

EXECUTIVE SUMMARY

This document is the Water Year's (WY's) 1990-1992 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 conducted by the Corps of Engineers from 1 October 1990 through 30 September 1992.

In the period of WY 1990 through WY 1992 the District has made many changes to improve the accuracy and efficiency of the diversion accounting, including:

The computer model used to simulate the watershed runoff has been updated to take into account the addition of Tunnel and Reservoir Plan and the canal system.

To evaluate the reported flows through and around the lakefront structures, flow velocities were measured downstream of each of the three structures, O'Brien Lock and Dam, Chicago Lock, and Wilmette Controlling Works.

The Illinois State Water Survey began collecting precipitation data from a 25 gage network in WY 1990. The new network extends through Cook County, IL on a six mile grid to cover the Des Plaines and diverted Lake Michigan watersheds within Cook County.

New regression equations were developed for the Romeoville AVM gage for calculating flows when the AVM is not operating. The USGS revised the regression equations and the updated flows have been included in the Accounting Reports for WY 1986 through WY 1989.

The USGS installed a gage on the west branch of the Grand Calumet River in Indiana near the Illinois border. Beginning with WY 1992, flows in the Grand Calumet River were measured.

The Third Technical Committee was under contract at the close of FY 1992. The Committee began its work in February 1993.

The Lake Michigan Diversion Accounting Reports for WY 1986, WY 1987, WY 1988, and WY 1989 have been completed. The State of Illinois exceeded the 3,200 cfs limit in all four years. The running average of the diversion for WY 1981 through WY 1989 is 3,443 cfs, or 243 cfs over the annual allocation. The cumulative deviation is now 2,189 cfs-years, with a maximum allowable cumulative deviation of 2,000 cfs-years.

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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) 1990-1992 Joint Annual Report on Lake Michigan Diversion Accounting presents Corps of Engineers activities in accounting for 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 1986, WY 1987, WY 1988, and WY 1989 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 in WY 1990, WY 1991, and WY 1992.

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 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 sewage 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 diversion 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.

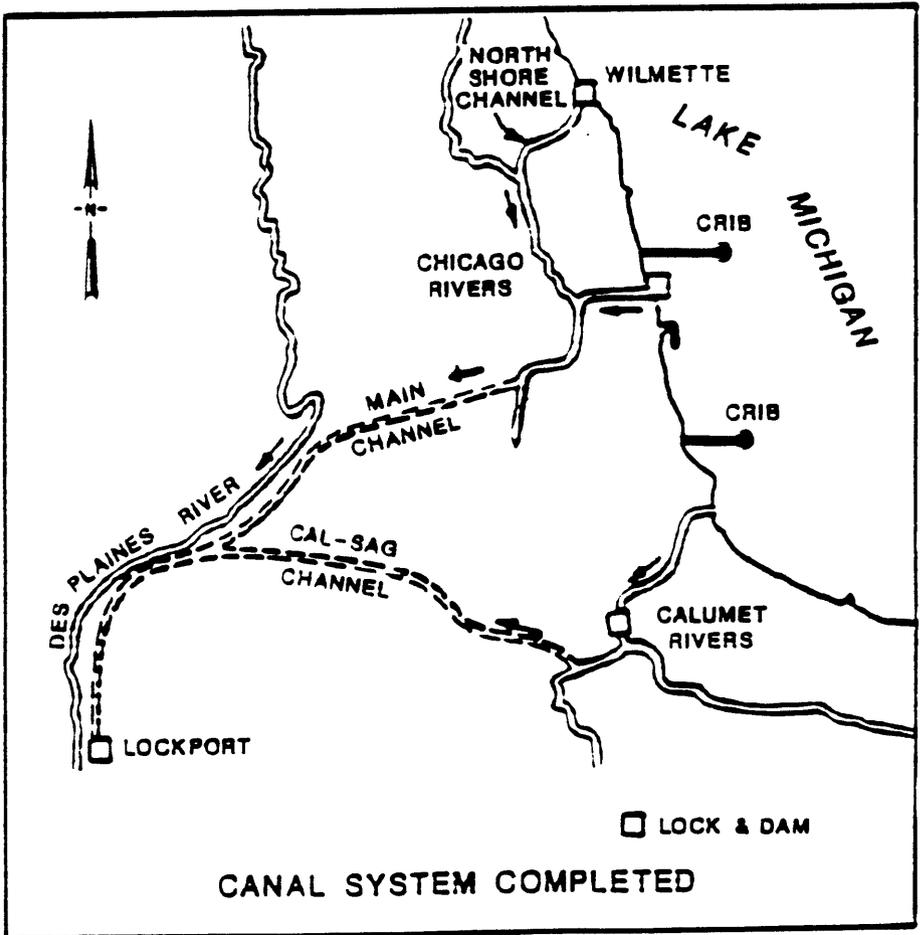
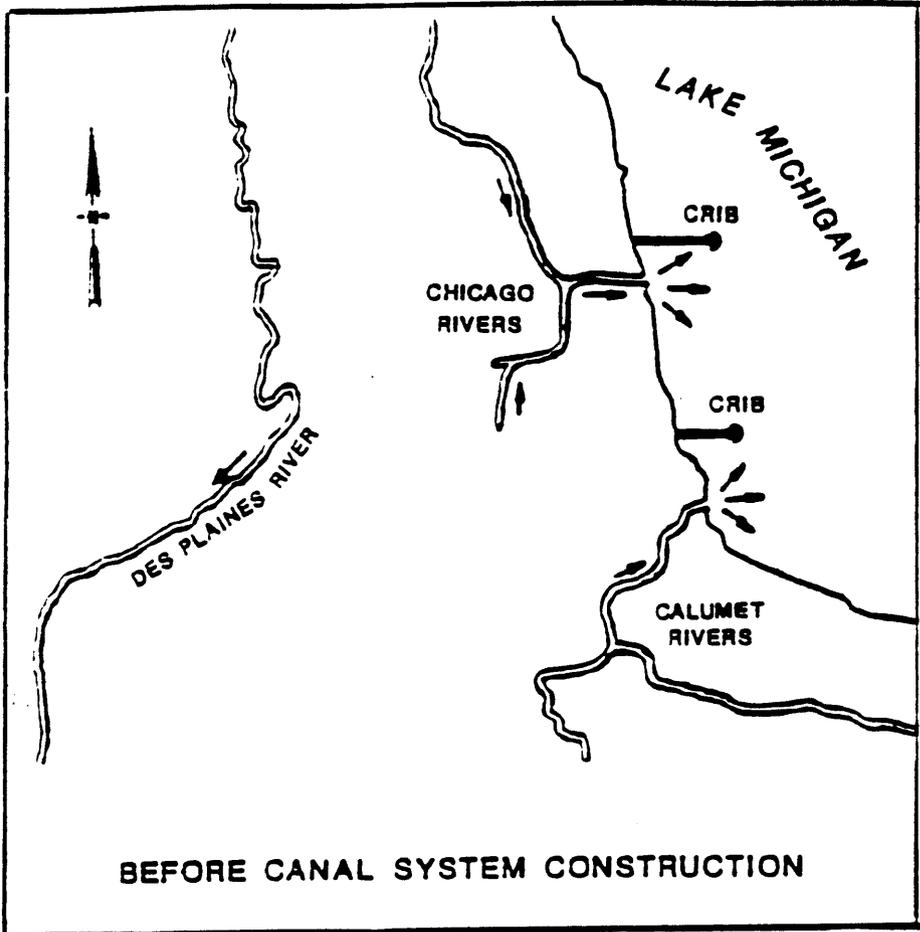
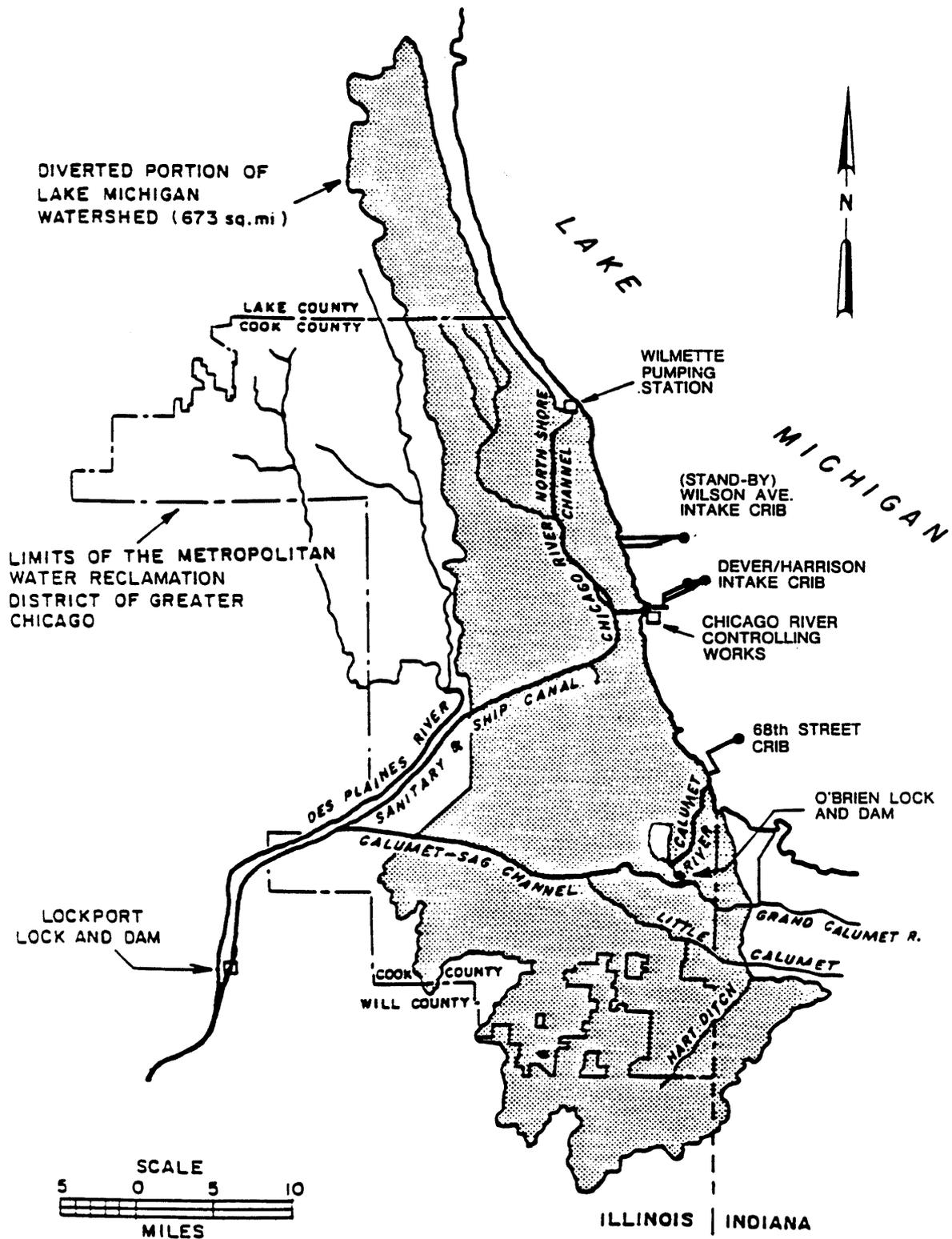


Figure 1



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 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), the Metropolitan Water Reclamation District of Greater Chicago (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 convened in February 1993.

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

In WY 1990, there were several significant hydrologic events. Unseasonably warm temperatures during the second week in March 1990 resulted in thunderstorms with rainfall averaging about 1.4 inches in northeast Illinois and northwest Indiana. The Fox and Des Plaines Rivers reached critical levels, but only the low lying, flood prone areas were affected. The Kankakee River in northwest Indiana reached near flood stage to 1.5 feet above flood stage. No significant flooding was reported near the Kankakee River.

During 9-11 May 1990, a 24 hour rain averaging about 3.4 inches caused flash flooding in some parts of northeast Illinois. This rain resulted in rises of about 1 to 1.5 feet above bankfull stages on Salt Creek, Des Plaines River and Du Page River. A 24 hour rain averaging about 1.7 inches caused flash flooding in some parts of northwest Indiana. This rain resulted in rises of 1 to 1.5 feet above bankfull stages on the Kankakee River and the Little Calumet River. Again, only the low lying flood prone areas were affected.

During the period 18-21 August 1990, a total of about 5.3 inches of rain fell at the National Weather Service O'Hare weather station. This rain event resulted in stages on Salt Creek at North Riverside about 3 feet over bankfull. The Des Plaines River at Riverside rose about 1.3 feet over bankfull. In northwest Indiana near the Illinois-Indiana border, a total of about 6.0 inches of rain fell at Hobart. The event caused stages above bankfull on the Kankakee River at Davis of 3.0 feet and at Shelby of 2.9 feet. No significant flood damages were reported from these storm events.

WY 1991 had two significant hydrologic events. On 27 November 1990, a 24 hour rain of 3.0 inches in northeastern Illinois and about 3.9 inches in the northwestern Indiana resulted in above bankfull conditions on the Des Plaines River, Salt Creek, and on the Kankakee and Calumet Rivers and their respective tributaries. New flood records reported were 5.2 feet above bankfull on the Little Calumet River at Munster, 2.7 feet above bankfull on Hart Ditch at Munster, and 5.4 feet above bankfull on the Little Calumet River at South Holland. The flooding in northwest Indiana forced the closure of the Calumet Highway and extensively damaged residences in northwestern Indiana near the Illinois border. Flood damages in northwest Indiana due to this extreme event were estimated at approximately \$7.2 million.

The second event in WY 1991 occurred during 28-29 December 1990 when 3 to 4 inches of rain fell over an existing 2 to 6 inches of snowpack in the Kankakee River basin. The river stages on the Kankakee River rose above its banks by about 2.5 to 3.5 feet, causing extensive agricultural flooding. Some county roads and residences were affected by this flood.

The first event of WY 1992 happened on 24-26 November 1991. Roughly 2.5 inches of rain fell in northeastern Illinois causing bankfull conditions and sending the Salt Creek at North Riverside 1.65 feet above bankfull and 0.65 over flood stage.

On 13 April 1992, Chicago River water flowing through a punctured freight tunnel flooded much of downtown Chicago, including approximately 23 buildings and 40 miles of tunnel. The flooding also closed portions of the Chicago Transit Authority subway system and one underpass on the Kennedy Expressway. The Corps of Engineers was requested by Federal Emergency Management Agency (FEMA) to plug the leaks and dewater the tunnels. During the flood the Chicago River, under the direction of the Corps of Engineers, was drawn down to reduce the water pressure on the tunnel plugs. North Central Division has directed that the increase in diversion associated with this effort not be charged to the State of Illinois.

On 9 September 1992, a strong storm front passed through the southern part of the District. O'Hare Airport received 1.05 inches, South Bend, IN 2.3 inches, Midway Airport 2.9 inches, Romeoville, IL 3.54 inches, and Shorewood, IL 4.3 inches. Gages south of Chicago rose to bankfull with Davis on the Kankakee River and Munster on Hart Ditch both rising to flood stages.

OTHER SIGNIFICANT EVENTS

Several significant non-hydrologic events occurred during Fiscal Year (FY) 1990, FY 1991, and FY 1992. The most significant were upgrading the Acoustic Velocity Meter (AVM) gaging station at Romeoville, IL, installing a stream gage on the Grand Calumet River near the Illinois border, and installing a new 25 gage network of precipitation gages.

The Chicago River, under the direction of the Corps of Engineers, was drawn down in February 1987 for the removal of the 16th Street Swing Bridge, and in August-September 1988 for navigation repairs near Lockport. North Central Division has directed that the increase in diversions associated with these efforts not be charged to the State of Illinois.

A separate, detailed chronology of significant non-hydrologic events is included in appendix A.

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 the WY 1981 through WY 1985. The WY 1986, WY 1987, WY 1988, and WY 1989 Lake Michigan Diversion Accounting Reports are certified with this Joint Water Year 1990-1992 Annual Report. Table 1 shows the accounting year, the certified flows, the running average flows, and the cumulative deviation from the allowable diversion of 3,200 cfs.

**Table 1 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

The running average diversion for the period WY 1981 through WY 1989 is 3,443 cfs, 243 cfs greater than the 3,200 cfs, 40 year average diversion specified by the modified decree. However, the running average is below the 40-year upper limit of 3,680 cfs, and the annual flows have not exceeded the two-year upper limit of 3,840 cfs. The cumulative deviation, the sum of the annual average flows over the allowed 3,200 cfs, is -2,189 cfs-years. The negative cumulative deviation indicates a flow debt against the 3,200 cfs average diversion with the maximum debt allowed of 2,000 cfs- years over the first 39 years of the 40 year averaging period.

The WY 1986 accounting was a joint project with NIPC (acting under contract to the Corps of Engineers) and the Corps of Engineers. The WY 1987, WY 1988, and WY 1989 accountings were completed by the Corps of Engineers.

Data collection and preparation for the WY 1987 accounting report was nearly completed in FY 1989. However, precipitation data was not available until July 1990. The WY 1988 accounting report was developed during the latter part of FY 1990 and the early part of FY 1991. The WY 1989 accounting report was developed during early FY 1991 and late FY 1992.

Data collection and preparation for the WY 1990 and WY 1991 accounting reports will be performed by the Corps. The Chicago District will complete these accounting reports. Data collection and preparation for these reports began in FY 1991. Certification is scheduled in FY 1994 for WY 1990 and WY 1991.

SOURCES OF DIVERSION

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

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 was 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.

Domestic pumpage from Lake Michigan is used for water supply and its effluent is discharged to 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 discharge 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 to ultimately drain into the Illinois River and the Mississippi River. The drainage area of the diverted Lake Michigan watershed is approximately 673 square miles.

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 of 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 attributable to 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.

During WY 1986, WY 1987, WY 1988, and WY 1989, the flow measured at Romeoville was roughly 110%, 107%, 105%, and 104%, respectively, of the average annual diversion and roughly 99%, 97%, 97%, and 97% of the diversion passed through the AVM.

Deductions from the Romeoville flow include runoff from 217 square miles of the Des Plaines River watershed discharged to the canal, groundwater supply effluent 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 NIPC 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 1% to 3% of the diversion. 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 budget for the CSSC estimated at the lakefront. 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 more detail later in this report.

WY 1986, WY 1987, WY 1988, AND WY 1989 DIVERSION ACCOUNTING

New regression equations were developed for the Romeoville AVM gage for calculating flows when the AVM is inoperable. The USGS has reviewed the AVM flows for WY 1986 through WY 1992. The USGS revised the regression equations and the updated flows have been included in the Accounting Reports for WY 1986 through WY 1989.

In WY 1986 and WY 1987, the Tunnel and Reservoir Plan (TARP) began influencing diversion accounting. TARP is a comprehensive plan to eliminate sewer overflows to Chicago rivers and streams by diverting overflows into a system of tunnels and reservoirs. The overflows will be treated and released as treatment capacity allows. In WY 1986, Phase I of the Mainstream TARP tunnel was operational. In WY 1987, Phase I of the Calumet TARP tunnel became operational. TARP changes diversion accounting in that overflows are now from the treatment plants instead of the original overflow outlets.

The overall budget balance for the three largest WRP's had weighted average simulated to recorded ratios of 1.00 for WY 1986, 0.96 for WY 1987, 0.92 for WY 1988, and 1.01 for WY 1989. The ratios show that simulated flows are 100%, 96%, 92%, and 101% of the recorded flows at the WRP's for each year. As the ratio approaches 100%, the modeling better approximates the runoff in the Des Plaines watershed.

The budget balance for the canal system compares the recorded outflows to the simulated and measured inflows. The outflow was 117% of inflow for WY 1986, 116% for WY 1987, 115% for WY 1988, and 116% for WY 1989. Possible causes of the imbalance include under-reporting of lakefront flows, unreported discharges to the canal, low values for the simulated and measured inflows, and AVM measurements. The largest sources of error are due to leakages at the lakefront controlling works and the Chicago River Harbor Wall. The Harbor Wall was subject to overtopping before WY 1987 and is leaking. During WY 1987, the Harbor Wall was capped to eliminate overtopping. The difference between the outflow and the inflow dropped 41 cfs (6.8%) between WY 1986 and WY 1987 and dropped another 96 cfs (17%) between WY 1987 and WY 1988. From WY 1988 to WY 1989, the difference rose 10 cfs (2%). The decrease in the difference is most likely due to the capping in WY 1987, and lower lake levels in WY 1988, and reductions in diversion through the lakefront structures.

The Lake Michigan Diversion Accounting for WY 1986, WY 1987, WY 1988, and WY 1989 are discussed in detail in appendices B, C, D and E.

CLARIFICATION OF THE ACCOUNTING REPORT RESULTS

As shown in table 1, the State of Illinois exceeded the 3,200 cfs limit in the four water years accounted for in this report (WY's 1986-1989). This section provides a clarification as to the nature of the excesses. The diversion will be overviewed in terms of the sources of diversion and the accounting procedures. The overview is based on the flows listed in table 2, which consists of the 13 columns from the summary of diversion flow tables in the diversion accounting reports (appendices B, C, D and E) plus additional supporting data.

SOURCES

The section above, SOURCES OF DIVERSION, states that the diverted flow is the sum of direct diversions (lockages, discretionary, navigation makeup, and leakage), water supply and stormwater runoff. In accordance with the report of Albert Maris, Special Master for the 1966 and 1980 Supreme Court Decrees, the diversion equals the total flow leaving the watershed, consisting of 1,700 cfs of water supply plus 1,500 cfs of direct diversion and stormwater runoff.

a. Water Supply - Column 11 of table 2 shows the that average of the pumpage from Lake Michigan accountable to the state of Illinois for WY's 1986-1989 is 1807 cfs. This number is computed directly from the pumpage records of each user. However, this is not the water supply that is diverted from the Lake Michigan Watershed. To compute the diverted water supply, the water consumed in the system (i.e. leakages, evaporation, etc.) would have to be subtracted from the pumpage. Table 2 shows that, for a conservative estimate of 10% consumptive use, the net water supply diverted would be 1,626 cfs. As the pumpage records are generally accurate values, and the 10% consumptive use is conservative, it can be concluded that the State of Illinois' Water Supply pumpage is within the guidelines specified by Maris' Report. It should also be noted that the State of Illinois has developed an extensive unaccounted-for-flow program. Through this program the State has required end users of Lake Michigan water to effectively utilize their allocation by reducing leaks in their water supply systems. The State of Illinois' evaluation of their program has shown a major decrease in unaccounted-for-flows of from 10.4% in 1979 to 5.4% in 1991.

b. Runoff plus Direct Diversion - Columns 12 and 13 of table 2 give an average total of 1,310 cfs of runoff from the diverted watershed plus direct diversions accountable to the State of Illinois. Although this total is below the guidelines of 1,500 cfs, from Maris' Report, the total does not include the high leakages indicated by preliminary flow measurements (see the section LAKEFRONT FLOW MEASUREMENTS, and appendix F). Table 2 also lists the imbalances, which are defined as the difference between the accountable flows (column 10) and sum of the water supply, runoff and direct diversions (columns 11, 12 and 13). From the table, the average imbalance is 454 cfs, or 634 cfs if consumptive use is included.

**Table 2 Water Year's 1986 - 1989
Average Diversion Flows (cfs)**

Column	Description	WY 86	WY 87	WY 88	WY 89	Average
1	Lockport Flows	3,725.0	3,780.5	3,101.7	3,334.0	3,485
	AVM Record	4,113.1	4,028.0	3,536.5	3,515.2	3,798
2	Diversion Above Gage	0.3	1.5	0.6	1.3	1
3	Total Canal Flow	4,113.4	4,029.5	3,537.1	3,516.5	3,799
4	Groundwater	128.0	119.8	110.2	82.0	110
5	Indiana Pumpage	82.1	81.6	31.3	27.8	56
6	Des Plaines Runoff	179.9	146.4	105.8	134.9	142
7	Federal Facilities	2.0	4.2	23.1	2.0	8
8	Total Deductions	392.0	352.0	270.4	246.8	315
9	By-Passed Flows	29.7	96.0	108.9	108.2	86
10	Accountable Flows	3,751.1	3,773.5	3,375.6	3,377.9	3,570
	Standard Deviation	205.8	200.7	179.2	177.2	191
11	Illinois Pumpage	1,723.8	1,804.9	1,906.4	1,791.9	1,807
	% Consumptive Use	10.0	10.0	10.0	10.0	10
	Consumptive Use	172.4	180.5	190.6	179.2	181
12	O'Hare Rainfall (inches)	40.2	39.5	27.6	39.2	36
	Watershed Runoff	876.5	811.7	519.6	706.8	729
13	Lockages	179.0	146.3	97.2	84.1	127
	Leakages	42.6	47.8	38.0	30.8	40
	Navigation Makeup	142.2	157.0	73.2	52.0	106
	Discretionary Flow	302.0	314.3	352.0	264.0	308
	Direct Diversions	665.8	665.4	560.4	430.7	581
	Imbalance	485.0	491.5	389.2	448.5	454
	Standard Deviation	260.8	259.4	222.4	226.0	242
	Imbalance with Consumptive Use	657.4	672.0	579.8	627.7	634
	Standard Deviation	258.6	256.3	219.8	222.9	239

The majority of the imbalances are in all likelihood due to leakages through the lakefront structures. Therefore, it is highly likely that the WY's 1986-1989 yearly aggregate of the direct diversion plus stormwater runoff component has significantly exceeded the 1500 cfs estimate. It should be noted that the only component of direct diversion for which the State of Illinois has authority, the discretionary flows, has remained reasonable constant (except for the effects of the 1988-1989 drought) and will be significantly reduced by the year 2000 (from a limit of 320 cfs to 101 cfs - assuming TARP in place, sewage treatment plants upgraded and aeration facilities constructed). Finally, it is also noted that in spite of the drought, the average precipitation for the period (e.g. O'Hare Airport) was almost an inch above the long term average of 36.3 inches.

PROCEDURES

This section will highlight the impacts of the changes and upgrades in the accounting procedure has had on the computation of the Lake Michigan diversion. The accounting of the diversion consists of measuring the water that flows past Lockport, subtracting the deductions and adding back the by-passes.

a. The installation of the AVM has produced the single largest impact of any change in the accounting procedures. The AVM flow measurements, plus the use of the regression equations (that translate Lockport flows into AVM flows) for filling in missing records, have significantly increased the flow records, and therefore the flows accountable to the State of Illinois. Table 2 shows that the average difference between the Lockport flows and the AVM record is equal to 313 cfs, or a cumulative difference for WY's 1986-1989 of 1,252 cfs.

b. Revisions to the accounting procedures have also resulted in changes to the computations of deductions and by-passed flows. It is noted that these are small changes when compared to the impacts of the AVM versus Lockport measurements. The major changes have been in the modeling of the mainstream and the Calumet TARP systems, and the update to the Calumet SCALP (i.e., sewer routing) model. The major effect of these modeling efforts is to compute the deductible inflow and infiltration into the TARP tunnels. The total of this deduction is 60 cfs.

ERROR ANALYSIS

Although the charge from the Supreme Court Decree is to use "state-of-the-art" methods in measurements and hydraulic computations, there are always errors inherent in any technical analysis. A Monte Carlo simulation was run to evaluate the effects of errors on the development of the diversion accounting flows. The basis of the simulation was to first assign an error distribution to each of the measured or simulated flows. Then for a large number of trials a random error is associated with each flow and a net diversion is computed. This process then results in a distribution of errors for the net diversion.

Table 2 lists the standard deviations for accountable flows and imbalances computed using the Monte Carlo simulation. The standard deviation for the accountable flow in each year is 191 cfs, and for the imbalances it is about 242 cfs. The analysis shows that even though the accounting is being performed at a state-of-the-art level, the cumulative errors of all of the measurements and computations could significantly effect the net accounting of the total diversion by the State of Illinois.

ACCOMPLISHMENTS DURING FY 1990, FY 1991, AND FY 1992

In each accounting year, changes improve the accuracy and efficiency of the diversion accounting.

REVISION OF COMPUTER MODEL

The computer model has been updated to take into account the addition of TARP to the canal system. TARP is modeled using an extension of the UNET (Unsteady flow NETwork) model called TNET (Tunnel NETwork). TNET models the flow through the tunnel for conditions ranging from almost dry to flowing full to pressurized flow. The model also takes into account gate operations and pump cycling.

LAKEFRONT FLOW MEASUREMENTS

The accuracy of the canal balance budget, used to check the canal modeling, depends on the accuracy of the reported lakefront flows. While errors in the lakefront flows do not change the diversion accounting flows, errors reduce the accuracy and usefulness of the budget. To quantify errors in the reported flows through and around the lakefront structures a series of measurements have been taken at all three lakefront structures, the Chicago Lock, the O'Brien Lock and Dam and the Wilmette Controlling Works.

The first series of measurements were taken in WY 1990. Flow velocities were measured downstream of each of the three structures between 23 July and 27 July. Five flow measurements were taken at each site while the nearby structures maintained constant gate openings with all locks closed. Measured flows were compared to flows calculated using the MWRDGC methods. The measured flows were about twice the calculated flows. Given the limited nature of the study, in time and equipment, the results are only a guide to the possible errors in the present lakefront flow calculations. A copy of the flow study is provided as appendix F.

In WY 1993 a far more extensive series of measurements were undertaken. The USGS conducted a detailed program utilizing an Acoustic Doppler Current Profiler (ADCP) and dye tests. While the results of these measurements are still preliminary, the range of measured values are provided here to aid in the clarification of the accounting results.

Chicago Lock East and West Gates: The Chicago Lock has been in a state of disrepair for the last thirty-years. Prior to FY 1993, the last work performed was in 1963 on the southeast gate. Gate closure problems began occurring in 1991 on the southeast gate. Through several underwater investigations, it was discovered in mid-1992 that the east and west gates' rollers had significant wear. From May to October of 1993 necessary modifications to the gates' rollers were undertaken. Additionally, side seals were fastened and center seals were modified and adjustments were made to reduce leakage through the gates. A full dewatering of the gate blocks has been scheduled in the near future to address other deteriorated components at the Chicago lock.

Prior to the completion of repairs to the east gates, the USGS measurements showed a leakage in the range of 825-939 cfs (through the east gates when the west gates were open). Also, prior to the completion of repairs to the west gates, USGS measurements showed a leakage in the range of 106-200 cfs (through the west gates when the east gates were closed). Finally, USGS measurements on the Chicago River at Lake Shore Drive, for the period of April through October 1993, showed leakage in the range of 175-359 cfs. The measurements at Lake Shore Drive include leakage through the Lock and leakage along the Chicago Harbor walls.

O'Brien Lock and Dam: The USGS completed measurements at the Lock and Dam in September 1993. The average of discharges measured was 53 cfs.

Wilmette Pumping Station: Prior to the sealing of the pump bays at the Wilmette Controlling Works, the USGS measured a flow of 53 cfs in the North Shore Channel. After the bays were sealed in the summer, the velocities were below the ADCP limits and the flow probably less than 10 cfs.

It should again be noted that the ranges and average values of measurements given here are still preliminary and subject to revision. Additional measurements and evaluations are planned for WY 1994. Further, as these measurements were made in WY 1993, they may not represent the level of leakage occurring during WY's 1986-1989. Without further review of the how the lakefront structures have changed over time, it would be inappropriate to generalize these results.

PRECIPITATION DATA COLLECTION

The Illinois State Water Survey (under contract with the Corps of Engineers) began collecting precipitation data from a 25 gage network in WY 1990. The new network spreads through Cook County, IL on a six mile grid to cover the Des Plaines and diverted Lake Michigan watersheds within Cook County. The new network replaces a group of thirteen gages scattered across the county with operation spread among three agencies, National Weather Service, MWRDGC, and the City of Chicago. With operation of the network within one agency, data collection and reduction are consistent. The gage locations improved on the previous locations by placing the gages on the ground (instead of rooftops) with attention to security, and wind and rain shadows.

AVM GAGE REGRESSION EQUATIONS

New regression equations were developed for the Romeoville AVM gage for calculating flows when the AVM is down. The USGS has reviewed the AVM flows for WY 1986 through WY 1992. The USGS revised the regression equations and the updated flows have been included in the Accounting Reports for WY 1986 through WY 1989. A complete description of the review and the regression equations will be published by the USGS in late FY 1993 while a brief description has been included in Accounting Reports for WY 1986 through WY 1988.

Another update of the regression equations is underway to include the AVM's installed in the Lockport Powerhouse by the MWRDGC.

GRAND CALUMET GAGE

The USGS installed a gage on the west branch of the Grand Calumet River approximately 0.5 miles east of the Illinois border (Hohman Avenue in Hammond IN). Beginning with WY 1992, flows in the Grand Calumet River were measured rather than being based on regression equations using Lake Michigan levels.

SOFTWARE IMPROVEMENT

The Special Contributing Area Loading Program (SCALP) was updated by Chicago District personnel to store data in the Corps of Engineers Hydrologic Engineering Center's Data Storage System (HEC-DSS). SCALP is the program that, using runoff data, calculates the sewer flow volumes and destinations. Presently, SCALP uses the Time Series Storage (TSS) database, which is awkward and inefficient. The SCALP output data must be converted to DSS for use by the UNET and TNET flow models used in the Diversion Accounting. By converting SCALP to DSS, the data conversion process is simple and faster.

ACTIVITIES FOR FY 1993

ACCOUNTING REPORTS

The Accounting Report for WY 1989 was completed in FY 1993 and the Accounting Reports for WY 1990 and WY 1991 will be completed in FY 1994. The Accounting Reports for WY 1992 and WY 1993 will be completed in FY 1995. For WY 1993 and after, data collection and the Accounting Reports are expected to be completed in the second fiscal year following the end of the water year.

THIRD TECHNICAL COMMITTEE

The Third Technical Committee was under contract at the close of FY 1992. The Committee began its work in February 1993.

FLOW MEASUREMENTS

To improve the accuracy of the canal balance budget, used to check the canal modeling, additional flow measurements will be made at each of the three lakefront structures and at the Upper Des Plaines pumping station. The USGS will utilize a Doppler meter to accurately measure the flows. To develop rating tables, a series of measurements will be made throughout the year.

DIVERSION ACCOUNTING MANUAL

A manual will be written during FY 1993 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 1990 Accounting Report.

SOFTWARE IMPROVEMENT

The conversion of the Hydrologic Simulation Program - FORTRAN (HSPF) from TSS to DSS is underway. HSPF uses hydrologic data, precipitation, wind speed, and so on, to calculate runoff. As with SCALP, the simulations and data conversions will be speeded up. The Corps of Engineers will be contracting with the USGS to convert HSPF.

SUMMARY AND CONCLUSIONS

SUMMARY

The Lake Michigan Diversion Accounting procedure continues to evolve with the inclusion of TARP in the modeling. A round of major improvements is underway for the WY 1990 report. Among the changes are inclusion of the more representative 25 rain gage network, and use of the more efficient DSS version of SCALP. A comprehensive manual will be written to include all the updates. The upcoming modification of HSPF will streamline the hydrology simulations and speed the completion of each subsequent report.

CONCLUSIONS

The Lake Michigan Diversion Accounting Reports for WY 1986, WY 1987, WY 1988, and WY 1989 have been completed as required by the Supreme Court Decree.

The State of Illinois exceeded the 3,200 cfs limit in all four years. The running average of the diversion for WY 1981 through WY 1989 is 3,443 cfs, or 243 cfs over the annual allocation. The cumulative deviation is now 2,189 cfs-years, with a maximum allowable cumulative deviation of 2,000 cfs-years.

APPENDIX A
SIGNIFICANT EVENTS (NON HYDROLOGIC)

- 04-Oct-89 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of August 1989. 3 offices on the mailing list.
- 20-Oct-89 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of September 1989.
- 30-Oct-89 Memorandum from NCC to NCD. Forwarded the Quarterly Status Report (QSR) and other documents for the Lake Michigan Diversion Accounting Program.
- 03-Nov-89 Letter from NCC to Northeastern Illinois Planning Commission. Forwarded to NIPC were data and materials needed for the preparation of WY86 Accounting Report and Reduction of WY87 Precipitation Data.
- 03-Nov-89 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of October 1989.
- 20-Nov-89 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of September 1989. 3 offices on the mailing list.
- 22-Nov-89 Letter from NCC to Illinois Department of Transportation. Forwarded revised scope of work by NCC which includes a suggested canal operation test. IDOT and MWRDGC are to review the scope of work for finalization by NCC.
- 06-Dec-89 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of November 1989.
- 12-Dec-89 Letter from NCC to IDOT. NCC reviewed the WY84 and WY85 LMDA reports developed by NIPC. Some of the simulation modeling parameters were questioned by the Second Technical Committee which warranted an evaluation by the Corps. Corps revisions are summarized in a combined WY84/WY85 LMDA report. WY84 and WY85 reports developed by IDOT were included as appendix to the Corps report. Forwarded draft of WY84/WY85 diversion accounting report developed by NCC to IDOT.
- 20-Dec-89 Memorandum from NCC to NCD. Forwarded a draft of the FY 89 Annual Report, the FY90 Diversion Accounting Budget, and the FY91-FY94 Projected Budgets.
- 03-Jan-90 Letter from NCC to Northeastern Illinois Planning Commission. NCC forwarded adjusted WY86 precipitation data by Illinois State Water Survey to Northeastern Illinois Planning Commission.

- 03-Jan-90 Letter from NCC to Northeastern Illinois Planning Commission. NCC forwarded a draft of the WY84/WY85 Accounting Report prepared by NCC to be used as a format for the WY86 Accounting Report being prepared by NIPC.
- 05-Jan-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of December 1989.
- 17-Jan-90 Memorandum from NCC-ED to NCC-OC. Wage rate determination for indefinite delivery contract extension with NIPC for hydrologic and hydraulic studies related to Lake Michigan Diversion Accounting.
- 19-Jan-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the months of October 1989 and November 1989. New format for the table. 4 offices on mailing list.
- 25-Jan-90 Memorandum from NCC-ED to NCR-CT. An extension of contract DACW23-89-D-0003 with Northeastern Illinois Planning Commission was requested.
- 07-Feb-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of January 1990.
- 13-Feb-90 Memorandum from NCC to NCD. Forwarded the FY89 Annual Report with a sample transmittal.
- 15-Feb-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of December 1989. 4 offices on the mailing list.
- 22-Feb-90 Letter from NCC to Northeastern Illinois Planning Commission. NCC forwarded WY87 revised Diversion Accounting Scope of Work.
- 02-Mar-90 Letter from NCC to NCE forwarding maps and pictures of three sites where flow measurements were to be taken. The three sites were Wilmette pumping station on the North Shore Channel, Chicago River Controlling Works and O'Brien Lock and Dam on the Calumet River. Based on the enclosed maps and pictures, a cost estimate for the flow measurements was to be determined. The feasibility of work being performed by NCE would be determined by the estimate they provided.
- 05-Mar-90 Letter from NCC to LTV Steel - Coke Plant. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.

- 05-Mar-90 Letter from NCC to Indiana Department of Environmental Management - Office of Water Management - Operations Branch. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Homewood Department of Public Works. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to the Town of Schererville. NCC requesting data for the completion of Lake Michigan Diversion Accounting for WY89 for the months of August and September 1989.
- 05-Mar-90 Letter from NCC to Calumet Flexicore Corp. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Underwriters Laboratories, Inc. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Illinois State Water Survey. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Texaco Refining and Marketing, Inc. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Republic Engineering Steel. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Illinois Department of Transportation. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to ACME Steel Company. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Indiana Department of Natural Resources. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.

- 05-Mar-90 Letter from NCC to Argonne National Laboratories. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Indiana Department of Environmental Management - Office of Water Management - Public Water Supply Section. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Whiting Filtration Plant. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to North Shore Sanitary District. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Stauffer Chemical. NCC requested data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 05-Mar-90 Letter from NCC to Village of Deerfield. NCC requesting data for the computation of Lake Michigan Diversion Accounting for WY88 and WY89.
- 07-Mar-90 Letter from NCC to Illinois Department of Transportation - Division of Water Resources. NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to Assistant Attorney General - Department of Justice. NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to Assistant Attorney General (Columbus, Ohio). NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to Metropolitan Water Reclamation District of Greater Chicago. NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to New York Power Authority. NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to Assistant Attorney General in Charge - Environmental Protection Division (Lansing, Michigan). NCC forwarded 1989 Annual Report on Lake Michigan Diversion.

- 07-Mar-90 Letter from NCC to Pennsylvania Department of Environmental Resources. NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to Solicitor General of the U.S. Department of Justice. NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to Assistant Attorney General - Department of Law - Environmental Protection Bureau. NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to Assistant Attorney General - Natural Resources Division (St. Paul, Minnesota). NCC forwarded 1989 Annual Report on Lake Michigan Diversion.
- 07-Mar-90 Letter from NCC to Northeastern Planning Commission. NCC forwarded 1989 Annual Report on Lake Michigan Diversion
- 07-Mar-90 Memorandum from NCC for CE-CCK. Forwarded 1989 Annual Report on Lake Michigan Diversion.
- 08-Mar-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of February 1990.
- 16-Mar-90 Letter from NCC to MWRDGC. NCC requesting information on how MWRDGC calculates the flow transfer rate from the O'Hare and Salt Creek Basins to the Northside Basin.
- 20-Mar-90 Memorandum from NCC to NCR. Preparation of WY86 Accounting Report extended from 4/13/90 to 7/20/90.
- 20-Mar-90 Letter from NCC to The Hydrologic Engineering Center Research Branch. NCC reviewed a report entitled "Review of Acoustic Velocity Meter Regression Analysis" developed by HEC. There were comments on the report and an updated version required to reflect the comments.
- 20-Mar-90 Letter from NCC to Consumer Illinois Water Company. NCC requesting data for the computation of Lake Michigan Diversion for WY88 and WY89.
- 21-Mar-90 Letter from NCC to MWRDGC referring to a letter of 18 August 1988. Information was being requested on any upgrades or changes on the metering devices at the four water reclamation plants. The information would help in the comprehensive data quality assurance program for Lake Michigan Diversion Accounting.

- 21-Mar-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of January 1990. 4 offices on the mailing list.
- 22-Mar-90 Memorandum from NCC to NCR. Appointment of Authorized Representative of the Contracting Officer (T. Lormand) for Contract DACW23-89-D-0003 with the Northeastern Illinois Planning Commission.
- 26-Mar-90 Letter from NCC to Metropolitan Water Reclamation District of Greater Chicago. NCC requesting data for the computation of Lake Michigan Diversion for WY88 and WY89.
- 03-Apr-90 Letter from NCC to USGS. Letter is the same as 02 March 1990. The feasibility of work being performed by USGS would be determined by the cost estimate they provided.
- 05-Apr-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of March 1990.
- 10-Apr-90 Memorandum from NCC to NCD. Forwarded report prepared by NCC entitled "Implementation of the Water Control Master Plan" covering the period of May 1989 through May 1990.
- 11-Apr-90 Memorandum from NCC to NCR. Termination of current (T. Price) Authorized Representative of the Contracting Officer for contract DACW23-89-D-0003 with the Northeastern Illinois Planning Commission.
- 13-Apr-90 Letter from NCC to Thorn Creek Basin Sanitary District. NCC requesting data for the computation of Lake Michigan Diversion for WY88 and WY89.
- 23-Apr-90 Letter from NCC to MWRDGC. NCC requesting data for the computation of Lake Michigan Diversion for WY88 and WY89.
- 30-Apr-90 Letter from NCC to UNOCAL. NCC requesting data required for the computation of Lake Michigan Diversion for WY88 and WY89.
- 30-Apr-90 Letter from NCC to North Shore Sanitary District requesting data required for the computation of Lake Michigan Diversion for WY88 and WY89.
- 04-May-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of April 1990.

- 14-May-90 Letter from NCC to National Oceanic and Atmospheric Administration. NCC forwarded Tables of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the months of October 1989 through February 1, 1990. An explanation of the information provided was also included.
- 14-May-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of February 1990. 5 offices on the mailing list.
- 18-May-90 Memorandum from NCC to NCE regarding scheduling a series of flow measurements at the three Lake Michigan control structures. Measurements needed to assess the accuracy of the reported diversion flows.
- 24-May-90 Letter from NCC to NIPC. Forwarded scope of work to NIPC for a study of TARP contributing areas, the revision of the TARP Computer Program, and the development of TARP Models for WY86, WY87, and WY88.
- 25-May-90 Memorandum from NCC to NCE regarding scheduling a series of flow measurements at the three Lake Michigan control structures. Measurements needed to assess the accuracy of the reported diversion flows. NCE will conduct flow measurements. Navigation notices were issued to inform river traffic of the date and times of measurements.
- 25-May-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of March 1990. 5 offices on the mailing list.
- 05-Jun-90 Letter from NCC to Jardine Water Purification Plant. NCC requesting hourly precipitation data for Springfield Pumping Station, Mayfair Pumping Station, Roseland Pumping Station, and South Water Filtration Plant for 10/01/89 thru 4/30/90.
- 05-Jun-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of April 1990. 5 offices on the mailing list.
- 05-Jun-90 Letter from NCC to MWRDGC. NCC requesting precipitation charts from Calumet Treatment Works, Northside Treatment Works, Stickney Treatment Works, Glenview, and Water Reclamation District Office for 10/01/89 thru 4/30/90.
- 05-Jun-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of May 1990.

- 08-Jun-90 Memorandum INHOUSE Subject: Legal Review of Lake Michigan Diversion Navigation Makeup Component Review Scope of Work.
- 11-Jun-90 Memorandum from NCC to NCE. Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan diversion from the months of July 1989 through April 1990. NCE added to NCC mailing list.
- 12-Jun-90 Memorandum from NCC to NCD. NCC forwarded the revised scope of work for the proposed Lake Michigan Diversion Navigation Makeup Component Review. Once revised it will be transmitted to all interested parties.
- 12-Jun-90 Memorandum from NCD to NCC. Revised Lake Michigan Diversion Navigation Makeup Component Review Scope of Work. NCC directed to program full funding for the subject activity.
- 12-Jun-90 Letter from NCC to MWRDGC. NCC scheduled flow measurements at Wilmette Pumping Station, Chicago River Controlling Works, and O'Brien Lock and Dam for 7/23 thru 7/27/90. The purpose of flow measurements is to assess the accuracy of reported diversion flows.
- 12-Jun-90 Memorandum from NCC to NCD. Forwarded for approval to NCD was the Revised Lake Michigan Diversion Navigation Makeup Component Review Scope of Work.
- 14-Jun-90 Memorandum from NCC to NCD. Revised FY91 and FY92 Budgets for Water Control and Lake Michigan Diversion Accounting Activities.
- 20-Jun-90 Memorandum from NCC-ED to NCC-OC. A legal review of Lake Michigan Diversion Navigation Makeup Component Review Scope of Work.
- 26-Jun-90 Letter from NCC to NIPC. Forwarded revised Scope of Work. See Letter dated 24 May 1990.
- 03-Jul-90 Memorandum from NCC-OC to NCC-ED. Legal Review of LMDA Navigation Makeup Component Review Scope of Work. Outline potential liability aspects against the Federal Government.
- 05-Jul-90 Letter from NCC to Northeastern Illinois Planning Commission. NCC forwarded a revised scope of work entitled "Study of TARP Contributing Areas, The Revision of the TARP Computer Program, and the Development of the TARP Models for Water Years 86, 87, and 88". NCC also requested a fee proposal to perform the tasks in the scope of work.
- 06-Jul-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of June 1990.

- 07-Jul-90 Memorandum from NCC-ED to NCC-OC. Memo regarding the MWRDGC participation in Lake Michigan Diversion Navigation Component Review - Canal Operations Test. It would be necessary to assess liability for the MWRDGC participation in this project.
- 10-Jul-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of May 1990. 7 offices on the mailing list.
- 10-Jul-90 Semiannual Status Report for the Lake Michigan Diversion Accounting Program forwarded to NCD.
- 11-Jul-90 Memorandum from NCC to NCD. Forwarded the legal review of LMDA Navigation Makeup Component Review Scope of Work prepared by NCC-OC.
- 25-Jul-90 Letter from NCC to Water Department - City of Chicago Heights. NCC requesting data required for the computation of Lake Michigan Diversion for WY88 and WY89.
- 30-Jul-90 Letter from NCC to USGS forwarding comments on the draft report prepared by USGS entitled "Romeoville AVM Quality Assurance Plan".
- 02-Aug-90 Letter from NCC to MWRDGC. NCC completed flow measurements conducted from 7/23 thru 7/27/90 at the three Lake Michigan Control Structures. Copies of the upstream and downstream circular water elevation charts for each of the five days of measurement at the three sites were also requested by NCC. See letter dated 12 June 1990.
- 08-Aug-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of July 1990.
- 09-Aug-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of June 1990. 7 offices on the mailing list.
- 23-Aug-90 Letter from NCC to Chamline and Associates. NCC forwarded data requested for direct diversion flows for 1981 thru 1990 for Wilmette Controlling Works, Chicago River Controlling Works, and O'Brien Lock and Dam.
- 28-Aug-90 Letter from NCC to Illinois Department of Transportation (IDOT) giving notice of a training seminar on the use of hydraulic models of the Chicago Sanitary and Ship Canal and adjoining waterways, and the TARP tunnels. Seminar would be held 4-6 September 1990. The instructor was Robert L. Barkau. PhD., P.E.

- 28-Aug-90 Letter from NCC to MWRDGC giving notice of a training seminar on the use of hydraulic models of the Chicago Sanitary and Ship Canal and adjoining waterways, and the TARP tunnels. Seminar would be held 4-6 September 1990. The instructor was Robert L. Barkau. PhD., P.E.
- 30-Aug-90 Letter from NCC to MWRDGC. NCC requesting rating curves or tables and other necessary information from which sluice gate flows and leakages can be determined for 7/23 thru 7/27/90 for the three Lake Michigan Control Structures.
- 30-Aug-90 NCC forwarded Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of July 1990. 7 offices on the mailing list.
- 14-Sep-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of August 1990.
- 25-Sep-90 Memorandum from CECW to NCC. An update on the status of activities related to the life cycle replacement of water control computer systems.
- 02-Oct-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of September 1990.
- 05-Oct-90 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of August 1990. Seven offices on the mailing list.
- 16-Oct-90 Letter from Illinois Department of Transportation to NCC. IDOT requesting a status report on the condition of the Chicago River locks, including a new timetable for maintenance/rehabilitation of the facility.
- 25-Oct-90 Letter from NCC to ISWS. NCC forwarded precipitation gage data for Contract No. DACW23-90-C- 0051 with ISWS.
- 30-Oct-90 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of September 1990. Seven offices on the mailing list.
- 31-Oct-90 Letter from NCC to MWRDGC. NCC forwarded lockage data for the Chicago Lock for June 1988.
- 05-Nov-90 Letter from NCC to ISWS regarding contract extension for Reduction and Adjustment of WY88 and WY89 Precipitation data for Lake Michigan Diversion Accounting. NCC saw no need for contract extension since it was only a few days difference ISWS was asking for.

- 05-Nov-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of October 1990.
- 09-Nov-90 Letter from NCC to MWRDGC. NCC forwarded lockage data for the Chicago Lock for August 1987.
- 09-Nov-90 Letter from NCC to NIPC. NCC reviewed report entitled "Reduction of 1987 Water Year Precipitation Data for Lake Michigan Diversion Accounting" and the accompanying data. NCC was satisfied with the work prepared as part of contract DACW23-89-R-0014
- 19-Nov-90 Memorandum from NCD to NCC. Report entitled "Lake Michigan Diversion Accounting Program End of the Fiscal Year 6 month Status Report" needed more close detail of the manpower utilization breakdown.
- 19-Nov-90 Memorandum from NCC to NCD. Memo to transmit the semiannual status report for the Lake Michigan Diversion Accounting Program.
- 19-Nov-90 Memorandum from NCC-ED-HW to NCC-ED-HF. Memo concerning review of EDC Foundation draft FERC application.
- 21-Nov-90 Letter from NCC to IDOT. Response from NCC to the condition of the Chicago Harbor Lock.
- 21-Nov-90 Letter from NCC to Illinois Department of Transportation. See Letter dated 16 October 1990. Response to the condition of the Chicago Harbor Lock.
- 26-Nov-90 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of October 1990. Seven offices on the mailing list.
- 27-Nov-90 Letter from NCC to NIPC. NCC to negotiate second work order of the Indefinite Delivery Contract with NIPC. NCC forwarded a scope of work for development of a DSS-TSS Data Exchange Program and User's Manual.
- 04-Dec-90 Letter from NCD to IDOT. Letter from NCD stating that they are unable to fund the studies necessary to support the current scope of work within the next few years.(Study and analysis of Navigation Flows as Related to the LMDA Program at Chicago).
- 05-Dec-90 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of November 1990.

- 07-Dec-90 Letter from NCC to MWRDGC. NCC requesting information regarding the operation of Mainstream and Calumet TARP. An itemized listing of information required was enclosed.
- 12-Dec-90 Letter from NCC to Calumet Water Reclamation Plant. NCC requesting information for the development of simulation models for the Calumet TARP systems for WY87 and WY88.
- 08-Jan-91 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of December 1990.
- 08-Jan-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of November 1990. Seven offices on the mailing list.
- 08-Jan-91 Letter from Illinois Department of Transportation to NCD (copy furnished to NCC). IDOT continued the discussion concerning the status of diversion accounting and measurements, and the possibility of amending the U.S. Supreme Court
- 22-Jan-91 Letter from NCC to STS Consultants. NCC forwarded regression and AVM Flows for WY84 through WY89 and a copy of the Chicago Sanitary and Ship Canal at Romeoville Acoustic Velocity Meter Backup System Report.
- 29-Jan-91 Letter from NCC to MWRDGC. NCC forwarded the Chicago Sanitary and Ship Canal at Romeoville Acoustic Velocity Meter Backup Report, Review of "Acoustic Velocity Meter Regression Analysis" report, and the AVM Dial Up Procedures.
- 30-Jan-91 USGS forwarded plans to NCC for the construction of gages on the Grand Calumet River and on the Indiana Harbor Canal. A summary of costs for FY91 and FY92 was also enclosed.
- 31-Jan-91 Letter from NCD to Illinois Department of Transportation (copy furnished to NCC). Reply to letter dated 08 January 1991, concerning the status of the Lake Michigan Diversion Accounting and measurements at Chicago.
- 01-Feb-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of December 1990. Seven offices on the mailing list.
- 05-Feb-91 Memorandum from NCC to NCD. NCC forwarded Water Control's Data System Annual Report covering the Fiscal Year 1990.

- 07-Feb-91 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of January 1991.
- 22-Feb-91 Letter from NCC to Illinois Department of Transportation. NCC response on current condition at the Chicago Lock and implications for Lake Michigan Diversion.
- 26-Feb-91 Letter from NCD to Illinois Department of Transportation (copy furnished to NCC). Further reply to letter dated January 8, 1991. Concerning the status of the Lake Michigan Diversion accounting and measurements at Chicago.
- 04-Mar-91 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of February 1991.
- 11-Mar-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of January 1991. Seven offices on the mailing list.
- 12-Mar-91 Letting of a service contract to Ferranti O.R.E., Inc. to service the AVM station 05536995 Chicago Sanitary and Ship Canal at Romeoville, IL O.R.E. provided a scope of work.
- 22-Mar-91 Letter from NCC to Water Department - City of Chicago Heights. NCC requesting data for the computation of Illinois Lake Michigan Diversion for WY87 and WY90.
- 02-Apr-91 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of March 1991.
- 03-Apr-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of February 1991. Seven offices on the mailing list.
- 05-Apr-91 Letter from ISWS to NCC. ISWS forwarded items pertaining to the 1988 and 1989 Water Year data reduction/adjustment project.
- 12-Apr-91 Fax from Metropolitan Water Reclamation District of Greater Chicago to NCC. MWRDGC in the process of installing a cavitation monitoring system to improve the operation of the Lockport Powerhouse Facility.
- 24-Apr-91 Letter from NCC to USGS. NCC forwarded soundings of the Indiana Harbor Canal for August 1990.

- 26-Apr-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of March 1991. Seven offices on the mailing list.
- 28-May-91 Letter from ISWS to the Chicago Park District (Copy For: NCC). ISWS and USACE thanking the Chicago Park District for having continued access to the Lincoln Park Gun Club site where one of 25 rain gages in Cook County is located.
- 28-May-91 Letter from ISWS to NCC. ISWS requesting provisional AVM records for the Romeoville Station for WY90 and WY91.
- 10-Jun-91 Memorandum from NCC to NCD. NCC forwarded the WY86 Lake Michigan Diversion Accounting Report for review.
- 11-Jun-91 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of May 1991.
- 12-Jun-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of April 1991. Seven offices on the mailing list.
- 17-Jun-91 USGS prepared a price quote for the Watchdog Timer Board per NCC request. USGS also informed NCC about a Lightning Protection Package.
- 19-Jun-91 Memorandum from NCC to NCD. Completion dates for the six month FY91 Status Report and the Lake Michigan Diversion Accounting 1990 Annual Report.
- 20-Jun-91 Letter from Illinois Department of Transportation to Metropolitan Water Reclamation District of Greater Chicago (copy furnished to NCC). Letter concerning request made by the COE to drawdown the pool of the Chicago Sanitary and Ship Canal, above Lockport, IL.
- 26-Jun-91 Letter from NCC to Siemon, Larson and Purdy. NCC forwarded the 1989 Lake Michigan Diversion Accounting 1989 Annual Report and the Lake Michigan Diversion Accounting Manual of Procedures.
- 03-Jul-91 Memorandum from NCC to NCD. Submittal of the Annual Report for Water Control Data System.
- 09-Jul-91 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of June 1991.

- 11-Jul-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of May 1991. Seven offices on the mailing list.
- 11-Jul-91 USGS to purchase and install two Watchdog Timer Boards for the ORE model 7410 AVM at Romeoville, IL by NCC request.
- 08-Aug-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of June 1991. Seven offices on the mailing list.
- 09-Aug-91 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of July 1991.
- 14-Aug-91 Letter from NCC to MWRDGC. NCC forwarded one 30x42 inch copy of an AUTOCAD drawing showing diverted Lake Michigan Watershed, the Lower Des Plaines Watershed, special contributing areas, and a DOS backup of the AUTOCAD drawing.
- 5-Aug-91 Letter from, Illinois Department of Transportation to Metropolitan Water Reclamation District of Greater Chicago (copy furnished to NCC). IDOT forwarded a copy of a navigation notice to MWRDGC issued by COE announcing maintenance work on the Lockport Approach Dike.
- 21-Aug-91 Letter from NCC to Indiana Dept. of Environmental Management - Drinking Water Branch. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Homewood Dept. of Public Works. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Village of Deerfield. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Rhone-Poulenc Basic Chemical. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Consumer Illinois Water Company. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Indiana Dept. of Natural Resources. NCC requesting data for the computation of Lake Michigan Diversion for WY90.

- 21-Aug-91 Letter from NCC to Illinois Department of Transportation - Div. of Water Resources. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to ACME Steel Company. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Illinois Environmental Protection Agency - Div. of Water Pollution Control. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Republic Engineering Steel. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Jardine Water Purification Plant. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Texaco Refining and Marketing Inc. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Calumet Flexicore Corp. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Thorn Creek Basin Sanitary District. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Northshore Sanitary District - Clavey Road STP. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Argonne National Laboratories. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to LTV Steel. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to the Town of Scherville. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Uno-Ven Corporation. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 21-Aug-91 Letter from NCC to Whiting Filtration Plant. NCC requesting data for the computation of Lake Michigan Diversion for WY90.

- 21-Aug-91 Letter from NCC to Underwriters Laboratories Inc. NCC requesting data for the computation of Lake Michigan Diversion for WY90.
- 29-Aug-91 Letter from NCC to Indiana Department of Environmental Management. NCC requested data for the computation of Illinois Lake Michigan Diversion for WY90.
- 29-Aug-91 NCC forwarded the Table of Preliminary Lockport Flows as provided by MWRDGC and estimate of Lake Michigan Diversion for the month of July 1991. Seven offices on the mailing list.
- 23-Sep-91 Letter from NCC to MWRDGC. Monthly diversion lockage report for the month of August 1991.
- 24-Sep-91 Fax from NCD to NCC. Lake Michigan Diversion Master Plan 5 year plan. NCD wanted WY86 Accounting Report by the end of CY91. NCC forwarded a schedule of completion for other reports.
- 25-Sep-91 Memorandum from NCD to NCC. NCD forwarded a copy of updated information on NEXRAD.
- 02-Oct-91 Memo from CECW-EH-D Subject: Hydraulic and Hydrologic conference. April 27-28 1992. Hyatt Regency Hotel, Fort Worth, TX.
- 08-Oct-91 Memo for NCD from NCC. Subject: Review of ER 1110-2-240, Water Control Management.
- 11-Oct-91 Letter to State of New York - Dept. of Environmental Conservation. Providing comments on a letter concerning the proposed Lowell, Indiana diversion from Lake Michigan.
- 11-Oct-91 THRU 22-July-92 Forwarded Table of Preliminary Lockport Flows as provided by MWRDGC. Monthly for WY92. Sent to: Office of Oceanographic & Marine Assessment, Great Lakes Environmental Research LAB, Monroe Wastewater Treatment Plant, IDOT (LM Management Section), North Central Div., Detroit Dist., Rock Island Dist.
- 18-Oct-91 Letter to NCC from Northeastern Illinois Planning Commission. Forwarding completed tasks for the water year 1986 diversion accounting work order.
- 21-Oct-91 Memo for NCC from NCD Subject: Implementation of the North Central Division Water Control Master Plan.
- 22-Oct-91 THRU 10 Jun-92 Monthly Diversion Lockage Reports forwarded to MWRDGC for WY92.

- 25-Oct-91 Fax to NCR from NCC. Changes made to a Request for Proposal Plan.
- 29-Oct-91 Memo for NCD from NCC Subject: Review of AFOS Products.
- 29-Oct-91 Memo for NCD from NCC Subject: Status of Reservoir Regulation Manuals.
- 30-Oct 91 Memo for NCC from NCD Subject: O&M funding for CENCD-PE-ED-W.
- 31-Oct-91 Memo INHOUSE Subject: Cup McCook Reservoir PMP - Water Control Section
- 04-Nov-91 Memo INHOUSE Subject: Cup O'Hare Reservoir PMP - Engineering Design during construction (EDDC).
- 15-Nov-91 Memo for NCC from NCD Subject: Software Conversion for next Generation Water Control Data System computer.
- 15-Nov-91 Memo INHOUSE Subject: FY92 funding allocations for water control and Lake Michigan Diversion Accounting Projects.
- 18-Nov-91 Fax (Memo) from NCR to NCD Subject: Study of Stage and Discharge Frequencies on the Lower Ohio River.
- 18-Nov-91 Letter to NCC from National Oceanic and Atmospheric Administration, Informing of the New Address and telephone number for the National Weather Service Forecast Office.
- 27-Nov-91 Fax from USGS to NCC - copy of memo concerning re-establishment of small business set-aside.
- 27-Nov-91 Letter from USGS to NCC. Enclosed list of streamgaging stations that were funded by ISWS but no longer would be.
- 27-NOV-91 Memo from INHOUSE Subject: RFP DACW23-92-R-0003, Precipitation Network, U of I .
- 02-Dec-91 Letter to NCC from Northeastern Illinois Planning Commission. Request for payment of funds under work order 0001 Contract DACW23-89-D-0003, Diversion Accounting.
- 05-Dec-91 Letter from NCC to USGS requesting groundwater withdrawal information for all permitted users in IL.

- 09-Dec-91 Memo for NCR from NCC. Subject: Cost and Time Estimates for CENCC-ED-HW Coordination in the study of stage and discharge frequencies on the lower Ohio River.
- 18-Dec-91 Memo INHOUSE Subject: Technical and Price Analysis pending firm fixed price service contract DACW23-92-R-0003.
- 31-Dec-91 IDOT forwarded two copies of the report " River Stages in Illinois: Flood and Damage Data"
- 02-Jan-92 ISWS forwarded 20 copies of the final report detailing operations and data reduction for WY91. Also sent printout of data matrix for WY91 and 3 disks containing data in digital form.
- 16-Jan-92 Memo for Record Subject: Negotiation Objectives - RFP DACW23-92-R-0003, Pending Service Contract.
- 24-Jan-92 Memo for NCR from NCC Subject: ISWS, U of I, Precipitation Gage Network Operation and Maintenance Contract Award.
- 03-Feb-92 Memo for NCD from NCC Subject: Water Control Section Annual Report.
- 07-Feb-92 Memo for NCD From NCC Subject: Lake Michigan Diversion 5- year Master Plan.
- 07-Feb-92 Memo INHOUSE Subject: Functional and Organizational Allocation of funding by project for FY92. Request to formulate the FY93 FORCON and FY92 Operating Budget.
- 07-Feb-92 Memo for NCD from NCC Subject: Lake Michigan Diversion 5-year Master Plan.
- 10-Feb-92 Letter to U of I from NCC. Letter stating release of contract (see release of contract 11 Mar 92).
- 11-Feb-92 Letter from IDOT to NCC concerning Lake Michigan Diversion Accounting and Three Member Tech Committee.
- 13-Feb-92 USGS forwarded rating tables for surface water gaging stations.
- 13-Feb-92 Fax (Memo) to NCC from NCD Subject: Update on receipt and processing AFOS data from the NWS.
- 24-Feb-92 Memo from NCD to NCC Subject: Update on receipt and processing AFOS data from the NWS.

- 25-Feb-92 Memo for NCC from NCD Subject: Real-Time Water Control Hardware/Software Development.
- 26-Feb-92 Letter to NCC from U of I at Urbana-Champaign. Regarding Contract DACW23-92-C-0019.
- 27-Feb-92 USGS forwarded rating tables for surface-water gaging stations.
- 28-Feb-92 Letter from NCC to USGS requesting hourly flow and stage data from the Romeoville Acoustic Velocity Meter.
- 04-Mar-92 Fax to ISWS - Advanced copy of signed contract DACW23-92-C-0019.
- 11-Mar-92 Release of Contract - work completed for contract DACW23-89-0005.
- 13-Mar-92 Memo for NCC from NCD Subject: Lake Michigan Diversion 5-Year Master Plan.
- 13-Mar-92 Letter from USGS to NCC - Disk forwarded with 88-89 groundwater withdrawal data for requested townships.
- 26-Mar-92 Memo for NCD from NCC Subject: Water Control Master Plan Update.
- 30-Apr-92 Memo for NCC from NCD Subject: Submittal of Annual Report for Water Control Data System.
- 07-May-92 Memo INHOUSE Subject: Retention of USACE, Chicago District, Great Chicago Flood (GCF) of 1992 Records.
- 12-May-92 Fax from USGS to COE. Romeoville AVM Discharge Record Computation.
- 18-May-92 Memo for NCC from CECW-EH-W Subject: Schedule for revision of Water Control manuals.
- 01-Jun-92 Memo for NCC from NCD Subject: Schedule for revision of Water Control Manuals.
- 12-Jun-92 Letter from IDOT to NCC concerning Lockport Diversion Flows for April 1992. In connection with Chicago Flood.
- 15-Jun-92 Memo for NCC from CECW-EH-W Subject: Collection of project funds for operation of Hydrologic Programs.
- 23-Jun-92 Memo for NCC from NCD Subject: Update of the Hydrologic Information Officer (HIO) Notification list.

- 06-Jul-92 Memo for NCC from NCD Subject: Drought Contingency Plans (DCP) record of completion.
- 08-Jul-92 Memo for NCD from NCC Subject: Schedule for revision of Water Control Manuals.
- 08-Jul-92 Memo for NCD from NCC Subject: Update of Hydrologic Information Officer (HIO) notification list.
- 14-Jul-92 Letter from USGS to NCC. List of stations that would be discontinued due to budget cuts in "92".
- 21-Jul-92 Memo for NCD from NCC Subject: Collection of project funds for operation of hydrologic programs.
- 22-Jul-92 Memo for NCC from NCD Subject: Status Report - HEC Support for Real Time Water Control Program.
- 24-Jul-92 Letter from IDOT to NCC. Concerning the extra diversion during the Chicago Flood and stating that the State of Illinois should not be charged for the extra diversion water under the U.S. Supreme Court Decree Diversion Limit. Request that tables be revised for April and May (Lockport Diversion Flows).
- 26-Aug-92 Memo for NCC from NCD Subject: Water Control Data System (WCDS) Software Development and Application.
- 02-Sep-92 Memo for NCC from NCD Subject: Review of the FY93 Cooperative Stream Gaging Program.
- 08-Sep-92 Memo for NCC from NCD Subject: Information for Corps Field Technical Advisory Group.
- 16-Sep-92 Memo for NCD from NCC Subject: Water Control Data System Software.
- 17-Sep-92 Memo for NCD from NCC Subject: USGS/Corps Cooperative Stream Gage Program, FY93.
- 28-Sep-92 Memo for NCD from NCC Subject: Lake Michigan Diversion Accounting Concerns.