**APPENDIX B**

**LAKE MICHIGAN DIVERSION ACCOUNTING**

**WATER YEAR 1986 REPORT**

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## EXECUTIVE SUMMARY

In compliance with the modified 1980 U.S. modified U.S. Supreme Court decree, the WY86 diversion was computed using the best engineering technology available to date as applied to the diverted watersheds.

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 WY86 diversion accountable to the State of Illinois is 3,751.1 cfs. This is 551.1 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 3,410 cfs and the cumulative deviation from the 3,200 cfs average is -1,261 cfs-years. The negative cumulative deviation indicates a water allocation debt and the maximum allowable debt is 2,000 cfs-years.

## INTRODUCTION

The diversion of water from the Lake Michigan watershed is of a major importance to the Great Lake 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) 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. This report represents the final Lake Michigan diversion accounting for WY86.

## AUTHORITY FOR REPORT

Under the provisions of the U.S. Supreme Court Decree in the Wisconsin, et al v. Illinois et al, 388 U.W. 426,87 S.Ct. 1774 (1967) as modified 449 U.S. 48, 101 S.Ct. 557 (1980), 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 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 Basin since the completion of the Illinois and Michigan Canal (I&M Canal) in 1848. At that time, diversion averaged about 500 cubic feet per second (cfs). The Illinois and Michigan Canal was built primarily to serve transportation needs. The canal provided a connecting watercourse between the Great Lakes and the Mississippi River system.

With the development of the Chicago metropolitan area, drainage 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 as such 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. This increased the rate and volume of runoff and resulted in increased flooding.

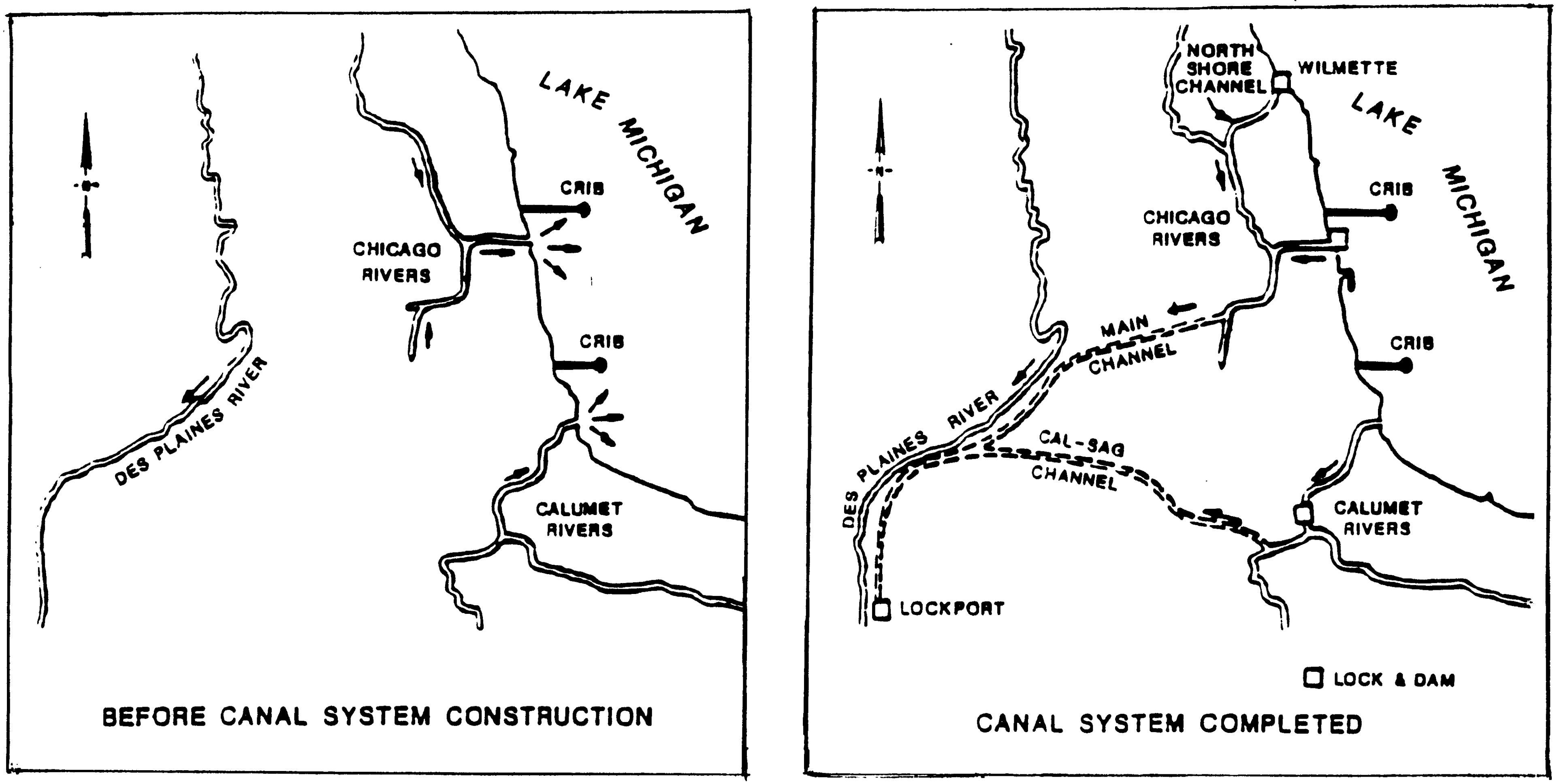
As a solution to the sanitation and flooding problems, construction of the Chicago Sanitary and Ship Canal (CSSC) was undertaken. This construction allowed the flow direction of the Chicago River to be reversed (Figure 1). Construction of the Chicago Sanitary and Ship Canal was completed in 1900 by the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

Between 1907 and 1910 the MWRDGC constructed a second sanitary canal called the North Shore Canal. It extended from Lake Michigan at Wilmette in a southerly direction 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 was constructed to carry 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 1

Development of the Chicago Canal System



BACKGROUND OF LAKE MICHIGAN DIVERSION ACCOUNTING

The Lake Michigan diversion accountable to Illinois is limited to 3,200 cfs over a forty year averaging period. During the forty year period, the average diversion in any annual accounting period may not exceed 3,680 cfs except in any two annual accounting periods in which the average diversion may not exceed 3,840 cfs as a result of extreme hydrologic conditions. During the first 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 Chicago Sanitary and Ship canal. Not all of the deductible flows could 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 member technical committee is convened every five 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 that the 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 miles upstream of Lockport. The AVM is a highly accurate flow meter 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 AVM, a replacement AVM was installed in November 1988.

To provide flows during periods of malfunction, various regression analyses were done to relate the MWRDGC reported Lockport flows to the AVM flows. Several sets of equations were proposed by the Corps of Engineers, the 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 regression equations that were ultimately used to estimate missing AVM flows from WY86 through WY91 were developed by the USGS in a report tentatively titled "Discharge and Regression Analyses for Acoustical Velocity Meter Data for the Chicago and Sanitary Ship Canal at Romeoville, Illinois." The final publication of this report is expected to be available in the spring of 1993.

The second and most recent 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 (C. B. Burke Engineering, Ltd.) in September of 1988 to review and update the modeling parameters. The final report 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 1988. 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, MWRDGC reported Lockport flows, adjusted using the WES rating curves, were used rather than 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 U.S. Geological Survey (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.

Upon completion of the analysis of the modeling parameters by Christopher B. Burke Engineering, LTD, 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 Engineer and transmitted to all interested parties in the Lake Michigan Diversion Accounting 1989 Annual Report (USACE, 1990).

The computation of the diversion from Lake Michigan by the State of Illinois for WY86 was undertaken as a joint effort between NIPC (under contract to the Corps of Engineers) and the Corps of Engineers. Significant revisions to the diversion accounting procedures were undertaken to account for changes in the diversion area attributable to TARP (Tunnel and Reservoir Plan). These revisions will be addressed latter in this report.

## DIVERSION ACCOUNTING PROCEDURES

The diversion from Lake Michigan that is 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 format of the diversion accounting tables have been revised for WY86 due to the streamlining of the computational process and to make the results easier to interpret. 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 Sanitary and Ship Canal. 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, 13 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 13, "Runoff from the Diverted Lake Michigan Watershed." Budget 7 through Budget 12 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. Budget 13 compares canal system inflows and outflows.

Table 1

Description of the Diversion Accounting Columns

| Column No. | 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 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 No. | Title | Description |
| --- | --- | --- |
| 1 | Diverted Lake Michigan Pumpage | This budget sums Lake Michigan water diverted by the State of Illinois in the form of municipal and industrial 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 this budget are used in Budget 13 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 this budget are used in Budget 13 and Column 12. |
| 5 | Thorn Creek at Thornton, IL | This budget performs a simple separation of stream flow into sanitary and runoff portions. The results this budget are used in Budget 13 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 this budget are used in Budget 13 and Column 12. |
| 7 | MWRDGC Northside Water Reclamation | 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 on Budget 13 and Columns 6 and 12. |

Table 2 (cont)

Description of the Diversion Accounting Computational Budgets

| Budget No. | Title | Description |
|---|---|---|
| 8 | MWRDGC 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 13 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 13 and Columns 6 and 12. |
| 11 | 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 13 and Columns 6 and 12. |

Table 2 (cont)

Description of the Diversion Accounting Computational Budgets

| Budget No. | Title | Description |
|---|---|---|
| 12 | 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 13 and Column 6. |
| 13 | 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 revisions to the diversion accounting procedure included modeling of the mainstream TARP (Tunnel and Reservoir Plan) Pumping Station and the revision of the regression equations that estimate daily AVM discharge at Romeoville on the Sanitary and Ship Canal during periods when the AVM is not operational. Additionally, several minor revisions were incorporated in the budget and column computations to streamline the diversion computations. These minor revisions do not significantly affect the computed diversion.

One revision to the diversion accounting procedures that affects the computed diversion is the inclusion of modeling of the Mainstream TARP Pumping Station. TARP is a comprehensive flood control and pollution control plan to alleviate the adverse effects of overflows on the waterways and Lake Michigan in the Chicago area. TARP is designed to capture sewage that would be conveyed into streams with runoff in the form of combined sewer overflows from the 375 square miles of combined sewer area within the MWRDGC service basin. The introduction of the Mainstream portion of the TARP system affects the methods employed to compute Illinois' diversion from Lake Michigan. Combined sewer overflows which prior to TARP discharged into a specific waterway, may now be discharged into a different waterway via the TARP Tunnels. In 1986, only Phase 1 of Mainstream TARP was in operation. A more detailed discussion of the Mainstream TARP modeling is presented in the section titled "Budget 9: Mainstream TARP" later in this report.

The second significant change to the diversion accounting procedure included the use of revised regression equations to estimate AVM discharge on days that the AVM is not operational. Development of these equations is discussed further in the section titled "Column 1: Chicago Sanitary and Ship Canal (CSSC) at Romeoville, USGS AVM Gage Record" presented later in this report.

## ACCOUNTING RESULTS

The WY86 diversion accounting monthly summary of flows is presented in Table 3. Table 3 shows the total WY86 Lake Michigan diversion accountable to the State of Illinois is 3,751.1 cfs (Column 10). This is 551.1 cfs greater than the 3,200 cfs average specified by the Decree. The 40 year running average, rounded to the nearest cfs, (Table 4) beginning with WY81 is 3,410 cfs. The cumulative deviation from the 3,200 cfs average is -1,261 cfs-years. The negative cumulative deviation indicates a water allocation debt and the maximum allowable debt is 2,000 cfs-years. Tabular data on daily diversion flows in presented in Appendix A.

# Table 3

## Lake Michigan Diversion Accounting – WY 1986

### Summary of Diversion Flows (cfs)

| *LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986* | ROMEOVILLE 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| OCT 85 | 4318.5 | 0.3 | 4318.8 | 123.4 | 74.5 | 181.4 | 1.6 | 381.0 | 28.4 | 3966.2 | 1573.1 | 717.9 | 895.1 |
| NOV 85 | 5244.1 | 0.3 | 5244.4 | 152.7 | 70.0 | 506.9 | 1.8 | 731.3 | 30.2 | 4543.3 | 1533.4 | 2395.7 | 296.9 |
| DEC 85 | 3347.0 | 0.2 | 3347.2 | 116.7 | 76.4 | 200.7 | 1.7 | 395.4 | 26.3 | 2978.1 | 1563.2 | 829.1 | 161.4 |
| JAN 86 | 2647.5 | 0.3 | 2647.8 | 114.2 | 75.4 | 114.4 | 2.4 | 306.4 | 27.0 | 2368.4 | 1584.9 | 376.4 | 140.9 |
| FEB 86 | 3622.8 | 0.3 | 3623.1 | 136.9 | 77.5 | 246.0 | 2.4 | 462.8 | 28.5 | 3188.8 | 1586.8 | 1075.3 | 160.2 |
| MAR 86 | 3482.9 | 0.2 | 3483.2 | 127.9 | 74.9 | 216.2 | 2.2 | 421.3 | 28.4 | 3090.3 | 1596.2 | 952.9 | 157.2 |
| APR 86 | 3098.4 | 0.3 | 3098.7 | 112.7 | 79.1 | 72.0 | 2.0 | 265.8 | 28.3 | 2861.2 | 1646.6 | 341.3 | 355.9 |
| MAY 86 | 3773.2 | 0.4 | 3773.6 | 121.8 | 82.8 | 117.1 | 1.9 | 323.6 | 30.2 | 3480.2 | 1723.8 | 754.9 | 468.1 |
| JUN 86 | 4570.6 | 0.5 | 4571.0 | 132.9 | 89.6 | 121.7 | 2.0 | 346.3 | 31.2 | 4255.9 | 1858.2 | 899.7 | 803.6 |
| JUL 86 | 5425.8 | 0.6 | 5426.4 | 128.0 | 98.3 | 163.2 | 2.3 | 391.8 | 33.4 | 5068.0 | 2142.4 | 838.9 | 1572.0 |
| AUG 86 | 4650.4 | 0.6 | 4651.0 | 120.3 | 98.5 | 40.4 | 2.0 | 261.1 | 32.3 | 4422.2 | 2037.7 | 277.4 | 1599.1 |
| SEP 86 | 5181.1 | 0.5 | 5181.6 | 150.2 | 87.5 | 191.3 | 1.8 | 430.8 | 32.2 | 4782.9 | 1825.2 | 1118.4 | 1334.0 |
| WY 86 | 4113.1 | 0.4 | 4113.4 | 128.0 | 82.1 | 179.9 | 2.0 | 392.0 | 29.7 | 3751.1 | 1723.8 | 876.5 | 665.8 |

COMPUTATIONS:

1. COLUMN 3 EQUALS THE SUM OF COLUMN 1 AND COLUMN 2.
2. COLUMN 8 EQUALS THE SUM OF COLUMN 4 THROUGH COLUMN 7.
3. COLUMN 10 EQUALS COLUMN 3 MINUS COLUMN 8 PLUS COLUMN 9.

(lightly shaded) DEDUCTIONS FROM THE ROMEOVILLE GAGE RECORD

(darkly shaded) ADDITIONS TO THE ROMEOVILLE GAGE RECORD

NOTES:

1. ALL VALUES ARE ROUNDED TO THE NEAREST TENTH.
2. MATHEMATICAL COMPUTATIONS BETWEEN COLUMNS UTILIZE UNROUNDED VALUES.
3. AVERAGE VALUES FOR WY86 WERE COMPUTED USING DAILY VALUES.

Table 4

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 |
|---|---|---|---|
| 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 |

## 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 WY86 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 with seven budgets are used to verify the diversion simulation models. The columns are discussed first followed by the discussion of the budgets.

## COLUMNS

The 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 columns display the three diversion components (Lake Michigan pumpage accountable to Illinois, runoff from the diverted watershed, and direct diversion through the lakefront control structures) and the sum of the three columns should theoretically equal the Romeoville based diversion calculation. A comparison of the sum of these three columns to the calculated diversion 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 WY86 is 4,113.1 cfs. The AVM was inoperable during WY86, therefore the flow at this accounting site was calculated from the regression equations. It was determined previously that the regression equations using MWRDGC reported Lockport flows more accurately estimates the flow in the canal at Romeoville than the MWRDGC Lockport flows alone (USACE, 1989).

The regression equations used to estimate AVM discharge during periods when the AVM was inoperable were revised by the USGS during a study performed for the Corps in December 1992. The study was performed in order to incorporate AVM discharge flow revisions into the regression equations as well as to statistically compare the performance of the two different AVMs, the Sarasota AVM (12 June 1984 - 3 November 1988) and the ORE AVM that became operable on 17 November 1988. Modifications to the AVM flow record were the result of corrections to the cross sectional area that were determined by measurement of the channel cross section at Romeoville in 1991. The period of record used in developing the revised regression equations was from WY86 through WY91. The equations were used to estimate daily-mean discharge at the AVM for the 545 days when the AVM was not operational from WY86 through WY91. It was determined that a single set of regression equations were valid for the entire period since it was statistically shown that the two different AVMs performed similarly. The complete development of the final regression equations can be found in the USGS report tentatively titled "Discharge and Regression Analyses for Acoustical Velocity Meter Data for the Chicago Sanitary and Ship Canal at Romeoville, Illinois." The final publication of this report should be available in the spring of 1993. The final regression equations developed in that report are as follows:

When flows at Lockport are through the turbines only,

$$(1)\quad Q_{AVM} = (1.1270 \times Q_{TLL}) + 75.48$$

When flows at Lockport are through the turbines and powerhouse sluice gates with sluice gate flow less than 5000 cfs,

$$(2)\quad Q_{AVM} = (1.1270 \times Q_{TLL}) + (0.6842 \times Q_{PHSG}) + 219.7$$

When flows at Lockport are through the turbines, powerhouse sluice gates, and controlling works <u>or</u> when flow through the powerhouse sluice gates is greater than 5000 cfs.

$$(3)\quad Q_{AVM} = (1.1270 \times Q_{TLL}) + (0.4361 \times Q_{PHSG}) + (0.3228 \times Q_{CW}) + 1086$$

Where: $Q_{AVM}$ = Estimated AVM discharge.
$Q_{TLL}$ = MWRDGC reported flow through the Lockport turbines and locks plus leakage.
$Q_{PHSG}$ = MWRDGC reported flow through the Lockport powerhouse sluice gates.
$Q_{CW}$ = MWRDGC reported flow through the Lockport controlling works.

COLUMN 2: DIVERSIONS FROM THE CSSC ABOVE THE GAGE

Argonne Laboratories was the only diversion from the Chicago Sanitary and Ship Canal water upstream of the Romeoville gage in WY86. The average withdrawal for WY86 is 0.4 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 canal flow is 4,113.5 cfs for WY86.

COLUMN 4: GROUNDWATER DISCHARGED TO THE CSSC AND ADJOINING CHANNELS

Column 4 is the effluent whose source is groundwater water supply pumpage by communities, industrial users, and other private users as reported by the Illinois State Water Survey (ISWS). It also includes the groundwater seepage into the TARP system that is discharged to the canal. This quantity is determined by summing all reported groundwater sources in the area tributary to the canal and the estimated groundwater seepage into the Mainstream TARP system (Budget 9). 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 service boundaries in which their effluent was discharged into the CSSC and adjoining channels. Groundwater seepage into the Mainstream TARP system was determined through simulation and is discussed further in Budget 9. 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 canal 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 and reaching 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 128.0 cfs for WY86. Groundwater pumpage tributary to the canal is composed of 39.8 cfs of groundwater pumpage from the Lake Michigan watershed, 35.9 cfs of groundwater pumpage from outside of the Lake Michigan watershed, and 52.5 cfs of groundwater seepage into the TARP system. The total of these three components is 128.2 cfs. However, the deduction from the Romeoville gage record is 128.0 cfs since 0.2 cfs of the 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 CHICAGO SANITARY AND SHIP CANAL

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 WY86, total flow in the Little Calumet River was 58.1 cfs, with 4.6 cfs of that flow being determined to be 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. 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 principle variable is lake levels.

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 for East Chicago, Hammond, and Whiting unless this sum is greater than the flow in the Grand Calumet River. In the case that the combine water supply for these communities is in excess of 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 WY86 was computed as 166.9 cfs. It was determined that 77.5 cfs of that flow was water supply pumpage. Therefore, the total WY86 Indiana water supply deduction, including the flow from the Little Calumet and Grand Calumet Rivers is 82.1 cfs.

## COLUMN 6: RUNOFF FROM THE DES PLAINES RIVER WATERSHED REACHING THE CHICAGO SANITARY AND SHIP CANAL

The WY86 average discharge of Des Plaines River watershed runoff reaching the canal (Column 6) is 179.9. The infiltration and inflow discharged to the water reclamation plants is 105.5 cfs, the infiltration and inflow reaching the canal through combined sewer overflows is 10.2 cfs, and the runoff from the Lower Des Plaines and Summit Conduit areas is 64.2 cfs. The deduction is largely determined by simulation but it is also influenced by the O'Hare basin flow transfer. O'Hare Basin flow transfer will be discussed in more detail later in the report.

## 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 State of Illinois, and is typically comprised of water supply used by federal facilities. Column 7 represents a deduction from the Romeoville record and the amount of the WY86 deduction is 2.0 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 WY86 is 392.0 cfs.

COLUMN 9: LAKE MICHIGAN PUMPAGE NOT DISCHARGED TO THE CANAL

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:

(1) Water supply used by communities serviced by water reclamation facilities that do not discharge to the CSSC (27.9 cfs)

(2) The sanitary portion of combined sewer overflows that do not discharge to the CSSC that is attributable to Lake Michigan domestic water supply (1.8 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 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 (1) the O'Hare flow transfer is treated at the Northside WRP that discharges sanitary effluent that is tributary to the canal and (2) the entire Lake Michigan component of the O'Hare flow transfer is from communities contained in the above list. The flow for these communities are measured while the flow of the second component is derived from simulation. Column 9 represents an addition to the Romeoville record and the total WY86 addition is 29.7 cfs.

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 WY86 is 3,751.1 cfs. This amount is 551.1 cfs greater than Illinois's long term diversion allocation of 3,200 cfs. The 40 year running average diversion, beginning with WY81, is 3,410 cfs and the cumulative deviation from the 3,200 cfs allocation is -1,261 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

Column 11 through Column 13 represent the three Lake Michigan diversion components (Lake Michigan pumpage accountable to Illinois, runoff from the diverted Lake Michigan watershed, and direct diversion through the lakefront structures). The sum of the columns (3,266.1 cfs) should theoretically equal the total diversion as shown in Column 10 (3,751.1 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 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. However, a difference between estimates of 485.0 cfs or 12.9% is a marginal balance. The difference between these two methods of estimating the diversion is greater than should be expected. This discrepancy becomes even greater when consumptive use is accounted for in Column 11. The discrepancy in these two estimates is related to the balance in Budget 13, discussed in a subsequent section, and potential sources of the discrepancy are addressed in that budget discussion.

Using the quantities derived from these three columns, approximately 52.8% of the WY86 Illinois diversion is attributable to pumpage from Lake Michigan for domestic water supply. Runoff from the diverted Lake Michigan Watershed accounted for 26.8% of the diversion and direct diversion through the lakefront structures accounted for 20.4% of the diversion. A more detailed breakdown of these percentages is shown in Table 5 and Figure 2.

Table 5

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

| Category | Flow | Percentage |
|---|---|---|
| Lake Michigan Pumpage by the State of Illinois | 1,723.8 cfs | 52.8 % |
| Runoff from the Diverted Lake Michigan Watershed | 876.5 cfs | 26.8 % |
| Direct Diversions | | |
| Lockages | 179.0 cfs | 5.5 % |
| Leakages | 42.6 cfs | 1.3 % |
| Navigation Makeup Flow | 142.2 cfs | 4.4 % |
| Discretionary Flow | 302.0 cfs | 9.2 % |

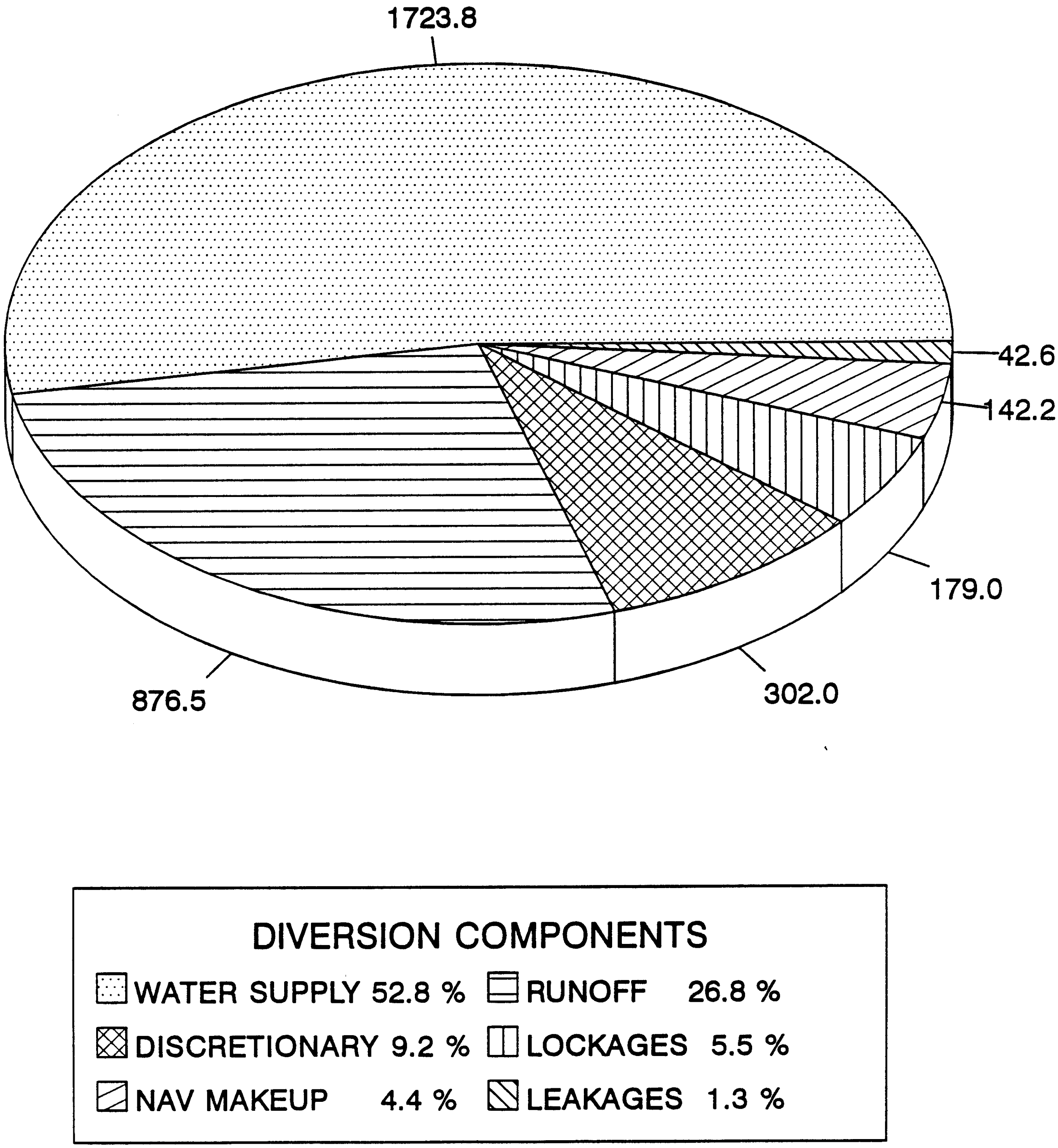
## BUDGETS

Budgets 1 and 2 are used to sum the water supply for the area influenced by the diversion. The following four budgets (Budgets 3 through 6) 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 budgets (Budgets 7 through 13) compare measured and simulated flows.

## 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 Chicago Sanitary and Ship Canal. Groundwater pumpage data is received as a total annual withdrawal based on calendar years.

## Figure 2
## Component Breakdown of Illinois' Diversion
### Based on Columns 11 through 13



## BUDGET 1: DIVERTED LAKE MICHIGAN WATER SUPPLY

Budget 1 represents the summation of Lake Michigan pumpage accountable to the State of Illinois. For WY86, the average annual Lake Michigan pumpage accountable to Illinois is 1,723.8 cfs.

## BUDGET 2: GROUNDWATER DIVERTED TO THE CHICAGO SANITARY AND SHIP CANAL

Budget 2 is groundwater water supply pumpage by communities, industrial users, and other private users, as reported by the Illinois State Water Survey (ISWS), whose effluent is discharged to the canal. This quantity is determined by summing all reported groundwater sources in the area tributary to the canal less groundwater not discharged to the canal in the form of combined sewer overflows.

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 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 75.7 cfs for WY86. 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 1.3 cfs from WY85 to WY86.

## BUDGETS 3 THROUGH BUDGET 6: STREAM GAGING STATIONS

Budgets 3 through 6 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 flow at the stream gaging sites is also part of Budget 13, 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 South Holland gage.

Table 6

Stream Gage Flow Separation

| Budget | Location | Flow cfs | Sanitary cfs | Runoff cfs |
|---|---|---|---|---|
| 3 | North Branch Chicago River at Niles, IL | 153.9 | 21.1 | 132.8 |
| 4 | Little Calumet River at IL-IN State Line | 58.1 | 3.6 | 54.5 |
| 5 | Thorn Creek at Thornton, IL | 91.7 | 17.7 | 74.0 |
| 6 | Little Calumet River at South Holland, IL | 167.2 | 19.5 | 147.7 |

BUDGETS 7 THROUGH BUDGET 12: 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 and from precipitation-based runoff simulations. The estimated sanitary flow input to the simulation model 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, with the exception of Budget 9, as the development of these models have been discussed in previous reports. The discussion of Budget 9 will go in-depth into the development of the Mainstream TARP model that was incorporated into the Lake Michigan diversion accounting program for WY86. A summary of the simulation results is presented in Table 7.

## TABLE 7

## WY 1986 SUMMARY OF SIMULATION STATISTICS

| Budget No.-> | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|
| Description | Northside WRP (1) | Upper Des Plaines Pump Station (1) | Mainstream TARP Pump Station (2) | Stickney WRP (1) | Calumet WRP (1) | Lemont WRP (1) | Chicago Canal System Balance (1) |
| Mean Recorded Flow, cfs | 451.2 | 83.1 | 110.5 | 1138.5 | 381.9 | 1.9 | 3467.8 |
| Max. Recorded Flow, cfs | 690.0 | 148.9 | 300.9 | 2277.2 | 461.0 | 3.0 | 11482.0 |
| Min. Recorded Flow, cfs | 310.8 | 36.5 | 18.3 | 719.4 | 210.4 | 1.2 | 1911.8 |
| Mean Simulated Flow, cfs | 429.0 | 70.8 | 84.5 | 1225.2 | 322.0 | 2.0 | 4115.9 |
| Max. Simulated Flow, cfs | 657.8 | 181.4 | 224.0 | 2569.7 | 660.0 | 5.4 | 10919.0 |
| Min. Simulated Flow, cfs | 312.9 | 43.0 | 42.7 | 847.1 | 211.0 | 1.3 | 1870.7 |
| Mean S/R | 0.95 | 0.85 | 0.77 | 1.08 | 0.84 | 1.05 | 1.19 |
| Max. S/R | 1.42 | 2.61 | 4.69 | 1.79 | 1.73 | 2.44 | 1.98 |
| Min. S/R | 0.63 | 0.38 | 0.29 | 0.64 | 0.58 | 0.56 | 0.57 |
| Correlation | 0.78 | 0.27 | 0.48 | 0.79 | 0.47 | 0.64 | 0.91 |

(1) Based on daily values.

(2) Based on weekly values.

## BUDGET 7: NORTHSIDE WATER RECLAMATION FACILITY

Budget 7 analyzes the water balance at the MWRDGC Northside Water Reclamation Facility (Figure 3). Overall, the balance for WY86 of the inflow to the Northside facility is very good. The simulated to recorded flow ratio (S/R) for the Northside is 0.95, indicating that the simulated inflow volume is extremely close to the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.78, indicating that the model predicted the inflow hydrograph to the Northside facility satisfactorily.

## BUDGET 8: UPPER DES PLAINES PUMP STATION

Budget 8 analyzes the water balance at Upper Des Plaines Pump Station (UDPPS) (Figure 4). The pump station budget is used to verify simulated flows. However it has no direct impact on the diversion calculation.

The balance at UDPPS for WY86 is poor. The simulated to recorded flow ratio (S/R) for the UDPPS is 0.85, indicating that the simulated inflow volume to UDPPS is close to the recorded inflow volume. However, the coefficient of correlation (R) simulated to recorded flow is 0.24, indicating the time series trends in the simulated inflow did not compare well with the time series trends of recorded inflow. The source of this discrepancy is unknown.

Based on this result and the plot of simulated and recorded inflow it appears that the recorded flow does not accurately reflect hydrologic conditions of the pump station service area. This may be due to problems with the flow measurement at the pump station. First, recorded flow data was only available for 227 days in WY86. This is attributable to meter malfunctions, problems with the recording charts, which made data reduction undoable, and various other reasons. In view of this significant quantity of missing data (38 % 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 of the simulation procedures.

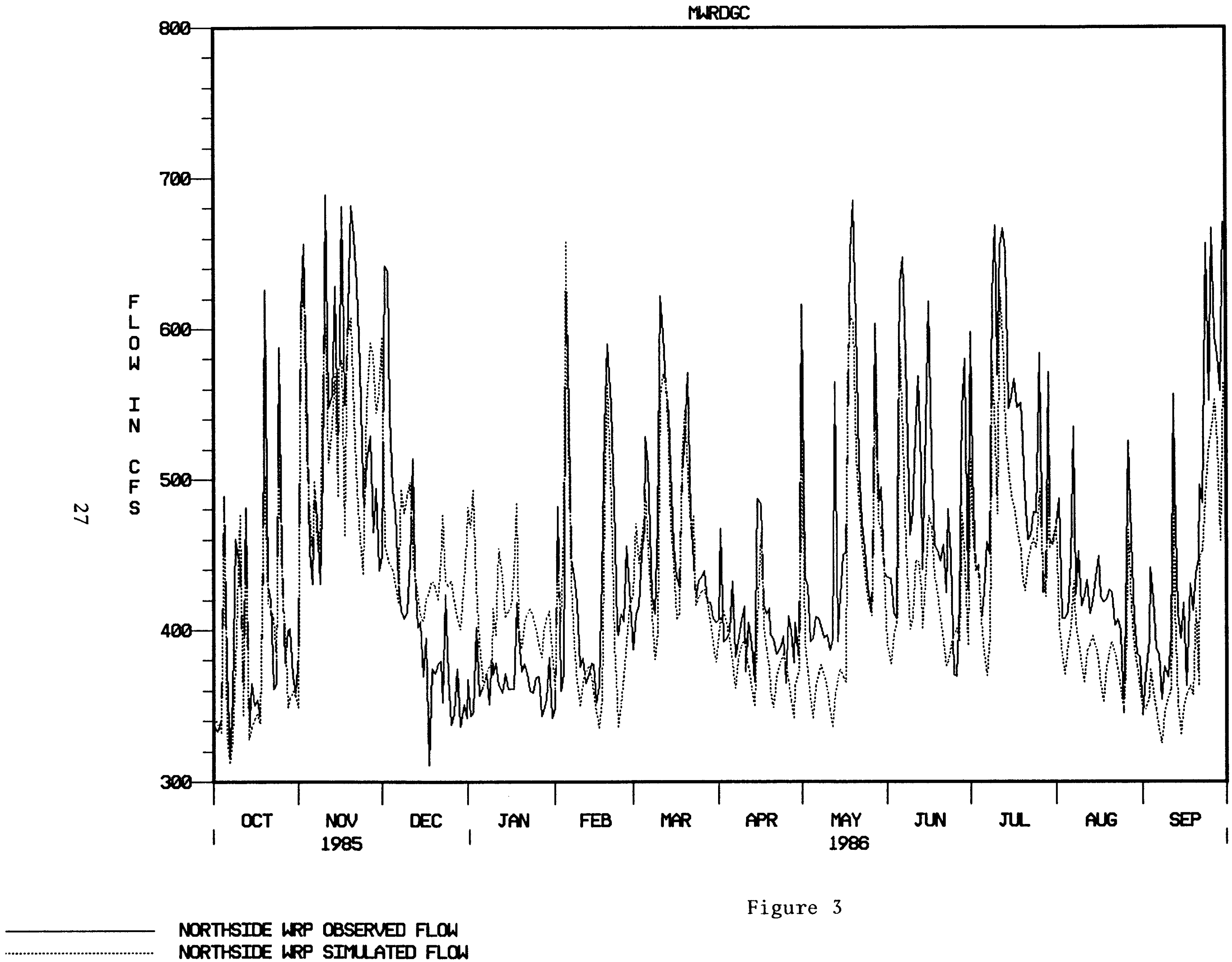



Figure 3

Budget 7 - Simulation of MWRDGC Northside Water Reclamation Facility

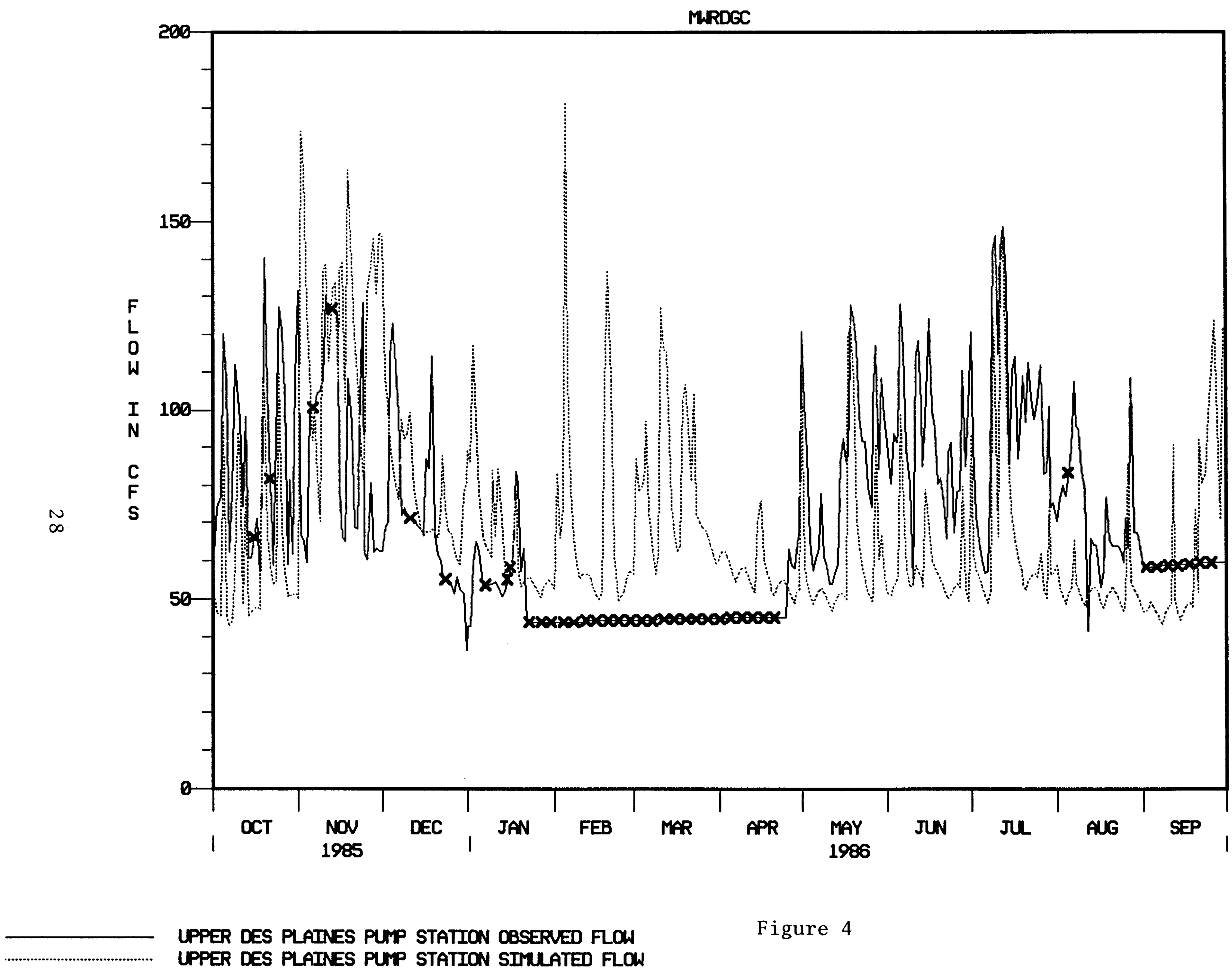



Figure 4

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

BUDGET 9: MAINSTREAM TARP

Budget 9 analyzes the water budget at the MWRDGC Mainstream TARP Pumping Station. The results of Budget 9 are used as input to Budget 10 in addition to providing a verification point for simulated flows.

The operation of the Mainstream TARP Pumping Station to Stickney was initiated in May, 1985. Removal of most of the bulkheads on the collector system was accomplished by October 1985 (Neubauer, 1990). Therefore, it was impractical to model Mainstream TARP prior to October 1985 due to the dynamics of the system as additional segments of Mainstream TARP were coming online when the bulkheads were removed.

Mainstream TARP extends from Wilmette, Illinois to McCook Illinois (Figure 5). It consists of large tunnels constructed 200 to 300 ft. below the North Shore Channel, the North and South Branches of the Chicago River, the Sanitary and Ship Canal with branches under the Chicago River and South Fork of the Chicago River. Additional branches extend west of Summit Conduit (Tunnel 13A).

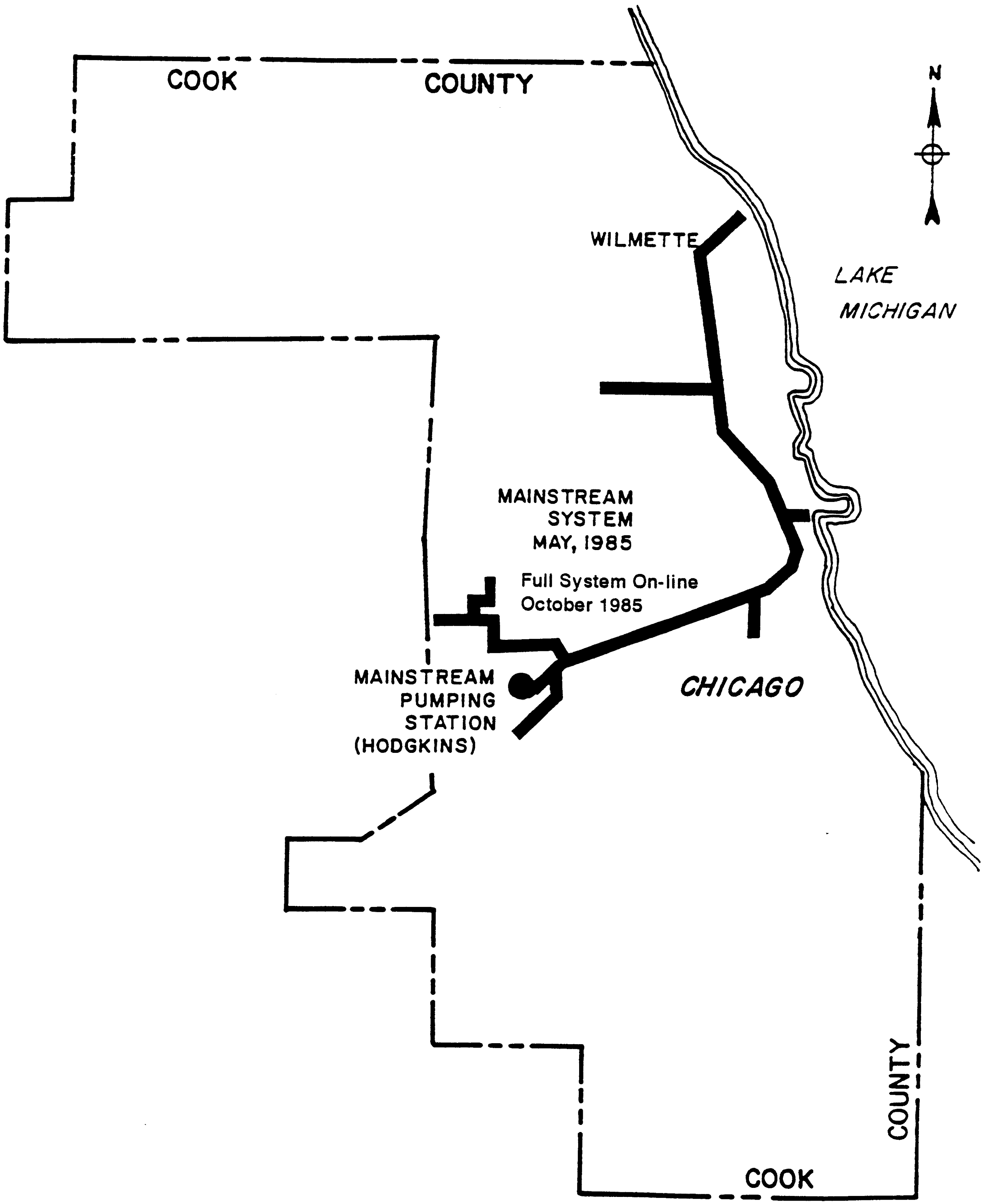
Mainstream TARP has 40.3 miles of tunnel ranging from 13 ft. to 35 ft. in diameter and has a tunnel storage volume of 3,697 acre-feet. There are 132 drop shafts ranging in size from 4 ft. to 17 ft. in diameter. The drop shafts provide for the dropping of combined sewer flow from 274 connecting structures near ground surface to the TARP tunnels.

The modeling of Mainstream TARP is performed using the TNET (Tunnel Network) dynamic hydraulic model. The development of the TNET model for Mainstream TARP was completed by Christopher B. Burke Engineering, LTD and their subcontractor, Dr. Robert L. Barkau for the Corps of Engineers (Burke, 1991). TNET simulates one-dimensional unsteady flow through a full network of open channels and conduits in both free surface and pressure flow conditions. Free surface flow is modeled using unsteady flow equations for open channel flow. In pressure flow situations, pressure flow is approximated using the concept of an infinitesimal slot (Preismann). This feature preserves the open channel nature of flow, but forces the high celerity of pressure waves.

In developing the Mainstream TARP TNET model, existing tunnel conditions were determined from the MWRDGC 1986 TARP atlas and available as-built drawing of the tunnels. Drainage areas that are tributary to Mainstream TARP were determined by Christopher B. Burke Engineering, LTD (Burke, 1991) from Input Data - CRSM - Existing Conditions - Mainstream System (Keifer, 1982) and other related documents. Operating procedures for the

Figure 5

Map of Mainstream TARP



Mainstream TARP were obtained from MWRDGC for Water Year 1986. These operating directives, for the December 10, 1985 through September 10, 1987, included guidelines for the operation of gated drop shafts, instructions for TARP pumping, and instructions for emergency conditions. Pumping capacity for both the Stickney Water Reclamation Facility and the Mainstream Pumping Station were obtained from MWRDGC as well (MWRDGC, 1990).

The operational data and pumping capacities obtained from MWRDGC were incorporated into the Mainstream TARP TNET model. Operational rules for gated drop shafts were incorporated in the form of a tunnel stage-percent drop shaft capacity rating curves referenced from index drop shafts. The curves were based on MWRDGC procedures regarding gate closures based on water surface elevation in the Mainstream TARP tunnels. A smooth curve over 4 ft. of elevation was used to prevent "slamming shut" of the gates. This unrealistic condition would cause severe wave oscillation in the tunnels and instability the numerical computations. The lower end of this curve, or the point at which gate closure begins, was derived from MWRDGC operational data.

Pumping from the Mainstream Pumping to the Stickney Water Reclamation Facility is determined based on the minimum of (1) available capacity at the Stickney Water Reclamation Facility and (2) pumping capacity at the Mainstream Pumping Station. Available capacity was determined as the difference between treatment capacity and simulated inflow from interceptor sewers.

Treatment capacity of the Stickney Water Reclamation Facility is variable. Normal pumping/secondary treatment capacity is about 2,227 cfs. Under high flow conditions, maximum pumping/ primary treatment capacity is about 2,738 cfs with flows exceeding secondary treatment capacity being bypassed to the Chicago Sanitary and Ship Canal. This is also contingent on the number of treatment batteries that are operational at any given time.

In the development of the Mainstream TARP TNET model, it is necessary to distinguish between conditions that would require only normal treatment capacity and those requiring maximum capacity. It was assumed that conditions requiring maximum treatment capacity would only occur in extreme hydrologic events. Therefore, an extreme hydrologic event was defined as occurring when the total combined sewer overflows into the Mainstream TARP system exceed 5,000 cfs. This became the change point between normal and maximum treatment capacities. When the composite combined sewer overflow routed to Mainstream TARP exceeds 5,000 cfs, then maximum treatment capacity conditions are applied.

Another factor in the development of the Mainstream TARP TNET model is the simulation of dry weather flow. Dry weather flow can consist of groundwater seepage and/or discharge from sewered areas that directly connect to Mainstream TARP. Through written and telephonic correspondence with MWRDGC, it was determined that flow to Mainstream TARP is derived strictly from interceptor relief points that are not open during dry weather (Sobanski, 1991). Also, MWRDGC reports that leakage into the sewer/TARP system for the Stickney Water Reclamation Facility is estimated to be between 0.75 and 1.0 MGD (1.2 to 1.5 cfs), which is an insignificant volume when compared with pumpage volume at the Mainstream Pumping Station for WY86. Therefore it was assumed that dry weather flow consisted entirely of groundwater seepage.

Design seepage in the tunnel is 0.05 million gallons per day per mile. Mainstream TARP has 40.3 miles of tunnel, giving a total design seepage of approximately 3.1 cfs. The Mainstream TARP TNET model was tested using a uniform distribution of flow within each reach of the tunnel network that resulted in the design groundwater seepage rate of 3.1 cfs. It was observed that the total simulated volume was significantly less than the recorded Mainstream Pumping Station discharge volume.

In MWRDGC correspondence dated 27 December 1990, MWRDGC reports that during dry weather conditions, dewatering Mainstream TARP requires approximately 100 million gallons of pumpage every three days. This translates into an average uniform inflow of approximately 51 cfs. The Mainstream TARP TNET model was tested using a uniform distribution of flow within each reach of the tunnel network that resulted in a groundwater seepage rate of 51.4 cfs. This resulted in a significant improvement of the water balance in the Mainstream TARP water balance.

Although effort was made to incorporate Mainstream TARP operating procedures into the TNET model, it was not feasible to incorporate all features of the operating procedures. First, operating procedures are divided into four categories, dry weather, "typical" precipitation event, "extreme" precipitation, and emergency operations. Dry weather operations tend to focus operating Mainstream TARP in the most economical fashion. Therefore, dry weather groundwater flows are allowed to accumulate, and are then pumped at night once there has been sufficient accumulation. Per MWRDGC correspondence, dry weather flows are normally pumped every three days and are pumped at night when costs for electrical service are reduced and normally requires the use of a high head pump for 10 hrs.

The Mainstream TNET model was developed to simulate MWRDGC procedures for pumping of dry weather flows. However, there are two major short comings of the model in simulating pumpage of dry weather flows. First the model cannot determine the optimum pumping time, therefore pumping can be initiated at any time if pumping is needed as indicated at the pump sense point. The pump sense point activates/deactivates the pumping algorithm of the model based on water surface elevation in the tunnel. Second, the TNET model cannot simulate the designated operation of a high head pump, but rather simulates based on available pumping capacity. Nevertheless, the TNET model did simulate dry weather operations of Mainstream TARP reasonable well. Based on a random sample of dry weather events, the average periodicity of pumping was 2.88 days, the average pumpage volume was 81.08 MGAL, and the average pumping time was 6 hrs.

A second limitation of the Mainstream TARP TNET model is the inability to "forecast" precipitation events. MWRDGC operational procedures call for the dewatering of the tunnel system of accumulated dry weather flow prior to a precipitation event to maximize storage of combined sewer overflows. The incorporation of a pseudo-forecast routine into the model would be helpful. However, the development of a pseudo-forecast algorithm into the model is logically complex and would require considerable effort and was therefore considered to be unfeasible at this time.

A third limitation of the Mainstream TARP model is the ability to change gated drop shaft operating procedures given the severity of the forecasted precipitation event. This again is attributable to the inability of the Mainstream TARP TNET model to "forecast" precipitation events. Therefore, gated drop shaft operating procedures for both "typical" and "extreme" precipitation events were evaluated to determine similarities in the procedures and to reduce the operating procedures to a single set of gate operating curves that would best encompass both conditions.

A fourth limitation is the limited number of sense points in the model, and the inability of the model to simulate gate closure based on an average water surface elevation within a tunnel reach. Incorporating a procedure based on improved sense point modeling would be more reflective of MWRDGC operating procedures and would provide for a better simulation.

In analyzing the balance at the Mainstream Pumping Station, weekly flows were used instead of daily flows. Days with no pumpage occur frequently. Therefore, it is not possible to compute a S/R ratio for these days.

The balance for WY86 of the inflow to the Mainstream Pumping Station is fair. The simulated to recorded flow ratio (S/R) for the Mainstream Pumping Station is 0.77, indicating that the simulated inflow volume is less than the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.48. This seems to indicate that the model does not satisfactorily predict the inflow hydrograph to the Mainstream Pumping Station.

Visually analyzing the plot of the simulated versus recorded flow at the pump station (Figure 6), it appears that the model responds similarly to recorded pumpage record. However, the model tends to have lower peak flows and a shorter duration hydrograph. Both of these factors result in the simulated pumpage volume being less than the recorded pumpage volume.

In summary, it appears that the simulation of the Mainstream TARP system is reasonable. However, there is concern regarding the consistent underestimation of pumpage volume and the difference in simulated pumpage 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). Further coordination with MWRDGC established that this is a frequent occurrence. This may account for the simulation of a pumpage volume that is less than the recorded pumpage volume. Records concerning the dates and pumpages back to TARP were not maintained for WY86. 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, that may improve the simulation, to prevent double accounting of flows. This will be investigated further in the future to assess the affects of return flow to TARP on the Mainstream TARP TNET simulation results.

BUDGET 10: STICKNEY WATER RECLAMATION FACILITY

Budget 10 analyzes the water balance at the MWRDGC Stickney Water Reclamation Facility (Figure 7). This budget has undergone significant revision to include the modeling of Mainstream TARP (Budget 9). Simulated Mainstream TARP pumpages from Budget 9 were combined with simulated interceptor inflow to Stickney Water Reclamation Facility to derive the total simulated inflow to the Stickney Facility. Total simulated inflow was compared with recorded inflow to assess the accuracy of the simulation.

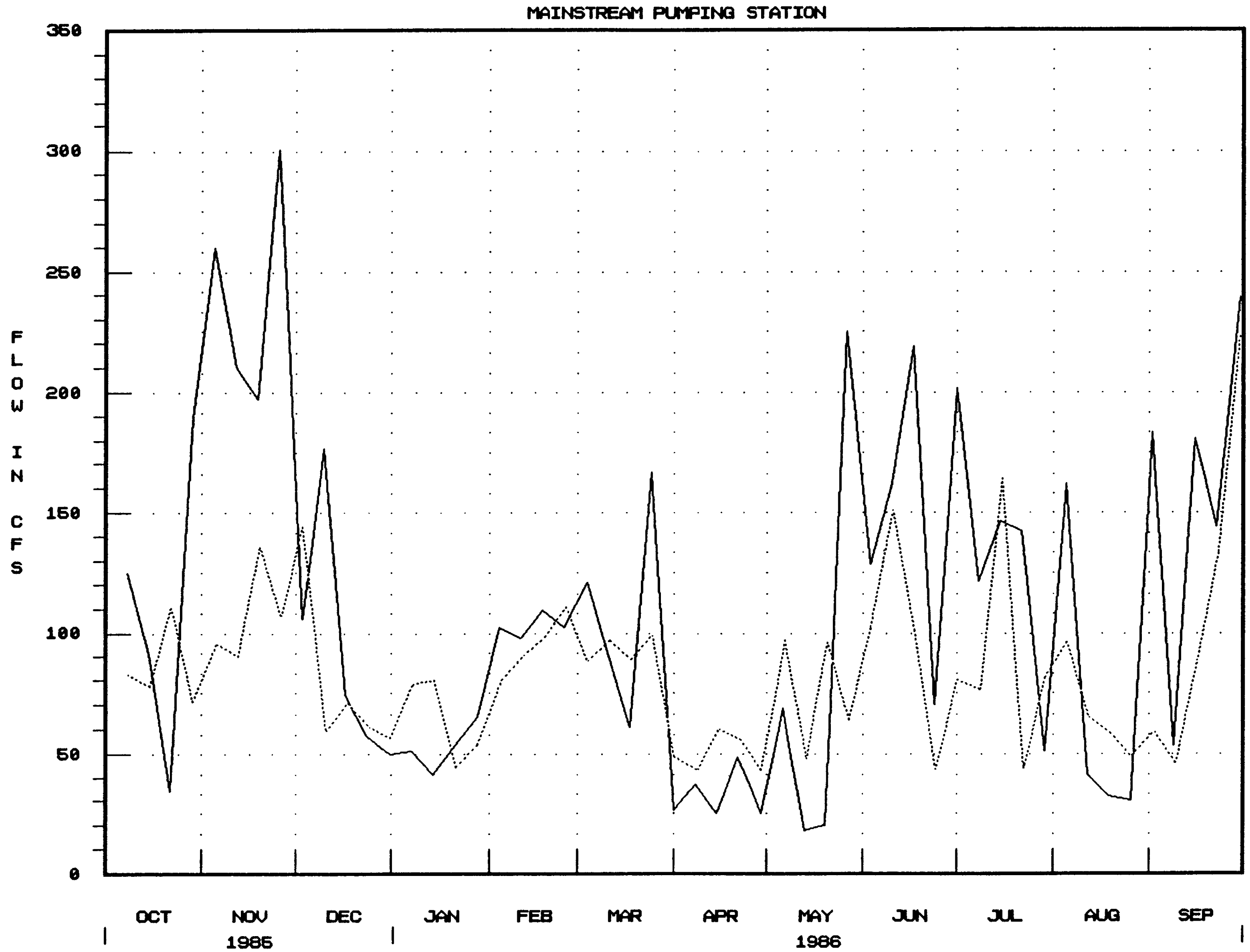



Figure 6

Budget 9 - Simulation of the MWRDGC Mainstream Pumping Station

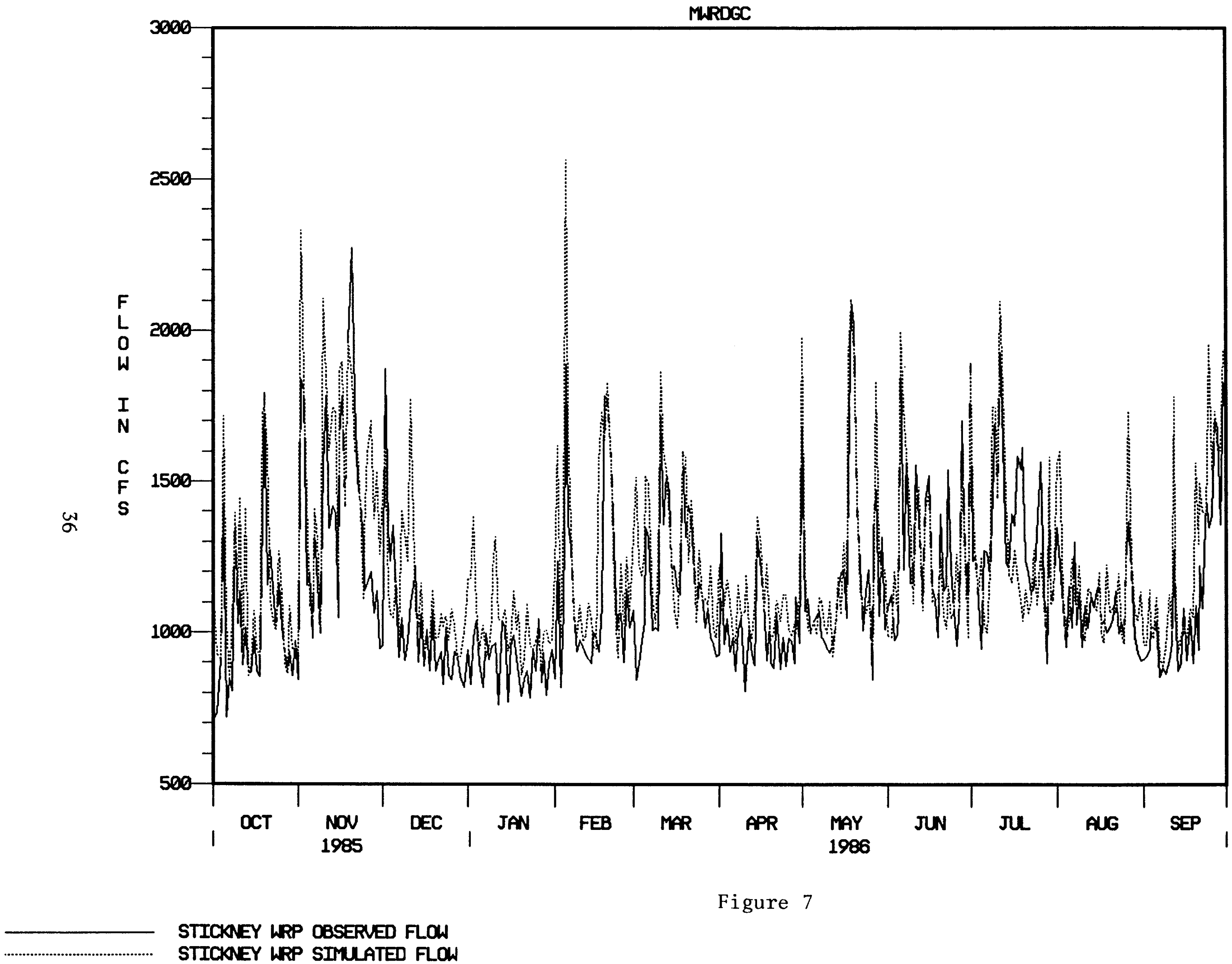



Figure 7

Budget 10 - Simulation of the MWRDGC Stickney Water Reclamation Facility

Overall, the balance for WY86 of the inflow to the Stickney facility is exceptionally good. The simulated to recorded flow ratio (S/R) for the Stickney is 1.08, indicating that the simulated inflow volume is slightly higher to the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.79, indicating that the model predicted the inflow hydrograph to the Stickney facility exceptionally well.

## BUDGET 11: CALUMET WATER RECLAMATION FACILITY

Budget 11 analyzes the water balance at the MWRDGC Calumet Water Reclamation Facility (Figure 8). The annual simulated to recorded flow ratio for Calumet Water (S/R=0.84) is fair, but the daily S/R shows a high degree of variability (Range, S/R=0.58 to 1.73). The coefficient of correlation of simulated inflow to recorded inflow (R) is 0.47. Both the high variability in S/R and the poor correlation seem to indicate that the simulation does not provide a satisfactory representation of the hydrology and/or hydraulics of the Calumet service basin.

The hydraulic response to storm events at the Calumet facility was compared to that of the Northside and the Stickney facilities. Base flow at Calumet is about 320 to 360 cfs while peak storm flows in response to inflow-infiltration are on the order of 420 to 460 cfs. At Northside and Stickney, peak flows can be twice as high or greater relative to base flow. Therefore, it appears that the model is simulating proper hydraulic response, but the treatment facility cannot accommodate the storm inflow. This will be investigated at a later date.

## BUDGET 12: LEMONT WATER RECLAMATION FACILITY

Budget 12 analyzes the water balance at the MWRDGC Lemont Water Reclamation Facility (Figure 9). Overall, the balance for WY86 of the inflow to the Lemont facility is good. The simulated to recorded flow ratio (S/R) for the Lemont is 1.05, indicating that the simulated inflow volume was extremely close to the recorded inflow volume. The coefficient of correlation (R) of simulated to recorded flow is 0.64, indicating that the model predicted the inflow hydrograph to the Lemont facility reasonably well.

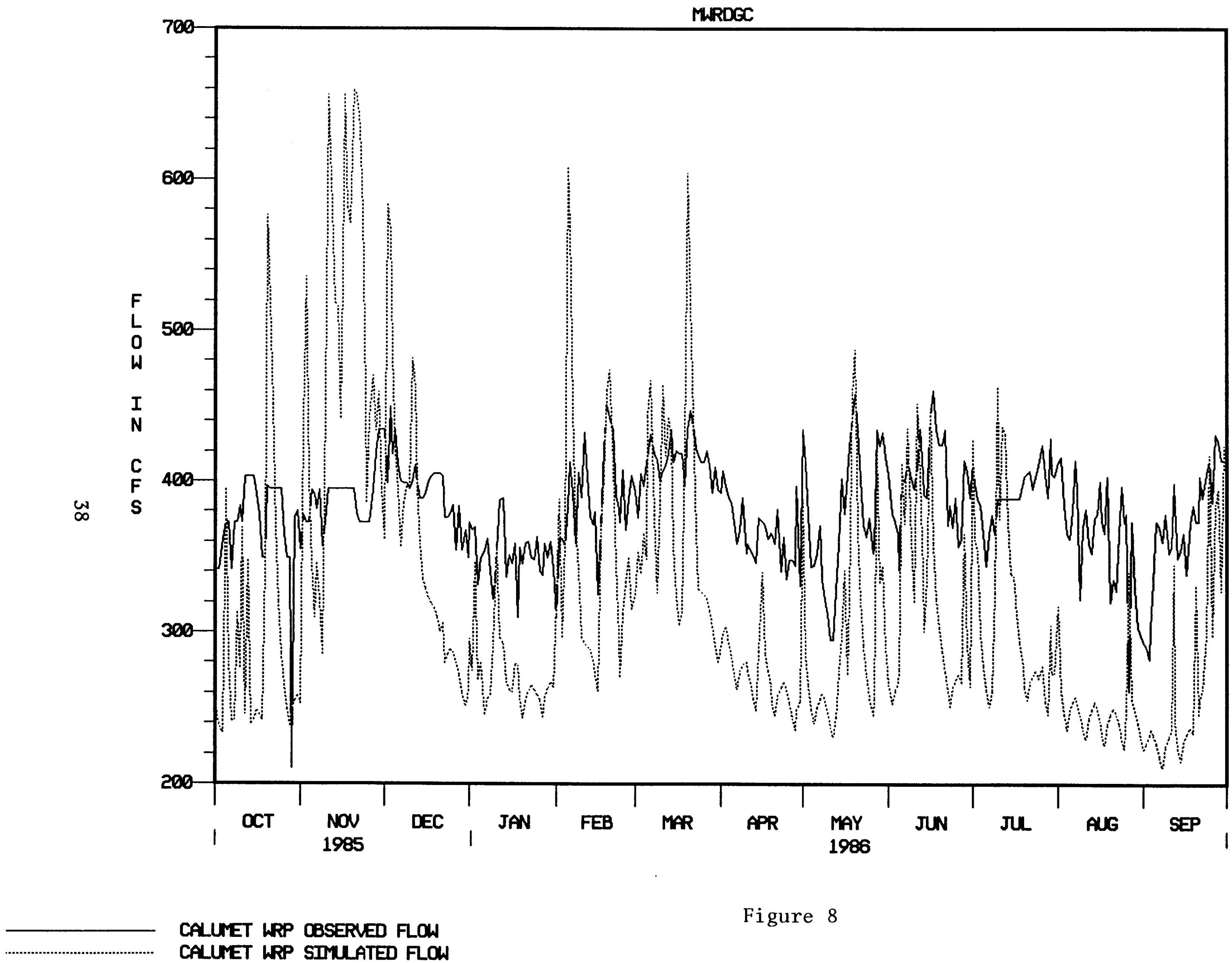



Figure 8

Budget 11 - Simulation of the MWRDGC Calumet Water Reclamation Facility

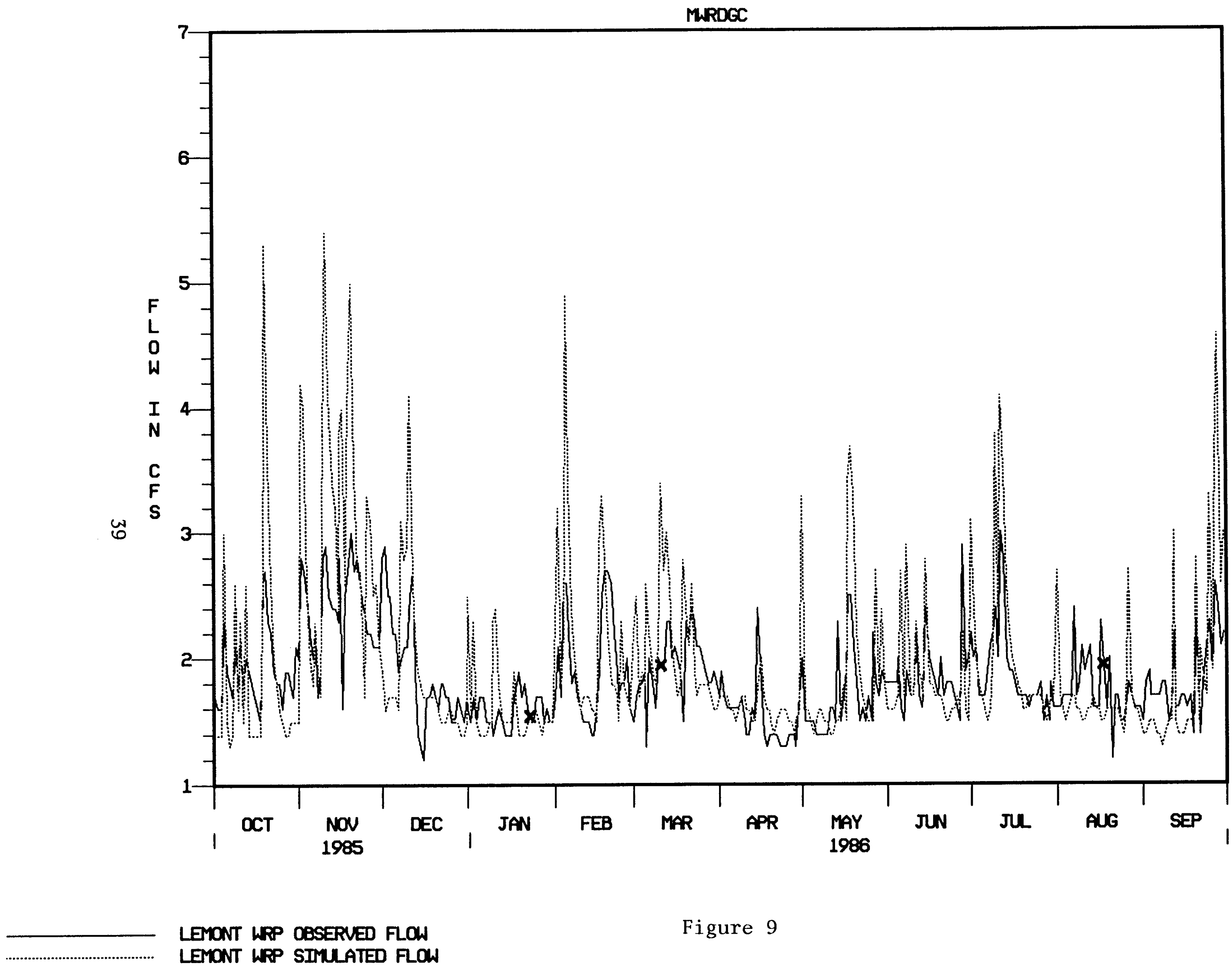



Figure 9

Budget 12 - Simulation of the MWRDGC Lemont Water Reclamation Facility

BUDGET 13: CHICAGO CANAL SYSTEM BALANCE

Budget 13 compares the inflows and outflows to the canal system (Figure 10). 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 at Lockport, backflows through the lakefront structures, and withdrawals upstream of Lockport by Argonne National labs. The individual components are presented in Table 8 for WY86.

Overall, the balance for WY86 of the inflow to the canal system to the outflows from the canal system is marginal. The S/R (outflow/inflow) for the canal system is 1.19, indicating that the inflow to the canal system is considerably less than the outflow from the canal system. The coefficient of correlation (R) of inflow to outflow is 0.91, indicating that the time series trends of inflow to outflow are well correlated. Therefore, 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.

In this balance the measured/simulated inflows are 648.1 cfs (15.7%) less than the measured/simulated outflows. In the Lake Michigan Diversion Accounting 1989 Report (USACE, 1990), it was reported that the Chicago Harbor wall was in poor condition and was not repaired until WY87. Therefore, some of the discrepancy in this budget may be due to this. Data necessary to perform this analysis is not available.

Other possible sources of the canal flow imbalance may include underreporting of the lakefront flows through the sluice gates and locks and 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 (USACE, 1990) showed that, given the accuracy limits of the Price AA current meter, lakefront flows are underreported, but the magnitude of underreporting could not be determined. Unaccounted flows could include unreported discharges to the canal.

TABLE 8

BREAKDOWN OF FLOW COMPONENTS IN BUDGET 13 FOR WY 1986

| INFLOWS (cfs) | |
|---|---|
| Lake Controlling Structures (measured) | |
| - Wilmette Controlling Works | 41.0 |
| - Chicago River Controlling Works | 291.7 |
| - O'Brien Lock and Dam | 333.0 |
| Streamflows (measured) | |
| - North Branch Chicago River at Niles | 153.9 |
| - Little Calumet River at South Holland | 167.2 |
| Streamflow (estimated) | |
| - Grand Calumet River at Holman Ave. | 166.9 |
| MWRDGC Water Reclamation Facilities | |
| - Northside | 451.2 |
| - Stickney | 1138.5 |
| - Calumet | 381.9 |
| - Lemont | 1.9 |
| Other Point Sources (measured) | 6.4 |
| Summit Conduit (simulated) | 11.5 |
| Combined Sewer Overflows | 199.0 |
| Direct Runoff to CSSC (simulated) | 123.7 |
| TOTAL INFLOWS (cfs) | 3467.8 |

| OUTFLOWS (cfs) | |
|---|---|
| Cal-Sag Flow Transferred to Calumet WRP as Steel Mill Blow-down | 2.4 |
| Lake Front Backflows | 0.0 |
| Argonne Laboratory | 0.4 |
| USGS AVM Record | 4113.1 |
| TOTAL OUTFLOWS (cfs) | 4115.9 |

| | |
|---|---|
| DIFFERENCE (cfs) | -648.1 |

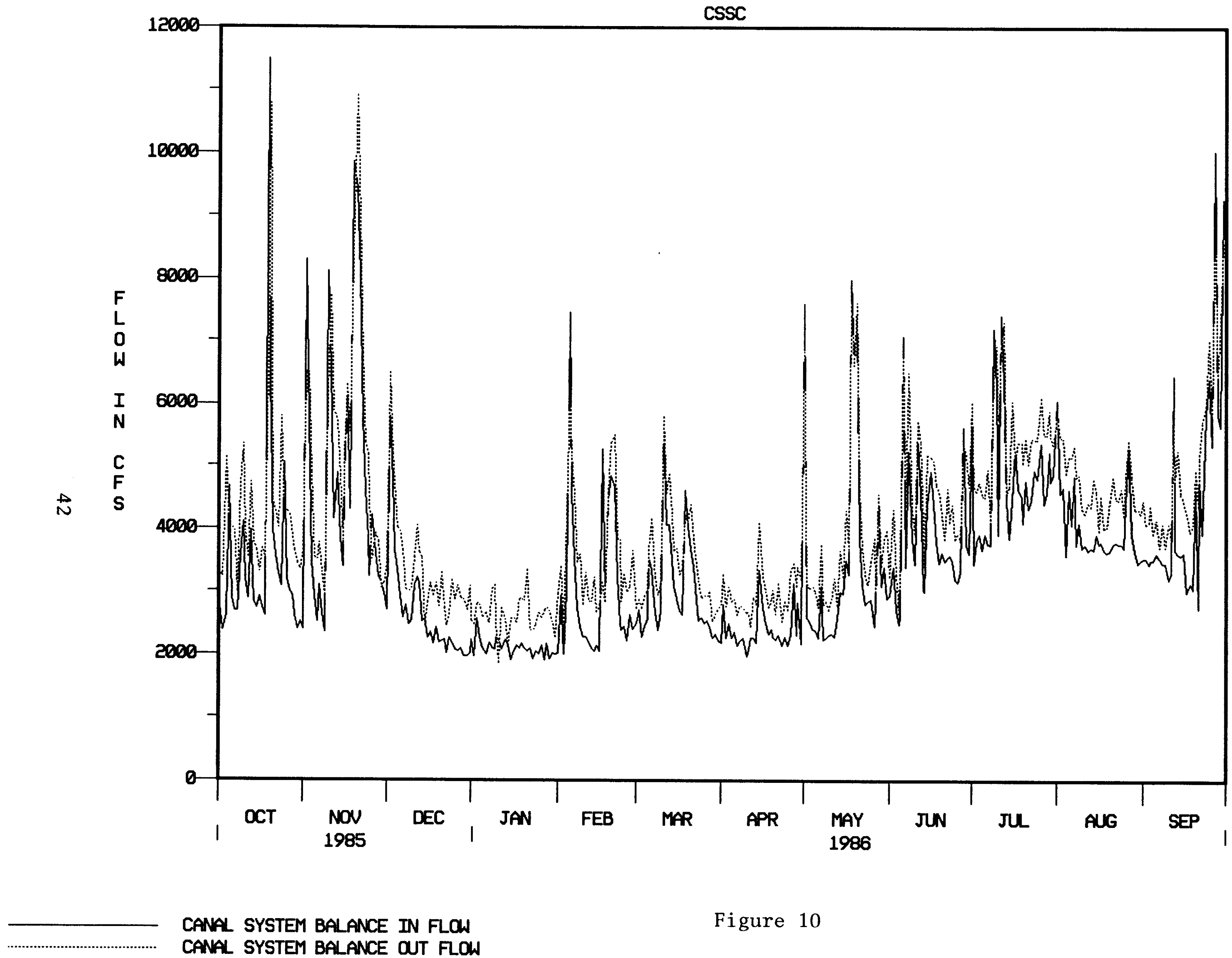



Figure 10

Budget 13 - Canal System Balance

## AREAS FOR IMPROVEMENT IN THE DIVERSION ACCOUNTING PROCEDURES

As a result of reviewing and calculating the WY86 diversion accounting, and referencing the results of the WY84 and WY85 diversion accounting, a number of areas of potential improvement have become evident. The following paragraphs discuss those areas where improvement is needed.

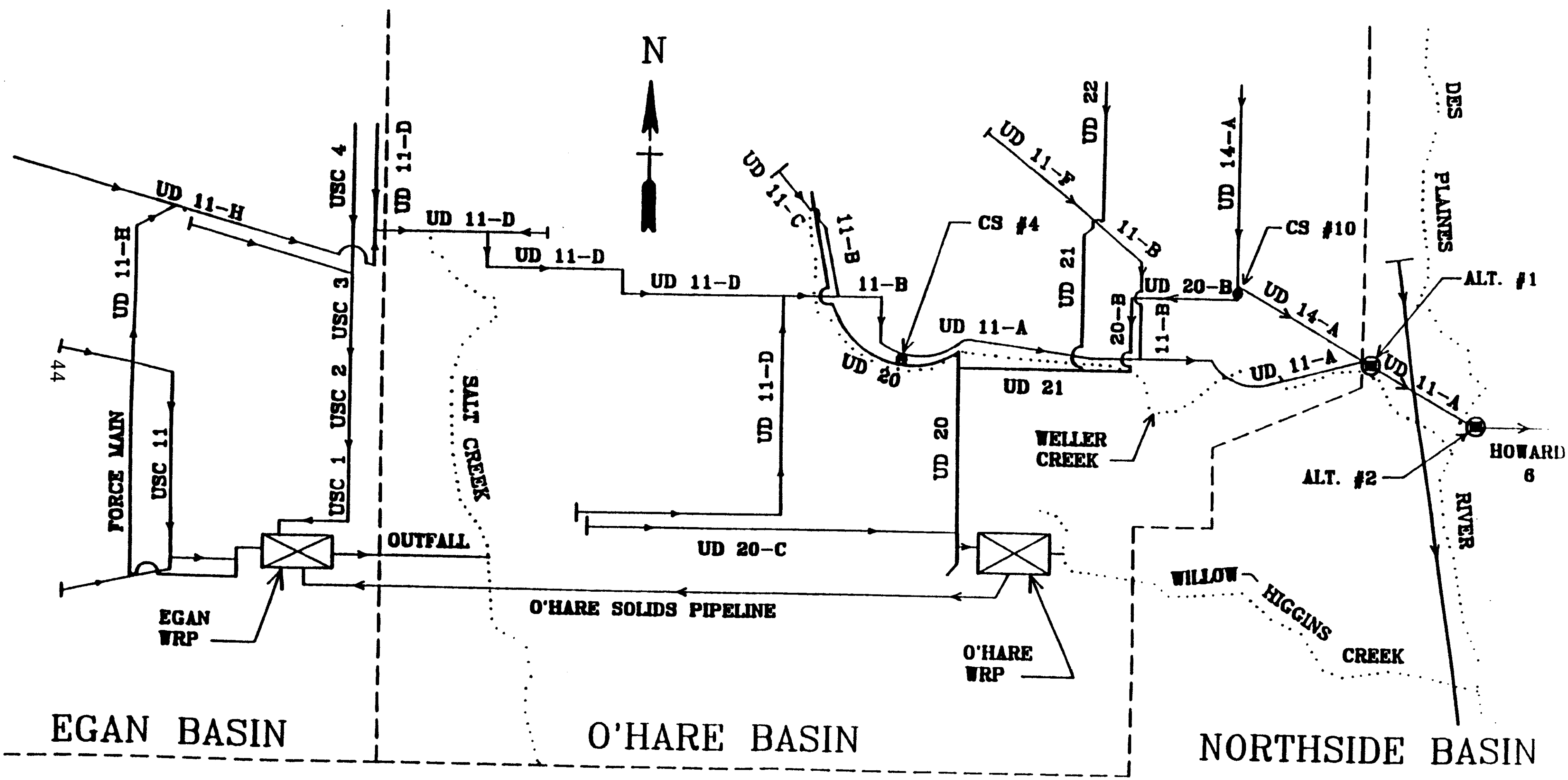
## O'HARE AND EGAN BASIN TRANSFER

Prior to 1950, the communities in the O'Hare and Egan Water Reclamation Facilities service basins utilized their own small capacity sewage treatment facilities. During the 1950s, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) constructed the Upper Des Plaines (UD) interceptors UD 11-A, UD 11-B, UD 11-C, and UD 11-D (Figure 11). These interceptors allowed sewage from the O'Hare and Egan basins to be conveyed east to the Northside Water Reclamation Facility. This resulted in the closing of the smaller community owned treatment plants.

The Egan Water Reclamation Facility began operating in 1975. The O'Hare Water Reclamation Facility and the O'Hare Tunnel and Reservoir Plan (TARP), Phase I, were placed in partial operation in 1980. Upon bringing these two facilities on-line, it was originally intended to bulkhead off the UD 11 interceptors so that all flows originating in the Egan and O'Hare basins would be treated by those facilities. This was never implemented for two reasons. The first reason was to transfer sludge to the Northside facility. Because of the inability of the O'Hare facility to handle sludge and due to sludge handling limitations at the Egan facility, sludge is often pumped to the Northside Water Reclamation Facility. The second reason for not installing bulkheads in the UD 11 interceptors was for ease of operation. Because of the watercourse that the Northside facility discharges to, Northside has lower treatment standards than those at the O'Hare facility. Additionally, it is economical to transfer flows to Northside because flows to O'Hare must be pumped out of a TARP tunnel while conveyance to Northside is accomplished by gravity.

The importance of the O'Hare-Egan basin transfer to diversion accounting is that the transfer contains two components that are deductions to the flow measured in the CSSC. These components are groundwater pumpage contained in the sanitary portion of the transfer, and diverted Des Plaines River watershed runoff.

Figure 11
O'Hare and Egan Basin Transfer Schematic




MWRD INTERCEPTOR
MWRD TARP TUNNEL
APPROXIMATE SERVICE BASIN BOUNDARY
APPROXIMATE STREAM/RIVER COURSE
● CS #4 MWRD CONTROL STRUCTURE
RECOMMENDED MARSH MCBIRNEY METER LOCATION

NOTES:
- DRAWING IS NOT TO SCALE.
- BASIN BOUNDARIES, STREAM/RIVER COURSES, AND SEWER NETWORKS MAY BE SIMPLIFIED IN SOME AREAS.

The water supply in the diverted area was entirely from groundwater sources during WY84. Therefore, the total basin transfer was a deduction from the Romeoville record for that year. The extent of the O'Hare service area being diverted is not known and the diverted flow is not measured. Thus an estimate of the annual basin transfer was provided by MWRDGC. At the current time, the amount of the transfer is only estimated.

In WY85, a portion of the diverted service area converted from groundwater supply sources to Lake Michigan water, thus, the full basin transfer was no longer a deduction. A determination of the deduction required not only an estimate of the amount transferred but also an estimate of the sanitary effluent portion of the transfer. It also required an estimate of the Lake Michigan water portion of the effluent.

In WY86, more of the diverted service area converted from groundwater supply sources to Lake Michigan water. Again, the computational procedures previously developed were used. Although they are an approximation, they are the best and only technique available at this time.

For future accounting, simply measuring the basin transfer will not provide any information on the component makeup of the transfer. Thus, a review of the complex hydraulics and hydrology is necessary to determine the best procedure for estimating these flows. Several alternatives, including flow measurement and modeling are under consideration at this time.

## GRAND CALUMET RIVER

The flow in the Grand Calumet River drains both to the Lake Michigan via Indiana Harbor and to the Calumet Sag Channel. When lake levels are high a larger portion of the flow drains to the Calumet Sag Channel. The Grand Calumet River flow calculation is based on a regression equation relating Lake Michigan stages and measured flows in Hart Ditch to the Grand Calumet River flow. A number of current meter measurements were made on the Grand Calumet by MWRDGC and other agencies. NIPC used these current meter observations to develop this regression equation. Review of the regression equations showed that it did not accurately determine flow when compared with the latest available flow measurements. Further review of the regression data showed that the data displayed a time dependent component, violating the assumptions of linear regression analysis.

The majority of the flow in the Grand Calumet River, draining to Illinois, is water supply effluent. The level of Lake Michigan influences the portion of the effluent that drains to Illinois and the portion that drains back to the lake. The water supply deduction is equal to the total water supply pumpage discharged to the river if the pumpage rate is less than the calculated river flow. The deduction is equal to the river flow if the pumpage rate is greater than the river flow.

This procedure is the only method currently available to calculate the Indiana deduction. A stream gage is being installed in the West Branch of the Grand Calumet River to measure flow into Illinois. This should increase the accuracy of this computation significantly. This stream gage will be operational in WY92. The same computational procedure for separating stream flow into sanitary and runoff will be used with the Grand Calumet stream gage record.

## MWRDGC CALUMET WATER RECLAMATION FACILITY

The MWRDGC Calumet Water Reclamation Facility balance was discussed in a previous section where it was noted that although the annual S/R ratio was reasonable, the simulated inflows exhibited poor correlation to the recorded inflows. While the simulated inflow fluctuations at the Calumet plant are similar to those at the other MWRDGC facilities, the recorded Calumet flow fluctuations are much less than at the others. The problem may be related to flow measurement at the plant. Personnel at MWRDGC need to be consulted on this issue to determine the source of the problem. In addition, a portion of the Calumet WRP service area in the vicinity of the Calumet River needs to be investigated to correct errors regarding the presence of combined versus separate sewers.

## MWRDGC UPPER DES PLAINES PUMP STATION

A review of the Upper Des Plaines pump station and its flow record indicates that the flow at the pump station is suspect and subject to operator error. Better flow measurement is needed at the pump station. With better flow measurement, this will become the most important balances for calibrating and verifying the simulation models of the Des Plaines watershed. In the diversion calculation, the primary use of the models is to calculate the deduction for runoff from the Des Plaines watershed discharged to the canal. All of the runoff draining to the pump station is from the Des Plaines watershed, is deductible, and is from somewhat similar land cover as the remaining deductible Des

Plaines watershed. Thus, the characteristics of the Upper Des Plaines watershed may be the gaged area that is the most representative of the total deductible Des Plaines watershed. Installation of better flow measurement equipment at the pump station is being investigated.

## CANAL SYSTEM BALANCE

As discussed previously, the canal system balance indicated that the total inflows were 15.7% less than the outflows. A portion of the imbalance may be the result of overtopping and leakage through the Chicago Harbor wall. The wall was repaired at the beginning of WY87 and the diversion accounting for that time should provide valuable insight on the magnitude of the overtopping and leakage. Flow meter measurements at the lakefront direct diversion points were done to assess if leakage is still significant. This study (USACE, 1990) showed that, given the accuracy limits of the Price AA current meter in extremely low velocity profiles, the lakefront flows are underreported. However, sound conclusions cannot be drawn regarding the magnitude of the underreporting.

In addition to the problems previously noted, there may be unreported discharges to the CSSC and adjoining waterways that affect the canal system balance. Reconnaissance missions should be made to determine if there are any unreported discharges that are being made directly to the canal system.

## PRECIPITATION DATA

The runoff simulation models used to accomplish the diversion accounting are driven by precipitation and other meteorologic data. In performing the WY83 diversion accounting, NIPC discovered problems with the precipitation data related to shielding of the rain gages by buildings and other obstructions. To address this problem, the Illinois State Water Survey (ISWS) was contracted to assess the problem and adjust the precipitation data. The ISWS has also adjusted the WY84 though WY89 data used for Lake Michigan diversion accounting. To resolve the problem, a precipitation gage network of 25 gages was installed by the ISWS under contract with the Corps. However, no data will be available from the network until WY90. Prior to WY90, the precipitation data will be adjusted as in the past.

TUNNEL AND RESERVOIR PLAN

The model developed for the Mainstream Pumping Station for WY86 performed acceptably for WY86, but there are several areas in which the model can be improved. First, modeling of dry weather flow can be improved to more accurately simulate MWRDGC operational procedures. Second, the incorporation of a pseudo-forecasting algorithm would allow the model to simulate MWRDGC dewatering procedures prior to a storm. Third, dynamic constituent (I-I versus sanitary versus groundwater) tracking can be incorporated to allow more accurate determination of the deductible components of TARP flow. Fourth, the inclusion of an algorithm to operate gaged dropshafts based on average water surface elevation in a tunnel reach would provide better simulation of gage operations.

SUMMARY

In compliance with the modified 1980 U.S. modified U.S. Supreme Court decree, the WY86 diversion was computed using the best engineering technology available to date as applied to the diverted watersheds. In the development of WY86 Lake Michigan diversion accounting, a new model, TNET, was incorporated into the computations to model the hydrologic condition of the diverted area that is affected by Mainstream TARP.

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 exceptional well. These two budgets combined compute the majority of the deductible Des Plaines River watershed runoff. Both of these budgets have simulated to recorded ratios between 0.90 and 1.10 and correlations greater than 0.75. 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 budgets are outstanding. Other simulation budgets have performed reasonably well, but there is room for improvement. Areas of improvement previously outlined will be considered in order to improve the accuracy of the diversion computation.

The WY86 diversion, rounded to the nearest cfs, accountable to the State of Illinois is 3,751 cfs. This is 551 cfs greater than the 3,200 cfs average specified by the Decree. The 40 year running average beginning with WY81 is 3,410 cfs and the cumulative deviation from the 3,200 cfs average is -1,261 cfs-years. The negative cumulative deviation indicates a water allocation debt and the maximum allowable debt is 2,000 cfs-years.

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Lake Michigan Diversion Accounting

Water Year 1986 Report

# Appendix A

## Summary of Daily Diversion Flows

COLUMN COMPUTATIONS

1. COLUMN 3 EQUALS THE SUM OF COLUMN 1 AND COLUMN 2.
2. COLUMN 8 EQUALS THE SUM OF COLUMNS 4 THROUGH COLUMN 7.
3. COLUMN 10 EQUALS COLUMN 3 LESS COLUMN 8 WITH THE ADDITION OF COLUMN 9.

NOTES

1. ALL VALUES ARE ROUNDED TO THE NEAREST TENTH.
2. MATHEMATICAL COMPUTATIONS BETWEEN COLUMNS UTILIZE UNROUNDED VALUES.
3. AVERAGE VALUES FOR WY87 WERE COMPUTED USING DAILY VALUES.

LEGEND

DEDUCTIONS FROM THE ROMEOVILLE GAGE RECORD

ADDITIONS TO THE ROMEOVILLE GAGE RECORD

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-85 | 3330 | 0.3 | 3330.2 | 175.7 | 74.5 | 50.4 | 1.6 | 302.2 | 28.0 | 3056.0 | 1613.8 | 164.9 | 1181.8 |
| 02-Oct-85 | 3231 | 0.8 | 3231.8 | 75.7 | 74.5 | 24.4 | 1.6 | 176.2 | 28.7 | 3084.3 | 1610.2 | 48.9 | 787.6 |
| 03-Oct-85 | 5133 | 0.2 | 5133.2 | 75.7 | 74.5 | 24.0 | 1.6 | 175.9 | 31.3 | 4988.7 | 1615.6 | 65.6 | 809.2 |
| 04-Oct-85 | 4020 | 0.4 | 4020.4 | 154.9 | 74.5 | 382.1 | 1.6 | 613.2 | 36.5 | 3443.6 | 1586.2 | 1988.0 | 568.7 |
| 05-Oct-85 | 4031 | 0.2 | 4031.2 | 164.8 | 74.5 | 78.9 | 1.6 | 319.9 | 25.2 | 3736.5 | 1543.6 | 460.2 | 893.4 |
| 06-Oct-85 | 3982 | 0.2 | 3982.2 | 75.7 | 74.5 | 49.3 | 1.6 | 201.2 | 25.9 | 3806.9 | 1510.0 | 183.7 | 876.5 |
| 07-Oct-85 | 2988 | 0.5 | 2988.5 | 163.2 | 74.5 | 43.5 | 1.6 | 282.9 | 28.3 | 2734.0 | 1587.4 | 175.0 | 882.0 |
| 08-Oct-85 | 4715 | 0.3 | 4715.3 | 142.2 | 74.5 | 198.6 | 1.6 | 416.9 | 31.4 | 4329.8 | 1595.6 | 651.1 | 943.0 |
| 09-Oct-85 | 5371 | 0.4 | 5371.4 | 128.8 | 74.5 | 136.0 | 1.6 | 341.0 | 30.8 | 5061.2 | 1581.5 | 495.6 | 1795.3 |
| 10-Oct-85 | 3977 | 0.3 | 3977.3 | 190.0 | 74.5 | 196.4 | 1.6 | 462.6 | 30.4 | 3545.1 | 1580.1 | 891.5 | 706.5 |
| 11-Oct-85 | 3570 | 0.8 | 3570.8 | 75.7 | 74.5 | 57.7 | 1.6 | 209.6 | 28.1 | 3389.3 | 1568.0 | 240.4 | 893.8 |
| 12-Oct-85 | 4767 | 0.1 | 4767.1 | 176.6 | 74.5 | 208.8 | 1.6 | 461.6 | 25.4 | 4330.9 | 1530.5 | 897.5 | 1466.1 |
| 13-Oct-85 | 3806 | 0.3 | 3806.3 | 75.7 | 74.5 | 62.1 | 1.6 | 214.0 | 27.5 | 3619.8 | 1523.2 | 231.8 | 886.3 |
| 14-Oct-85 | 3667 | 0.4 | 3667.4 | 75.7 | 74.5 | 47.0 | 1.6 | 198.8 | 27.6 | 3496.1 | 1592.1 | 197.2 | 788.5 |
| 15-Oct-85 | 3296 | 0.3 | 3296.3 | 170.6 | 74.5 | 46.7 | 1.6 | 293.4 | 28.1 | 3031.0 | 1591.1 | 214.2 | 884.3 |
| 16-Oct-85 | 3714 | 0.4 | 3714.4 | 75.7 | 74.5 | 36.1 | 1.6 | 188.0 | 27.9 | 3554.3 | 1596.9 | 128.3 | 881.5 |
| 17-Oct-85 | 3561 | 0.3 | 3561.2 | 75.7 | 74.5 | 34.1 | 1.6 | 185.9 | 27.3 | 3402.6 | 1588.2 | 117.3 | 830.5 |
| 18-Oct-85 | 6586 | 0.3 | 6586.3 | 173.2 | 74.5 | 1311.7 | 1.6 | 1561.1 | 38.6 | 5063.9 | 1583.8 | 5888.1 | 517.0 |
| 19-Oct-85 | 10801 | 0.2 | 10801.0 | 119.9 | 74.5 | 911.1 | 1.6 | 1107.2 | 27.8 | 9721.8 | 1578.3 | 2982.7 | 578.8 |
| 20-Oct-85 | 4484 | 0.2 | 4484.2 | 318.6 | 74.5 | 460.9 | 1.6 | 855.7 | 23.7 | 3652.3 | 1491.2 | 1445.8 | 792.0 |
| 21-Oct-85 | 4289 | 0.2 | 4289.2 | 75.7 | 74.5 | 290.1 | 1.6 | 442.0 | 26.8 | 3874.1 | 1570.0 | 825.9 | 796.3 |
| 22-Oct-85 | 4006 | 0.2 | 4006.2 | 75.7 | 74.5 | 185.2 | 1.6 | 337.0 | 27.1 | 3696.3 | 1584.2 | 524.8 | 877.5 |
| 23-Oct-85 | 5828 | 0.4 | 5828.4 | 75.7 | 74.5 | 123.8 | 1.6 | 275.6 | 27.7 | 5580.5 | 1599.3 | 361.5 | 933.4 |
| 24-Oct-85 | 4226 | 0.4 | 4226.4 | 169.9 | 74.5 | 169.8 | 1.6 | 415.9 | 30.7 | 3841.2 | 1585.9 | 1132.2 | 2012.6 |
| 25-Oct-85 | 4297 | 0.0 | 4297.0 | 182.2 | 74.5 | 105.3 | 1.6 | 363.6 | 27.9 | 3961.3 | 1575.3 | 501.3 | 922.6 |
| 26-Oct-85 | 4210 | 0.4 | 4210.4 | 75.7 | 74.5 | 79.9 | 1.6 | 231.7 | 27.2 | 4005.9 | 1549.5 | 302.4 | 967.1 |
| 27-Oct-85 | 3878 | 0.2 | 3878.2 | 75.7 | 74.5 | 70.0 | 1.6 | 221.9 | 23.4 | 3679.7 | 1554.7 | 255.8 | 980.6 |
| 28-Oct-85 | 3657 | 0.4 | 3657.4 | 184.6 | 74.5 | 71.5 | 1.6 | 332.2 | 27.7 | 3352.9 | 1574.0 | 273.3 | 762.5 |
| 29-Oct-85 | 3462 | 1.0 | 3463.0 | 75.7 | 74.5 | 60.2 | 1.6 | 212.0 | 28.2 | 3279.2 | 1582.0 | 194.9 | 507.9 |
| 30-Oct-85 | 3343 | 0.2 | 3343.2 | 75.7 | 74.5 | 54.5 | 1.6 | 206.4 | 26.2 | 3163.0 | 1572.9 | 207.9 | 507.2 |
| 31-Oct-85 | 3647 | 0.3 | 3647.3 | 75.7 | 74.5 | 52.5 | 1.6 | 204.4 | 28.5 | 3471.4 | 1550.6 | 208.5 | 518.3 |
| OCT 85 | 4318.5 | 0.3 | 4318.8 | 123.4 | 74.5 | 181.4 | 1.6 | 381.0 | 28.4 | 3966.2 | 1573.1 | 717.9 | 895.1 |

| *LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986* | ROMEOVILLE 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-85 | 6527 | 0.3 | 6527.3 | 183.5 | 70.0 | 866.9 | 1.8 | 1122.1 | 48.4 | 5453.6 | 1565.1 | 4876.8 | 813.8 |
| 02-Nov-85 | 6522 | 0.3 | 6522.2 | 201.3 | 70.0 | 683.9 | 1.8 | 957.0 | 32.8 | 5598.1 | 1518.0 | 2959.6 | 585.5 |
| 03-Nov-85 | 4896 | 0.6 | 4896.6 | 253.6 | 70.0 | 414.8 | 1.8 | 740.2 | 24.8 | 4181.1 | 1500.4 | 1522.0 | 195.8 |
| 04-Nov-85 | 3561 | 0.2 | 3561.2 | 75.6 | 70.0 | 272.9 | 1.8 | 420.3 | 26.1 | 3167.1 | 1566.6 | 876.3 | 145.3 |
| 05-Nov-85 | 3512 | 0.3 | 3512.3 | 75.7 | 70.0 | 184.4 | 1.8 | 331.8 | 25.2 | 3205.7 | 1554.4 | 616.0 | 144.3 |
| 06-Nov-85 | 3804 | 0.1 | 3804.1 | 117.6 | 70.0 | 265.4 | 1.8 | 454.8 | 31.3 | 3380.7 | 1568.5 | 1024.9 | 169.5 |
| 07-Nov-85 | 3322 | 0.4 | 3322.4 | 223.6 | 70.0 | 206.0 | 1.8 | 501.3 | 26.8 | 2847.9 | 1572.9 | 638.8 | 140.8 |
| 08-Nov-85 | 2949 | 0.5 | 2949.5 | 75.6 | 70.0 | 145.9 | 1.8 | 293.3 | 27.1 | 2683.3 | 1552.4 | 497.1 | 164.3 |
| 09-Nov-85 | 6126 | 0.1 | 6126.1 | 85.8 | 70.0 | 1138.5 | 1.8 | 1296.0 | 39.9 | 4870.0 | 1497.5 | 4551.6 | 526.8 |
| 10-Nov-85 | 7714 | 1.2 | 7715.2 | 101.9 | 70.0 | 970.6 | 1.8 | 1144.3 | 27.7 | 6598.6 | 1477.6 | 3667.7 | 263.5 |
| 11-Nov-85 | 5915 | 0.1 | 5915.1 | 236.8 | 70.0 | 587.3 | 1.8 | 895.8 | 29.1 | 5048.4 | 1552.0 | 2135.8 | 141.0 |
| 12-Nov-85 | 5736 | 0.3 | 5736.3 | 223.9 | 70.0 | 539.2 | 1.8 | 834.9 | 32.6 | 4934.0 | 1507.8 | 2062.9 | 965.3 |
| 13-Nov-85 | 4838 | 0.2 | 4838.2 | 239.1 | 70.0 | 493.6 | 1.8 | 804.4 | 29.5 | 4063.3 | 1545.5 | 1774.8 | 178.3 |
| 14-Nov-85 | 3827 | 0.3 | 3827.3 | 75.6 | 70.0 | 329.5 | 1.8 | 476.9 | 29.2 | 3379.6 | 1541.0 | 1122.3 | 515.5 |
| 15-Nov-85 | 5188 | 0.3 | 5188.3 | 89.6 | 70.0 | 604.9 | 1.8 | 766.2 | 34.3 | 4456.3 | 1559.5 | 2359.7 | 253.3 |
| 16-Nov-85 | 6308 | 0.1 | 6308.1 | 163.0 | 70.0 | 681.6 | 1.8 | 916.3 | 28.5 | 5420.3 | 1519.4 | 3617.2 | 157.5 |
| 17-Nov-85 | 5528 | 0.2 | 5528.2 | 243.5 | 70.0 | 414.6 | 1.8 | 729.8 | 26.3 | 4824.7 | 1503.0 | 2187.2 | 169.5 |
| 18-Nov-85 | 8401 | 0.3 | 8401.3 | 80.9 | 70.0 | 1071.8 | 1.8 | 1224.4 | 39.6 | 7216.5 | 1556.2 | 5392.0 | 978.8 |
| 19-Nov-85 | 10916 | 0.3 | 10916.0 | 90.7 | 70.0 | 873.8 | 1.8 | 1036.2 | 30.4 | 9910.4 | 1577.0 | 5714.8 | 582.8 |
| 20-Nov-85 | 8970 | 0.2 | 8970.2 | 160.1 | 70.0 | 611.7 | 1.8 | 843.5 | 29.1 | 8155.8 | 1557.9 | 5114.2 | 521.5 |
| 21-Nov-85 | 6805 | 0.2 | 6805.2 | 246.6 | 70.0 | 456.4 | 1.8 | 774.8 | 27.8 | 6058.1 | 1560.7 | 3629.7 | 113.5 |
| 22-Nov-85 | 5404 | 0.2 | 5404.2 | 137.2 | 70.0 | 391.0 | 1.8 | 600.0 | 29.4 | 4833.5 | 1547.7 | 2529.1 | 148.8 |
| 23-Nov-85 | 5180 | 0.2 | 5180.2 | 75.6 | 70.0 | 270.4 | 1.8 | 417.8 | 25.6 | 4788.0 | 1517.4 | 1803.5 | 130.5 |
| 24-Nov-85 | 4460 | 0.2 | 4460.1 | 191.7 | 70.0 | 261.5 | 1.8 | 525.0 | 27.1 | 3962.3 | 1477.3 | 1553.9 | 94.0 |
| 25-Nov-85 | 3521 | 0.2 | 3521.1 | 87.8 | 70.0 | 594.5 | 1.8 | 754.0 | 34.7 | 2801.9 | 1551.9 | 2272.2 | 131.3 |
| 26-Nov-85 | 3943 | 0.4 | 3943.4 | 228.1 | 70.0 | 496.5 | 1.8 | 796.4 | 31.7 | 3178.7 | 1549.5 | 1787.4 | 142.3 |
| 27-Nov-85 | 3791 | 0.3 | 3791.3 | 86.5 | 70.0 | 362.3 | 1.8 | 520.6 | 32.5 | 3303.2 | 1548.1 | 1548.7 | 150.8 |
| 28-Nov-85 | 3061 | 0.2 | 3061.2 | 222.5 | 70.0 | 370.1 | 1.8 | 664.4 | 25.8 | 2422.6 | 1494.0 | 1394.9 | 124.3 |
| 29-Nov-85 | 3145 | 0.2 | 3145.2 | 75.2 | 70.0 | 330.3 | 1.8 | 477.2 | 31.0 | 2699.0 | 1481.0 | 1398.2 | 139.0 |
| 30-Nov-85 | 3453 | 0.2 | 3453.2 | 232.4 | 70.0 | 316.1 | 1.8 | 620.2 | 22.9 | 2855.9 | 1480.8 | 1241.2 | 118.0 |
| | | | | | | | | | | | | | |
| NOV 85 | 5244.1 | 0.3 | 5244.4 | 152.7 | 70.0 | 506.9 | 1.8 | 731.3 | 30.2 | 4543.3 | 1533.4 | 2395.7 | 296.9 |

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-85 | 6511 | 0.2 | 6511.2 | 198.1 | 76.4 | 298.1 | 1.7 | 574.2 | 24.2 | 5961.2 | 1475.9 | 2975.1 | 400.3 |
| 02-Dec-85 | 5199 | 0.3 | 5199.3 | 109.3 | 76.4 | 238.7 | 1.7 | 426.0 | 27.6 | 4800.9 | 1556.2 | 2588.4 | 122.6 |
| 03-Dec-85 | 4707 | 0.3 | 4707.3 | 75.7 | 76.4 | 194.9 | 1.7 | 348.7 | 26.4 | 4385.0 | 1549.7 | 1589.3 | 132.5 |
| 04-Dec-85 | 4022 | 0.2 | 4022.2 | 75.7 | 76.4 | 173.8 | 1.7 | 327.5 | 27.5 | 3722.1 | 1578.5 | 1116.7 | 132.2 |
| 05-Dec-85 | 3988 | 0.3 | 3988.3 | 176.3 | 76.4 | 169.2 | 1.7 | 423.6 | 27.1 | 3591.8 | 1560.8 | 979.9 | 132.9 |
| 06-Dec-85 | 3651 | 0.3 | 3651.3 | 75.7 | 76.4 | 156.1 | 1.7 | 309.8 | 26.1 | 3367.6 | 1564.6 | 806.3 | 171.5 |
| 07-Dec-85 | 3051 | 0.2 | 3051.2 | 138.9 | 76.4 | 372.3 | 1.7 | 589.2 | 27.6 | 2489.6 | 1513.1 | 1179.3 | 118.5 |
| 08-Dec-85 | 2999 | 0.2 | 2999.2 | 169.9 | 76.4 | 370.9 | 1.7 | 618.8 | 24.5 | 2404.9 | 1519.6 | 986.3 | 110.6 |
| 09-Dec-85 | 3055 | 0.4 | 3055.4 | 75.5 | 76.4 | 346.5 | 1.7 | 500.1 | 28.7 | 2583.9 | 1566.7 | 944.6 | 130.8 |
| 10-Dec-85 | 3562 | 0.2 | 3562.2 | 153.1 | 76.4 | 500.3 | 1.7 | 731.4 | 30.9 | 2861.7 | 1568.5 | 1552.5 | 143.2 |
| 11-Dec-85 | 4072 | 0.2 | 4072.1 | 190.0 | 76.4 | 334.9 | 1.7 | 603.0 | 26.0 | 3495.1 | 1554.2 | 1359.3 | 124.3 |
| 12-Dec-85 | 3627 | 0.4 | 3627.4 | 75.7 | 76.4 | 258.3 | 1.7 | 412.0 | 26.2 | 3241.6 | 1531.2 | 1072.0 | 124.1 |
| 13-Dec-85 | 3527 | 0.0 | 3527.0 | 75.7 | 76.4 | 214.0 | 1.7 | 367.8 | 26.8 | 3186.0 | 1556.3 | 810.3 | 120.1 |
| 14-Dec-85 | 2462 | 0.2 | 2462.2 | 190.2 | 76.4 | 203.3 | 1.7 | 471.6 | 24.1 | 2014.7 | 1539.1 | 718.0 | 139.2 |
| 15-Dec-85 | 2821 | 0.2 | 2821.2 | 75.7 | 76.4 | 174.9 | 1.7 | 328.6 | 24.4 | 2516.9 | 1547.7 | 595.5 | 109.7 |
| 16-Dec-85 | 3131 | 0.3 | 3131.2 | 75.7 | 76.4 | 161.3 | 1.7 | 315.0 | 27.7 | 2843.9 | 1575.0 | 496.5 | 132.4 |
| 17-Dec-85 | 2942 | 0.3 | 2942.2 | 75.7 | 76.4 | 150.5 | 1.7 | 304.2 | 27.7 | 2665.8 | 1594.5 | 453.7 | 194.2 |
| 18-Dec-85 | 3161 | 0.3 | 3161.3 | 158.5 | 76.4 | 149.3 | 1.7 | 385.9 | 26.2 | 2801.6 | 1587.0 | 460.1 | 201.9 |
| 19-Dec-85 | 2758 | 0.3 | 2758.3 | 75.7 | 76.4 | 137.4 | 1.7 | 291.2 | 27.7 | 2494.9 | 1607.6 | 395.5 | 204.4 |
| 20-Dec-85 | 3303 | 0.2 | 3303.2 | 94.0 | 76.4 | 132.7 | 1.7 | 304.8 | 25.5 | 3023.9 | 1581.2 | 405.2 | 178.6 |
| 21-Dec-85 | 2732 | 0.2 | 2732.2 | 140.9 | 76.4 | 144.7 | 1.7 | 363.6 | 26.3 | 2394.9 | 1567.9 | 482.3 | 178.6 |
| 22-Dec-85 | 2460 | 0.2 | 2460.2 | 111.7 | 76.4 | 160.7 | 1.7 | 350.5 | 24.9 | 2134.6 | 1544.0 | 519.7 | 130.2 |
| 23-Dec-85 | 2639 | 0.3 | 2639.3 | 138.3 | 76.4 | 134.4 | 1.7 | 350.7 | 27.0 | 2315.5 | 1592.4 | 406.4 | 121.2 |
| 24-Dec-85 | 3190 | 0.2 | 3190.2 | 75.7 | 76.4 | 117.5 | 1.7 | 271.2 | 25.9 | 2944.9 | 1615.8 | 397.8 | 187.6 |
| 25-Dec-85 | 2877 | 0.2 | 2877.2 | 138.3 | 76.4 | 116.1 | 1.7 | 332.4 | 23.2 | 2568.0 | 1513.3 | 362.3 | 190.9 |
| 26-Dec-85 | 3110 | 0.3 | 3110.2 | 116.4 | 76.4 | 107.3 | 1.7 | 301.7 | 23.5 | 2832.1 | 1576.4 | 275.5 | 180.0 |
| 27-Dec-85 | 2908 | 0.2 | 2908.2 | 75.7 | 76.4 | 99.4 | 1.7 | 253.2 | 26.9 | 2681.9 | 1613.1 | 272.9 | 158.4 |
| 28-Dec-85 | 2908 | 0.2 | 2908.2 | 95.5 | 76.4 | 98.2 | 1.7 | 271.8 | 24.0 | 2660.4 | 1574.4 | 245.4 | 210.9 |
| 29-Dec-85 | 2715 | 0.2 | 2715.2 | 144.8 | 76.4 | 122.8 | 1.7 | 345.7 | 26.7 | 2396.2 | 1545.4 | 349.7 | 187.4 |
| 30-Dec-85 | 3124 | 0.6 | 3124.6 | 127.6 | 76.4 | 137.9 | 1.7 | 343.5 | 25.9 | 2807.1 | 1588.7 | 387.6 | 177.4 |
| 31-Dec-85 | 2545 | 0.1 | 2545.1 | 117.4 | 76.4 | 244.7 | 1.7 | 440.2 | 26.9 | 2131.8 | 1601.2 | 516.8 | 156.4 |
| DEC 85 | 3347.0 | 0.2 | 3347.2 | 116.7 | 76.4 | 200.7 | 1.7 | 395.4 | 26.3 | 2978.1 | 1563.2 | 829.1 | 161.4 |

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-86 | 2477 | 0.3 | 2477.3 | 181.4 | 77.0 | 133.3 | 2.4 | 394.1 | 25.5 | 2108.7 | 1535.0 | 348.0 | 163.8 |
| 02-Jan-86 | 2823 | 0.3 | 2823.3 | 116.8 | 77.0 | 297.8 | 2.4 | 494.0 | 29.9 | 2359.2 | 1519.8 | 922.3 | 169.5 |
| 03-Jan-86 | 2813 | 0.3 | 2813.2 | 134.7 | 77.0 | 141.8 | 2.4 | 355.9 | 27.3 | 2484.7 | 1592.1 | 404.1 | 144.5 |
| 04-Jan-86 | 2609 | 0.2 | 2609.2 | 75.7 | 77.0 | 109.3 | 2.4 | 264.4 | 23.1 | 2367.9 | 1559.1 | 376.8 | 135.6 |
| 05-Jan-86 | 2665 | 0.4 | 2665.4 | 166.5 | 77.0 | 98.4 | 2.4 | 344.2 | 24.6 | 2345.8 | 1551.0 | 289.7 | 177.2 |
| 06-Jan-86 | 2492 | 0.3 | 2492.3 | 75.7 | 77.0 | 83.3 | 2.4 | 238.4 | 27.4 | 2281.4 | 1609.5 | 230.2 | 192.2 |
| 07-Jan-86 | 3033 | 0.2 | 3033.2 | 75.7 | 77.0 | 77.3 | 2.4 | 232.3 | 28.0 | 2828.9 | 1612.3 | 215.8 | 210.2 |
| 08-Jan-86 | 3122 | 0.2 | 3122.2 | 125.8 | 50.8 | 76.5 | 2.4 | 255.5 | 27.8 | 2894.6 | 1642.9 | 227.0 | 183.0 |
| 09-Jan-86 | 2505 | 0.3 | 2505.2 | 117.0 | 54.5 | 242.6 | 2.4 | 416.5 | 30.3 | 2119.0 | 1619.8 | 565.2 | 131.6 |
| 10-Jan-86 | 1868 | 0.2 | 1868.2 | 190.2 | 77.0 | 228.6 | 2.4 | 498.1 | 28.4 | 1398.5 | 1600.3 | 589.6 | 121.2 |
| 11-Jan-86 | 2735 | 0.2 | 2735.2 | 75.4 | 77.0 | 177.3 | 2.4 | 332.0 | 28.9 | 2430.1 | 1579.8 | 606.3 | 126.4 |
| 12-Jan-86 | 2577 | 0.2 | 2577.2 | 123.1 | 77.0 | 122.1 | 2.4 | 324.6 | 28.9 | 2279.5 | 1564.5 | 483.4 | 154.0 |
| 13-Jan-86 | 2145 | 0.2 | 2145.2 | 169.5 | 77.0 | 87.4 | 2.4 | 336.2 | 28.1 | 1835.1 | 1586.2 | 335.8 | 148.8 |
| 14-Jan-86 | 2580 | 0.2 | 2580.2 | 75.7 | 77.0 | 69.4 | 2.4 | 224.4 | 27.8 | 2383.6 | 1621.1 | 272.8 | 141.3 |
| 15-Jan-86 | 2596 | 0.2 | 2596.2 | 93.9 | 77.0 | 63.9 | 2.4 | 237.2 | 27.2 | 2386.3 | 1588.6 | 227.8 | 148.7 |
| 16-Jan-86 | 2504 | 0.2 | 2504.2 | 140.9 | 77.0 | 130.2 | 2.4 | 350.4 | 28.6 | 2182.4 | 1606.0 | 392.8 | 142.6 |
| 17-Jan-86 | 2903 | 0.4 | 2903.4 | 75.6 | 77.0 | 134.1 | 2.4 | 289.1 | 27.5 | 2641.8 | 1603.7 | 499.1 | 90.9 |
| 18-Jan-86 | 2902 | 0.4 | 2902.4 | 183.4 | 77.0 | 96.2 | 2.4 | 358.9 | 25.0 | 2568.5 | 1567.2 | 514.3 | 99.4 |
| 19-Jan-86 | 2846 | 0.2 | 2846.1 | 75.7 | 77.0 | 80.0 | 2.4 | 235.1 | 25.2 | 2636.3 | 1526.2 | 491.3 | 101.0 |
| 20-Jan-86 | 3357 | 0.2 | 3357.2 | 75.7 | 77.0 | 76.7 | 2.4 | 231.7 | 28.4 | 3151.9 | 1591.8 | 376.0 | 89.2 |
| 21-Jan-86 | 2394 | 0.3 | 2394.2 | 171.0 | 77.0 | 82.2 | 2.4 | 332.5 | 27.6 | 2089.3 | 1592.7 | 385.5 | 132.9 |
| 22-Jan-86 | 2392 | 0.3 | 2392.3 | 75.7 | 77.0 | 76.3 | 2.4 | 231.3 | 27.8 | 2188.8 | 1587.3 | 325.3 | 95.7 |
| 23-Jan-86 | 2475 | 0.4 | 2475.4 | 75.7 | 77.0 | 77.0 | 2.4 | 232.0 | 27.0 | 2270.4 | 1596.2 | 276.0 | 113.5 |
| 24-Jan-86 | 2666 | 0.3 | 2666.3 | 94.1 | 77.0 | 92.4 | 2.4 | 265.8 | 28.7 | 2427.2 | 1573.4 | 288.6 | 108.7 |
| 25-Jan-86 | 2565 | 0.1 | 2565.1 | 142.5 | 77.0 | 97.0 | 2.4 | 318.9 | 24.7 | 2271.0 | 1566.8 | 300.5 | 107.0 |
| 26-Jan-86 | 2726 | 0.2 | 2726.2 | 75.7 | 77.0 | 84.8 | 2.4 | 239.8 | 23.6 | 2510.0 | 1512.4 | 283.8 | 99.0 |
| 27-Jan-86 | 2755 | 0.3 | 2755.3 | 129.0 | 77.0 | 86.7 | 2.4 | 295.0 | 27.1 | 2487.4 | 1592.3 | 306.8 | 237.1 |
| 28-Jan-86 | 2718 | 0.3 | 2718.3 | 118.2 | 77.0 | 85.1 | 2.4 | 282.6 | 27.9 | 2463.6 | 1614.5 | 238.0 | 180.7 |
| 29-Jan-86 | 2559 | 0.5 | 2559.5 | 75.7 | 77.0 | 81.7 | 2.4 | 236.7 | 28.0 | 2350.7 | 1606.3 | 228.9 | 132.2 |
| 30-Jan-86 | 2293 | 0.2 | 2293.2 | 94.1 | 77.0 | 82.3 | 2.4 | 255.8 | 27.5 | 2064.9 | 1617.2 | 205.6 | 145.9 |
| 31-Jan-86 | 2978 | 0.2 | 2978.2 | 141.4 | 77.0 | 173.3 | 2.4 | 394.1 | 27.9 | 2612.0 | 1594.6 | 460.8 | 143.9 |
| JAN 86 | 2647.5 | 0.3 | 2647.8 | 114.2 | 75.4 | 114.4 | 2.4 | 306.4 | 27.0 | 2368.4 | 1584.9 | 376.4 | 140.9 |

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-86 | 3405 | 0.2 | 3405.2 | 207.0 | 77.5 | 401.1 | 2.4 | 688.0 | 27.4 | 2744.6 | 1557.0 | 1069.8 | 98.0 |
| 02-Feb-86 | 2461 | 0.3 | 2461.3 | 75.6 | 77.5 | 175.8 | 2.4 | 331.4 | 23.2 | 2153.1 | 1546.5 | 429.3 | 106.4 |
| 03-Feb-86 | 4242 | 0.3 | 4242.3 | 166.3 | 77.5 | 209.3 | 2.4 | 455.6 | 29.5 | 3816.2 | 1603.1 | 795.3 | 766.5 |
| 04-Feb-86 | 6220 | 0.3 | 6220.3 | 124.4 | 77.5 | 892.3 | 2.4 | 1096.5 | 46.1 | 5169.9 | 1603.6 | 4766.7 | 644.8 |
| 05-Feb-86 | 5195 | 0.9 | 5195.9 | 212.2 | 77.5 | 495.1 | 2.4 | 787.2 | 30.0 | 4438.7 | 1606.6 | 2597.4 | 112.5 |
| 06-Feb-86 | 4520 | 0.3 | 4520.3 | 180.2 | 77.5 | 323.8 | 2.4 | 583.9 | 28.7 | 3965.1 | 1601.9 | 1448.8 | 151.8 |
| 07-Feb-86 | 3462 | 0.3 | 3462.3 | 75.7 | 77.5 | 219.8 | 2.4 | 375.3 | 28.7 | 3115.6 | 1593.8 | 811.3 | 120.9 |
| 08-Feb-86 | 3603 | 0.2 | 3603.2 | 75.7 | 77.5 | 167.6 | 2.4 | 323.1 | 24.7 | 3304.8 | 1561.0 | 594.2 | 124.7 |
| 09-Feb-86 | 2815 | 0.2 | 2815.2 | 175.3 | 77.5 | 145.2 | 2.4 | 400.5 | 25.6 | 2440.3 | 1551.8 | 483.5 | 91.9 |
| 10-Feb-86 | 3327 | 0.3 | 3327.3 | 75.7 | 77.5 | 121.3 | 2.4 | 276.9 | 27.4 | 3077.8 | 1606.9 | 361.1 | 115.7 |
| 11-Feb-86 | 2848 | 0.3 | 2848.3 | 75.7 | 77.5 | 110.3 | 2.4 | 265.8 | 27.7 | 2610.3 | 1613.3 | 318.1 | 135.1 |
| 12-Feb-86 | 2830 | 0.3 | 2830.3 | 136.2 | 77.5 | 106.7 | 2.4 | 322.8 | 27.0 | 2534.5 | 1611.3 | 290.0 | 133.4 |
| 13-Feb-86 | 3265 | 0.4 | 3265.4 | 115.3 | 77.5 | 99.6 | 2.4 | 294.7 | 26.6 | 2997.2 | 1615.4 | 229.2 | 128.5 |
| 14-Feb-86 | 2657 | 0.5 | 2657.5 | 75.7 | 77.5 | 92.3 | 2.4 | 247.9 | 27.1 | 2436.7 | 1589.3 | 211.1 | 127.0 |
| 15-Feb-86 | 2776 | 0.1 | 2776.1 | 94.9 | 77.5 | 89.6 | 2.4 | 264.5 | 25.6 | 2537.3 | 1571.9 | 203.9 | 137.9 |
| 16-Feb-86 | 3166 | 0.1 | 3166.1 | 146.2 | 77.5 | 976.5 | 2.4 | 1202.6 | 29.3 | 1992.8 | 1523.4 | 2337.8 | 91.4 |
| 17-Feb-86 | 2849 | 0.3 | 2849.3 | 311.8 | 77.5 | 286.9 | 2.4 | 678.5 | 26.0 | 2196.9 | 1611.9 | 1118.0 | 95.4 |
| 18-Feb-86 | 4585 | 0.3 | 4585.2 | 75.0 | 77.5 | 336.4 | 2.4 | 491.3 | 35.6 | 4129.6 | 1595.2 | 2050.6 | 106.0 |
| 19-Feb-86 | 5394 | 0.3 | 5394.3 | 266.4 | 77.5 | 330.9 | 2.4 | 677.2 | 37.2 | 4754.4 | 1608.2 | 2651.5 | 106.4 |
| 20-Feb-86 | 5506 | 0.2 | 5506.2 | 197.4 | 77.5 | 227.7 | 2.4 | 505.0 | 33.1 | 5034.3 | 1598.1 | 2504.3 | 110.5 |
| 21-Feb-86 | 3855 | 0.2 | 3855.2 | 151.8 | 77.5 | 148.9 | 2.4 | 380.6 | 25.7 | 3500.3 | 1572.9 | 1050.2 | 136.7 |
| 22-Feb-86 | 3838 | 0.2 | 3838.2 | 75.7 | 77.5 | 121.1 | 2.4 | 276.7 | 25.2 | 3586.8 | 1597.4 | 569.4 | 125.4 |
| 23-Feb-86 | 2830 | 0.1 | 2830.1 | 75.7 | 77.5 | 106.3 | 2.4 | 261.9 | 23.2 | 2591.4 | 1538.7 | 431.8 | 87.7 |
| 24-Feb-86 | 3276 | 0.3 | 3276.2 | 164.1 | 77.5 | 178.5 | 2.4 | 422.4 | 27.4 | 2881.3 | 1592.2 | 544.0 | 97.1 |
| 25-Feb-86 | 3006 | 0.2 | 3006.2 | 75.7 | 77.5 | 118.3 | 2.4 | 273.9 | 26.3 | 2758.6 | 1593.2 | 415.2 | 127.7 |
| 26-Feb-86 | 3096 | 0.2 | 3096.2 | 195.8 | 77.5 | 111.4 | 2.4 | 387.1 | 27.4 | 2736.5 | 1571.9 | 588.3 | 137.4 |
| 27-Feb-86 | 3671 | 0.2 | 3671.2 | 75.6 | 77.5 | 96.7 | 2.4 | 252.2 | 26.6 | 3445.7 | 1601.4 | 564.7 | 122.8 |
| 28-Feb-86 | 2740 | 0.3 | 2740.3 | 157.6 | 77.5 | 197.7 | 2.4 | 435.2 | 29.3 | 2334.5 | 1591.2 | 674.6 | 146.0 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| FEB 86 | 3622.8 | 0.3 | 3623.1 | 136.9 | 77.5 | 246.0 | 2.4 | 462.8 | 28.5 | 3188.8 | 1586.8 | 1075.3 | 160.2 |

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-86 | 2879 | 0.1 | 2879.1 | 160.0 | 74.9 | 278.6 | 2.2 | 515.8 | 29.3 | 2392.7 | 1560.4 | 1211.6 | 116.0 |
| 02-Mar-86 | 2731 | 0.0 | 2731.0 | 153.7 | 74.9 | 161.0 | 2.2 | 391.8 | 26.4 | 2365.6 | 1538.6 | 672.5 | 106.5 |
| 03-Mar-86 | 2931 | 0.5 | 2931.4 | 90.4 | 74.9 | 157.0 | 2.2 | 324.6 | 29.0 | 2635.8 | 1622.4 | 702.9 | 109.7 |
| 04-Mar-86 | 3035 | 0.1 | 3035.1 | 150.6 | 74.9 | 145.8 | 2.2 | 373.5 | 29.2 | 2690.8 | 1613.5 | 699.3 | 116.7 |
| 05-Mar-86 | 3664 | 0.5 | 3664.4 | 97.9 | 74.9 | 294.8 | 2.2 | 469.8 | 32.4 | 3227.0 | 1614.7 | 1445.3 | 120.5 |
| 06-Mar-86 | 4180 | 0.0 | 4180.0 | 253.9 | 74.9 | 258.6 | 2.2 | 589.7 | 27.6 | 3617.9 | 1610.2 | 1217.6 | 117.0 |
| 07-Mar-86 | 3229 | 0.5 | 3229.5 | 75.7 | 74.9 | 168.0 | 2.2 | 320.8 | 27.0 | 2935.7 | 1632.3 | 719.2 | 148.0 |
| 08-Mar-86 | 2948 | 0.0 | 2948.0 | 75.7 | 74.9 | 129.6 | 2.2 | 282.4 | 24.7 | 2690.3 | 1574.2 | 447.5 | 100.9 |
| 09-Mar-86 | 3172 | 0.1 | 3172.1 | 158.0 | 74.9 | 186.1 | 2.2 | 421.3 | 26.0 | 2776.9 | 1554.9 | 855.3 | 97.2 |
| 10-Mar-86 | 5795 | 0.4 | 5795.4 | 137.8 | 74.9 | 552.7 | 2.2 | 767.6 | 36.8 | 5064.6 | 1616.0 | 2917.6 | 469.8 |
| 11-Mar-86 | 4569 | 0.0 | 4569.0 | 218.9 | 74.9 | 386.7 | 2.2 | 682.8 | 26.6 | 3915.0 | 1603.0 | 1933.5 | 121.7 |
| 12-Mar-86 | 4889 | 0.4 | 4889.4 | 114.9 | 74.9 | 374.4 | 2.2 | 566.5 | 30.4 | 4353.3 | 1607.1 | 1572.3 | 355.0 |
| 13-Mar-86 | 4222 | 0.0 | 4222.0 | 106.5 | 74.9 | 307.9 | 2.2 | 491.6 | 27.6 | 3758.0 | 1606.9 | 1227.0 | 122.2 |
| 14-Mar-86 | 3649 | 0.6 | 3649.6 | 141.5 | 74.9 | 214.5 | 2.2 | 433.1 | 27.8 | 3244.3 | 1602.5 | 938.8 | 130.8 |
| 15-Mar-86 | 3713 | 0.0 | 3713.0 | 75.7 | 74.9 | 165.2 | 2.2 | 318.0 | 28.4 | 3421.5 | 1572.1 | 746.7 | 100.6 |
| 16-Mar-86 | 3280 | 0.0 | 3280.0 | 75.7 | 74.9 | 142.7 | 2.2 | 295.5 | 25.7 | 3010.2 | 1551.4 | 623.5 | 86.2 |
| 17-Mar-86 | 3380 | 0.5 | 3380.4 | 180.2 | 74.9 | 138.0 | 2.2 | 395.4 | 27.8 | 3012.9 | 1606.6 | 591.9 | 121.6 |
| 18-Mar-86 | 4224 | 0.0 | 4224.0 | 92.9 | 74.9 | 363.2 | 2.2 | 533.3 | 33.3 | 3724.0 | 1603.8 | 1687.4 | 620.8 |
| 19-Mar-86 | 4137 | 0.5 | 4137.5 | 216.9 | 74.9 | 358.2 | 2.2 | 652.3 | 30.0 | 3515.2 | 1590.6 | 2012.7 | 176.0 |
| 20-Mar-86 | 4417 | 0.0 | 4417.0 | 75.6 | 74.9 | 257.6 | 2.2 | 410.4 | 30.3 | 4037.0 | 1596.3 | 1396.4 | 104.2 |
| 21-Mar-86 | 3848 | 0.4 | 3848.4 | 153.5 | 74.9 | 330.6 | 2.2 | 561.2 | 27.5 | 3314.7 | 1592.2 | 1200.3 | 106.5 |
| 22-Mar-86 | 3430 | 0.0 | 3430.0 | 147.5 | 74.9 | 225.8 | 2.2 | 450.5 | 30.5 | 3010.0 | 1574.5 | 932.5 | 89.5 |
| 23-Mar-86 | 3197 | 0.2 | 3197.2 | 75.7 | 74.9 | 157.3 | 2.2 | 310.1 | 28.2 | 2913.3 | 1546.4 | 589.0 | 122.3 |
| 24-Mar-86 | 2895 | 0.4 | 2895.4 | 195.9 | 74.9 | 147.4 | 2.2 | 420.4 | 28.4 | 2503.4 | 1607.8 | 559.8 | 94.4 |
| 25-Mar-86 | 2957 | 0.3 | 2957.3 | 75.6 | 74.9 | 129.5 | 2.2 | 282.3 | 29.4 | 2704.4 | 1619.4 | 434.0 | 96.5 |
| 26-Mar-86 | 2919 | 0.4 | 2919.4 | 75.6 | 74.9 | 122.5 | 2.2 | 275.3 | 28.8 | 2672.9 | 1610.8 | 414.7 | 264.4 |
| 27-Mar-86 | 2991 | 0.2 | 2991.2 | 75.6 | 74.9 | 117.2 | 2.2 | 270.0 | 28.0 | 2749.1 | 1627.1 | 397.4 | 105.7 |
| 28-Mar-86 | 2538 | 0.4 | 2538.4 | 176.2 | 74.9 | 119.0 | 2.2 | 372.3 | 27.5 | 2193.6 | 1593.6 | 393.8 | 109.2 |
| 29-Mar-86 | 2634 | 0.3 | 2634.3 | 75.7 | 74.9 | 107.2 | 2.2 | 260.1 | 28.2 | 2400.4 | 1626.1 | 330.2 | 177.8 |
| 30-Mar-86 | 2736 | 0.4 | 2736.4 | 75.7 | 74.9 | 101.9 | 2.2 | 254.8 | 24.6 | 2506.3 | 1547.9 | 320.6 | 140.5 |
| 31-Mar-86 | 2782 | 0.3 | 2782.3 | 186.1 | 74.9 | 103.9 | 2.2 | 367.2 | 28.1 | 2441.2 | 1657.4 | 348.8 | 124.5 |
| MAR 86 | 3482.9 | 0.2 | 3483.2 | 127.9 | 74.9 | 216.2 | 2.2 | 421.3 | 28.4 | 3090.3 | 1596.2 | 952.9 | 157.2 |

| *LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986* | ROMEOVILLE 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-86 | 3274 | 0.2 | 3274.2 | 75.6 | 79.1 | 92.0 | 2.0 | 248.8 | 28.9 | 3054.3 | 1619.6 | 325.1 | 225.8 |
| 02-Apr-86 | 2771 | 0.5 | 2771.5 | 75.6 | 79.1 | 87.9 | 2.0 | 244.7 | 29.3 | 2556.2 | 1629.4 | 334.8 | 143.0 |
| 03-Apr-86 | 3089 | 0.2 | 3089.2 | 140.2 | 79.1 | 87.9 | 2.0 | 309.1 | 27.5 | 2807.5 | 1601.6 | 345.4 | 296.4 |
| 04-Apr-86 | 2856 | 0.5 | 2856.5 | 112.7 | 79.1 | 82.1 | 2.0 | 275.9 | 28.0 | 2608.6 | 1622.6 | 333.7 | 174.5 |
| 05-Apr-86 | 2895 | 0.3 | 2895.2 | 75.7 | 79.1 | 75.7 | 2.0 | 232.4 | 27.3 | 2690.1 | 1593.4 | 300.7 | 197.7 |
| 06-Apr-86 | 2627 | 0.3 | 2627.3 | 75.7 | 79.1 | 69.5 | 2.0 | 226.2 | 23.3 | 2424.4 | 1582.1 | 269.1 | 190.0 |
| 07-Apr-86 | 2785 | 0.3 | 2785.3 | 159.3 | 79.1 | 71.5 | 2.0 | 311.9 | 28.8 | 2502.2 | 1658.6 | 268.7 | 138.8 |
| 08-Apr-86 | 2748 | 0.3 | 2748.3 | 75.7 | 79.1 | 62.7 | 2.0 | 219.5 | 28.8 | 2557.6 | 1638.7 | 224.1 | 134.5 |
| 09-Apr-86 | 2658 | 0.2 | 2658.2 | 75.6 | 79.1 | 59.9 | 2.0 | 216.7 | 28.7 | 2470.2 | 1614.7 | 220.3 | 113.0 |
| 10-Apr-86 | 2695 | 0.3 | 2695.3 | 159.3 | 79.1 | 62.8 | 2.0 | 303.1 | 29.1 | 2421.3 | 1620.6 | 246.9 | 141.8 |
| 11-Apr-86 | 2458 | 0.3 | 2458.3 | 75.7 | 79.1 | 54.6 | 2.0 | 211.4 | 28.1 | 2275.1 | 1661.3 | 186.5 | 208.1 |
| 12-Apr-86 | 2928 | 0.3 | 2928.3 | 75.7 | 79.1 | 52.2 | 2.0 | 209.0 | 29.0 | 2748.3 | 1581.0 | 216.2 | 269.4 |
| 13-Apr-86 | 2813 | 0.2 | 2813.2 | 168.4 | 79.1 | 56.4 | 2.0 | 305.9 | 26.6 | 2533.9 | 1566.5 | 262.1 | 252.5 |
| 14-Apr-86 | 4111 | 0.2 | 4111.2 | 160.2 | 79.1 | 107.8 | 2.0 | 349.1 | 30.1 | 3792.2 | 1609.6 | 629.8 | 726.7 |
| 15-Apr-86 | 3252 | 0.4 | 3252.4 | 110.4 | 79.1 | 126.9 | 2.0 | 318.4 | 30.0 | 2963.9 | 1608.8 | 685.2 | 166.2 |
| 16-Apr-86 | 3030 | 0.2 | 3030.2 | 75.6 | 79.1 | 60.5 | 2.0 | 217.2 | 27.9 | 2840.9 | 1617.1 | 324.5 | 201.1 |
| 17-Apr-86 | 2750 | 0.3 | 2750.3 | 184.2 | 79.1 | 60.0 | 2.0 | 325.4 | 28.8 | 2453.7 | 1641.8 | 332.8 | 266.4 |
| 18-Apr-86 | 2900 | 0.3 | 2900.3 | 75.7 | 79.1 | 49.3 | 2.0 | 206.1 | 28.5 | 2722.7 | 1648.7 | 254.1 | 229.8 |
| 19-Apr-86 | 3055 | 0.2 | 3055.2 | 75.7 | 79.1 | 46.6 | 2.0 | 203.4 | 26.6 | 2878.4 | 1616.1 | 236.1 | 259.5 |
| 20-Apr-86 | 2652 | 0.3 | 2652.3 | 111.4 | 79.1 | 46.7 | 2.0 | 239.3 | 25.0 | 2438.0 | 1526.8 | 212.5 | 276.1 |
| 21-Apr-86 | 3136 | 0.3 | 3136.3 | 139.0 | 79.1 | 47.0 | 2.0 | 267.1 | 27.9 | 2897.2 | 1585.9 | 224.7 | 185.6 |
| 22-Apr-86 | 2537 | 0.3 | 2537.3 | 75.7 | 79.1 | 41.4 | 2.0 | 198.2 | 27.6 | 2366.7 | 1609.9 | 235.1 | 194.0 |
| 23-Apr-86 | 2866 | 0.2 | 2866.2 | 118.7 | 79.1 | 42.6 | 2.0 | 242.5 | 28.9 | 2652.6 | 1681.0 | 228.3 | 207.3 |
| 24-Apr-86 | 2706 | 0.4 | 2706.4 | 134.8 | 79.1 | 41.7 | 2.0 | 257.6 | 29.1 | 2477.9 | 1721.1 | 192.2 | 258.8 |
| 25-Apr-86 | 3322 | 0.3 | 3322.3 | 75.7 | 79.1 | 35.8 | 2.0 | 192.6 | 28.5 | 3158.3 | 1768.2 | 160.7 | 271.3 |
| 26-Apr-86 | 3459 | 0.4 | 3459.4 | 93.8 | 79.1 | 35.4 | 2.0 | 210.3 | 26.8 | 3275.9 | 1847.8 | 201.9 | 1060.7 |
| 27-Apr-86 | 3101 | 0.3 | 3101.3 | 141.0 | 79.1 | 36.8 | 2.0 | 258.9 | 26.8 | 2869.2 | 1776.2 | 224.4 | 348.4 |
| 28-Apr-86 | 3396 | 0.5 | 3396.5 | 75.7 | 79.1 | 31.3 | 2.0 | 188.0 | 27.1 | 3235.6 | 1702.1 | 179.6 | 609.6 |
| 29-Apr-86 | 3215 | 0.4 | 3215.4 | 133.6 | 79.1 | 33.9 | 2.0 | 248.6 | 28.9 | 2995.6 | 1776.6 | 192.5 | 184.8 |
| 30-Apr-86 | 6867 | 0.4 | 6867.4 | 253.5 | 79.1 | 401.0 | 2.0 | 735.7 | 36.7 | 6168.5 | 1670.6 | 2191.1 | 2744.5 |
| | | | | | | | | | | | | | |
| APR 86 | 3098.4 | 0.3 | 3098.7 | 112.7 | 79.1 | 72.0 | 2.0 | 265.8 | 28.3 | 2861.2 | 1646.6 | 341.3 | 355.9 |

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-86 | 3127 | 0.4 | 3127.4 | 175.8 | 82.8 | 66.9 | 1.9 | 327.3 | 29.1 | 2829.1 | 1668.1 | 448.7 | 172.6 |
| 02-May-86 | 3034 | 0.3 | 3034.3 | 75.7 | 82.8 | 44.7 | 1.9 | 205.1 | 28.6 | 2857.9 | 1655.8 | 250.3 | 225.4 |
| 03-May-86 | 3084 | 0.1 | 3084.1 | 93.7 | 82.8 | 37.8 | 1.9 | 216.2 | 26.7 | 2894.6 | 1654.0 | 207.0 | 303.1 |
| 04-May-86 | 2998 | 0.2 | 2998.2 | 140.9 | 82.8 | 36.0 | 1.9 | 261.6 | 27.9 | 2764.5 | 1677.0 | 182.9 | 296.2 |
| 05-May-86 | 2754 | 0.3 | 2754.3 | 75.7 | 82.8 | 28.5 | 1.9 | 188.8 | 30.0 | 2595.6 | 1827.6 | 138.1 | 166.0 |
| 06-May-86 | 3751 | 0.4 | 3751.4 | 133.8 | 82.8 | 30.2 | 1.9 | 248.6 | 31.1 | 3533.8 | 1850.9 | 192.3 | 917.1 |
| 07-May-86 | 2781 | 0.5 | 2781.5 | 114.2 | 82.8 | 27.5 | 1.9 | 226.3 | 31.1 | 2586.2 | 1836.0 | 191.5 | 183.6 |
| 08-May-86 | 2857 | 0.4 | 2857.4 | 75.7 | 82.8 | 23.6 | 1.9 | 184.0 | 30.2 | 2703.7 | 1807.0 | 186.2 | 223.4 |
| 09-May-86 | 2726 | 0.5 | 2726.4 | 75.7 | 82.8 | 22.4 | 1.9 | 182.8 | 29.7 | 2573.4 | 1830.5 | 170.7 | 303.2 |
| 10-May-86 | 2879 | 0.3 | 2879.2 | 168.5 | 82.8 | 27.5 | 1.9 | 280.8 | 29.4 | 2627.9 | 1862.2 | 200.7 | 370.5 |
| 11-May-86 | 3222 | 0.6 | 3222.6 | 75.7 | 82.8 | 20.8 | 1.9 | 181.2 | 26.7 | 3068.2 | 1739.0 | 149.2 | 296.5 |
| 12-May-86 | 2778 | 0.4 | 2778.4 | 93.1 | 82.8 | 21.6 | 1.9 | 199.3 | 31.6 | 2610.7 | 1706.6 | 160.5 | 356.1 |
| 13-May-86 | 3676 | 0.4 | 3676.4 | 159.8 | 82.8 | 29.5 | 1.9 | 273.9 | 31.2 | 3433.6 | 1781.9 | 324.0 | 667.0 |
| 14-May-86 | 3265 | 0.3 | 3265.3 | 75.7 | 82.8 | 23.1 | 1.9 | 183.5 | 30.3 | 3112.2 | 1691.3 | 339.0 | 489.2 |
| 15-May-86 | 4320 | 0.5 | 4320.5 | 136.4 | 82.8 | 52.6 | 1.9 | 273.6 | 31.8 | 4078.7 | 1696.6 | 662.3 | 507.9 |
| 16-May-86 | 3691 | 0.4 | 3691.4 | 130.3 | 82.8 | 32.2 | 1.9 | 247.2 | 31.2 | 3475.5 | 1704.9 | 459.2 | 777.8 |
| 17-May-86 | 7631 | 0.6 | 7631.6 | 83.1 | 82.8 | 574.1 | 1.9 | 741.9 | 41.9 | 6931.6 | 1657.0 | 3870.0 | 1911.0 |
| 18-May-86 | 6616 | 0.3 | 6616.3 | 193.7 | 82.8 | 514.6 | 1.9 | 793.0 | 32.5 | 5855.8 | 1573.3 | 2904.7 | 1366.6 |
| 19-May-86 | 7624 | 0.3 | 7624.3 | 166.5 | 82.8 | 567.5 | 1.9 | 818.7 | 34.4 | 6840.0 | 1623.2 | 3525.1 | 1008.6 |
| 20-May-86 | 4612 | 0.3 | 4612.3 | 239.1 | 82.8 | 222.5 | 1.9 | 546.3 | 29.2 | 4095.2 | 1590.0 | 1364.2 | 196.6 |
| 21-May-86 | 3714 | 0.3 | 3714.3 | 75.6 | 82.8 | 129.0 | 1.9 | 289.4 | 29.4 | 3454.4 | 1684.7 | 735.8 | 238.3 |
| 22-May-86 | 3290 | 0.7 | 3290.7 | 75.6 | 82.8 | 87.6 | 1.9 | 247.9 | 30.1 | 3072.9 | 1679.8 | 539.3 | 366.3 |
| 23-May-86 | 3117 | 0.4 | 3117.4 | 92.2 | 82.8 | 67.5 | 1.9 | 244.4 | 28.7 | 2901.7 | 1717.7 | 443.9 | 371.1 |
| 24-May-86 | 3484 | 0.3 | 3484.3 | 159.8 | 82.8 | 60.8 | 1.9 | 305.3 | 27.3 | 3206.3 | 1733.6 | 416.3 | 370.3 |
| 25-May-86 | 3866 | 0.4 | 3866.4 | 75.7 | 82.8 | 49.2 | 1.9 | 209.6 | 26.4 | 3683.3 | 1660.9 | 340.3 | 378.0 |
| 26-May-86 | 2998 | 0.2 | 2998.2 | 90.2 | 82.8 | 47.0 | 1.9 | 221.9 | 26.9 | 2803.2 | 1574.5 | 337.3 | 311.8 |
| 27-May-86 | 4583 | 0.3 | 4583.3 | 231.6 | 82.8 | 311.5 | 1.9 | 627.8 | 32.6 | 3988.1 | 1661.5 | 1874.0 | 378.3 |
| 28-May-86 | 3419 | 0.4 | 3419.4 | 167.8 | 82.8 | 116.3 | 1.9 | 368.8 | 29.4 | 3080.0 | 1712.8 | 920.6 | 242.1 |
| 29-May-86 | 3838 | 0.5 | 3838.5 | 75.5 | 82.8 | 180.0 | 1.9 | 340.3 | 32.0 | 3530.3 | 1701.2 | 832.7 | 305.9 |
| 30-May-86 | 3979 | 0.5 | 3979.5 | 174.3 | 82.8 | 105.7 | 1.9 | 364.8 | 29.4 | 3644.1 | 1834.4 | 613.5 | 365.3 |
| 31-May-86 | 3256 | 0.5 | 3256.5 | 75.7 | 82.8 | 72.8 | 1.9 | 233.1 | 30.3 | 3053.8 | 2044.4 | 423.0 | 446.1 |
| MAY 86 | 3773.2 | 0.4 | 3773.6 | 121.8 | 82.8 | 117.1 | 1.9 | 323.6 | 30.2 | 3480.2 | 1723.8 | 754.9 | 468.1 |

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-86 | 4332 | 0.3 | 4332.3 | 75.7 | 89.6 | 61.6 | 2.0 | 228.9 | 29.2 | 4132.6 | 1810.6 | 363.4 | 917.8 |
| 02-Jun-86 | 3286 | 0.3 | 3286.3 | 172.5 | 89.6 | 59.6 | 2.0 | 323.8 | 29.8 | 2992.3 | 1780.9 | 350.8 | 479.2 |
| 03-Jun-86 | 2671 | 0.4 | 2671.4 | 75.6 | 89.6 | 48.1 | 2.0 | 215.4 | 30.8 | 2486.9 | 1872.8 | 248.1 | 288.7 |
| 04-Jun-86 | 3454 | 0.3 | 3454.3 | 75.6 | 89.6 | 44.5 | 2.0 | 211.8 | 31.3 | 3273.8 | 1858.7 | 262.0 | 296.1 |
| 05-Jun-86 | 6772 | 0.5 | 6772.5 | 180.5 | 89.6 | 368.5 | 2.0 | 640.7 | 28.0 | 6169.8 | 1716.3 | 3087.2 | 1088.1 |
| 06-Jun-86 | 4379 | 0.3 | 4379.3 | 370.4 | 89.6 | 126.9 | 2.0 | 588.9 | 30.1 | 3820.4 | 1700.9 | 1216.1 | 228.7 |
| 07-Jun-86 | 6496 | 0.4 | 6496.4 | 126.6 | 89.6 | 279.1 | 2.0 | 497.3 | 30.8 | 6029.9 | 1696.4 | 2024.1 | 745.6 |
| 08-Jun-86 | 4315 | 0.3 | 4315.3 | 277.9 | 89.6 | 137.3 | 2.0 | 506.8 | 27.4 | 3835.9 | 1689.8 | 1275.5 | 630.2 |
| 09-Jun-86 | 3940 | 0.4 | 3940.4 | 75.6 | 89.6 | 85.3 | 2.0 | 252.5 | 29.3 | 3717.2 | 1793.9 | 765.0 | 547.4 |
| 10-Jun-86 | 5717 | 0.7 | 5717.7 | 97.5 | 89.6 | 193.9 | 2.0 | 383.0 | 31.9 | 5366.7 | 1780.1 | 1417.4 | 1505.7 |
| 11-Jun-86 | 5386 | 0.4 | 5386.4 | 269.8 | 89.6 | 132.6 | 2.0 | 494.0 | 30.7 | 4923.1 | 1839.4 | 1033.2 | 1235.2 |
| 12-Jun-86 | 4103 | 0.4 | 4103.4 | 75.6 | 89.6 | 83.1 | 2.0 | 250.4 | 31.4 | 3884.4 | 1734.6 | 638.7 | 227.3 |
| 13-Jun-86 | 3394 | 0.4 | 3394.4 | 75.6 | 89.6 | 61.7 | 2.0 | 229.0 | 30.0 | 3195.4 | 1753.2 | 426.0 | 484.0 |
| 14-Jun-86 | 5201 | 0.2 | 5201.2 | 109.3 | 89.6 | 251.9 | 2.0 | 452.8 | 33.0 | 4781.4 | 1653.1 | 1409.3 | 791.2 |
| 15-Jun-86 | 5157 | 0.3 | 5157.3 | 263.8 | 89.6 | 211.9 | 2.0 | 567.3 | 25.9 | 4616.0 | 1618.2 | 2046.7 | 639.0 |
| 16-Jun-86 | 5112 | 0.7 | 5112.7 | 75.6 | 89.6 | 118.6 | 2.0 | 285.8 | 29.8 | 4856.6 | 1825.0 | 1245.3 | 1017.0 |
| 17-Jun-86 | 4714 | 0.6 | 4714.6 | 75.6 | 89.6 | 84.3 | 2.0 | 251.6 | 29.6 | 4492.6 | 1790.7 | 686.3 | 1023.9 |
| 18-Jun-86 | 4588 | 0.5 | 4588.5 | 75.6 | 89.6 | 64.6 | 2.0 | 231.9 | 30.2 | 4386.9 | 1831.6 | 460.2 | 1010.9 |
| 19-Jun-86 | 4219 | 0.9 | 4219.9 | 172.7 | 89.6 | 59.1 | 2.0 | 323.5 | 32.9 | 3929.3 | 2099.2 | 412.9 | 842.4 |
| 20-Jun-86 | 3845 | 0.7 | 3845.7 | 75.7 | 89.6 | 47.1 | 2.0 | 214.3 | 32.5 | 3663.8 | 2024.1 | 329.8 | 954.9 |
| 21-Jun-86 | 4672 | 0.6 | 4672.6 | 75.7 | 89.6 | 43.3 | 2.0 | 210.6 | 31.8 | 4493.8 | 2267.7 | 287.5 | 1123.6 |
| 22-Jun-86 | 4136 | 0.3 | 4136.3 | 163.5 | 89.6 | 58.9 | 2.0 | 314.1 | 31.2 | 3853.4 | 2073.4 | 368.1 | 694.5 |
| 23-Jun-86 | 4408 | 0.8 | 4408.8 | 75.7 | 89.6 | 40.3 | 2.0 | 207.6 | 30.5 | 4231.6 | 2133.2 | 253.0 | 1057.1 |
| 24-Jun-86 | 3834 | 0.3 | 3834.3 | 75.6 | 89.6 | 38.0 | 2.0 | 205.3 | 30.1 | 3659.2 | 1832.2 | 256.8 | 963.9 |
| 25-Jun-86 | 3936 | 0.3 | 3936.3 | 179.4 | 89.6 | 43.2 | 2.0 | 314.2 | 30.1 | 3652.2 | 1919.1 | 274.4 | 1062.2 |
| 26-Jun-86 | 3820 | 0.6 | 3820.6 | 75.6 | 89.6 | 35.0 | 2.0 | 202.2 | 32.0 | 3650.3 | 2263.0 | 210.7 | 1029.9 |
| 27-Jun-86 | 5318 | 0.7 | 5318.7 | 123.9 | 89.6 | 233.0 | 2.0 | 448.5 | 39.5 | 4909.7 | 1954.9 | 1813.1 | 1332.5 |
| 28-Jun-86 | 5199 | 0.5 | 5199.5 | 197.0 | 89.6 | 82.0 | 2.0 | 370.6 | 28.9 | 4857.7 | 1863.7 | 984.1 | 466.9 |
| 29-Jun-86 | 4677 | 0.7 | 4677.7 | 75.7 | 89.6 | 56.3 | 2.0 | 223.6 | 29.6 | 4483.7 | 1825.8 | 473.4 | 1061.1 |
| 30-Jun-86 | 6036 | 0.3 | 6036.3 | 148.8 | 89.6 | 502.7 | 2.0 | 743.0 | 38.9 | 5330.1 | 1742.8 | 2370.5 | 364.2 |
| | | | | | | | | | | | | | |
| JUN 86 | 4570.6 | 0.5 | 4571.0 | 132.9 | 89.6 | 121.7 | 2.0 | 346.3 | 31.2 | 4255.9 | 1858.2 | 899.7 | 803.6 |

| *LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986* | ROMEOVILLE 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-86 | 4685 | 0.4 | 4685.4 | 210.7 | 98.3 | 187.8 | 2.3 | 499.1 | 28.0 | 4214.3 | 1732.8 | 739.6 | 609.0 |
| 02-Jul-86 | 4602 | 0.5 | 4602.5 | 75.5 | 98.3 | 129.1 | 2.3 | 305.3 | 31.2 | 4328.4 | 1776.5 | 542.8 | 1117.3 |
| 03-Jul-86 | 4766 | 0.5 | 4766.5 | 75.6 | 98.3 | 81.1 | 2.3 | 257.4 | 30.0 | 4539.1 | 1833.1 | 377.0 | 1444.7 |
| 04-Jul-86 | 4561 | 0.5 | 4561.5 | 176.4 | 98.3 | 65.3 | 2.3 | 342.3 | 28.4 | 4247.6 | 1917.4 | 320.6 | 1476.7 |
| 05-Jul-86 | 4512 | 0.6 | 4512.6 | 75.7 | 98.3 | 47.3 | 2.3 | 223.6 | 29.1 | 4318.1 | 2264.7 | 237.1 | 1440.7 |
| 06-Jul-86 | 4966 | 0.7 | 4966.7 | 75.7 | 98.3 | 40.8 | 2.3 | 217.1 | 31.2 | 4780.8 | 2347.0 | 232.7 | 1215.1 |
| 07-Jul-86 | 4110 | 0.7 | 4110.7 | 171.6 | 98.3 | 44.6 | 2.3 | 316.9 | 32.2 | 3826.0 | 1995.8 | 310.3 | 1292.6 |
| 08-Jul-86 | 6485 | 0.6 | 6485.6 | 184.3 | 98.3 | 529.3 | 2.3 | 814.3 | 40.9 | 5712.2 | 1936.7 | 2761.8 | 1528.2 |
| 09-Jul-86 | 6947 | 0.4 | 6947.4 | 191.3 | 98.3 | 442.2 | 2.3 | 734.0 | 35.6 | 6248.9 | 1860.9 | 2501.1 | 602.0 |
| 10-Jul-86 | 5497 | 0.4 | 5497.4 | 196.3 | 98.3 | 208.6 | 2.3 | 505.5 | 32.3 | 5024.3 | 1810.9 | 1178.2 | 371.8 |
| 11-Jul-86 | 6916 | 0.7 | 6916.7 | 145.1 | 98.3 | 723.7 | 2.3 | 969.5 | 43.1 | 5990.3 | 1815.6 | 3197.6 | 1317.0 |
| 12-Jul-86 | 7323 | 0.5 | 7323.5 | 244.8 | 98.3 | 539.5 | 2.3 | 885.0 | 35.5 | 6473.9 | 1807.3 | 2157.7 | 1696.5 |
| 13-Jul-86 | 4588 | 0.6 | 4588.6 | 201.5 | 98.3 | 337.2 | 2.3 | 639.3 | 30.5 | 3979.8 | 1816.8 | 1444.1 | 820.9 |
| 14-Jul-86 | 4698 | 0.5 | 4698.5 | 75.6 | 98.3 | 206.4 | 2.3 | 382.6 | 31.4 | 4347.3 | 1906.8 | 745.4 | 931.1 |
| 15-Jul-86 | 6044 | 0.9 | 6044.9 | 75.6 | 98.3 | 145.4 | 2.3 | 321.7 | 31.3 | 5754.6 | 2124.5 | 727.2 | 1362.2 |
| 16-Jul-86 | 5147 | 0.5 | 5147.5 | 144.7 | 98.3 | 108.5 | 2.3 | 353.9 | 31.9 | 4825.6 | 2580.0 | 781.3 | 2099.9 |
| 17-Jul-86 | 5404 | 1.2 | 5405.2 | 109.1 | 98.3 | 85.7 | 2.3 | 295.5 | 35.2 | 5144.9 | 2806.9 | 606.0 | 1409.1 |
| 18-Jul-86 | 5392 | 0.9 | 5392.9 | 75.6 | 98.3 | 72.0 | 2.3 | 248.3 | 33.3 | 5177.9 | 2820.4 | 449.3 | 1428.1 |
| 19-Jul-86 | 5071 | 0.8 | 5071.8 | 75.7 | 98.3 | 65.3 | 2.3 | 241.6 | 35.1 | 4865.3 | 2687.2 | 401.3 | 980.7 |
| 20-Jul-86 | 5448 | 0.5 | 5448.5 | 163.0 | 98.3 | 66.9 | 2.3 | 330.5 | 32.0 | 5150.0 | 2244.3 | 436.2 | 2066.7 |
| 21-Jul-86 | 5039 | 0.9 | 5039.9 | 75.6 | 98.3 | 57.9 | 2.3 | 234.2 | 32.6 | 4838.3 | 2200.8 | 346.1 | 1757.9 |
| 22-Jul-86 | 5454 | 0.5 | 5454.5 | 75.6 | 98.3 | 55.3 | 2.3 | 231.5 | 34.3 | 5257.3 | 2255.0 | 288.6 | 2040.5 |
| 23-Jul-86 | 5454 | 0.6 | 5454.6 | 172.4 | 98.3 | 59.2 | 2.3 | 332.2 | 34.4 | 5156.8 | 2416.0 | 310.4 | 2452.3 |
| 24-Jul-86 | 5412 | 0.7 | 5412.7 | 75.6 | 98.3 | 50.7 | 2.3 | 227.0 | 36.4 | 5222.2 | 2491.9 | 242.9 | 2164.5 |
| 25-Jul-86 | 6099 | 0.9 | 6099.9 | 148.9 | 98.3 | 69.6 | 2.3 | 319.1 | 36.8 | 5817.6 | 2107.9 | 564.5 | 2237.6 |
| 26-Jul-86 | 5509 | 0.4 | 5509.4 | 106.5 | 98.3 | 51.9 | 2.3 | 259.1 | 31.9 | 5282.2 | 2039.7 | 339.6 | 1931.3 |
| 27-Jul-86 | 5500 | 0.9 | 5500.9 | 75.7 | 98.3 | 46.7 | 2.3 | 222.9 | 30.2 | 5308.1 | 2164.5 | 241.2 | 2428.3 |
| 28-Jul-86 | 5917 | 0.7 | 5917.7 | 225.8 | 98.3 | 115.7 | 2.3 | 442.1 | 35.1 | 5510.8 | 2129.1 | 1019.4 | 1943.3 |
| 29-Jul-86 | 5486 | 0.7 | 5486.7 | 75.6 | 98.3 | 48.5 | 2.3 | 224.8 | 34.0 | 5296.0 | 2160.3 | 318.9 | 2288.3 |
| 30-Jul-86 | 5340 | 0.2 | 5340.2 | 75.6 | 98.3 | 44.8 | 2.3 | 221.0 | 32.9 | 5152.1 | 2158.3 | 251.7 | 2437.5 |
| 31-Jul-86 | 5828 | 0.6 | 5828.6 | 116.2 | 98.3 | 332.5 | 2.3 | 549.3 | 37.3 | 5316.7 | 2203.8 | 1934.2 | 1841.7 |
| JUL 86 | 5425.8 | 0.6 | 5426.4 | 128.0 | 98.3 | 163.2 | 2.3 | 391.8 | 33.4 | 5068.0 | 2142.4 | 838.9 | 1572.0 |

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-86 | 5468 | 0.8 | 5468.8 | 392.4 | 98.5 | 91.1 | 2.0 | 584.0 | 34.4 | 4919.2 | 2091.3 | 397.3 | 1997.7 |
| 02-Aug-86 | 5478 | 0.6 | 5478.6 | 134.2 | 98.5 | 58.1 | 2.0 | 292.8 | 32.8 | 5218.5 | 2054.9 | 241.8 | 2343.9 |
| 03-Aug-86 | 4898 | 0.5 | 4898.5 | 75.7 | 98.5 | 45.7 | 2.0 | 221.8 | 31.7 | 4708.4 | 2007.0 | 201.7 | 1424.3 |
| 04-Aug-86 | 5170 | 0.5 | 5170.5 | 75.6 | 98.5 | 40.7 | 2.0 | 216.8 | 33.1 | 4986.8 | 2179.1 | 177.8 | 2333.4 |
| 05-Aug-86 | 5129 | 0.8 | 5129.8 | 181.6 | 98.5 | 44.6 | 2.0 | 326.7 | 34.3 | 4837.4 | 2143.1 | 226.1 | 1865.5 |
| 06-Aug-86 | 5323 | 0.8 | 5323.8 | 75.6 | 98.5 | 50.2 | 2.0 | 226.2 | 37.9 | 5135.4 | 1918.0 | 374.0 | 2053.1 |
| 07-Aug-86 | 4831 | 0.7 | 4831.7 | 75.6 | 98.5 | 35.5 | 2.0 | 211.7 | 27.0 | 4647.1 | 1912.3 | 324.0 | 1397.0 |
| 08-Aug-86 | 4878 | 0.6 | 4878.6 | 185.4 | 98.5 | 41.4 | 2.0 | 327.3 | 32.1 | 4583.4 | 2029.5 | 315.1 | 1697.4 |
| 09-Aug-86 | 4342 | 0.4 | 4342.4 | 75.7 | 98.5 | 32.7 | 2.0 | 208.8 | 30.1 | 4163.7 | 2065.8 | 229.2 | 1518.1 |
| 10-Aug-86 | 4242 | 0.7 | 4242.7 | 75.7 | 98.5 | 31.5 | 2.0 | 207.6 | 28.6 | 4063.7 | 1836.5 | 244.1 | 1363.5 |
| 11-Aug-86 | 4440 | 0.4 | 4440.4 | 143.7 | 98.5 | 34.1 | 2.0 | 278.3 | 30.6 | 4192.7 | 2019.9 | 245.1 | 1414.5 |
| 12-Aug-86 | 4354 | 0.5 | 4354.5 | 113.4 | 98.5 | 28.6 | 2.0 | 242.5 | 32.5 | 4144.5 | 2086.0 | 204.2 | 1411.3 |
| 13-Aug-86 | 4810 | 0.4 | 4810.4 | 75.6 | 98.5 | 25.3 | 2.0 | 201.4 | 32.0 | 4641.0 | 2150.5 | 168.2 | 1397.2 |
| 14-Aug-86 | 4604 | 1.1 | 4605.1 | 75.6 | 98.5 | 24.7 | 2.0 | 200.8 | 32.7 | 4437.0 | 1999.2 | 145.9 | 1588.7 |
| 15-Aug-86 | 3990 | 0.7 | 3990.7 | 174.1 | 98.5 | 30.7 | 2.0 | 305.3 | 32.0 | 3717.4 | 2016.2 | 206.9 | 1352.5 |
| 16-Aug-86 | 4530 | 0.5 | 4530.5 | 75.7 | 98.5 | 23.7 | 2.0 | 199.8 | 29.9 | 4360.5 | 2055.7 | 164.8 | 1542.1 |
| 17-Aug-86 | 4021 | 1.0 | 4022.0 | 75.7 | 98.5 | 22.9 | 2.0 | 199.1 | 28.6 | 3851.5 | 1998.4 | 179.5 | 1412.0 |
| 18-Aug-86 | 4035 | 0.5 | 4035.5 | 195.0 | 98.5 | 30.0 | 2.0 | 325.4 | 31.2 | 3741.3 | 2173.4 | 240.0 | 1393.8 |
| 19-Aug-86 | 4481 | 0.6 | 4481.6 | 75.6 | 98.5 | 21.4 | 2.0 | 197.5 | 34.4 | 4318.4 | 2157.2 | 174.2 | 1479.6 |
| 20-Aug-86 | 4832 | 0.7 | 4832.7 | 75.6 | 98.5 | 20.6 | 2.0 | 196.8 | 33.4 | 4669.4 | 2279.6 | 152.6 | 1565.3 |
| 21-Aug-86 | 4497 | 0.7 | 4497.7 | 75.6 | 98.5 | 20.0 | 2.0 | 196.1 | 35.1 | 4336.6 | 2201.4 | 169.2 | 1525.0 |
| 22-Aug-86 | 4463 | 0.7 | 4463.7 | 174.7 | 98.5 | 26.0 | 2.0 | 301.2 | 34.6 | 4197.1 | 2270.5 | 204.5 | 1597.9 |
| 23-Aug-86 | 4669 | 0.7 | 4669.7 | 75.7 | 98.5 | 19.1 | 2.0 | 195.3 | 32.0 | 4506.5 | 2158.2 | 153.8 | 1542.1 |
| 24-Aug-86 | 4218 | 0.4 | 4218.4 | 75.7 | 98.5 | 18.7 | 2.0 | 194.9 | 33.1 | 4056.7 | 2074.7 | 129.4 | 1624.2 |
| 25-Aug-86 | 4847 | 0.8 | 4847.8 | 188.7 | 98.5 | 25.8 | 2.0 | 314.9 | 33.5 | 4566.4 | 2119.8 | 204.3 | 2010.4 |
| 26-Aug-86 | 5411 | 0.7 | 5411.7 | 169.4 | 98.5 | 280.7 | 2.0 | 550.6 | 42.0 | 4903.2 | 1971.0 | 1936.9 | 1416.7 |
| 27-Aug-86 | 4828 | 0.5 | 4828.5 | 152.2 | 98.5 | 37.4 | 2.0 | 290.1 | 33.3 | 4571.7 | 1833.6 | 489.9 | 1237.5 |
| 28-Aug-86 | 4326 | 0.4 | 4326.4 | 75.6 | 98.5 | 24.2 | 2.0 | 200.3 | 31.5 | 4157.7 | 1833.1 | 233.4 | 1478.4 |
| 29-Aug-86 | 4340 | 0.4 | 4340.4 | 75.7 | 98.5 | 21.5 | 2.0 | 197.7 | 30.7 | 4173.4 | 1791.0 | 165.7 | 1445.4 |
| 30-Aug-86 | 4234 | 0.4 | 4234.4 | 162.7 | 98.5 | 25.6 | 2.0 | 288.7 | 29.5 | 3975.1 | 1872.7 | 175.3 | 1540.3 |
| 31-Aug-86 | 4472 | 0.3 | 4472.3 | 75.7 | 98.5 | 18.7 | 2.0 | 194.9 | 28.5 | 4305.9 | 1868.5 | 125.2 | 1603.4 |
| AUG 86 | 4650.4 | 0.6 | 4651.0 | 120.3 | 98.5 | 40.4 | 2.0 | 261.1 | 32.3 | 4422.2 | 2037.7 | 277.4 | 1599.1 |

| LAKE MICHIGAN DIVERSION ACCOUNTING WY 1986 | ROMEOVILLE 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-86 | 4072 | 0.3 | 4072.3 | 75.7 | 87.5 | 18.7 | 1.8 | 183.6 | 28.8 | 3917.5 | 1963.4 | 128.1 | 1589.6 |
| 02-Sep-86 | 4135 | 0.5 | 4135.5 | 173.8 | 87.5 | 24.6 | 1.8 | 287.7 | 32.5 | 3880.3 | 2094.5 | 186.5 | 1483.9 |
| 03-Sep-86 | 4387 | 0.4 | 4387.4 | 75.7 | 87.5 | 19.5 | 1.8 | 184.4 | 32.3 | 4235.2 | 1963.8 | 174.3 | 1376.1 |
| 04-Sep-86 | 3942 | 0.5 | 3942.5 | 75.7 | 87.5 | 17.8 | 1.8 | 182.8 | 32.8 | 3792.5 | 1962.0 | 145.2 | 1381.7 |
| 05-Sep-86 | 4176 | 0.4 | 4176.4 | 176.4 | 87.5 | 24.0 | 1.8 | 289.7 | 31.7 | 3918.3 | 1957.3 | 177.0 | 1462.8 |
| 06-Sep-86 | 3698 | 0.3 | 3698.3 | 75.7 | 87.5 | 17.2 | 1.8 | 182.2 | 30.0 | 3546.1 | 1815.4 | 136.2 | 1549.4 |
| 07-Sep-86 | 4109 | 0.3 | 4109.3 | 75.7 | 87.5 | 17.2 | 1.8 | 182.1 | 29.9 | 3957.0 | 1778.8 | 133.7 | 1514.2 |
| 08-Sep-86 | 3703 | 0.4 | 3703.4 | 75.7 | 87.5 | 17.1 | 1.8 | 182.0 | 31.1 | 3552.4 | 1904.4 | 213.1 | 1431.0 |
| 09-Sep-86 | 4101 | 0.5 | 4101.5 | 166.1 | 87.5 | 23.0 | 1.8 | 278.3 | 32.4 | 3855.5 | 1882.7 | 154.1 | 1290.2 |
| 10-Sep-86 | 3876 | 0.7 | 3876.7 | 75.7 | 87.5 | 17.0 | 1.8 | 181.9 | 32.1 | 3727.0 | 1941.7 | 97.5 | 1302.5 |
| 11-Sep-86 | 5676 | 0.6 | 5676.6 | 160.9 | 87.5 | 424.9 | 1.8 | 675.1 | 40.5 | 5042.0 | 1857.9 | 3267.3 | 896.0 |
| 12-Sep-86 | 4767 | 0.5 | 4767.5 | 182.7 | 87.5 | 61.9 | 1.8 | 334.0 | 31.3 | 4464.8 | 1788.0 | 585.4 | 1084.3 |
| 13-Sep-86 | 5281 | 0.3 | 5281.3 | 75.7 | 87.5 | 32.3 | 1.8 | 197.2 | 28.1 | 5112.2 | 1744.1 | 227.2 | 1535.2 |
| 14-Sep-86 | 4579 | 0.3 | 4579.3 | 131.1 | 87.5 | 28.0 | 1.8 | 248.3 | 29.0 | 4360.0 | 1691.1 | 223.6 | 1512.4 |
| 15-Sep-86 | 4445 | 0.5 | 4445.5 | 119.1 | 87.5 | 24.5 | 1.8 | 232.9 | 29.0 | 4241.6 | 1797.7 | 229.2 | 1366.0 |
| 16-Sep-86 | 4262 | 0.2 | 4262.2 | 75.7 | 87.5 | 20.0 | 1.8 | 185.0 | 29.8 | 4107.1 | 1784.3 | 186.1 | 1026.0 |
| 17-Sep-86 | 3958 | 0.3 | 3958.3 | 122.6 | 87.5 | 22.2 | 1.8 | 234.0 | 30.2 | 3754.5 | 1774.3 | 177.6 | 944.0 |
| 18-Sep-86 | 4080 | 0.5 | 4080.4 | 115.8 | 87.5 | 21.4 | 1.8 | 226.4 | 28.9 | 3882.9 | 1748.8 | 197.0 | 968.4 |
| 19-Sep-86 | 4940 | 0.3 | 4940.3 | 118.7 | 87.5 | 230.0 | 1.8 | 438.0 | 35.1 | 4537.4 | 1772.6 | 1346.3 | 1305.4 |
| 20-Sep-86 | 4385 | 0.5 | 4385.5 | 254.7 | 87.5 | 76.5 | 1.8 | 420.5 | 28.9 | 3991.9 | 1713.0 | 551.2 | 363.5 |
| 21-Sep-86 | 5147 | 0.4 | 5147.4 | 214.8 | 87.5 | 213.8 | 1.8 | 517.8 | 32.9 | 4662.4 | 1673.8 | 1369.0 | 1547.3 |
| 22-Sep-86 | 5728 | 0.9 | 5728.9 | 203.0 | 87.5 | 142.2 | 1.8 | 434.5 | 34.3 | 5328.7 | 1852.2 | 1300.9 | 794.4 |
| 23-Sep-86 | 5977 | 0.7 | 5977.7 | 202.9 | 87.5 | 122.3 | 1.8 | 414.5 | 29.4 | 5592.6 | 1783.4 | 1251.1 | 2293.5 |
| 24-Sep-86 | 7018 | 0.6 | 7018.6 | 158.9 | 87.5 | 396.5 | 1.8 | 644.7 | 40.2 | 6414.1 | 1779.5 | 2571.1 | 1675.8 |
| 25-Sep-86 | 5819 | 1.0 | 5820.0 | 287.7 | 87.5 | 206.2 | 1.8 | 583.1 | 30.8 | 5267.6 | 1868.1 | 1429.5 | 1649.0 |
| 26-Sep-86 | 8826 | 0.3 | 8826.3 | 81.4 | 87.5 | 1565.5 | 1.8 | 1736.2 | 40.6 | 7130.8 | 1814.8 | 4910.1 | 745.6 |
| 27-Sep-86 | 6427 | 0.7 | 6427.7 | 232.5 | 87.5 | 536.3 | 1.8 | 858.0 | 28.3 | 5598.0 | 1770.8 | 1951.5 | 1368.2 |
| 28-Sep-86 | 7270 | 0.5 | 7270.5 | 357.7 | 87.5 | 328.9 | 1.8 | 775.9 | 28.4 | 6523.1 | 1720.2 | 1657.2 | 1818.7 |
| 29-Sep-86 | 8586 | 0.8 | 8586.8 | 174.8 | 87.5 | 478.9 | 1.8 | 743.0 | 40.8 | 7884.6 | 1790.3 | 4458.9 | 1759.1 |
| 30-Sep-86 | 8063 | 0.3 | 8063.3 | 190.6 | 87.5 | 610.9 | 1.8 | 890.8 | 37.3 | 7209.7 | 1767.7 | 4115.2 | 985.8 |
| | | | | | | | | | | | | | |
| SEP 86 | 5181.1 | 0.5 | 5181.6 | 150.2 | 87.5 | 191.3 | 1.8 | 430.8 | 32.2 | 4782.9 | 1825.2 | 1118.4 | 1334.0 |