 - 18, 1980.

Appendix A

Summary of Daily Diversion Flows

Computations:

1. Column 3 equals the sum of Columns 1 and 2.
2. Column 8 equals the sum of Columns 4 through 7.
3. Column 10 equals Column 3 minus Column 8 plus Column 9.

Deductions from the Romeoville Gage Record

Additions to the Romeoville Gage Record

Lake Michigan Diversion Accounting - WY1992
October 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Oct-91	2245.0	0.7	2245.7	116.6	19.6	31.7	1.9	169.8	117.3	**2193.2**	1871.1	97.6	118.0
02-Oct-91	2968.0	0.6	2968.6	85.8	28.6	590.4	1.9	706.7	117.2	**2379.1**	1852.3	2723.0	112.0
03-Oct-91	4123.0	0.6	4123.6	289.0	28.3	486.7	1.9	805.9	121.6	**3439.3**	1753.8	2154.5	122.0
04-Oct-91	10650.0	0.5	10650.5	281.1	57.4	1922.9	1.8	2263.2	141.7	**8529.0**	1723.8	14249.0	509.0
05-Oct-91	8089.0	0.4	8089.4	317.6	42.2	387.9	1.7	749.4	116.7	**7456.7**	1710.5	3063.4	106.0
06-Oct-91	4718.0	0.5	4718.5	369.8	26.2	228.7	2.0	616.7	111.9	**4213.7**	1675.5	1556.5	111.0
07-Oct-91	3466.0	0.5	3466.5	113.3	25.4	125.0	1.7	265.4	116.8	**3317.9**	1724.5	677.7	107.0
08-Oct-91	2567.0	0.6	2567.6	45.6	22.3	71.6	1.9	141.4	114.5	**2540.7**	1757.3	361.0	105.0
09-Oct-91	2887.0	0.6	2887.6	52.1	23.3	47.6	1.9	124.9	117.2	**2879.9**	1768.2	231.9	122.0
10-Oct-91	2514.0	0.6	2514.6	99.7	22.3	39.3	1.9	163.2	116.0	**2467.4**	1745.3	188.4	142.0
11-Oct-91	2476.0	0.5	2476.5	37.0	22.5	29.0	1.8	90.3	116.6	**2502.8**	1731.1	121.2	127.0
12-Oct-91	2634.0	0.4	2634.4	99.4	23.2	30.6	1.8	155.0	111.6	**2591.0**	1690.8	152.5	163.0
13-Oct-91	2272.0	0.5	2272.5	64.1	21.3	25.9	1.7	113.0	112.9	**2272.4**	1638.5	113.2	139.0
14-Oct-91	2736.0	0.5	2736.5	195.2	25.4	71.5	1.8	233.9	115.8	**2618.4**	1724.2	401.0	100.0
15-Oct-91	2264.0	0.5	2264.5	37.0	21.3	24.8	1.8	84.9	119.2	**2298.8**	1703.2	111.6	113.0
16-Oct-91	2432.0	0.6	2432.6	45.3	21.3	23.9	1.9	92.4	117.2	**2457.4**	1724.7	90.4	82.0
17-Oct-91	2171.0	0.6	2171.6	37.0	21.5	22.7	1.8	83.0	116.2	**2204.8**	1726.2	81.9	133.0
18-Oct-91	2331.0	0.4	2331.4	117.2	23.2	59.8	1.8	202.0	117.0	**2246.4**	1671.4	276.4	102.0
19-Oct-91	2822.0	0.4	2822.4	46.0	21.2	24.6	1.9	93.7	113.2	**2841.9**	1668.9	141.3	109.0
20-Oct-91	2257.0	0.4	2257.4	110.7	21.2	27.7	1.8	161.4	112.8	**2208.8**	1645.2	143.5	110.0
21-Oct-91	2077.0	0.6	2077.6	55.7	21.4	23.2	1.8	102.1	117.1	**2092.6**	1709.8	96.6	80.0
22-Oct-91	2413.0	0.6	2413.6	37.0	21.3	21.2	2.0	81.5	116.8	**2448.9**	1733.7	79.5	117.0
23-Oct-91	2379.0	0.6	2379.6	88.9	22.6	24.2	1.8	137.5	115.5	**2357.6**	1738.9	105.0	113.0
24-Oct-91	4829.0	0.6	4829.6	132.4	25.7	610.6	1.8	770.5	123.7	**4182.8**	1678.8	4142.3	154.0
25-Oct-91	8084.0	0.5	8084.5	283.2	36.6	1206.3	1.9	1508.0	122.5	**6699.0**	1682.6	7585.4	855.0
26-Oct-91	8737.0	0.5	8737.5	311.7	41.8	1553.6	1.8	1908.9	131.2	**6959.8**	1645.6	8563.5	82.0
27-Oct-91	6024.0	0.5	6024.5	303.6	35.2	486.9	1.9	827.6	115.4	**5312.3**	1673.9	2085.1	474.0
28-Oct-91	4239.0	0.5	4239.5	285.1	28.4	581.3	1.9	896.7	117.8	**3460.6**	1670.3	2148.8	143.0
29-Oct-91	4501.0	0.6	4501.6	270.8	31.3	491.1	1.9	795.1	116.5	**3823.0**	1674.8	1890.2	431.0
30-Oct-91	9241.0	0.5	9241.5	205.5	46.1	1514.2	1.9	1767.7	131.2	**7605.0**	1659.0	7809.4	83.0
31-Oct-91	5894.0	0.6	5894.6	239.3	36.5	450.4	1.9	728.1	117.9	**5284.4**	1667.9	2382.2	104.0
Averages	4098.1	0.5	4098.6	151.1	27.9	362.4	1.8	543.2	118.4	**3673.8**	1711.0	2058.8	173.2

Lake Michigan Diversion Accounting - WY1992
November 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Nov-91	6087.0	0.5	6087.5	279.2	40.2	759.9	1.5	1080.8	105.1	**5111.8**	1669.4	4740.0	313.0
02-Nov-91	4907.0	0.4	4907.4	283.2	32.2	366.7	1.6	683.7	97.3	**4321.0**	1660.0	1743.8	39.0
03-Nov-91	3773.0	0.4	3773.4	165.0	28.3	247.9	1.6	442.8	96.9	**3427.5**	1631.4	1063.6	44.0
04-Nov-91	3320.0	0.3	3320.3	53.6	28.3	168.8	1.7	252.4	98.5	**3166.4**	1675.4	702.7	57.0
05-Nov-91	2609.0	0.4	2609.4	51.5	28.3	129.9	1.4	211.1	98.3	**2496.6**	1666.3	557.6	51.0
06-Nov-91	2759.0	0.3	2759.3	92.9	27.2	112.4	1.5	234.0	99.6	**2624.9**	1688.8	495.8	80.0
07-Nov-91	2534.0	0.4	2534.4	43.5	26.3	96.9	1.6	168.3	98.2	**2464.3**	1651.7	381.9	73.0
08-Nov-91	2362.0	0.4	2362.4	136.3	25.1	97.1	1.5	260.0	98.2	**2200.6**	1654.7	357.7	87.0
09-Nov-91	2480.0	0.5	2480.5	45.6	24.3	84.5	1.5	155.9	97.0	**2421.6**	1662.4	253.1	81.0
10-Nov-91	2423.0	0.7	2423.7	52.3	23.4	152.7	1.3	229.7	94.2	**2288.2**	1612.3	397.7	82.0
11-Nov-91	2243.0	0.4	2243.4	143.5	25.3	118.0	1.6	288.4	97.8	**2052.8**	1680.1	380.7	73.0
12-Nov-91	2462.0	0.3	2462.3	44.0	24.3	89.2	1.6	159.1	99.3	**2402.5**	1671.4	256.6	77.0
13-Nov-91	2134.0	0.4	2134.4	43.6	25.2	83.4	1.6	153.8	98.1	**2078.7**	1656.4	219.4	77.0
14-Nov-91	3374.0	0.4	3374.4	82.7	25.4	592.1	1.5	701.7	106.3	**2779.0**	1674.3	2142.9	223.0
15-Nov-91	4338.0	0.4	4338.4	247.2	34.3	571.0	1.3	853.8	101.6	**3586.2**	1655.7	2381.2	177.0
16-Nov-91	3638.0	0.5	3638.5	308.1	26.2	267.2	1.4	602.9	95.0	**3130.6**	1620.7	1205.4	77.0
17-Nov-91	2889.0	0.4	2889.4	50.4	24.3	175.1	1.5	251.3	96.2	**2734.3**	1610.2	621.8	69.0
18-Nov-91	3500.0	0.6	3500.6	253.4	32.3	392.6	1.5	679.8	98.0	**2918.8**	1647.2	1476.9	65.0
19-Nov-91	3503.0	0.5	3503.5	93.6	34.2	568.5	1.6	697.9	106.1	**2911.7**	1661.4	3238.6	130.0
20-Nov-91	5083.0	0.4	5083.4	233.3	46.2	432.9	1.4	713.8	97.7	**4467.3**	1630.7	2750.0	55.0
21-Nov-91	4899.0	0.5	4899.5	296.2	33.3	239.2	1.4	570.1	97.7	**4427.1**	1645.5	1841.8	63.0
22-Nov-91	3823.0	0.4	3823.4	48.2	29.4	167.2	1.6	246.4	96.2	**3673.2**	1626.4	965.4	72.0
23-Nov-91	3578.0	0.3	3578.3	53.4	32.2	232.2	1.8	319.6	96.8	**3355.5**	1613.3	951.7	54.0
24-Nov-91	2560.0	0.3	2560.3	145.0	27.3	154.6	1.5	328.4	94.5	**2326.4**	1590.4	709.8	68.0
25-Nov-91	2682.0	0.5	2682.5	43.0	27.2	127.0	1.8	199.0	98.0	**2581.5**	1666.8	466.4	58.0
26-Nov-91	2671.0	0.4	2671.4	52.6	26.3	118.0	1.6	198.5	95.3	**2568.2**	1657.0	394.8	56.0
27-Nov-91	2705.0	0.4	2705.4	268.0	27.2	394.0	1.5	690.7	100.8	**2115.5**	1668.0	1413.0	55.0
28-Nov-91	3511.0	0.4	3511.4	134.4	36.2	969.8	1.5	1141.9	107.8	**2477.3**	1608.2	4303.0	59.0
29-Nov-91	6237.0	0.5	6237.5	262.2	45.3	854.9	1.6	1164.0	102.0	**5175.5**	1591.2	3779.1	61.0
30-Nov-91	5950.0	0.3	5950.3	301.6	44.3	509.3	1.5	856.7	97.5	**5191.1**	1584.5	3324.7	55.0
Averages	3501.1	0.4	3501.5	143.6	30.3	309.1	1.5	484.5	98.9	**3115.9**	1644.4	1450.6	84.4

Lake Michigan Diversion Accounting - WY1992
December 1991 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	1	2	3	4	5	6	7	8	9	10	11	12	13
01-Dec-91	5138.0	0.8	5138.8	201.5	35.9	342.9	1.7	672.0	102.2	**4569.0**	1593.9	1886.1	47.0
02-Dec-91	4029.0	0.8	4029.8	66.9	32.9	288.7	1.8	390.3	105.8	**3745.3**	1636.5	1287.6	54.0
03-Dec-91	3450.0	0.8	3450.8	59.4	37.9	213.9	1.9	313.1	99.4	**3237.1**	1646.3	955.8	76.0
04-Dec-91	3732.0	1.0	3733.0	142.4	30.9	185.4	1.8	360.5	98.6	**3471.1**	1646.9	840.3	64.0
05-Dec-91	2918.0	0.9	2918.9	48.2	27.8	167.7	1.8	245.5	103.2	**2776.6**	1652.0	633.3	53.0
06-Dec-91	2631.0	0.8	2631.8	225.0	27.9	534.2	1.9	789.0	108.7	**1951.5**	1652.0	1448.9	65.0
07-Dec-91	3960.0	0.8	3960.8	356.7	34.1	657.9	1.8	1050.5	107.6	**3017.9**	1631.2	4142.3	62.0
08-Dec-91	5212.0	0.9	5212.9	299.5	36.8	529.6	1.9	867.8	102.9	**4448.0**	1627.0	2611.1	64.0
09-Dec-91	4368.0	1.0	4369.0	205.0	35.8	317.7	1.9	560.4	102.8	**3911.4**	1653.5	1742.5	57.0
10-Dec-91	3600.0	0.9	3600.9	59.1	30.9	235.1	1.8	326.9	103.4	**3377.4**	1654.5	1130.8	58.0
11-Dec-91	3462.0	0.9	3462.9	55.0	29.9	193.8	1.8	280.5	102.3	**3284.7**	1665.6	793.6	56.0
12/12/199	4766.0	1.0	4767.0	261.1	43.8	539.3	1.7	845.9	107.7	**4028.8**	1640.3	2503.1	62.0
13-Dec-91	3679.0	1.0	3680.0	204.3	38.8	283.7	2.0	528.8	102.7	**3253.9**	1632.9	1701.8	60.0
14-Dec-91	4112.0	0.9	4112.9	56.6	35.9	231.1	1.8	325.4	98.9	**3886.4**	1614.5	1275.5	50.0
15-Dec-91	2777.0	1.0	2778.0	59.5	31.9	183.4	1.8	276.6	100.6	**2602.0**	1613.3	793.4	50.0
16-Dec-91	2771.0	1.0	2772.0	143.0	29.8	169.1	1.8	343.7	103.9	**2532.2**	1656.0	635.4	50.0
17-Dec-91	2857.0	0.9	2857.9	48.0	30.9	149.2	1.9	230.0	105.1	**2733.0**	1680.8	505.7	245.0
18-Dec-91	2919.0	1.0	2920.0	47.8	28.8	140.1	2.1	218.8	101.3	**2802.5**	1670.3	430.7	55.0
19-Dec-91	2610.0	0.9	2610.9	42.1	25.9	133.3	1.8	203.1	105.4	**2513.2**	1694.7	385.5	63.0
20-Dec-91	2656.0	0.9	2656.9	173.1	25.0	326.1	1.8	526.0	106.5	**2237.4**	1645.1	1104.4	62.0
21-Dec-91	2839.0	0.9	2839.9	160.0	25.8	206.7	1.8	394.3	101.8	**2547.4**	1618.7	552.3	56.0
22-Dec-91	2551.0	0.8	2551.8	60.7	23.9	231.2	1.8	317.6	102.2	**2336.4**	1592.0	578.6	50.0
23-Dec-91	2579.0	0.9	2579.9	148.2	27.9	262.3	1.8	440.2	102.6	**2242.3**	1611.8	879.6	56.0
24-Dec-91	2636.0	0.9	2636.9	73.1	25.9	187.5	1.8	288.3	101.3	**2449.9**	1633.6	505.1	76.0
25-Dec-91	2357.0	0.8	2357.8	49.5	24.1	167.1	1.7	242.4	101.6	**2217.0**	1568.8	452.2	62.0
26-Dec-91	2401.0	0.9	2401.9	121.4	23.8	219.8	1.7	366.7	100.0	**2135.2**	1618.1	630.5	56.0
27-Dec-91	2487.0	0.9	2487.9	77.1	25.0	145.8	1.7	249.6	102.1	**2340.4**	1633.2	487.0	68.0
28-Dec-91	2311.0	0.9	2311.9	53.8	25.9	121.5	1.7	202.9	102.1	**2211.1**	1601.4	352.2	73.0
29-Dec-91	2318.0	0.8	2318.8	49.3	26.0	108.7	1.8	185.8	101.4	**2234.4**	1605.7	316.5	71.0
30-Dec-91	2250.0	1.0	2251.0	119.2	26.1	108.0	1.9	255.2	102.9	**2098.7**	1619.4	335.8	78.0
31-Dec-91	2386.0	0.8	2386.8	43.2	24.9	97.8	1.8	167.7	101.5	**2320.6**	1623.5	268.1	73.0
Averages	3185.9	0.9	3186.8	122.6	30.0	247.7	1.8	402.1	102.9	**2887.6**	1633.3	1037.6	66.8

Lake Michigan Diversion Accounting - WY1992
January 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	1	2	3	4	5	6	7	8	9	10	11	12	13
01-Jan-92	2427.0	2.2	2429.2	52.8	23.6	94.9	1.8	173.1	106.8	**2362.9**	1554.4	259.0	60.0
02-Jan-92	2382.0	2.2	2384.2	117.1	23.7	97.8	1.9	240.5	109.2	**2252.9**	1605.5	330.4	61.0
03-Jan-92	2407.0	2.2	2409.2	49.2	25.7	89.3	1.8	160.0	111.0	**2360.2**	1622.5	264.9	72.0
04-Jan-92	2193.0	2.2	2195.2	43.6	24.7	86.7	1.9	156.9	109.8	**2147.9**	1613.9	255.2	75.0
05-Jan-92	2334.0	2.1	2336.1	123.7	23.7	90.3	1.9	239.6	108.4	**2204.9**	1596.7	306.5	57.0
06-Jan-92	2193.0	2.1	2195.1	43.8	24.8	81.9	2.0	152.5	111.5	**2154.1**	1643.3	239.7	63.0
07-Jan-92	2417.0	2.2	2419.2	59.5	23.8	80.8	1.9	166.0	110.2	**2363.4**	1639.4	245.7	78.0
08-Jan-92	2916.0	2.2	2918.2	89.5	27.6	81.2	1.8	200.1	109.7	**2827.8**	1650.3	290.0	71.0
09-Jan-92	2527.0	2.2	2529.2	225.5	24.7	372.1	2.0	624.3	115.1	**2020.0**	1648.4	1290.0	62.0
10-Jan-92	2253.0	2.2	2255.2	110.2	23.7	140.8	2.1	276.8	111.9	**2090.3**	1643.0	415.8	60.0
11-Jan-92	2415.0	2.2	2417.2	53.9	23.8	107.1	1.9	186.7	109.2	**2339.7**	1621.6	314.1	65.0
12-Jan-92	2299.0	2.2	2301.2	86.5	22.6	111.4	1.8	222.3	108.8	**2187.7**	1614.8	396.1	58.0
13-Jan-92	2418.0	2.3	2420.3	82.1	25.7	225.6	1.9	335.3	111.1	**2196.1**	1621.2	702.6	71.0
14-Jan-92	2645.0	2.3	2647.3	43.5	38.7	107.5	1.8	191.5	111.1	**2566.9**	1638.7	377.3	72.0
15-Jan-92	2444.0	2.3	2446.3	132.4	27.7	99.0	2.0	261.1	111.1	**2296.3**	1641.2	338.8	67.0
16-Jan-92	2207.0	2.2	2209.2	43.8	22.7	83.9	1.9	152.3	112.2	**2169.1**	1657.0	249.7	76.0
17-Jan-92	2503.0	2.2	2505.2	44.1	22.6	78.3	1.9	146.9	113.0	**2471.3**	1668.3	231.8	104.0
18-Jan-92	2261.0	2.2	2263.2	133.3	21.6	80.3	2.0	237.2	109.2	**2135.2**	1650.3	283.3	75.0
19-Jan-92	2151.0	2.1	2153.1	44.1	20.8	69.4	1.8	136.1	110.1	**2127.1**	1626.9	209.5	57.0
20-Jan-92	2459.0	2.2	2461.2	44.2	22.8	65.9	1.9	134.8	114.4	**2440.8**	1694.9	201.6	69.0
21-Jan-92	2342.0	2.2	2344.2	151.2	22.7	200.3	2.0	376.2	113.7	**2081.7**	1706.9	550.4	87.0
22-Jan-92	2386.0	2.4	2388.4	127.5	23.7	370.4	1.9	523.5	119.4	**1984.3**	1679.1	1867.9	76.0
23-Jan-92	3352.0	2.2	3354.2	227.7	28.8	233.5	1.9	491.9	112.9	**2975.2**	1676.1	874.2	63.0
24-Jan-92	2792.0	2.3	2794.3	52.1	26.7	103.3	2.2	184.3	111.1	**2721.1**	1687.7	450.0	73.0
25-Jan-92	2527.0	2.2	2529.2	44.7	25.6	80.3	2.2	152.8	109.9	**2486.3**	1643.7	337.6	55.0
26-Jan-92	2715.0	2.2	2717.2	44.6	23.8	67.8	1.9	138.1	110.8	**2689.9**	1631.2	274.0	56.0
27-Jan-92	2696.0	2.3	2698.3	121.9	23.8	66.6	1.9	214.2	110.5	**2594.6**	1671.2	296.2	77.0
28-Jan-92	2410.0	2.3	2412.3	46.0	23.7	69.5	1.9	141.1	114.2	**2385.4**	1665.1	242.1	75.0
29-Jan-92	2320.0	2.2	2322.2	141.8	22.5	195.4	1.9	361.6	113.2	**2073.8**	1668.0	732.4	87.0
30-Jan-92	2337.0	2.2	2339.2	106.6	22.7	260.0	1.9	391.2	115.0	**2063.0**	1659.1	722.8	69.0
31-Jan-92	2470.0	2.3	2472.3	123.6	23.7	150.4	1.9	299.6	112.7	**2285.4**	1665.0	555.8	67.0
Averages	2458.0	2.2	2460.2	90.5	24.6	190.4	1.9	247.4	111.5	**2324.3**	1645.3	455.0	69.6

Lake Michigan Diversion Accounting - WY1992
February 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Feb-92	2294.0	1.6	2295.6	42.2	25.2	104.2	1.6	173.2	125.7	**2248.1**	1625.5	394.0	60.0
02-Feb-92	2444.0	1.7	2445.7	101.6	23.2	151.4	1.6	277.8	129.7	**2297.6**	1629.8	510.3	59.0
03-Feb-92	2277.0	1.8	2278.8	71.8	24.2	99.4	1.7	197.1	126.6	**2208.3**	1650.3	394.9	66.0
04-Feb-92	2583.0	1.8	2584.8	97.2	26.2	70.2	1.6	195.2	128.9	**2518.5**	1668.8	334.9	67.0
05-Feb-92	2705.0	1.7	2706.7	44.6	24.0	57.5	1.6	127.7	128.2	**2707.2**	1664.9	313.0	59.0
06-Feb-92	2487.0	1.7	2488.7	44.1	24.2	54.5	1.7	124.5	128.5	**2492.7**	1667.6	295.7	70.0
07-Feb-92	2365.0	1.6	2366.6	121.4	25.2	59.2	1.6	207.4	127.2	**2286.4**	1652.3	324.9	73.0
08-Feb-92	2398.0	1.6	2399.6	44.1	24.3	53.0	1.7	123.1	126.5	**2403.0**	1653.1	229.1	72.0
09-Feb-92	2301.0	1.7	2302.7	106.1	23.9	57.7	1.6	188.7	126.9	**2240.9**	1636.1	238.1	67.0
10-Feb-92	2195.0	2.0	2197.0	70.8	22.3	105.3	1.6	200.0	127.3	**2124.3**	1635.3	296.0	59.0
11-Feb-92	2298.0	1.6	2299.6	52.3	25.2	83.3	1.7	162.5	127.2	**2264.3**	1631.3	312.3	59.0
12-Feb-92	2227.0	1.7	2228.7	84.2	23.2	67.8	1.7	176.9	127.3	**2179.1**	1642.1	241.3	71.0
13-Feb-92	2328.0	1.6	2329.6	78.0	23.1	62.6	1.7	165.4	127.6	**2292.0**	1667.3	220.5	55.0
14-Feb-92	2366.0	1.7	2367.7	73.6	23.2	362.1	1.6	460.5	131.0	**2038.2**	1624.4	1318.4	67.0
15-Feb-92	4450.0	1.6	4451.6	273.3	55.1	730.8	1.6	1060.8	131.7	**3522.5**	1619.1	4517.0	67.0
16-Feb-92	3801.0	1.7	3802.7	249.1	31.2	262.3	1.6	544.2	126.1	**3384.6**	1597.3	1202.4	57.0
17-Feb-92	3492.0	1.7	3493.7	49.9	28.1	222.8	1.6	302.4	125.6	**3316.9**	1657.6	789.4	57.0
18-Feb-92	3716.0	1.7	3717.7	233.0	40.2	609.0	1.6	883.8	132.7	**2966.6**	1627.3	2523.3	212.0
19-Feb-92	4038.0	1.6	4039.6	231.8	32.0	262.4	1.6	527.8	126.4	**3638.2**	1637.5	1558.7	109.0
20-Feb-92	3260.0	1.7	3261.7	54.9	29.1	163.7	1.6	249.3	127.6	**3140.0**	1645.0	896.0	43.0
21-Feb-92	2965.0	1.7	2966.7	51.5	30.2	125.4	1.6	208.7	127.2	**2885.2**	1621.9	676.2	66.0
22-Feb-92	2932.0	1.7	2933.7	43.0	28.1	104.6	1.6	177.3	126.0	**2882.4**	1601.0	536.5	62.0
23-Feb-92	2776.0	1.7	2777.7	118.3	28.2	100.1	1.6	248.2	126.6	**2656.1**	1592.8	502.4	66.0
24-Feb-92	2728.0	1.7	2729.7	69.2	30.3	424.1	1.7	525.3	132.3	**2336.7**	1632.5	1717.5	67.0
25-Feb-92	3573.0	1.6	3574.6	297.2	35.3	287.1	1.6	621.2	128.2	**3081.6**	1637.4	1143.3	71.0
26-Feb-92	2910.0	1.7	2911.7	85.6	28.0	184.0	1.6	299.2	128.1	**2740.6**	1646.2	731.0	52.0
27-Feb-92	2806.0	1.6	2807.6	52.0	28.2	137.6	1.6	219.4	127.8	**2716.0**	1621.8	551.3	62.0
28-Feb-92	2890.0	1.7	2891.7	94.8	29.1	119.6	1.7	245.2	126.8	**2773.3**	1608.5	532.8	59.0
29-Feb-92	2616.0	1.7	2617.7	85.7	26.1	104.7	1.6	218.1	125.3	**2524.9**	1589.2	427.9	61.0
Averages	2835.2	1.7	2836.9	104.2	28.1	180.2	1.6	314.1	127.8	**2650.6**	1633.9	818.2	69.5

Lake Michigan Diversion Accounting - WY1992
March 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Mar-92	2565.0	1.6	2566.6	43.5	24.0	94.5	1.8	163.8	164.6	**2557.4**	1587.3	348.8	51.0
02-Mar-92	2488.0	1.6	2489.6	43.1	26.1	90.0	1.7	160.9	155.0	**2483.7**	1639.3	317.5	72.0
03-Mar-92	2430.0	1.6	2431.6	127.8	26.9	93.3	1.8	249.8	152.4	**2334.2**	1638.6	360.4	68.0
04-Mar-92	2341.0	1.5	2342.5	44.7	26.0	84.4	1.8	156.9	156.2	**2341.8**	1648.7	264.2	62.0
05-Mar-92	2534.0	1.9	2535.9	54.5	26.8	121.7	1.7	204.7	154.5	**2485.7**	1627.0	420.8	82.0
06-Mar-92	3731.0	1.6	3732.6	182.6	41.0	329.6	1.8	555.0	157.4	**3335.0**	1607.5	1907.1	145.0
07-Mar-92	3604.0	1.5	3605.5	276.5	36.9	230.3	1.7	545.4	156.9	**3217.0**	1585.7	1300.0	65.0
08-Mar-92	3335.0	1.5	3336.5	41.5	29.1	128.5	1.8	200.9	162.8	**3288.4**	1591.4	697.4	80.0
09-Mar-92	3761.0	1.6	3762.6	70.3	37.9	665.3	1.8	775.3	164.1	**3151.4**	1591.6	3256.9	258.0
10-Mar-92	4594.0	1.5	4595.5	244.4	71.3	315.1	1.7	632.5	155.5	**4118.5**	1636.8	2059.8	71.0
11-Mar-92	3455.0	1.5	3456.5	239.1	35.9	216.4	1.9	493.3	156.6	**3119.8**	1620.7	1032.1	70.0
12-Mar-92	3298.0	1.5	3299.5	74.2	36.9	152.2	1.7	265.0	157.5	**3192.0**	1629.5	712.1	68.0
13-Mar-92	2945.0	1.5	2946.5	59.0	30.9	142.0	1.6	233.5	157.0	**2870.0**	1636.0	700.7	63.0
14-Mar-92	2800.0	1.4	2801.4	143.3	30.0	123.1	1.3	297.7	156.8	**2659.5**	1612.7	573.7	61.0
15-Mar-92	2969.0	1.5	2970.5	49.8	29.0	97.3	2.6	178.7	164.0	**2945.8**	1586.3	430.5	56.0
16-Mar-92	2822.0	1.5	2823.5	62.8	28.9	232.9	2.3	316.9	158.5	**2665.1**	1619.7	821.5	53.0
17-Mar-92	3212.0	1.4	3213.4	271.3	32.9	203.2	1.6	509.0	156.6	**2861.0**	1619.3	1008.9	61.0
18-Mar-92	2732.0	1.5	2733.5	51.5	28.9	123.9	1.8	206.1	156.3	**2683.7**	1615.5	508.8	66.0
19-Mar-92	2437.0	1.5	2438.5	42.9	29.9	103.2	1.5	177.5	157.1	**2418.1**	1622.3	433.4	72.0
20-Mar-92	2850.0	1.4	2851.4	43.0	28.1	92.4	1.9	165.4	155.4	**2841.4**	1613.1	379.9	69.0
21-Mar-92	2495.0	1.4	2496.4	212.1	27.9	361.9	1.9	603.8	163.0	**2055.6**	1615.6	2578.2	84.0
22-Mar-92	3303.0	1.4	3304.4	271.6	40.0	448.0	1.7	761.3	165.7	**2698.8**	1585.1	1517.0	66.0
23-Mar-92	3665.0	1.5	3666.5	239.4	30.0	553.4	1.7	824.5	188.8	**3010.8**	1644.1	1880.2	71.0
24-Mar-92	3609.0	1.6	3610.6	251.8	28.9	422.1	1.8	704.4	162.9	**3069.1**	1643.2	1409.1	66.0
25-Mar-92	3937.0	1.5	3938.5	173.7	27.9	206.0	1.8	409.4	157.8	**3686.9**	1626.4	936.5	318.0
26-Mar-92	3669.0	1.6	3670.6	41.9	30.9	147.4	1.8	222.0	155.3	**3603.9**	1621.7	773.5	62.0
27-Mar-92	3087.0	1.6	3088.6	43.5	39.0	122.4	1.8	206.7	155.1	**3037.0**	1601.8	631.0	69.0
28-Mar-92	3102.0	1.7	3103.7	50.8	28.8	111.7	1.7	193.0	154.3	**3065.0**	1589.0	572.2	60.0
29-Mar-92	3170.0	1.7	3171.7	152.1	31.0	289.9	1.7	474.7	155.8	**2852.8**	1568.5	1248.3	68.0
30-Mar-92	3132.0	1.7	3133.7	153.9	33.0	167.8	1.8	356.5	158.2	**2935.4**	1606.4	713.7	62.0
31-Mar-92	3003.0	1.7	3004.7	52.5	29.8	130.9	1.7	214.9	154.5	**2944.3**	1609.2	688.1	71.0
Averages	3131.5	1.5	3133.0	122.5	32.4	212.9	1.8	369.6	157.0	**2920.4**	1614.2	983.3	83.5

Lake Michigan Diversion Accounting - WY1992
April 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Apr-92	2858.0	1.7	2859.7	89.7	32.9	117.5	1.8	241.9	190.1	**2807.9**	1622.0	536.1	71.0
02-Apr-92	2770.0	1.9	2771.9	87.1	30.9	118.1	1.7	237.8	190.8	**2724.7**	1631.4	507.5	69.0
03-Apr-92	2489.0	1.7	2490.7	61.1	30.9	125.0	1.8	218.8	192.0	**2463.9**	1626.8	523.7	70.0
04-Apr-92	2901.0	1.7	2902.7	42.5	32.0	100.4	1.7	176.6	190.0	**2916.1**	1591.0	419.8	88.0
05-Apr-92	2353.0	1.7	2354.7	124.1	30.1	100.0	1.7	255.9	189.5	**2288.3**	1547.5	424.6	89.0
06-Apr-92	2516.0	1.8	2517.8	43.1	31.0	90.7	1.8	166.6	192.7	**2543.9**	1624.7	320.3	70.0
07-Apr-92	2607.0	1.7	2608.7	55.4	31.1	88.6	1.8	176.9	191.8	**2623.6**	1644.8	310.7	125.0
08-Apr-92	2786.0	1.9	2787.9	106.0	30.9	89.5	1.7	228.1	192.7	**2752.5**	1642.3	331.3	226.0
09-Apr-92	2554.0	1.7	2555.7	44.6	31.0	81.6	1.8	159.0	192.9	**2589.6**	1638.1	269.3	86.0
10-Apr-92	3396.0	1.6	3397.6	43.6	31.9	112.0	1.7	189.2	193.4	**3401.8**	1621.1	359.4	376.0
11-Apr-92	3587.0	1.6	3588.6	210.2	42.0	149.0	1.5	402.7	190.9	**3376.8**	1605.7	780.9	553.0
12-Apr-92	2508.0	1.6	2509.6	44.3	34.0	88.8	1.2	168.3	191.5	**2532.8**	1559.3	370.4	78.0
13-Apr-92	3661.0	1.7	3662.7	43.9	34.1	89.8	1.4	169.2	191.1	**3684.6**	1614.1	297.0	931.0
14-Apr-92	2808.0	1.6	2809.6	202.2	36.9	183.0	1.5	423.6	193.4	**2579.4**	1611.4	619.9	86.0
15-Apr-92	7961.0	1.6	7962.6	175.4	48.0	719.3	1504.8	2447.5	201.8	**5716.9**	1620.5	3757.2	87.0
16-Apr-92	8614.0	1.6	8615.6	232.0	47.0	668.0	3351.5	4298.5	197.2	**4514.3**	1612.4	2603.5	100.0
17-Apr-92	7111.0	1.6	7112.6	259.4	41.9	298.8	2596.8	3196.9	191.5	**4107.2**	1589.7	1118.8	137.0
18-Apr-92	7340.0	1.6	7341.6	79.6	40.9	273.3	3388.7	3782.7	191.0	**3749.9**	1562.8	885.0	154.0
19-Apr-92	7092.0	1.7	7093.7	123.1	42.0	177.2	3473.8	3816.1	189.3	**3466.9**	1549.4	749.2	123.0
20-Apr-92	7050.0	1.7	7051.7	58.5	44.0	136.5	3448.8	3687.8	193.4	**3557.3**	1632.3	634.4	124.0
21-Apr-92	6761.0	1.6	6762.6	100.8	42.0	113.2	3518.8	3774.8	191.7	**3179.5**	1625.7	476.7	117.0
22-Apr-92	7179.0	1.6	7180.6	72.0	41.9	98.3	3368.8	3581.0	193.4	**3793.0**	1606.0	363.4	106.0
23-Apr-92	7534.0	1.6	7535.6	43.2	43.5	130.9	3573.8	3791.4	193.3	**3937.5**	1617.3	323.3	127.0
24-Apr-92	7397.0	1.5	7398.5	163.7	51.4	262.8	3358.8	3836.7	193.9	**3755.7**	1597.4	829.5	135.0
25-Apr-92	7327.0	1.7	7328.7	54.2	47.2	140.3	3558.6	3800.3	190.6	**3719.0**	1564.8	463.9	159.0
26-Apr-92	7169.0	1.6	7170.6	43.2	45.9	132.6	3647.8	3869.5	190.6	**3491.7**	1536.6	359.0	159.0
27-Apr-92	7211.0	1.6	7212.6	57.3	49.1	105.2	3763.9	3975.5	191.6	**3428.7**	1604.3	303.9	91.0
28-Apr-92	6686.0	1.6	6687.6	107.7	46.0	97.5	3188.9	3440.1	192.1	**3439.6**	1640.9	325.1	128.0
29-Apr-92	6765.0	1.7	6766.7	43.6	44.0	86.2	3410.6	3584.4	192.3	**3374.6**	1646.6	279.5	137.0
30-Apr-92	6816.0	1.8	6817.8	43.6	45.9	81.9	3472.9	3644.3	191.2	**3364.7**	1639.0	253.6	140.0
Averages	5193.6	1.7	5195.3	95.2	39.3	168.5	1755.0	2058.0	192.3	**3329.6**	1607.5	659.9	164.7

Lake Michigan Diversion Accounting - WY1992
May 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-May-92	6583.0	3.0	6586.0	113.1	43.7	83.6	3026.8	3267.2	281.3	**3600.1**	1694.6	272.4	186.0
02-May-92	6732.0	2.7	6734.7	44.1	42.9	74.7	3120.9	3282.6	282.8	**3734.9**	1702.9	199.8	214.0
03-May-92	6639.0	2.6	6641.6	43.7	40.9	70.8	3584.9	3740.3	284.8	**3186.1**	1634.1	189.8	176.0
04-May-92	6563.0	2.7	6565.7	115.3	40.9	72.8	3542.0	3771.0	283.6	**3078.3**	1693.1	226.0	145.0
05-May-92	6623.0	2.6	6625.6	43.8	41.8	64.1	3520.9	3670.6	281.8	**3236.8**	1679.0	167.2	141.0
06-May-92	6557.0	2.7	6559.7	44.3	39.5	60.9	3359.8	3504.5	281.5	**3336.7**	1696.6	155.4	168.0
07-May-92	6594.0	2.7	6596.7	134.1	37.0	64.4	3627.9	3863.4	282.3	**3015.6**	1759.3	212.1	187.0
08-May-92	6527.0	2.7	6529.7	44.4	37.6	54.4	3496.0	3632.4	284.6	**3181.9**	1818.2	139.1	211.0
09-May-92	6514.0	2.7	6516.7	44.8	38.3	51.1	3459.0	3593.2	283.0	**3206.5**	1851.6	129.3	246.0
10-May-92	6500.0	2.8	6502.8	126.7	36.2	54.4	3403.9	3621.2	283.5	**3165.1**	1843.0	183.6	220.0
11-May-92	6478.0	2.9	6480.9	45.4	35.5	44.8	3495.0	3620.7	282.9	**3143.1**	1906.3	109.5	173.0
12-May-92	6541.0	2.8	6543.8	36.9	37.3	42.7	3590.8	3707.7	284.5	**3120.6**	1896.7	112.7	176.0
13-May-92	6540.0	2.6	6542.6	56.9	41.1	41.3	3525.9	3665.2	285.6	**3163.0**	1812.3	296.3	157.0
14-May-92	6506.0	2.7	6508.7	109.1	35.9	42.7	3442.1	3629.8	285.2	**3164.1**	1807.3	178.5	172.0
15-May-92	6465.0	2.7	6467.7	44.0	35.0	35.8	3532.1	3646.9	286.1	**3106.9**	1905.1	101.6	225.0
16-May-92	6469.0	2.9	6471.9	44.1	38.2	33.5	3327.0	3442.8	285.9	**3315.0**	2021.2	97.6	229.0
17-May-92	6613.0	2.9	6615.9	118.1	36.6	36.9	3289.9	3481.5	285.5	**3419.9**	1965.2	177.0	226.0
18-May-92	6298.0	2.7	6300.7	44.8	35.9	29.7	3433.9	3544.3	286.1	**3042.5**	1872.7	79.9	169.0
19-May-92	5945.0	2.8	5947.8	84.4	34.1	31.2	3362.0	3511.7	287.3	**2723.4**	1996.2	100.8	225.0
20-May-92	4083.0	2.9	4085.9	68.7	32.6	27.9	1853.9	1983.1	290.3	**2393.1**	2136.1	83.1	207.0
21-May-92	2337.0	3.0	2340.0	45.6	33.0	23.8	2.1	104.5	291.0	**2526.5**	2220.9	57.5	209.0
22-May-92	2685.0	3.0	2688.0	83.7	32.7	25.1	2.1	143.6	290.9	**2835.3**	2126.4	90.5	181.0
23-May-92	2641.0	2.7	2643.7	78.2	36.2	24.6	1.7	140.7	279.9	**2782.9**	1761.7	146.0	166.0
24-May-92	2914.0	2.7	2916.7	44.8	39.0	20.7	1.9	106.4	275.6	**3085.9**	1625.4	92.5	156.0
25-May-92	2535.0	2.7	2537.7	126.5	32.0	26.6	1.9	187.0	276.3	**2627.0**	1683.7	123.0	180.0
26-May-92	2428.0	2.7	2430.7	45.6	31.4	19.6	2.0	98.6	281.0	**2613.1**	1706.7	55.0	140.0
27-May-92	2378.0	2.8	2380.8	44.7	28.9	18.7	2.0	94.3	285.7	**2572.2**	1866.2	52.6	167.0
28-May-92	2768.0	2.9	2770.9	44.4	28.2	17.5	2.0	92.1	281.1	**2959.9**	2006.7	43.7	377.0
29-May-92	2884.0	2.7	2886.7	117.4	28.5	21.9	2.1	169.9	283.7	**3000.5**	2027.5	94.3	167.0
30-May-92	2617.0	2.6	2619.6	60.9	32.6	16.1	1.9	111.5	282.5	**2790.6**	1790.7	166.3	224.0
31-May-92	2682.0	2.7	2684.7	44.6	27.8	14.8	2.1	89.3	283.4	**2878.8**	1929.9	63.4	197.0
Averages	5052.9	2.8	5055.7	69.1	35.8	40.2	2161.8	2306.9	283.9	**3032.7**	1852.8	135.4	194.1

Lake Michigan Diversion Accounting - WY1992
June 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Jun-92	3066.0	2.6	3068.6	138.5	29.4	21.0	2.3	191.2	348.5	**3225.9**	2089.5	110.2	535.0
02-Jun-92	3222.0	2.5	3224.5	36.9	29.4	13.0	2.3	81.6	351.7	**3494.6**	2148.3	41.5	536.0
03-Jun-92	3062.0	2.6	3064.6	36.9	29.6	12.1	2.6	81.2	348.8	**3332.2**	2225.7	33.6	525.0
04-Jun-92	3348.0	2.4	3350.4	69.6	30.7	13.8	2.4	116.5	344.7	**3578.6**	1979.3	73.8	394.0
05-Jun-92	3027.0	2.6	3029.6	86.4	31.9	14.9	2.1	135.3	343.1	**3237.4**	1915.5	121.6	527.0
06-Jun-92	3373.0	2.5	3375.5	36.9	30.1	10.8	2.2	79.8	338.8	**3634.5**	1967.9	76.3	537.0
07-Jun-92	3381.0	2.6	3383.6	36.9	32.4	10.1	2.3	81.7	341.0	**3642.9**	1963.2	78.2	560.0
08-Jun-92	3066.0	2.4	3068.4	116.9	30.1	15.3	2.3	164.6	342.6	**3246.4**	2106.3	104.9	567.0
09-Jun-92	3256.0	2.6	3258.6	45.6	30.3	9.5	2.3	87.7	344.4	**3515.3**	2157.1	45.8	593.0
10-Jun-92	3227.0	2.5	3229.5	61.0	30.5	10.7	2.5	104.7	348.0	**3472.8**	2265.7	52.7	721.0
11-Jun-92	3992.0	2.5	3994.5	93.7	30.8	12.8	2.7	140.0	349.7	**4204.2**	2363.9	70.2	941.0
12-Jun-92	4532.0	2.7	4534.7	36.9	30.0	8.7	2.5	78.1	352.4	**4809.0**	2440.5	28.5	1307.0
13-Jun-92	4652.0	2.7	4654.7	45.6	30.0	9.1	2.5	87.2	357.9	**4925.4**	2500.6	30.7	1268.0
14-Jun-92	4469.0	2.7	4471.7	118.4	33.3	14.6	2.5	168.8	350.2	**4653.1**	2399.0	85.6	1087.0
15-Jun-92	3008.0	2.8	3010.8	36.9	34.2	8.7	2.6	82.4	347.2	**3275.6**	2267.4	36.2	524.0
16-Jun-92	3349.0	2.8	3351.8	36.9	31.7	8.7	2.6	79.9	348.8	**3620.7**	2312.3	39.8	544.0
17-Jun-92	5780.0	2.7	5782.7	224.3	35.9	1123.7	2.4	1386.3	354.3	**4750.7**	2080.4	7853.6	364.0
18-Jun-92	4232.0	2.5	4234.5	246.4	34.1	51.6	2.2	334.3	340.5	**4240.7**	1902.2	401.3	396.0
19-Jun-92	3658.0	2.4	3660.4	36.9	30.1	12.5	2.4	81.9	342.7	**3921.2**	1838.7	75.4	484.0
20-Jun-92	3597.0	2.2	3599.2	36.9	30.1	10.8	2.1	79.9	344.0	**3863.3**	1781.4	53.7	545.0
21-Jun-92	3623.0	2.3	3625.3	66.1	30.2	12.0	2.4	110.7	341.7	**3856.3**	1808.0	61.5	548.0
22-Jun-92	3521.0	2.4	3523.4	97.8	25.7	13.6	2.3	139.4	343.1	**3727.1**	1887.8	75.7	510.0
23-Jun-92	2939.0	2.3	2941.3	36.9	25.3	9.0	2.4	73.6	341.4	**3209.1**	1906.0	36.2	447.0
24-Jun-92	3056.0	2.5	3058.5	45.6	27.6	9.2	2.2	84.6	342.0	**3315.9**	1990.1	34.5	524.0
25-Jun-92	3536.0	2.6	3538.6	115.5	26.8	14.4	2.4	159.1	341.9	**3721.4**	2099.1	79.5	540.0
26-Jun-92	3446.0	2.6	3448.6	36.9	26.9	8.7	2.2	74.7	342.0	**3715.9**	2125.1	39.4	762.0
27-Jun-92	3525.0	2.6	3527.6	36.9	27.1	8.7	2.2	74.9	348.0	**3800.7**	2083.1	34.4	881.0
28-Jun-92	3770.0	2.3	3772.3	122.4	25.1	14.9	2.3	164.7	341.7	**3949.3**	2105.5	90.3	893.0
29-Jun-92	3614.0	2.6	3616.6	45.5	25.3	9.1	2.5	82.4	348.9	**3881.1**	2301.0	32.1	884.0
30-Jun-92	3402.0	2.5	3404.5	36.9	27.0	8.7	2.4	75.0	345.1	**3674.6**	2291.6	35.2	938.0
Averages	3591.0	2.5	3593.5	74.0	29.7	50.0	2.4	156.1	345.8	**3783.2**	2110.1	331.1	662.7

Lake Michigan Diversion Accounting - WY1992
July 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Jul-92	3818.0	2.6	3820.6	119.9	28.2	15.0	2.2	165.3	274.3	**3929.6**	2607.0	92.2	1317.0
02-Jul-92	6037.0	2.6	6039.6	134.8	33.5	370.2	2.2	540.7	278.1	**5777.0**	2423.0	1020.9	1959.0
03-Jul-92	5013.0	2.3	5015.3	235.0	35.4	31.0	2.0	303.4	264.5	**4976.4**	1943.4	280.4	1661.0
04-Jul-92	4244.0	2.5	4246.5	36.8	25.1	22.0	2.2	86.1	264.4	**4424.8**	1960.5	281.9	1240.0
05-Jul-92	4428.0	2.3	4430.3	163.0	24.5	54.1	2.0	243.6	264.5	**4451.2**	1900.1	269.5	1200.0
06-Jul-92	4079.0	2.6	4081.6	45.6	25.8	12.0	2.1	85.5	268.4	**4264.5**	2149.4	45.0	1243.0
07-Jul-92	4250.0	2.4	4252.4	44.3	26.8	21.4	2.2	94.7	268.5	**4426.2**	2041.2	84.7	1409.0
08-Jul-92	3644.0	2.7	3646.7	123.5	26.1	20.1	2.1	171.8	266.8	**3741.7**	2251.4	237.8	1278.0
09-Jul-92	3877.0	2.6	3879.6	60.0	28.1	11.6	2.3	102.0	269.0	**4046.6**	2302.1	112.8	1278.0
10-Jul-92	3573.0	2.6	3575.6	44.4	28.1	11.0	2.2	85.7	268.2	**3758.1**	2261.0	83.7	1247.0
11-Jul-92	4347.0	2.5	4349.5	83.3	28.0	40.4	2.1	153.8	268.9	**4464.6**	2324.1	522.0	1236.0
12-Jul-92	4668.0	2.7	4670.7	309.8	27.2	268.1	2.1	607.2	268.7	**4332.2**	1966.8	823.6	1372.0
13-Jul-92	6853.0	2.6	6855.6	153.9	32.1	633.0	2.0	821.0	279.3	**6313.9**	1936.6	4793.1	1321.0
14-Jul-92	5395.0	2.4	5397.4	307.7	51.1	470.8	1.9	831.5	272.1	**4838.0**	1925.6	2600.8	1936.0
15-Jul-92	4529.0	2.5	4531.5	285.4	38.1	60.5	2.0	386.0	265.8	**4411.3**	1960.7	592.2	953.0
16-Jul-92	4123.0	2.5	4125.5	44.3	31.0	30.3	2.0	107.6	265.5	**4283.4**	1927.0	210.4	1095.0
17-Jul-92	4115.0	2.8	4117.8	44.2	32.0	24.4	2.1	102.7	269.4	**4284.5**	2015.1	147.7	1242.0
18-Jul-92	4788.0	2.5	4790.5	239.4	29.0	460.5	2.0	730.9	267.6	**4327.2**	1958.1	1091.5	1000.0
19-Jul-92	4728.0	2.6	4730.6	45.6	28.1	40.5	2.0	116.2	265.2	**4879.6**	1945.9	118.4	1101.0
20-Jul-92	3654.0	2.5	3656.5	58.6	33.2	30.5	2.1	124.4	266.5	**3798.6**	1976.4	166.9	1284.0
21-Jul-92	4182.0	2.5	4184.5	109.8	32.0	28.3	2.0	172.1	266.7	**4281.1**	2037.4	144.0	1678.0
22-Jul-92	3473.0	2.3	3475.3	44.3	29.0	20.0	2.0	95.3	266.3	**3645.3**	1985.2	77.0	833.0
23-Jul-92	3975.0	2.3	3977.3	136.7	34.0	51.4	2.0	224.1	268.4	**4021.6**	1930.8	587.4	1182.0
24-Jul-92	3616.0	2.4	3618.4	36.9	30.0	18.7	2.0	87.6	265.6	**3796.4**	1932.3	189.4	1201.0
25-Jul-92	4068.0	2.4	4070.4	36.8	28.0	40.3	1.6	106.7	265.7	**4229.4**	1913.3	210.1	1165.0
26-Jul-92	4093.0	2.5	4095.5	220.4	32.0	206.0	1.4	459.8	265.3	**3901.0**	1877.4	793.4	1164.0
27-Jul-92	4041.0	2.6	4043.6	36.9	28.1	27.6	1.4	94.0	268.3	**4217.9**	2043.3	128.2	1402.0
28-Jul-92	3847.0	2.7	3849.7	78.4	28.1	175.6	1.7	283.8	268.6	**3834.5**	2140.3	340.1	1263.0
29-Jul-92	4309.0	2.5	4311.5	75.5	37.0	40.5	1.9	154.9	269.7	**4426.3**	2057.3	184.2	1082.0
30-Jul-92	4009.0	2.4	4011.4	190.2	33.1	368.4	2.0	593.7	275.5	**3693.2**	1912.4	1816.7	1139.0
31-Jul-92	4755.0	2.5	4757.5	254.5	52.1	166.3	2.0	474.9	267.4	**4550.0**	1938.7	878.4	1260.0
Averages	4339.7	2.5	4342.2	122.6	31.4	121.6	2.0	277.6	268.5	**4333.1**	2049.8	610.5	1282.0

Lake Michigan Diversion Accounting - WY1992
August 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Aug-92	4334.0	2.6	4336.6	44.1	28.0	39.9	2.1	113.5	257.0	**4480.1**	1943.7	248.2	1245.0
02-Aug-92	3980.0	2.5	3982.5	118.2	23.1	49.6	2.1	193.0	258.7	**4048.2**	1902.7	512.4	1154.0
03-Aug-92	4008.0	2.6	4010.6	77.3	25.1	55.5	2.2	160.1	258.3	**4108.8**	1958.0	399.6	940.0
04-Aug-92	3801.0	1.9	3802.9	44.0	29.1	27.8	2.1	103.0	258.9	**3958.8**	1952.9	151.6	1306.0
05-Aug-92	4070.0	2.5	4072.5	147.2	26.0	31.9	1.9	207.0	261.1	**4126.6**	1971.0	176.1	1360.0
06-Aug-92	3751.0	2.6	3753.6	44.1	25.1	21.6	2.2	93.0	261.7	**3922.3**	2043.2	68.6	1290.0
07-Aug-92	3834.0	2.7	3836.7	57.6	24.1	118.0	2.2	201.9	264.5	**3899.3**	2001.6	1134.9	963.0
08-Aug-92	4082.0	2.7	4084.7	229.2	23.1	48.2	2.1	302.6	258.6	**4040.7**	1964.5	276.1	1284.0
09-Aug-92	4523.0	2.9	4525.9	44.2	24.2	22.3	2.2	92.9	258.8	**4691.8**	2219.6	98.2	1208.0
10-Aug-92	3349.0	3.1	3352.1	45.6	23.6	20.0	2.2	91.4	261.1	**3521.8**	2401.0	228.6	728.0
11-Aug-92	4083.0	2.5	4085.5	113.6	25.4	23.9	2.3	165.2	262.9	**4183.2**	2214.9	106.5	1215.0
12-Aug-92	4231.0	2.6	4233.6	86.6	40.4	52.9	2.1	182.0	261.1	**4312.7**	1998.0	583.1	718.0
13-Aug-92	3646.0	2.5	3648.5	101.1	29.1	24.1	2.1	156.4	258.6	**3750.7**	1901.4	219.7	1065.0
14-Aug-92	4002.0	2.3	4004.3	295.1	22.2	38.3	2.1	357.7	256.4	**3905.0**	1872.7	657.3	1061.0
15-Aug-92	3907.0	2.4	3909.4	36.9	21.3	16.7	2.0	76.9	257.7	**4090.2**	1905.1	60.1	1383.0
16-Aug-92	4014.0	2.5	4016.5	36.9	22.4	15.8	2.2	77.3	256.6	**4195.8**	1875.5	51.5	1350.0
17-Aug-92	3727.0	2.6	3729.6	36.9	21.7	15.0	2.1	75.7	259.4	**3913.3**	2000.3	38.3	1292.0
18-Aug-92	3301.0	2.6	3303.6	126.3	21.6	21.2	2.1	171.2	261.7	**3394.1**	2056.6	203.3	1082.0
19-Aug-92	3765.0	2.5	3767.5	45.6	21.4	14.3	2.0	83.3	259.7	**3943.9**	2071.1	36.2	1274.0
20-Aug-92	3711.0	2.6	3713.6	133.8	21.7	20.4	2.1	178.0	261.7	**3797.3**	2103.7	93.8	1314.0
21-Aug-92	3466.0	2.5	3468.5	44.3	21.1	12.9	2.2	80.5	261.3	**3649.3**	2179.3	22.2	1254.0
22-Aug-92	3764.0	2.6	3766.6	44.3	19.9	12.3	2.2	78.7	260.9	**3948.8**	2195.4	21.3	1283.0
23-Aug-92	3796.0	2.6	3798.6	131.0	20.0	18.3	2.1	171.4	261.4	**3888.6**	2245.4	102.9	1286.0
24-Aug-92	3465.0	2.8	3467.8	45.3	21.2	11.1	2.2	79.8	263.5	**3651.5**	2415.1	48.6	1239.0
25-Aug-92	3606.0	2.9	3608.9	36.9	20.8	11.5	2.2	71.4	263.6	**3801.1**	2469.5	68.2	1044.0
26-Aug-92	4022.0	2.7	4024.7	223.6	20.7	225.9	2.2	472.4	267.6	**3819.9**	2077.9	1091.5	691.0
27-Aug-92	5477.0	2.4	5479.4	243.7	64.2	854.1	2.1	1164.1	267.0	**4582.3**	1895.8	5295.5	1053.0
28-Aug-92	4798.0	2.4	4800.4	246.4	36.0	51.2	2.0	335.6	256.1	**4722.9**	1897.4	498.4	1122.0
29-Aug-92	4345.0	2.5	4347.5	168.8	24.9	55.5	2.0	251.2	259.5	**4355.8**	1890.2	508.1	1025.0
30-Aug-92	4251.0	2.3	4253.3	59.9	21.1	22.1	2.1	105.2	257.2	**4405.3**	1892.0	121.2	979.0
31-Aug-92	3562.0	2.4	3564.4	44.4	21.4	17.5	2.0	85.3	259.1	**3738.2**	1988.4	79.2	1078.0
Averages	3957.1	2.6	3959.7	101.7	25.5	63.5	2.1	192.8	260.5	**4027.4**	2048.5	425.8	1138.3

Lake Michigan Diversion Accounting - WY1992
September 1992 - Summary of Diversion Flows (All in cfs)

LAKE MICHIGAN DIVERSION ACCOUNTING WY 1992	ROMEOVILLE AVM GAGE RECORD	DIVERSIONS ABOVE THE GAGE	TOTAL FLOW THROUGH THE CANAL	GROUNDWATER PUMPAGE DISCHARGED INTO THE CANAL	WATER SUPPLY PUMPAGE FROM INDIANA REACHING THE CANAL	RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CANAL	LAKE MICHIGAN PUMPAGE BY FEDERAL FACILITIES DISCHARGED TO THE CANAL	TOTAL DEDUCTION FROM THE ROMEOVILLE GAGE RECORD	LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL	**TOTAL DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS**	PUMPAGE FROM LAKE MICHIGAN ACCOUNTABLE TO THE STATE OF ILLINOIS	RUNOFF FROM THE DIVERTED LAKE MICHIGAN WATERSHED	DIRECT DIVERSION ACCOUNTABLE TO THE STATE OF ILLINOIS
DATE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
01-Sep-92	3670.0	0.5	3670.5	45.6	23.8	15.5	1.8	86.7	241.4	**3825.2**	2006.3	59.3	1240.0
02-Sep-92	2987.0	0.7	2987.7	110.4	23.7	30.5	1.7	166.3	239.2	**3060.6**	1924.9	188.3	336.0
03-Sep-92	3527.0	0.5	3527.5	89.1	32.7	16.2	1.7	139.7	241.7	**3629.5**	1968.0	150.0	1016.0
04-Sep-92	3618.0	0.6	3618.6	36.9	20.7	13.0	1.7	72.3	240.8	**3787.1**	2015.2	149.2	1246.0
05-Sep-92	3941.0	0.6	3941.6	124.1	19.6	16.5	1.8	164.0	237.0	**4014.6**	2014.8	174.5	1255.0
06-Sep-92	3370.0	0.7	3370.7	45.7	18.8	12.0	1.7	78.2	239.0	**3531.5**	1929.5	83.1	1184.0
07-Sep-92	3613.0	0.6	3613.6	86.2	20.8	216.0	2.0	325.0	237.0	**3525.6**	1994.9	189.1	976.0
08-Sep-92	3884.0	0.6	3884.6	146.3	27.1	89.3	1.5	264.2	238.7	**3859.1**	1936.0	403.4	989.0
09-Sep-92	9767.0	0.6	9767.6	140.9	83.1	2684.0	1.7	2909.7	258.5	**7116.4**	1863.0	13719.0	556.0
10-Sep-92	7747.0	0.5	7747.5	347.7	83.1	419.7	1.7	852.2	238.1	**7133.4**	1848.2	2391.7	67.0
11-Sep-92	4946.0	0.5	4946.5	220.0	31.5	207.3	1.7	460.5	239.2	**4725.2**	1874.8	1122.4	639.0
12-Sep-92	4842.0	0.4	4842.4	52.3	25.4	119.3	1.6	198.6	235.7	**4879.5**	1824.8	476.1	1149.0
13-Sep-92	4026.0	0.3	4026.3	42.9	23.6	74.1	1.6	142.2	235.9	**4120.0**	1831.4	298.6	1113.0
14-Sep-92	4374.0	0.2	4374.2	151.8	29.8	262.5	1.7	445.8	244.2	**4172.6**	1917.7	2016.3	1014.0
15-Sep-92	5937.0	0.7	5937.7	255.1	28.6	195.2	1.6	480.5	247.4	**5704.6**	1889.6	3728.1	715.0
16-Sep-92	4915.0	0.9	4915.9	243.9	23.7	111.0	1.7	380.3	239.4	**4775.0**	1922.6	465.8	1171.0
17-Sep-92	5041.0	0.7	5041.7	44.5	23.6	75.1	1.7	144.9	239.0	**5135.8**	1907.9	275.2	1954.0
18-Sep-92	5048.0	0.6	5048.6	143.6	24.7	107.6	1.7	277.6	239.3	**5010.3**	1847.6	460.2	1882.0
19-Sep-92	5145.0	0.4	5145.4	36.9	25.4	54.8	1.6	118.7	237.5	**5264.2**	1838.1	176.7	2357.0
20-Sep-92	4611.0	0.4	4611.4	37.0	25.7	55.0	1.6	119.3	236.6	**4727.7**	1759.8	179.3	962.0
21-Sep-92	4727.0	0.6	4727.6	186.9	36.7	609.9	1.6	835.1	241.7	**4134.2**	1806.3	2843.0	519.0
22-Sep-92	4872.0	0.4	4872.4	182.2	26.6	121.2	1.7	331.7	239.4	**4780.1**	1824.3	417.9	2057.0
23-Sep-92	4529.0	0.4	4529.4	43.9	24.4	73.1	1.7	143.1	239.1	**4625.4**	1808.7	204.7	1763.0
24-Sep-92	5012.0	0.4	5012.4	44.3	23.7	53.7	1.7	123.4	238.2	**5127.2**	1799.8	145.8	2402.0
25-Sep-92	5829.0	0.6	5829.6	106.5	23.4	48.3	1.6	179.8	238.2	**5888.0**	1839.8	154.4	2921.0
26-Sep-92	6293.0	0.4	6293.4	191.5	33.6	834.9	1.7	1061.7	251.1	**5482.8**	1774.6	4262.7	1519.0
27-Sep-92	7116.0	0.4	7116.4	337.7	28.5	203.9	1.7	571.8	236.3	**6780.9**	1745.4	908.2	2588.0
28-Sep-92	6639.0	0.3	6639.3	177.1	25.6	120.6	1.7	325.0	238.6	**6552.9**	1804.6	432.5	3243.0
29-Sep-92	5104.0	0.3	5104.3	43.9	23.6	76.9	1.6	146.0	237.7	**5196.0**	1783.0	208.5	2471.0
30-Sep-92	4097.0	0.4	4097.4	44.2	24.7	59.6	1.8	130.3	238.2	**4205.3**	1817.1	154.1	1406.0
Averages	4974.2	0.5	4974.7	125.3	29.5	232.6	1.7	389.1	240.1	**4825.7**	1870.6	1214.6	1423.7